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-044, Rev. 2	Sheet: 1 of 1

Nuclear Safety Classification: (SR) NSR AQ	Subject: Replication of 1989 EPRI-SOG hazard for individual Law Engineering sources	Discipline: Seismology
Originator: Jason M. Altekruse (JMA) Reviewer: Robin K. McGuire (RKM)	Origination Date: 11-24-09	Principal Professional: J. Allan Tice

Comments: This calculation was prepared by Risk Engineering, a part of Fugro William Lettis Associates and is supported by electronic files in Record No. 2047-ACR-045. The Risk Engineering cover sheet documents their review and approval. This cover sheet documents final approval by MACTEC. JAS 9/21/11

Revision 2 is issued to clarify site name terminology and software use from ~~Hope Creek to PSEG Site~~. No changes in the supporting documents were necessary. This cover sheet documents approval of Rev. 2 by MACTEC. Revision 2 was prepared by John Vlasity (JV) and reviewed by ~~RKM~~ Robin McGuire (RKM). John Vlasity (JV). JAS 9/21/11

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. SJC 10/14/10

JAS 12/14/10

Rev #: 0	Reason: Original issue	By: RKM	Date: 5-20-10	Approved:
Rev #: 1	Reason: Not used	By:	Date:	Approved:
Rev #: 2	Reason: Clarify site name	By: RKM	Date: 5-20-10	Approved: JAS 12/14/10
Rev #:	Reason:	By:	Date:	Approved:

Rev. 1 10-23-09

2047-COO-011

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

2251-ESP-REI-2047-ACR-044, Rev 2

MACTEC **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: _____ Date: 10/13/10 Approved by: SJF Date: 10/14/10

S&L Acceptance Review : Name: Dan Kocunik Sign: Daniel Kocunik Date: 10/11/11

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-044. Rev. 2	Sheet: 1 of 1

Nuclear Safety Classification: (SR) NSR AQ	Subject: Replication of 1989 EPRI-SOG hazard for individual Law Engineering sources	Discipline: Seismology
Originator: Jason M. Altekruse (JMA) Reviewer: Robin K. McGuire (RKM)	Origination Date: 11-24-09	Principal Professional: J. Allan Tice

Comments: This calculation was prepared by Risk Engineering, a part of Fugro William Lettis Associates and is supported by electronic files in Record No. 2047-ACR-045. The Risk Engineering cover sheet documents their review and approval. This cover sheet documents final approval by MACTEC. JAS 9/22/11

Revision 2 is issued to ~~change~~ clarify site name terminology ~~from Hope Creek to PSEG Site~~ and software use. No changes in the supporting documents were necessary. This cover sheet documents approval of Rev. 2 by MACTEC. Revision 2 was prepared by ~~John Vlasity (JV)~~ and reviewed by ~~RKM~~. McGuire (RKM) John Vlasity (JV)

JAS 9/22/11

JAS 5/20/10

Rev #: 0	Reason: Original issue	By: RKM	Date: 5-20-10	Approved:
Rev #: 1	Reason: Not used	By:	Date:	Approved:
Rev #: 2	Reason: Clarify site name	By: RKM	Date: 5-20-10	Approved: JAS 5/20/10
Rev #:	Reason:	By:	Date:	Approved:

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

Title: ***Replication of 1989 EPRI-SOG hazard for individual Law Engineering sources***

Record No. 2047 -ACR- 044 **Rev. 2** (calcs)

Record No. 2047 -ACR- 045 (elec. files)

Rev.	Status	Date	Description	Prep. by	Rev. by	App.* by
0	Final	11/24/2009	Initial Issue	JMA	RKM	RKM
1	Final	5/13/2010	Clarification of site name	JAV	RKM	RKM
2	Final	5/20/2010	Clarification of software use	RCh	JV	RKM

*Approval for release of results

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

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 hazard for individual Law Engineering team sources for **the** Hope Creek **plant** using the EQHAZARD program (EQHAZ module) and the 1989 EPRI-SOG assumptions (Ref. 1) at PGA. Compare EQHAZ results to individual source hazards calculated in Ref. 2.

