May 15, 2014

Mr. Ray Lazuk
Climax Molybdenum Company
Climax Mine
Highway 91 – Fremont Pass
Climax, CO 80429

Subject: Mayflower Tailing Storage Facility (5 Dam) Post-Closure Condition Seepage and Stability Analyses, Climax Mine, Climax, Colorado;
Prepared as Addendum to "Mayflower Tailing Storage Facility, 5 Dam Operating Condition Seepage and Stability Analyses, Climax Mine, Climax, Colorado" Report dated September 2013
Project No. 22243088

Dear Ray:

URS Corporation (URS) has prepared this letter report presenting the results of seepage and stability analyses for the post-closure conditions at the Mayflower Tailing Dam (Mayflower) at Climax Mine (Climax). This letter has been prepared at the request of the Colorado Division of Reclamation and Mining Safety (DRMS) as part of the review completed for the Mayflower tailing dam operation permit. Presented below is a brief project background, a summary of our analyses, and our conclusions and recommendations.

PROJECT BACKGROUND

We recently completed seepage and stability analyses representing operating conditions for Mayflower to satisfy DRMS requirements prior to initiating deposition. The approach to and results of those analyses are presented in our report, "Final Report, Mayflower Tailing Storage Facility, 5 Dam Operating Condition Seepage and Stability Analyses, Climax, Colorado," dated September 2013. DRMS has provided comments on the report and requested an evaluation of the Mayflower tailing dam stability for the post-closure condition. The post-closure condition is represented by the maximum height of the tailing dam (elevation 10,820) after deposition has ended and pore pressures stabilize as the dam reaches steady state seepage conditions.

We completed this analysis of Mayflower for the post-closure conditions and the results are presented below. The final tailing dam (as constructed material properties) are predicated on managed tailing deposition. We have estimated these properties to develop the internal geometry for the post-closure condition by projecting the existing material properties to the final elevation. This assumes a consistent upstream raise producing similar tailing properties. A simplified seepage

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model was completed to estimate the phreatic surface for the steady state seepage conditions after deposition has concluded.

The critical stability case is post seismic. The selected design criterion for the Maximum Design Earthquake (MDE) corresponds to a 7.0 magnitude earthquake with a 5,000-year return period. The design criterion selection is based on the current state requirements for water dams and the application of a state of the practice probabilistic evaluation. This approach provides continuity with the Colorado Office of the State Engineer’s requirements for water dam facilities. Supporting documentation for the seismic criteria is provided in Attachment A.

This report was prepared as a supplement to our September 2013 report. As such, this letter report refers to data, information and discussions included in the operating condition report.

SUMMARY OF ANALYSES

Seepage and slope stability analyses were performed to evaluate the stability of Mayflower under post-closure conditions. An update to the Probabilistic Seismic Hazard Analysis (PSHA) was completed as part of our work. The seepage analyses were also updated to establish the pore pressure conditions within the tailing dam at steady state seepage conditions during post-closure conditions. A summary of the slope stability analyses are provided below.

PSHA Update

A site-specific PSHA was completed in 2007. Numerous studies on the Gore Range Frontal fault system since that time have provided additional data to be included in the ground motion model. Large earthquakes across the world (e.g., the Tohoku earthquake in Japan in 2011) also provide additional data for inclusion in the source model.

The 2007 PSHA was updated for our work and the results used to calculate the ground motions associated with the MDE. The updated site-specific ground motion model continues to show a calculated peak ground acceleration of 0.20g for the MDE. A summary of the prescribed PSHA update is in Attachment B.

Seepage Analysis

The phreatic surface at post-closure conditions was estimated by preparing a seepage model scenario, identified as Case 4 of the 2013 URS report. The calibrated material properties were used for the Case 4 calculations. We understand from Climax the proposed post-closure configuration includes sludge treatment cells and a water detention storage pond. The downstream edge of the sludge treatment cells will be located 2,800 feet upstream of the crest and the pond will be located upstream of the sludge treatment cells.

Total head nodes were conservatively applied at all locations greater than 2,800 feet upstream of the proposed crest to model water introduced by proposed sludge treatment cells and a future water detention pond. The assumed impoundment slope to the water pond is -0.7 percent. A constant head was applied to the ground surface (elevation 10,800) at the total head nodes described above. Similar to previous analyses, review nodes were applied along the downstream slope and no-flow nodes were applied below the bedrock. Detailed discussions of our approach, methodology and model development are discussed in the URS September 2013 report.

A sustained water surface elevation of 10,800 feet at locations greater than 2,800 feet upstream of the dam crest was modeled for steady-state conditions to evaluate long-term steady-state seepage conditions. Compared to the operating basis case, the primary effect of moving the pond to a location 2,800 feet upstream of the crest is a longer seepage path. The resulting phreatic surface is lowered between the pond and the drain beneath the lower portion of the dam as a result of this longer seepage path. The results of this case are shown in Figure 1.

Liquefaction Triggering Analysis

A liquefaction triggering analysis for the MDE case was completed using the same methodology applied to evaluate triggering for the OBE case (as described in the URS September 2013 report). The results are presented in Figure 2.

The figure presents the CSR and the calculated factor of safety (FS) against liquefaction with depth for 2012 test holes and CPT soundings. The FS values were calculated for each SPT and CPT data point below the water surface at the time the drill holes were advanced into the subsurface tailing tests. The figure also shows the post-closure steady-state unsaturated zone as estimated by the seepage analysis described above.

