MACTEC DESIGN CALCULATION OR ANALYSIS COVER SHEET

Project Name: PSEG ESP Application Project	Project Number: 6468-08-2251	Calc/Anls Number: 2251-ESP-REI-2047-ACR-014. Rev 1	Sheet: 1 of 1

Nuclear Safety Classification: (SR) NSR AQ	Subject: PSEG Site hazard contribution by source	Discipline: Seismology

Originator: Jason M. Altekruse (JMA)	Origination Date: 10-22-09	Principal Professional: J. Allan Tice
Reviewer: John Vlasity (JV)		

Comments: The attached calculation was prepared by Risk Engineering, a part of Fugro William Lettis Associates and is supported by electronic files in Record No. 2047-ACR-015. The Risk Engineering cover sheet documents their review and approval. This cover sheet documents final approval by MACTEC.

Revision 1 is issued to change site name terminology from Hope Creek to PSEG Site. A revision in chart titles in the file HAZARD_SENS_PLOT.XLS contained within the supporting record was also made and the Supporting Record is revised to Rev. 1. This cover sheet documents approval of Rev. 1 by MACTEC. Revision 1 was prepared by John Vlasity and reviewed by Robin McGuire.

As part of the response to MACTEC's Corrective Action Plan for Condition Report PSEG-22, a MACTEC Design Verification sheet has been completed and attached. The original design verification (designated as approval on the REI cover sheet) was reviewed by MACTEC personnel and the MACTEC Design Verification sheet was completed to indicate acceptance of the REI approval.

This calculation is one of 12 that were prepared for development of the Probabalistic Seismic Hazard Assessment (PSHA) and Hazard as described in Work Instruction 128. A list of all the calculations associated with the PSHA and Hazard is attached.

SJR 10/14/10

Rev #: 0	Reason: Original issue	By: RLK 5/20/10	Date: 5.20.10	Approved: —
Rev #: 1	Reason: Change terminology from Hope Creek to PSEG Site	By: RLK	Date: 5.20.10	Approved: JJT 5/20/10
Rev #:	Reason:	By:	Date:	Approved:
Rev #:	Reason:	By:	Date:	Approved:

LISTING OF CALCULATIONS
PERFORMED UNDER WI 128
(PSHA and HAZARD)

REI CALCULATION RECORD NO.	SUBJECT	MACTEC CALCULATION NO. ASSIGNED
2047-ACR-013 Rev. 1	Documentation of ground motion equations for the PSEG Site	2251-ESP-REI-2047-ACR-013 Rev. 1
2047-ACR-014 Rev. 1	PSEG Site hazard contribution by source	2251-ESP-REI-2047-ACR-014 Rev. 1
2047-ACR-016 Rev. 1	Base rock hazard calculation (no CAV) for the PSEG Site	2251-ESP-REI-2047-ACR-016 Rev. 1
2047-ACR-018 Rev. 2	Deaggregation of 10^{-4} rock hazard at the PSEG Site	2251-ESP-REI-2047-ACR-018 Rev. 2
2047-ACR-020 Rev. 1	Deaggregation of 10^{-5} rock hazard at the PSEG Site	2251-ESP-REI-2047-ACR-020 Rev. 1
2047-ACR-022 Rev. 1	Deaggregation of 10^{-6} rock hazard at the PSEG Site	2251-ESP-REI-2047-ACR-022 Rev. 1
2047-ACR-024 Rev. 1	High- and low-frequency horizontal spectra for the PSEG Site	2251-ESP-REI-2047-ACR-0024 Rev. 1
2047-ACR-026 Rev. 2	Create *.SRC files for EPRI-SOG sources (CAV, $M_{min} = 4.3$), PSEG Site	2251-ESP-REI-2047-ACR-026 Rev. 2
2047-ACR-028 Rev. 1	Create *.SRC files for comparision to 1989 hazard, Hope Creek plant	2251-ESP-REI-2047-ACR-028 Rev. 1
2047-ACR-030 Rev. 1	Replication of 1989 EPRI-SOG hazard for the Hope Creek plant	2251-ESP-REI-2047-ACR-030 Rev. 1
2047-ACR-036 Rev. 1	Calculation of soil hazard for the PSEG Site	2251-ESP-REI-2047-ACR-036 Rev. 1
2047-ACR-044 Rev. 2	Replication of 1989 EPRI-SOG hazard for individual Law Engineering sources	2251-ESP-REI-2047-ACR-044 Rev. 2

MACTEC 2251-ESP-REI-2047-ACR-014 Rev 1

DESIGN VERIFICATION CONTROL SHEET

Design Verification Checklist (excerpted from ANSI N.45.11 [1974 Edition] and ASME NQA-1-1994 Edition			
Yes	No	N/A	Design Verification Element Note: Any items checked "No" automatically imply the design is not verified.
		X	Is the person performing the design verification qualified to originate the document?
X			Is the design verification being performed by someone other than the supervisor of the originator?
X			Were the design inputs correctly selected and incorporated into design?
X			Are assumptions necessary to perform the design activity adequately described and reasonable? Where necessary, are assumptions identified for subsequent re-verifications when the detailed design activities are completed?
		X	Are the appropriate quality and quality assurance requirements specified?
		X	Are the applicable codes, standards and regulatory requirements including issue and addenda properly identified, and their requirements for design met?
		X	Have applicable construction and operating experiences been considered?
		X	Have the design interface requirements been satisfied?
X			Were appropriate design methods and computer programs used?
X			Is the design output reasonable compared to design inputs?
		X	Are the specified parts, equipment, and processes suitable for the required application?
		X	Are the specified materials compatible with each other and the design environmental conditions to which the material will be exposed?
		X	Have adequate maintenance features and requirements been specified?
		X	Are accessibility and other design provisions adequate for performance of needed maintenance and repair?
		X	Have adequate accessibility been provided to perform the in-service inspection expected to be required during the plant life?
		X	Has the design properly considered radiation exposure to the public and plant personnel?
		X	Are the acceptance criteria incorporated in the design documents sufficient to allow verification that design requirements have been satisfactorily accomplished?
		X	Have adequate pre-operational and subsequent periodic test requirements been appropriately specified?
		X	Have adequate handling, storage, cleaning, and shipping requirements been specified?
		X	Are adequate identification requirements specified?
		X	Are requirements for record preparation review, acceptance, retention, etc., adequately specified?

Verified by: [signature] Date: 10-12-10 Approved by: [signature] SSR Date: 10/14/10

S&L Acceptance Review : Name: Dan Kocunik Sign: [signature] Date: 10/11/10.

MACTEC DESIGN CALCULATION OR ANALYSIS COVER SHEET

Project Name: PSEG ESP Application Project	Project Number: 6468-08-2251	Calc/Anls Number: 2251-ESP-REI-2047-ACR-014. Rev 1	Sheet: 1 of 19

Nuclear Safety Classification: SR NSR AQ	Subject: PSEG Site hazard contribution by source	Discipline: Seismology

Originator: Jason M. Altekruse (JMA) Reviewer: John Vlasity (JV)	Origination Date: 10-22-09	Principal Professional: J. Allan Tice

Comments: The attached calculation was prepared by Risk Engineering, a part of Fugro William Lettis Associates and is supported by electronic files in Record No. 2047-ACR-015. The Risk Engineering cover sheet documents their review and approval. This cover sheet documents final approval by MACTEC.

Revision 1 is issued to change site name terminology from Hope Creek to PSEG Site. A revision in chart titles in the file HAZARD_SENS_PLOT.XLS contained within the supporting record was also made and the Supporting Record is revised to Rev. 1. This cover sheet documents approval of Rev. 1 by MACTEC. Revision 1 was prepared by John Vlasity and reviewed by Robin McGuire.