2. Inputs

Sample problem: Ref. 3 (vol. 3) includes a sample problem that is used here to validate the EQHAZ executable. The sample input data is copied from tables in Ref. 3 (see Table 1). Note that the seismicity data for Team 2 (Table 9-8, p. 9-16, in Ref. 3, vol. 3) has an extra "1" in the first line. If the seismicity data is used as specified, the hazard for the first source (source A) will be calculated using only the first cell. The basic output for Team 2 (Table 9-10, see p. 9-10, in Ref. 3, vol. 3) shows that all six cells were included. Team 2 results (Table 9-11, p. 9-24, in Ref. 3, vol. 3) are reproduced here by removing the extraneous number from the seismicity data.

Table 1. Sample problem input data – source tables in Ref. 3 (vol. 3)

	Geometry Data (FORT.10)	Seismicity Data (FORT.11)	Basic Input (FORT.12)
Team 1	Table 9-1 (p. 9-3)	Table 9-2 (p. 9-3)	Table 9-3 (p. 9-4)
Team 2	Table 9-7 (p. 9-16)	Table 9-8 (p. 9-16)	Table 9-9 (p. 9-17)

LAW source hazard: Input files are copied from Ref. 4. The geometry data file (FORT.10) is file 10LAWG.DAT, the seismicity data file (FORT.11) is file 10LAWS.DAT, and the basic input file (FORT.12) is file 10LAWB.DAT. Note that the basic input file instructs EQHAZ to calculate hazard at PGA and 5 other frequencies; only PGA is considered here.

3. Literature search and background information

As seen in Ref. 2, PGA mean hazard for **the** Hope Creek **plant** calculated using FRISK88 does not match the PGA mean hazard for **the** Hope Creek **plant reported** using EQHAZARD in Ref. 1. This difference is traced in Ref. 2 to LAW team hazard. This calculation reproduces the individual source hazards for LAW using the EQHAZ module of EQHAZARD for hard rock conditions for comparison to individual LAW source hazards calculated using FRISK88 in Ref. 2.

*.FRAC and *.FRAC_C files for LAW are copied from the LAW\H_PGA directory in Ref. 5 to directory LAW_FRISK88 in Ref. 6 for comparison to EQHAZ results.

4. Assumptions and basis

It is assumed that the correct version of EQHAZ is used in this calculation. The basis is that the sample problem included in Ref. 3 (vol. 3) is run and EQHAZ produces the same results (see discussion below).

It is assumed that the EQHAZARD input files for LAW are correct and appropriate for use. The basis is that these files were transmitted as valid input under QA control (Ref. 4).

It is assumed that the *.FRAC and *.FRAC_C files for LAW are correct. The basis is that these files were generated under QA control (Ref. 2).

5. Computer calculations

Program name: EQHAZ.EXE (EQHAZARD module EQHAZ, Release No. 01, Modification No. 006, Release Date 08/19/88)

Note that software EQHAZ.EXE is not controlled by the Software Quality Assurance Plan and is used here as external, independent software to check calculations performed by internal software that *is* controlled by the SQAP, as documented in Ref. 3 and 5. This is a valid use of external software, on a project-specific basis. The calculations developed with software EQHAZ.EXE are not used for any design recommendations.

All electronic files for this calculation are included in Ref. 6. The electronic files include directories containing the sample problem calculations, the EQHAZ calculation for LAW, and copies of LAW hazard results (*.FRAC and *.FRAC_C files) from Ref. 2.

EQHAZ is run by copying the executable into the relevant directory and running the executable. Input files are read automatically using the default file names (FORT.10, FORT.11, and FORT.12 for the geometry data file, the seismicity data file, and the basic input file, respectively) (Ref. 3, vol. 3). Basic output is written to file FORT.16. Hazard results for each ground motion measure (frequency) are written to files FORT.17 through FORT.16+*n*, where *n* is the number of frequencies. The hazard results files (e.g. FORT.17) contain lines for each possible combination of smoothing option, maximum magnitude, and attenuation equation for each source.

The sample problem calculations are contained in subdirectories of EQHAZ_SAMPLES in Ref. 6. The input data are reproduced from Ref. 3 (vol. 3) as noted in Table 1.

The LAW calculation is contained in directory LAW_EQHAZ.

6. Hand calculations

Hazard results calculated with EQHAZ are compared to the results from Ref. 2 in Excel file SRC_COMP.XLS (Ref. 6). The activity rate for each individual source is the sum of the scenario weights in which a source is active (scenario weights copied from file 10EQPOST.INP in Ref. 4 to worksheet LAW_WTS). EQHAZ output file FORT.17 in directory LAW_EQHAZ is imported to worksheet EQHAZ. The total hazard for an individual source is the weighted sum of the hazards for each branch (smoothing option, maximum magnitude, and attenuation equation combination). These hazards are multiplied by the activity rate from worksheet LAW_WTS to get the effective hazard for each source.

PGA mean hazards for individual LAW sources and the team total are imported from *.FRAC and *.FRAC_C files, respectively, in directory LAW_FRISK88 to worksheet FRISK88.

SUMMARY OF SAMPLE PROBLEM RESULTS:

Output files in the two sample problem subdirectories (Ref. 6) are compared to tables in Ref. 3 (vol. 3) as indicated in Table 2. Hazard files for ground motion measure 1 (Hazard File 1) for both teams are identical to the results listed in Ref. 3 (see Table 2). Hazard files for ground motion measure 2 (Hazard File 2) for both teams are identical to the results listed in Ref. 3 (see Table 2) except for three values, likely due to round-off error (see Table 3). Table 3 lists the hazard file for ground motion 2, team 1 (file FORT.18), and shows the three values that do not match the results listed in Ref. 3 (with a difference of ±0.001). Team 2 results are identical to Team 1 except that Team 2 does not include source C.

Table 2. Sample problem output tables in Ref. 3 (vol. 3)

	Hazard File 1 (FORT.17)	Hazard File 2 (FORT.18)
Team 1	Table 9-5 (p. 9-14)	Table 9-6 (p. 9-15)
Team 2	Table 9-11 (p. 9-24)	Table 9-12 (p. 9-25)

Note: Hazard files 1 and 2 correspond to ground motion measures 1 and 2, respectively.

The excellent agreement between EQHAZ output (Ref. 6) and Ref. 3 (see Table 2 for the corresponding tables) indicates that the EQHAZ executable listed in Section 5 is appropriate for use in reproducing individual source hazards for LAW using the assumptions of Ref. 1.

Table 3. Hazard File 2 for Team 1 (FORT.18) vs. Table 9-6 in Ref. 3 (vol. 3, p. 9-15)

SAMPLE PROBLEM		TEAM 1, SITE 1						89.80		35.81		
A	1	1.00	1	6.5	0.85	1	0.50	3.456	4.272	5.072	6.488	7.904	
A	1	1.00	2	6.8	0.15	1	0.50	3.369	4.051	4.705	5.851	6.989	
A	1	1.00	1	6.5	0.85	2	0.50	2.595	3.083	3.535	4.342	5.171	→ 3.084
A	1	1.00	2	6.8	0.15	2	0.50	2.579	3.036	3.424	4.053	4.684	
B	3	0.75	1	6.0	0.33	1	0.50*	3.800	4.541	5.255	6.541	7.877	
B	3	0.75	2	6.5	0.34	1	0.50*	3.645	4.279	4.859	5.782	6.673	
B	3	0.75	3	6.9	0.33	1	0.50*	3.596	4.163	4.673	5.463	6.156	
B	3	0.75	1	6.0	0.33	2	0.50*	3.072	3.556	4.050	4.885	5.675	
B	3	0.75	2	6.5	0.34	2	0.50*	3.013	3.417	3.805	4.460	5.058	
B	3	0.75	3	6.9	0.33	2	0.50*	3.000	3.385	3.734	4.279	4.766	
B	4	0.25	1	6.0	0.33	1	0.50*	4.630	5.357	6.057	7.330	8.660	
B	4	0.25	2	6.5	0.34	1	0.50*	4.455	5.071	5.627	6.524	7.402	→ 6.523
B	4	0.25	3	6.9	0.33	1	0.50*	4.397	4.944	5.430	6.180	6.850	
B	4	0.25	1	6.0	0.33	2	0.50*	3.878	4.375	4.868	5.689	6.467	→ 5.688
B	4	0.25	2	6.5	0.34	2	0.50*	3.809	4.214	4.597	5.236	5.815	
B	4	0.25	3	6.9	0.33	2	0.50*	3.793	4.176	4.515	5.042	5.513	
C	4	1.00	1	5.5	0.85	1	0.50*	4.713	5.760	6.820	8.766	9.999	
C	4	1.00	2	6.2	0.15	1	0.50*	4.113	4.908	5.622	6.806	7.973	
C	4	1.00	1	5.5	0.85	2	0.50*	3.613	4.432	5.172	6.429	7.695	
C	4	1.00	2	6.2	0.15	2	0.50*	3.173	3.731	4.271	5.150	5.927	