Rev #: 0	Reason: Original issue	By: 5/20/10	Date: 5-20-10	Approved:
Rev #: 1	Reason: Change terminology from Hope Creek to PSEG Site	By:	Date: 5.20.10	Approved: 5/20/10
Rev #:	Reason:	By:	Date:	Approved:
Rev #:	Reason:	By:	Date:	Approved:

2047-000-013

RISK ENGINEERING, INC.
V: PROJECT ANALYSIS AND CALCULATION RECORD

Title: ***PSEG Site hazard contribution by source***

Record No. 2047 -ACR- 014 **Rev. 1** (calcs)

Record No. 2047 -ACR- 015 **Rev. 1** (elec. files)

Rev.	Status	Date	Description	Prep. by	Rev. by	App.* by
0	Final	10/22/2009	Initial Issue	JMA	JAV	RKM
1	Final	5/12/2010	Clarification of site name	JV	RKM	RKM

*Approval for release of results

Description of work:	Reviewer Initials
1. Are objectives clearly stated?	RKM
2. Are inputs correctly selected, stated, and referenced?	RKM
3. Are literature searches and background information completely described?	RKM
4. Are assumptions completely described and referenced?	RKM
5. Is an appropriate computer program used for analysis?	RKM
6. Are appropriate methods/equations used for hand calculations?	RKM
7. Are the results reasonable, considering the input?	RKM
8. Have mathematical checks been made to ensure the accuracy of the results?	RKM
9. Have the accuracy and conclusions been confirmed?	RKM

All calculations shall fully describe:
1. Objectives of analysis.
2. Design inputs, sources, and references.
3. Literature searches and background information.
4. Assumptions, basis for assumptions, and references.
5. If computer calculations, program name and version name.
6. If hand calculations, equations used and outputs.

1. Objectives of analysis

Calculate rock seismic hazard curves (no CAV filter) for 1 and 10 Hz at **the PSEG Site**, using the seismic sources presented in Refs. 1 – 3. Evaluate the contribution by source to total team hazard at **the PSEG Site** for each of the six EPRI-SOG teams for the individual EPRI-SOG and Charleston sources. **Rev. 1 clarifies the site name.**

2. Inputs

Seismic sources: Table 1 lists the EPRI-SOG sources (Ref. 1) and Charleston sources (Refs. 2 and 3) used in this sensitivity study. These include all EPRI sources within 200 miles of **the PSEG Site**, plus EPRI Charlevoix/St. Lawrence sources and the Charleston sources.

Table 1. EPRI-SOG and Charleston sources

BEC		02, 03, 13, 17, 23, 24, 25A, E, BZ4, BZ5, BZ6, BZ8, C08
DAM		04, 4C, 4D, 40, 41, 42, 43, 44, 45, 47, 53, 58, 59, 63, C01, C02
LAW		9SW, 12, 17, 101, 102, 103, 105, 107, 112, 217, C10, C11, C13, M11, M12, M13, M14, M15, M16, M17, M18, M19, M20, M21, M22, M25, M26
RND		29, 30, 31, 32, 33, 37, 39, 41, C01, C02, C07, C09
WCC		01, 02, 10, 11, 12, 14, 21, 21A, 22, 23, 24, 25, 26, 27, 28, 53, 61, 63, B10, C07
WGC		01, 04, 10, 16, 19, 22, 102, 103, C01, C02, C06, C07, C08, C09, C10, C17, C18, C19, C21, C22, C23, C24, C27, C28, C34, C35
Charleston	Characteristic fault sources	C-A, C-B, C-BP, C-C
	Exponential area sources	C-A-exp, C-B-exp, C-BP-exp, C-C-exp

*Note: underlined sources have "-HC" appended to their *.SRC file names (Ref. 1).*

Ground motions: The 2004 EPRI ground motion model is used for all EPRI-SOG sources as documented in Ref. 6.

3. Literature search and background information

This analysis uses a hard rock seismic hazard calculation with 2004 EPRI ground motions (Ref. 4), no CAV filter and a minimum magnitude of 5.0 for the **PSEG Site**. Note that LAW source 105 conservatively uses a minimum magnitude of 4.3 as discussed in Ref. 1 (see note about ATTEN_TBL_*.DAT file below).

This analysis identifies contributing and non-contributing sources for each of the six EPRI-SOG teams. The total mean hazard of all non-contributing sources must be less than 1% of the total mean hazard for each team.

4. Assumptions and basis

It is assumed that the *.SRC files for the sources listed above are accurate and appropriate for use. The basis is that they were developed under QA control (Ref. 1). It is assumed that the 2004 EPRI ground motion relations are appropriate for use. The basis is that they were developed under their own QA control (Ref. 4). It is assumed that the

appropriate ground motion equations are used for each source. The basis is documented in Ref. 6.

5. Computer calculations

Program name:	ATTEN_TBL_EPRI2003G.EXE	(ATTEN_TBL Ver. 1.02)
Program name:	PREP88V107.EXE	(PREP88 Ver. 1.07)
Program name:	FRISK88_VER30_EPRI2003G.EXE	(FRISK88 Ver. 3.0)

All electronic files for the sensitivity calculation are included in Ref. 5.

6. Hand calculations

BEC and WCC *.TREE files (Ref. 1) were split into two parts due to the large number of logic tree branches. All *.SRC and *.TREE files (copied from Refs. 1 – 3) are stored in the SOUR_TREE_FILES_HC-2009-R0 directory (Ref. 5) and are copied into the team directories when needed. All other directories are subdirectories of EPRI_HC_2009 in Ref. 5.

EPRI3M, EPRIF, and RIFT3M *.ATT files were created for 1 and 10 Hz in the ATTEN directory (*_H_1HZ.ATT and *_H_10HZ.ATT). The JCALC code is in the form "*nx*," where *x* represents the frequency (1 Hz, *x* = 3, and 10 Hz, *x* = 6), and *n* is from 1 to 9 for general area sources (EPRI3M), and from 1 to 12 for non-general areas and faults (RIFT3M and EPRIF). Table 2 lists the coefficient values used in the *.ATT files.

Table 2. *.ATT file coefficient values

Model	C8	C9	C10
EPRI3M	11 to 13	2	11 to 16
RIFT3M	11 to 13	2	11 to 16
EPRIF	0	0	11 to 16

CALCULATION PROCEDURE:

Batch files are used to run the calculation steps listed below. Except for steps 1 and 5, below, all batch files are run from the main calculation directory (EPRI_HC_2009) in Ref. 5.

1. In the ATTEN_TBL directory, check that ATTEN_TBL_*.DAT files specify the correct magnitude and distance distributions. Run ATTEN_TBL (RUN_ATTEN_TBL*.BAT files) to generate *.ATT_TABLE files. Note that file ATTEN_TBL_50z-EPRI3M.DAT reflects a minimum magnitude of 4.3 for LAW source 105 (see Section 3).
2. Check that *.LIST files in each team directory lists the correct sources (Table 1) and specifies the correct *.TREE file for each source.
3. Run the MGR batch file (RUNMGR.BAT) to generate *.MAS files for each source in the frequency sub-directories. The *.MAS files are then used by PREP88 to generate *.INP files for FRISK88 and produces batch files to run FRISK88 in each frequency subdirectory for each team (e.g. BEC_H_1HZ.BAT).
4. Run FRISK88 batch files (RUNFRISK.BAT) to generate *.FRAC files for each individual source at both frequencies.

5. Repeat steps 2 – 4 in the Charleston directory (CHARLES) using the *CHAR.BAT batch files.
6. Mean hazards for individual sources (*.FRAC files) at 1 and 10 Hz are imported into Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5) on worksheet MEANS. Charleston source mean hazards are imported on worksheet CHARLES_MEANS. All mean hazards are compiled on worksheet MEAN_BY_SOURCE, and the total mean hazard for each team is calculated (the sum of individual source mean hazards, including Charleston sources). Plot worksheets reference the hazard curves on worksheet MEAN_BY_SOURCE.

HAZARD CONTRIBUTION BY SOURCE:

Mean hazard curves for each team's individual sources are compared to the team total mean hazard curves in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).

This analysis compares mean hazard curves at 1 and 10 Hz for all individual EPRI and Charleston sources to the total mean hazard for each team. The total mean hazard for a team is the sum of mean hazard from all of the team's individual sources and all Charleston sources. The "target amplitude" is the amplitude at which the team total mean hazard is 1E-4. The subset of individual EPRI and Charleston sources that contribute 99% of the total mean hazard at the "target amplitude" for each team are called contributing sources (see Table 3) and are the source model for subsequent **PSEG Site** hazard calculations. The combined hazard of all non-contributing sources, or sources to be excluded from the source model, must be less than 1% of the team total hazard at the "target amplitude".

Table 5 shows the total hazard for all sources, contributing sources, and non-contributing (dropped) sources, and the percent contribution of dropped sources to total hazard for all sources. Table 2 contains excerpts from the sensitivity tables on each team worksheet in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5), which are used to separate contributing and non-contributing sources. The tables provide a clear way to identify contributing sources when the plots (Figures 3 – 8) are insufficient due to the large number of sources.

Figure 1 shows 1 and 10 Hz mean hazard curves for the individual Charleston sources. The solid lines marked by dots are the total hazard for the Charleston fault and Charleston exponential sources, respectively.

Figure 2 shows the 1 and 10 Hz team total mean hazard curves with the total Charleston hazard curves from Figure 1 (solid lines with dots). Each team total hazard curve includes all of the team's sources listed in Table 1 and all Charleston sources.

Figures 3 through 8 show 1 and 10 Hz mean hazard curves for individual EPRI sources by team and the total team mean hazard curve. The team total hazard curves include all team sources listed in Table 1 and all Charleston sources. Note that it is difficult to identify individual sources on the DAM, LAW, WCC, and WGC plots due to the large number of sources plotted, for a clearer view of individual source contributions, see the sensitivity tables in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).

SUMMARY OF RESULTS:

Table 3 lists the EPRI-SOG and Charleston sources that contribute 99% of site hazard, by team, at **the PSEG Site**. This source model is for use in subsequent **PSEG Site** hazard calculations. Table 4 identifies the sources that were included in the 1989 source model (Ref. 7) that are not contributing sources **for the PSEG Site** (Table 3).

Table 3. Contributing EPRI-SOG and Charleston sources

BEC	(8)	02, 03, 13, 24, BZ4, BZ5, BZ6, E
DAM	(11)	04, 4D, 40, 41, 42, 47, 53, 58, 59, 63, C01
LAW	(17)	9SW, 12, 17, 107, C10, C11, C13, M11, M13, M14, M15, M16, M17, M18, M19, M20, M21
RND	(6)	29, 30, 31, 37, C01, C09
WCC	(12)	12, 21, 21A, 22, 23, 24, 26, 27, 53, 61, 63, B10
WGC	(16)	01, 22, C01, C07, C08, C17, C18, C19, C21, C22, C23, C24, C27, C28, C34, C35
Charleston	(4)	C-A, C-B, C-BP, C-C

*Notes: underlined sources have "-HC" appended to their *.SRC file names (Ref. 1). The number in parentheses is the number of contributing sources.*

Table 4. Comparison to the 1989 EPRI-SOG source model

LAW-22	Represented by sources C11 and C13.
LAW-C09	Represented by source C10.
WCC-B09	**Background B09 is replaced by Background B10.** B09 and B10 are identical.
WGC-28A	Represented by source C01.
WGC-C09	C08 and C09 are the two source-21 combination zones included in the 1989 source model. This calculation also considers the remaining two source-21 combination zones, C07 and C10. Of these four, C07 and C08 are contributing sources.

References

1. Risk Engineering, Inc. (**2010**). *Create *.SRC files for EPRI-SOG sources, **PSEG Site***. REI QA record 2047-ACR-005 **Rev. 1**.
2. Risk Engineering, Inc. (2009). *Source files for WLA Charleston fault sources*. REI QA record 2047-ACR-009.
3. Risk Engineering, Inc. (2009). *Source files for WLA Charleston exponential sources*. REI QA record 2047-ACR-011 **Rev. 1**.
4. EPRI. (2004). *CEUS ground motion project, Final Report*. Elec. Power Res. Inst, Palo Alto, CA, Rept. 1009684, December.
5. Risk Engineering, Inc. (**2010**). *Electronic files for Sensitivity study for **the PSEG Site***. REI QA record 2047-ACR-015 **Rev. 1**.

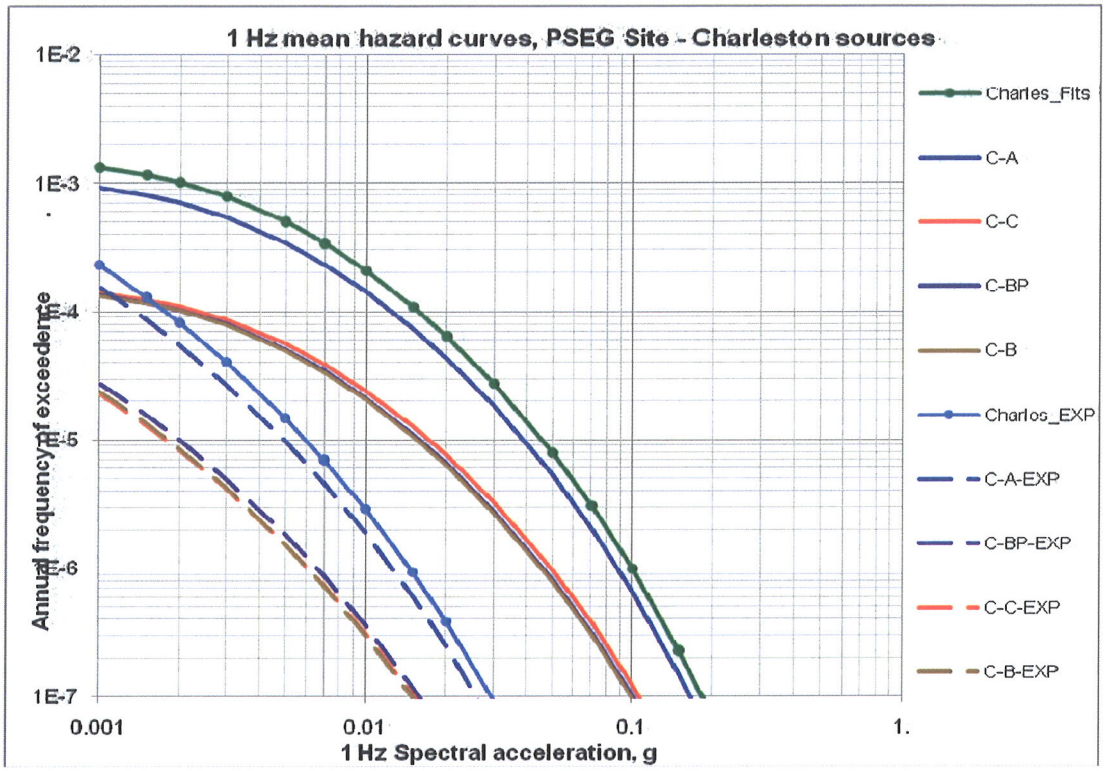
6. Risk Engineering, Inc. (**2010**). *Documentation of ground motion equations for the **PSEG Site***. REI QA record 2047-ACR-013 **Rev. 1**.

7. Mactec. (2009). *Transmittal of EPRI-SOG input files for Hope Creek*, REI QA record 2047-EXD-001.

Table 5. Total hazard and percent contribution of dropped sources at 1 and 10 Hz

Freq.	Ampl. (g)	Total Hazard: All sources[1]	Total Hazard: Contributing Sources[2]	Total Hazard: Dropped Sources[3]	Percent Contribution: Dropped Sources[4]
Bechtel					
1 Hz	0.030	1.090E-04	1.088E-04	2.209E-07	0.20%
	0.050	3.899E-05	3.896E-05	3.269E-08	0.08%
10 Hz	0.300	1.097E-04	1.097E-04	1.176E-09	< 0.01%
	0.500	4.583E-05	4.583E-05	7.917E-11	< 0.01%
Dames & Moore					
1 Hz	0.020	1.119E-04	1.111E-04	7.348E-07	0.66%
	0.030	4.880E-05	4.853E-05	2.632E-07	0.54%
10 Hz	0.070	1.384E-04	1.379E-04	4.673E-07	0.34%
	0.100	7.125E-05	7.105E-05	2.003E-07	0.28%
Law Engineering					
1 Hz	0.030	1.159E-04	1.151E-04	7.416E-07	0.64%
	0.050	4.089E-05	4.072E-05	1.619E-07	0.40%
10 Hz	0.200	1.027E-04	1.024E-04	3.196E-07	0.31%
	0.300	4.747E-05	4.742E-05	5.436E-08	0.11%
Rondout					
1 Hz	0.030	1.563E-04	1.560E-04	3.426E-07	0.22%
	0.050	5.533E-05	5.528E-05	4.779E-08	0.09%
10 Hz	0.200	1.649E-04	1.648E-04	2.174E-08	0.01%
	0.300	8.964E-05	8.964E-05	3.049E-09	< 0.01%
Woodward-Clyde					
1 Hz	0.030	1.426E-04	1.417E-04	9.619E-07	0.37%
	0.050	5.336E-05	5.313E-05	2.285E-07	0.24%
10 Hz	0.300	1.183E-04	1.183E-04	2.694E-08	0.02%
	0.500	4.945E-05	4.944E-05	3.585E-09	0.01%
Weston					
1 Hz	0.020	1.374E-04	1.363E-04	1.101E-06	0.80%
	0.030	5.773E-05	5.742E-05	3.132E-07	0.54%
10 Hz	0.100	1.636E-04	1.628E-04	7.858E-07	0.48%
	0.150	8.179E-05	8.159E-05	1.980E-07	0.24%

Notes: (1) Total hazard includes all team sources and Charleston sources. (2) Contributing sources include sources listed in Table 3 and Charleston faults. (3) Dropped sources include remaining team sources and Charleston exponential sources. (4) Total hazard for dropped sources relative to total hazard for all sources. Data copied from team worksheets in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).