Note: Data is from file FORT.18 (team 1) in Ref. 6, values that differ from those listed in Ref. 3 are boxed, the corresponding values reported in Ref. 3 are shown underlined in the right column. Results for team 2 are identical, but only include sources A and B.

SUMMARY OF LAW RESULTS:

The difference between hazards calculated in Ref. 1 and Ref. 2 can be traced primarily to two sources – LAW-107 and LAW-M16. Table 4 shows the percent difference between hazard calculated with FRISK88/POST88 (Ref. 2) and hazard calculated here using EQHAZ.

Source M16: Inspection of the basic output (file FORT.16 in the LAW_EQHAZ directory, Ref. 6) indicates that (1) there is a large error in the area calculation for source M16 (EQHAZ calculates an area of 4,863 km^2, compared to an area calculated from Albers coordinates of 53.5 km^2), and that (2) M16 is incorrectly identified as a host source (see worksheet LAW-M16 in Excel file SRC_CMP, Ref. 6). This error in the area calculation likely arises from the geometry of M16, which includes adjacent vertices that are very close together (±0.01 degrees). Excluding source M16 from the total LAW hazard (Alternate Total #1 in Table 4) produces a significantly better match between FRISK88 (Ref. 2) and EQHAZ results.

Source 107: Hazard calculated using FRISK88 (Ref. 2) is about 58% of the hazard calculated by EQHAZ. This is because the background probability (P_B) of 0.42 is not applied in the EQHAZ calculation. Scaling the EQHAZ hazard for source 107 by P_B=0.42 and excluding source M16 (Alternate Total #2 in Table 4) results in good agreement between FRISK88 and EQHAZ results.

Other sources generally show good agreement (within a few percent) between FRISK88 (Ref. 2) and EQHAZ results. This includes all amplitudes with hazards >1E-9. A few sources show larger differences at large amplitudes, notably sources M20 and M21 (amplitudes of 500 cm/s^2 and above), and sources 17 and M19 (at 1000 cm/s^2). At these amplitudes, these four sources have very low hazards (< 3E-10) that are roughly three orders of magnitude below the total hazard.

CONCLUSIONS:

Sample problem: Comparison of the sample problem results to the corresponding tables in Ref. 3 (see Table 2) indicates that the EQHAZ executable listed in Section 5 above is the same version used in Ref. 3, and that, therefore, it is the correct version to use in reproducing individual LAW source hazards.