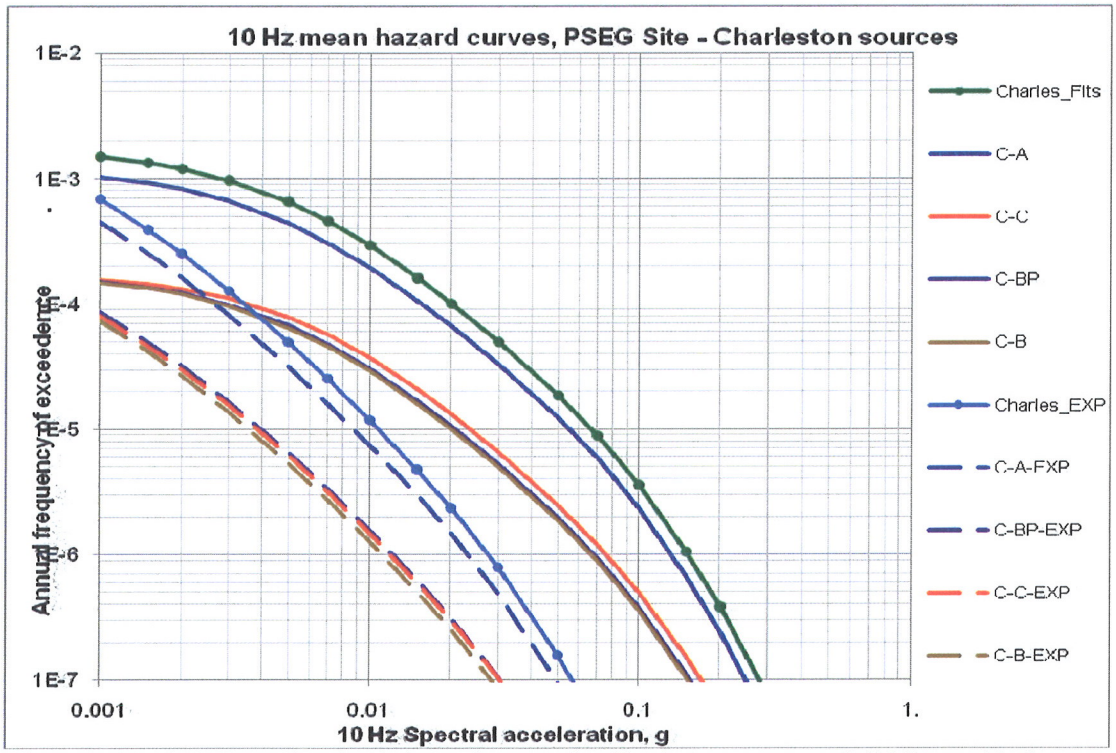
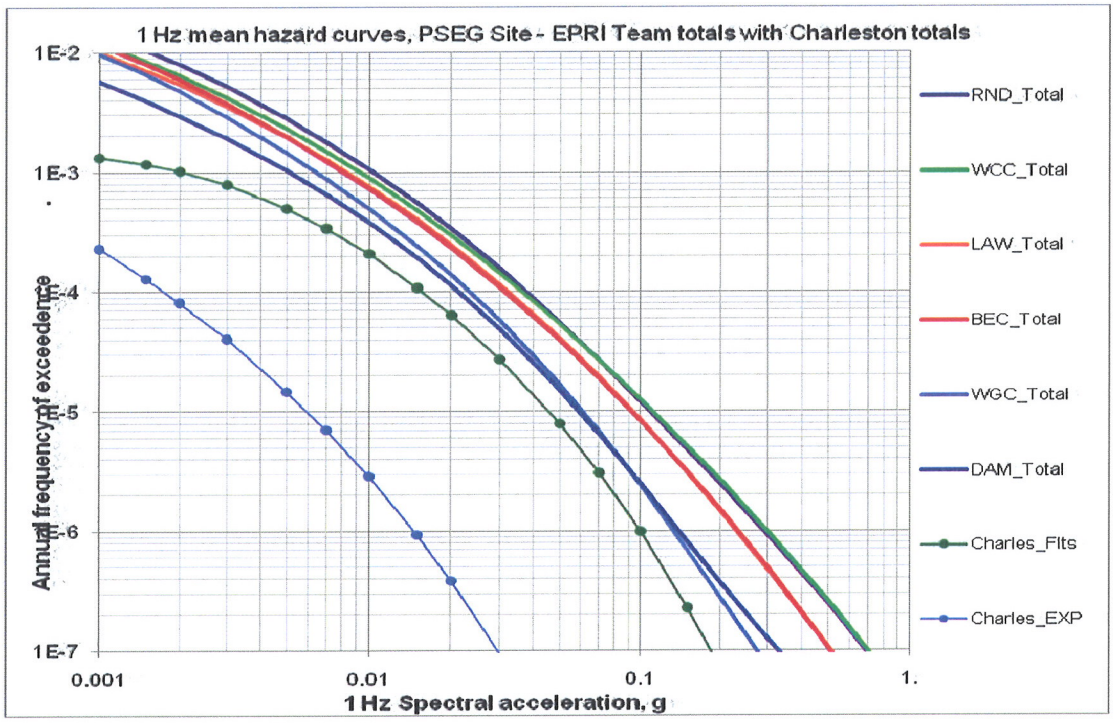


Figure 1. 1 and 10 Hz rock seismic hazard curves for Charleston sources. Solid lines with dots are the total hazard from Charleston faults and Charleston exponential sources, respectively.
Figure source: worksheet SUMMARY_PLOTS in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).



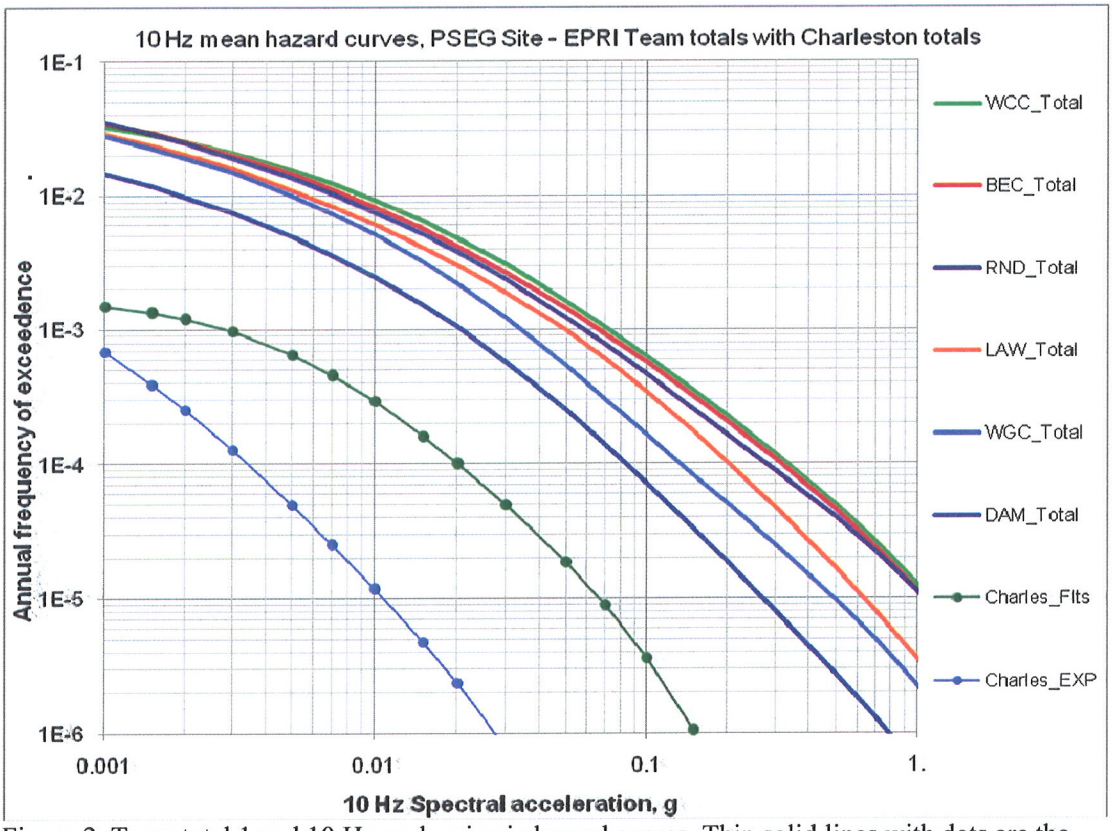
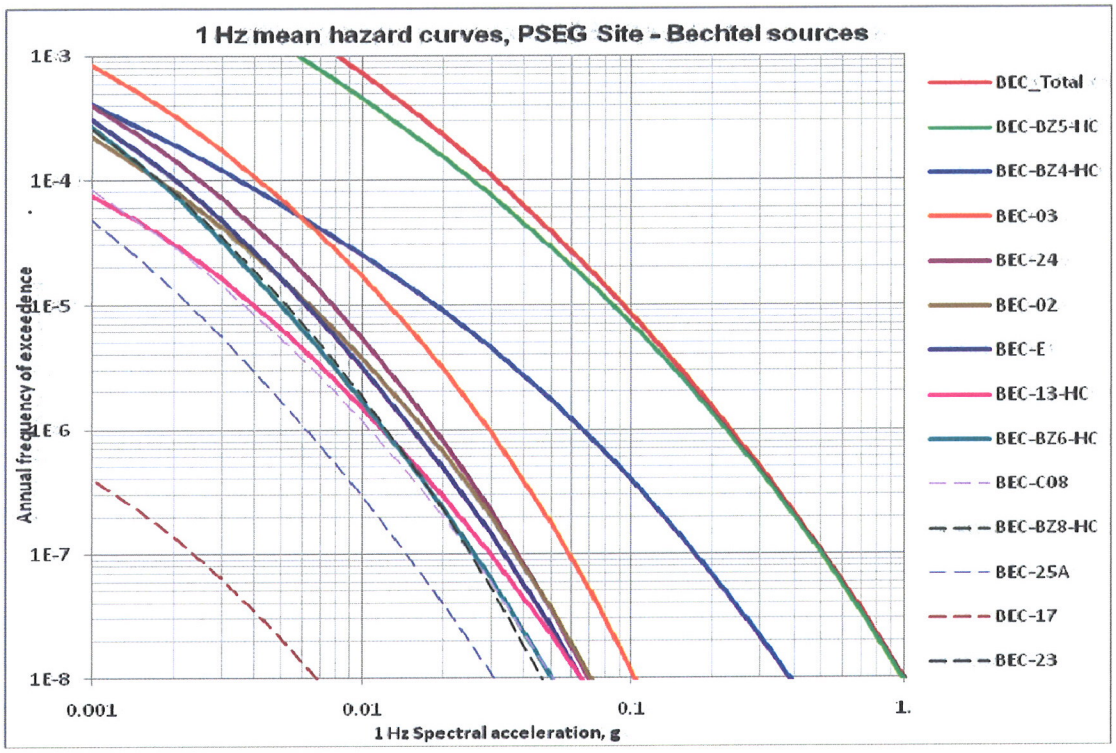


Figure 2. Team total 1 and 10 Hz rock seismic hazard curves. Thin solid lines with dots are the total hazard from Charleston faults and Charleston exponential sources, respectively.
Figure source: worksheet SUMMARY_PLOTS in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).



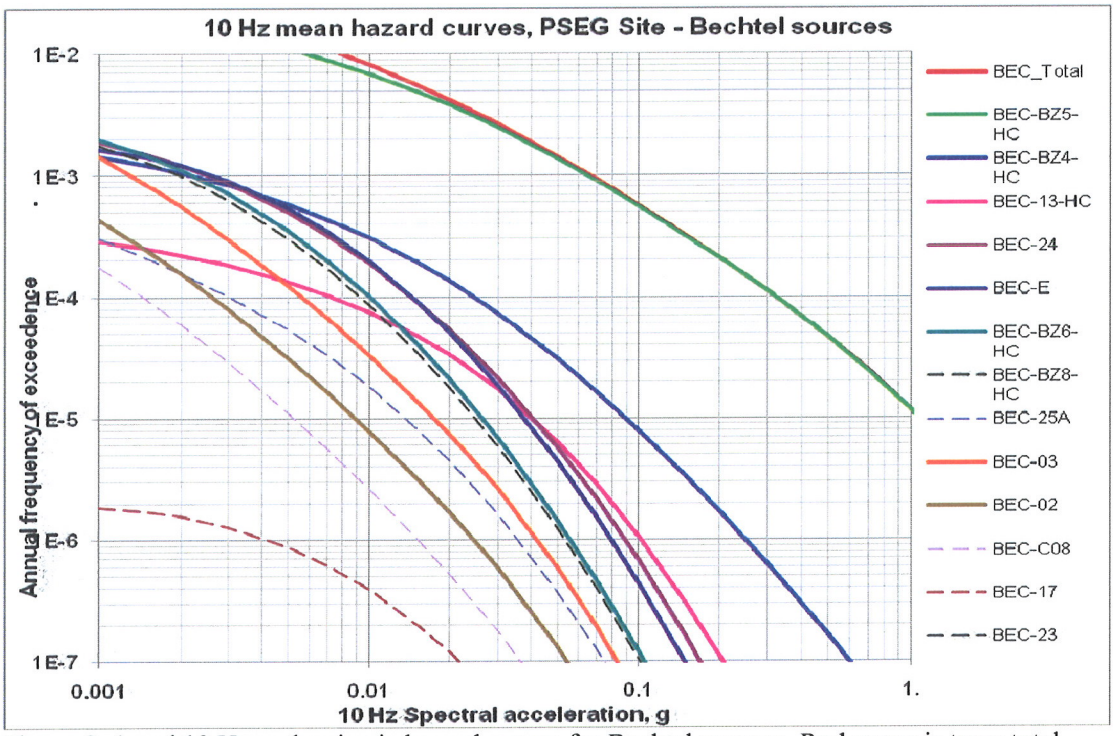
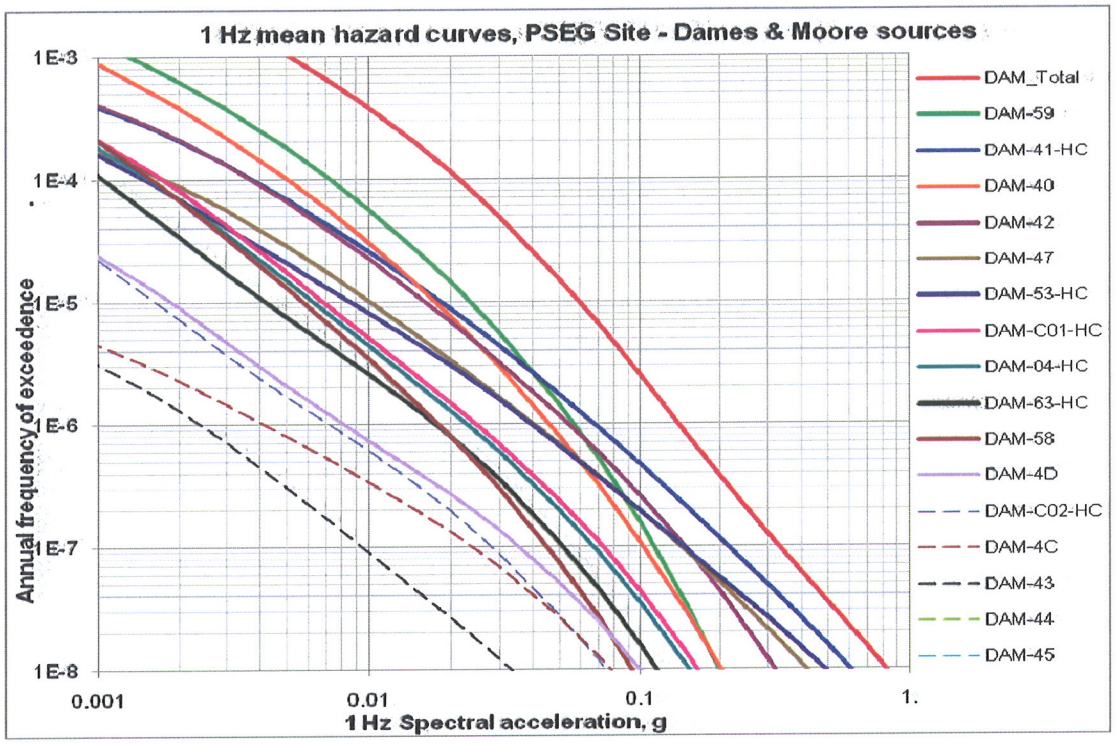


Figure 3. 1 and 10 Hz rock seismic hazard curves for Bechtel sources. Red curve is team total, which is the sum of all individual BEC sources and all eight Charleston sources. The hazard curve for source 23 is not visible at this scale. Non-contributing sources are shown with dashed lines. See Excel file (Ref. 5) for plot data.
Figure source: worksheet BEC in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).