LAW source hazards: The difference in hazard calculated by FRISK88 (Ref. 2) and EQHAZ is traced to two sources – LAW-107 and LAW-M16. The basic output from EQHAZ indicates that there is a large error in the area calculation for source M16 and that M16 is incorrectly identified as a host source. The hazard for source 107 from EQHAZ does not include the background probability (P_B=0.42), thus, hazard calculated by FRISK88, which does include P_B, is about 58% of the hazard calculated by EQHAZ. Four individual sources show larger differences between EQHAZ and FRISK88 mean hazards, but only at larger amplitudes at which the annual frequency of exceedence of the individual sources is less that 3E-10. Calculating the total LAW hazard from EQHAZ for all sources except M16, and weighting the hazard of 107 by 0.42 (Alternate Total #2 in Table 4), results in excellent agreement between mean hazards calculated by FRISK88 and EQHAZ with differences of less than ±3% at all amplitudes (see Table 4).

References

1. Risk Engineering, Inc., et al. (1989). *Probabilistic seismic hazard evaluation for Hope Creek*, Elec. Power Res. Inst., Draft Rept. RP101-53, January.
2. Risk Engineering, Inc. (2009). *Replication of 1989 EPRI-SOG hazard for Hope Creek*, REI QA record 2047-ACR-030 **Rev. 1**.
3. EPRI. (1989). *Seismic Hazard Methodology for the Central and Eastern United States; Vol. 1: Methodology, Vol. 1: Theory, Vol. 2: Programmer's Manual, Vol. 3: User's Manual, Vol. 4: Applications, Vols. 5 through 10: Tectonic Interpretations.* Elec. Power Res. Inst. Rept. NP-4726, 1986 (Volumes 1 through 4 revised in 1988).
4. Mactec. (2009). Transmittal of EPRI-SOG input files for Hope Creek, REI QA record 2047-EXD-001.
5. Risk Engineering, Inc. (2009). *Electronic files for Replication of 1989 EPRI-SOG hazard for Hope Creek*, REI QA record 2047-ACR-031.
6. Risk Engineering, Inc. (2009). *Electronic files for Replication of 1989 EPRI-SOG hazard for individual Law Engineering sources*, REI QA record 2047-ACR-045.

Table 4. LAW hazard – FRISK88 vs. EQHAZ, difference as a percentage of EQHAZ results							
Source	Amplitude (cm/s^2)						
	5	50	100	250	500	700	1000
17	-2.88%	0.02%	-0.35%	-0.73%	-1.16%	-2.72%	-17.33%
22	-3.80%	0.37%	0.66%	1.45%	2.49%	2.76%	3.41%
107	-58.62%	-58.17%	-57.95%	-57.15%	-55.91%	-55.36%	-54.63%
C09	-1.92%	-0.30%	-0.44%	-0.57%	-0.55%	-0.97%	-1.16%
C10	-1.92%	-0.31%	-0.45%	-0.55%	-0.46%	-0.85%	-1.08%
C11	-3.67%	0.36%	0.67%	1.43%	2.39%	2.69%	3.31%
C13	-3.34%	0.30%	0.63%	1.37%	2.46%	2.73%	3.24%
M16	0.19%	-45.97%	-71.69%	-89.26%	-95.97%	-97.98%	-99.21%
M17	0.16%	0.59%	0.92%	0.81%	0.88%	0.62%	0.22%
M18	0.13%	0.79%	0.96%	0.74%	0.78%	0.22%	-0.27%
M19	-0.04%	0.36%	0.21%	-0.19%	-1.11%	-9.23%	-60.37%
M20	0.04%	0.05%	-0.18%	-1.57%	-35.45%	-92.77%	-99.80%
M21	0.38%	0.28%	0.05%	-2.38%	-71.86%	-98.78%	-99.97%
Total	-9.67%	-19.99%	-29.91%	-42.61%	-51.44%	-55.99%	-60.22%
Alternate Total #1 (1)	-10.15%	-14.34%	-15.92%	-14.99%	-8.94%	-5.06%	-1.16%
Alternate Total #2 (2)	-2.40%	0.30%	0.56%	1.09%	1.94%	2.17%	2.63%
Notes: 1) Alternate Total #1 includes hazard for all sources except M16. 2) Alternate Total #2 excludes source M16, and scales the EQHAZ hazard for source 107 by P_B=0.42. Data copied from worksheet COMP in Excel file SRC_COMP.XLS in Ref. 6							