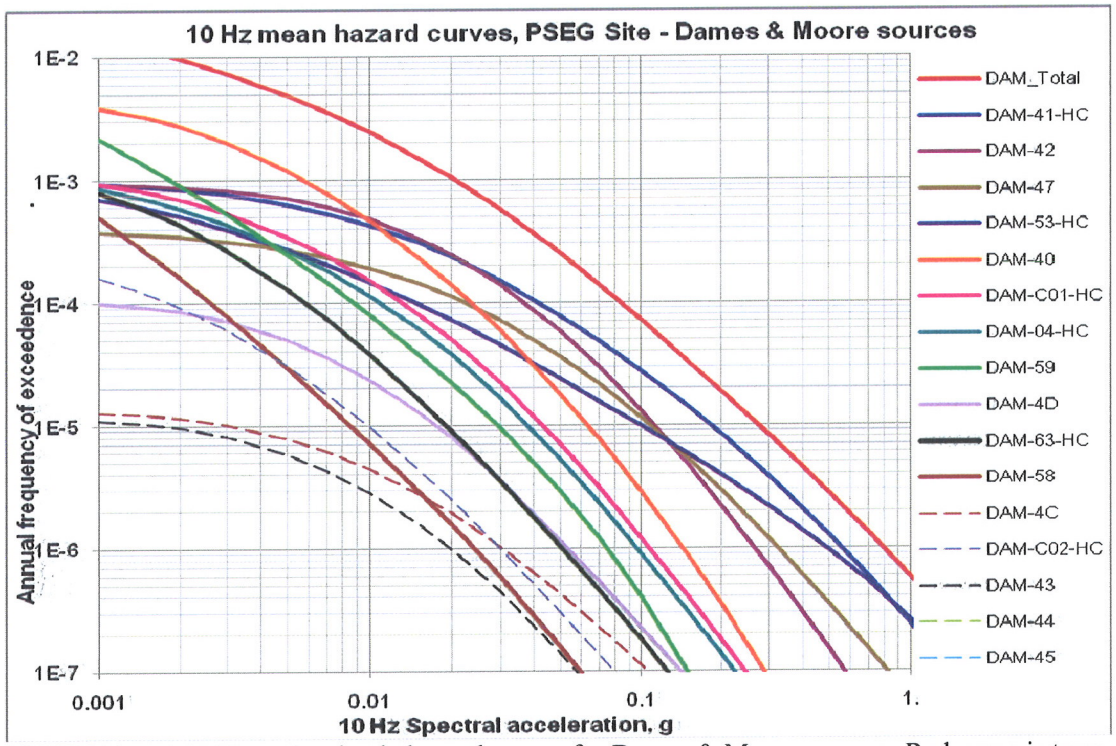
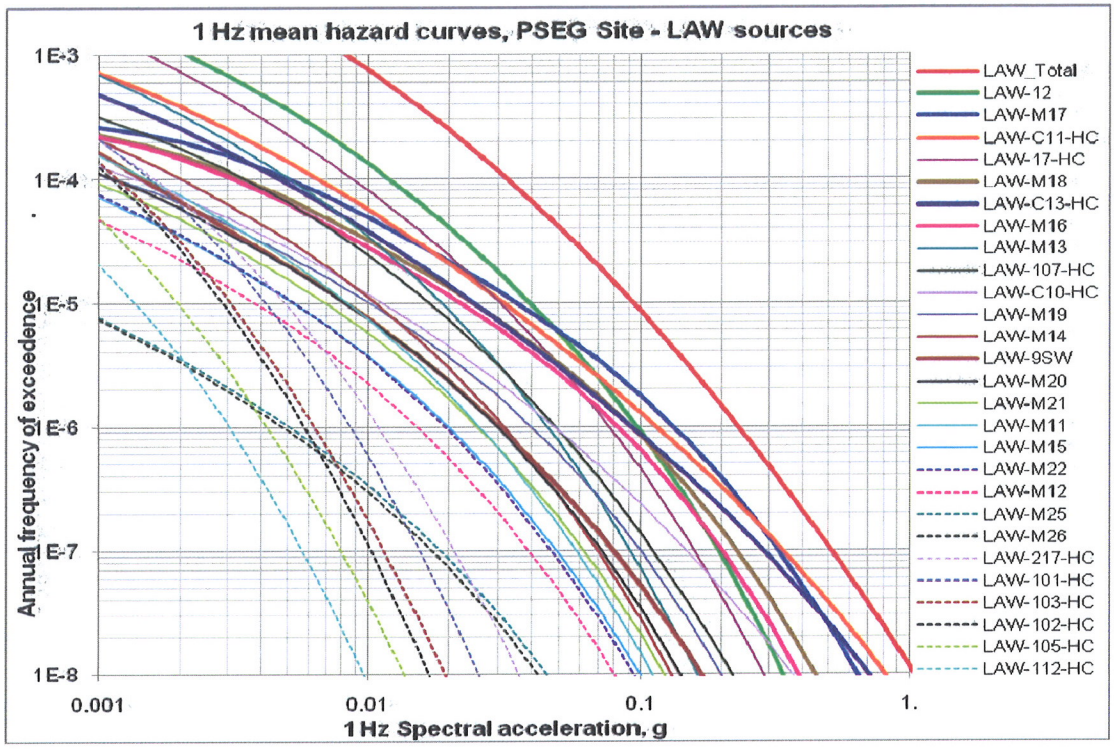


Figure 4. 1 and 10 Hz rock seismic hazard curves for Dames & Moore sources. Red curve is team total, which is the sum of all individual DAM sources and all eight Charleston sources. Source 44 and 45 hazard curves are not visible at this scale. Non-contributing sources are shown with dashed lines. See Excel file (Ref. 5) for plot data.
Figure source: worksheet DAM in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).



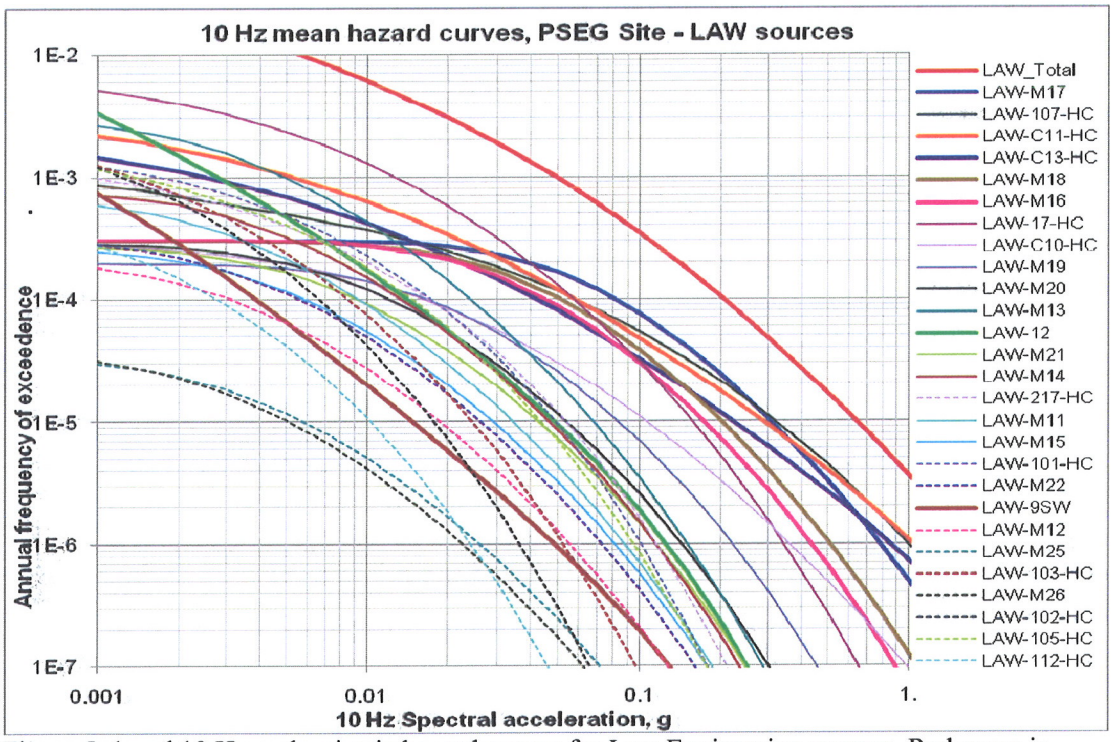


Figure 5. 1 and 10 Hz rock seismic hazard curves for Law Engineering sources. Red curve is team total, which is the sum of all individual LAW sources and all eight Charleston sources. Non-contributing sources are shown with dashed lines. See Excel file (Ref. 5) for plot data.
Figure source: worksheet LAW in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).

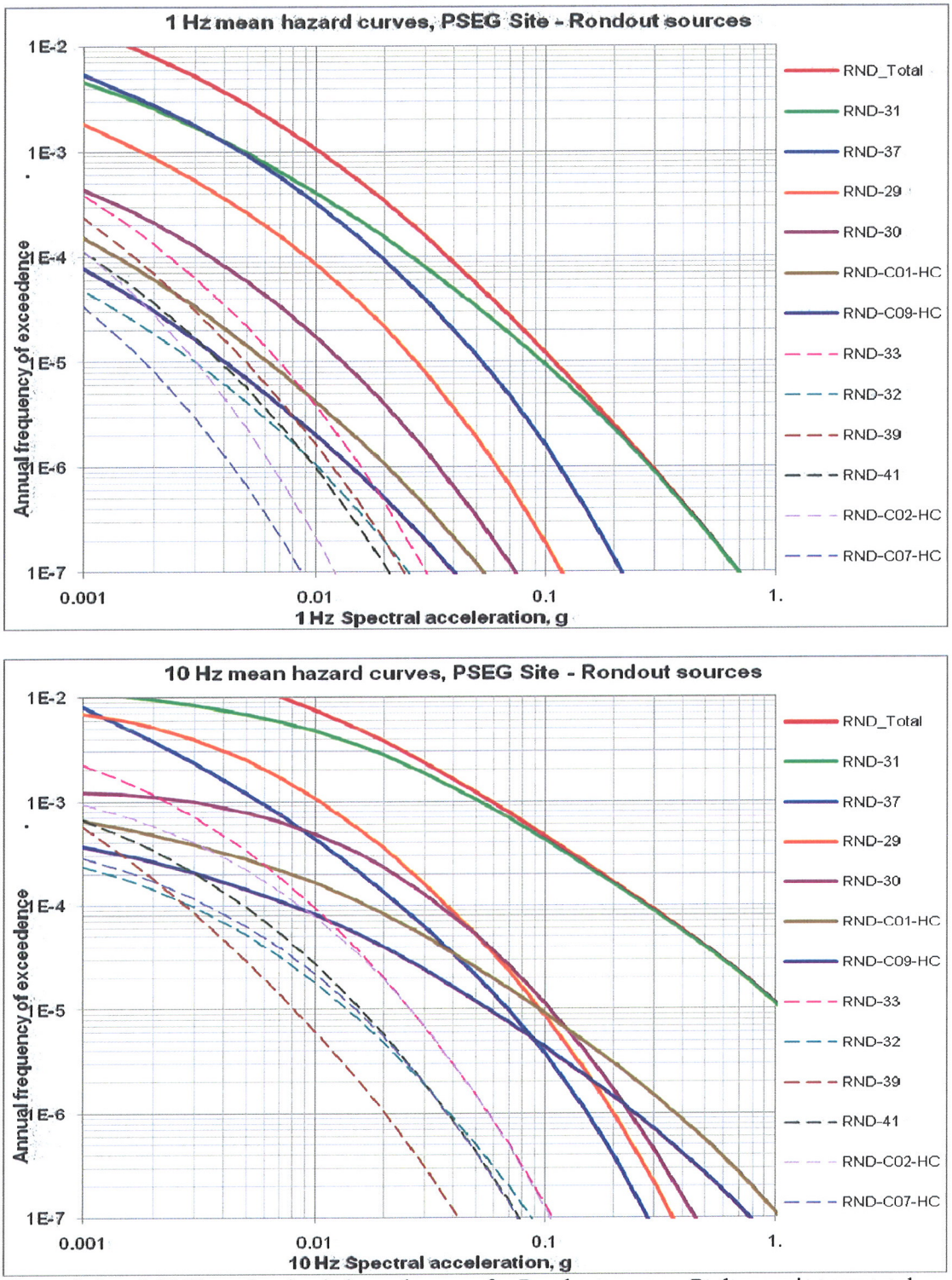
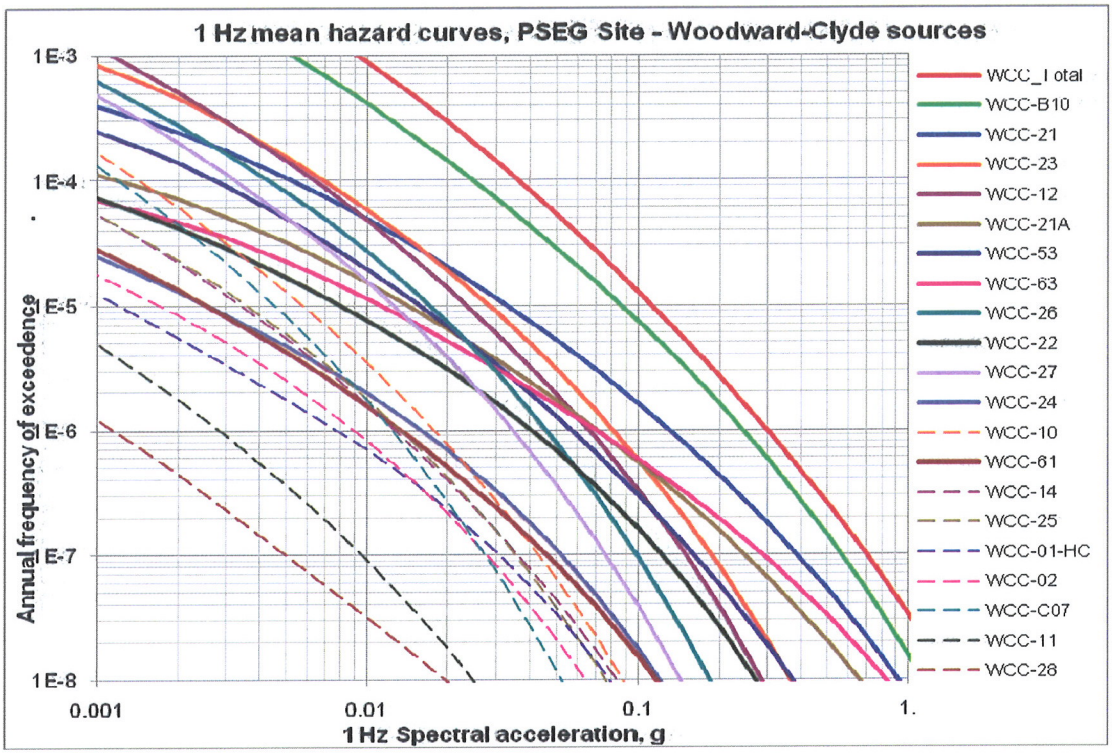


Figure 6. 1 and 10 Hz rock seismic hazard curves for Rondout sources. Red curve is team total, which is the sum of all individual RND sources and all eight Charleston sources. Non-contributing sources are shown with dashed lines. See Excel file (Ref. 5) for plot data.
Figure source: worksheet RND in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).



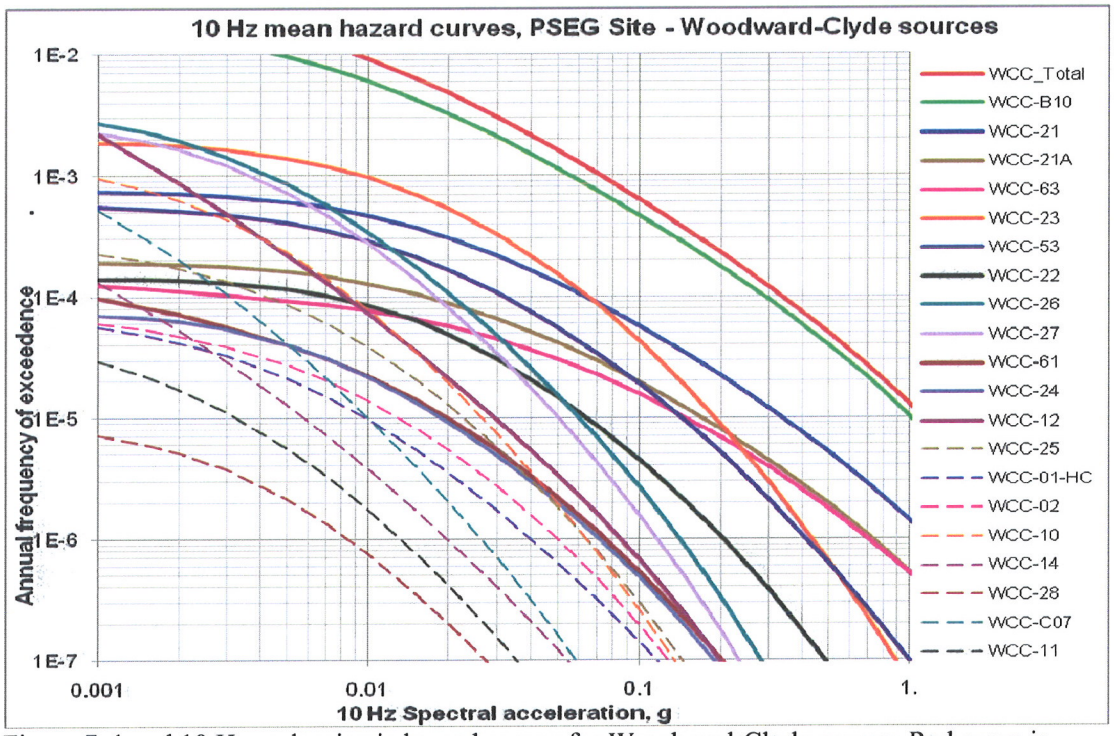


Figure 7. 1 and 10 Hz rock seismic hazard curves for Woodward-Clyde sources Red curve is team total, which is the sum of all individual WCC sources and all eight Charleston sources. Non-contributing sources are shown with dashed lines. See Excel file (Ref. 5) for plot data.
Figure source: worksheet WCC in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).

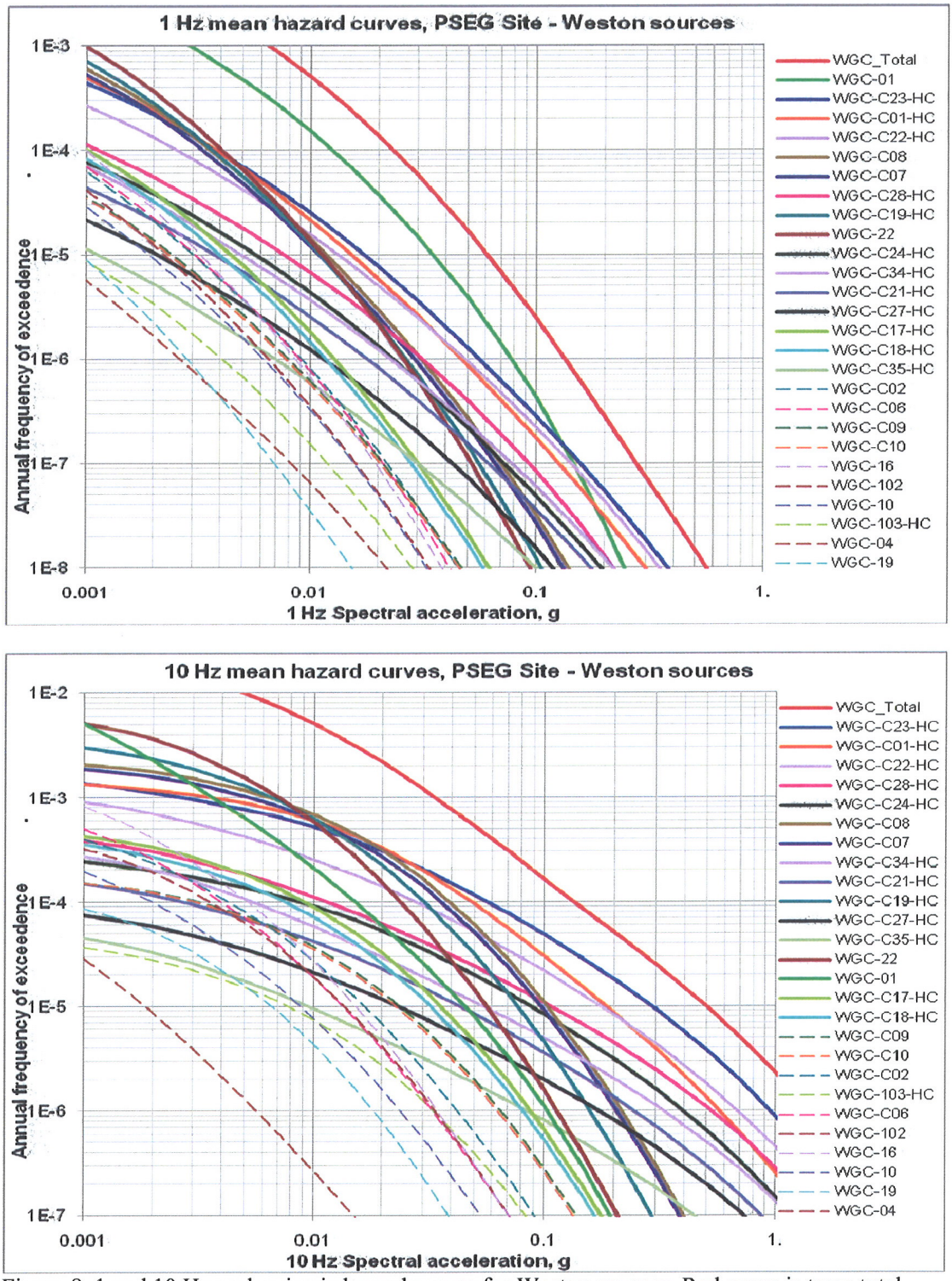


Figure 8. 1 and 10 Hz rock seismic hazard curves for Weston sources. Red curve is team total, which is the sum of all individual WGC sources and all eight Charleston sources. Non-contributing sources are shown with dashed lines. See Excel file (Ref. 5) for plot data.
Figure source: worksheet WGC in Excel file HAZARD_SENS_PLOTS.XLS (Ref. 5).

Check list for seismic hazard runs

Document 2047-ACR-014 **Rev. 1**

Files	Check	Directory						
		ATTEN	BEC	DAM	LAW	RND	WCC	WGC
*.ATT	Appropriate for types of sources (fault, rift, generic)?	gv RCA	------	------	------	------	------	------
*.ATT	Correct coefficients?	gv RCA	------	------	------	------	------	------
*.ATT	Correct JCALCS?	gv RCA	------	------	------	------	------	------
*.ATT	Correct group and sigma designators?	gv RCA	------	------	------	------	------	------
*.ATTEN_TBL	Consistent with *.ATT files?	gv RCA	------	------	------	------	------	------
*.LIST	Correct and complete list of sources?	-----	gv RCA	gv RCA	gv RCA	gv RCA	gv RCA	gv RCA
*.LIST	Correct references to *.ATT file?	-----	gv RCA	gv RCA	gv RCA	gv RCA	gv RCA	gv RCA
*P.TREE	Correct and complete for POST88 calcs?	-----	-----	-----	-----	-----	-----	-----
.IN2 (.TMP)	Complete (all sources)?	-----	-----	-----	-----	-----	-----	-----
.IN2 (.TMP)	Correct collapsing?	-----	-----	-----	-----	-----	-----	-----