Results from the liquefaction triggering analyses show calculated FS values greater than 1.0 for the SPT approach and generally greater than 1.0 for the CPT approach, indicating a low risk for widespread liquefaction for the MDE.

Current CPT data indicate the coarse tailing (cycloned and whole tailing) is generally dilative during shear. Results of the cyclic triaxial test at 0.19, which feature CSRs greater than the MDE CSRs (generally less than 1.0), show the coarse tailing did not lose strength after being cycled for motions higher than the MDE event (see discussion in Subsection 5.1.2 of the September 2013 report). The performance and state of the existing tailing, along with the relatively high factors of safety against liquefaction triggering and the relatively low stresses due to the MDE event (as compared to the laboratory testing stresses) indicate that the risk for wide-spread strength reduction due to liquefaction is low for the MDE event.

Stability Analysis

The MDE is characterized by ground motions that are not anticipated to cause liquefaction (as evident by the above-described liquefaction triggering analysis) or cause the coarse tailing to undergo significant shear strength loss during ground shaking (as evident by the cyclic triaxial test results discussed in Section 5 of the September 2013 report). However, the MDE event may induce excess pore pressures, essentially creating an undrained loading condition in the saturated materials; therefore the post-earthquake MDE loading condition was analyzed using undrained properties developed for analysis of the post-earthquake OBE condition. The minimum required FS for the post-earthquake analysis is 1.0.

The minimum calculated FS values for the section analyzed were computed for circular and noncircular failure surfaces of different sizes. A relatively small circular failure in the existing slope resulted in a minimum circular FS of 2.4 while a relatively large circular global failure surface resulted in a minimum non-circular FS of 2.8. A relatively large, global noncircular failure surface resulted in an FS of 2.2. Stability analysis results are presented in Figure 3.

The results show that calculated theoretical FS values exceed required criteria. Table 1 provides results of the stability analysis.

Table 1
Calculated Theoretical Factors of Safety for Stability Analyses,
Mayflower Tailing Dam

Loading Condition	Design Section	Failure Surface	Calculated Minimum FS (Global Failure)	Minimum Recommended FS
Post-Earthquake (MDE Event)	Future Design Elevation (Elevation 10,820)	Circular	2.8	1.0
		Noncircular	2.2	

CONCLUSIONS

Seepage analyses performed indicate the highest phreatic surface will occur during deposition at elevation 10,820. Current closure plans include maintaining a pond farther upstream that results in a lower calculated phreatic surface.

Review of available SPT and CPT data and laboratory test results indicate the whole tailing is generally dilative during shearing. Liquefaction triggering analyses and cyclic shear test results indicate that widespread liquefaction and strength loss is unlikely for the OBE and MDE events.

The post-earthquake strength of the tailing was assumed to be no less than the undrained strength of the tailing for both OBE and MDE events because of the dilative nature of the tailing and the lack of strength reduction during cyclic testing.

The MDE FS values exceed those calculated for the OBE event; therefore the most critical case for stability at Mayflower is the undrained/OBE post-earthquake loading condition. This is the result of a lower phreatic surface created by moving the downstream edge of the decant pond to a location 2,800 feet upstream of the crest.

GENERAL INFORMATION

Professional judgments are presented in this report. These are based partly on evaluation of technical information gathered and partly on our general experience with similar projects.

It is important to note the condition of a tailing dam is evolutionary in nature and depends on numerous and constantly changing internal and external conditions. It would be incorrect to assume the present condition of a dam will continue to represent the condition of that dam at some point in the future. Only through periodic, updated inspections and ongoing monitoring can unsafe conditions be detected so that corrective action can be taken. Likewise, continued care and maintenance are necessary to minimize the risk of unsafe conditions.

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CLOSING

If you have any questions or comments, please do not hesitate to call.

Sincerely,

Christopher N. Hatton, P.E.
Principal Engineer

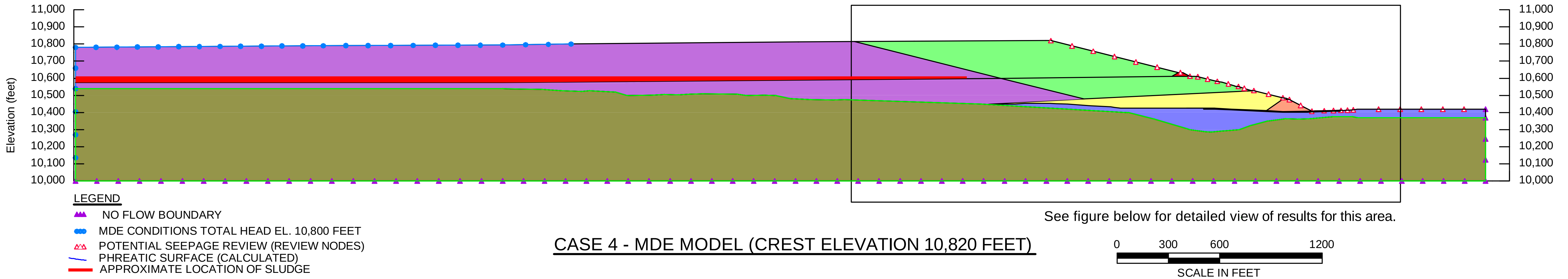
Lisa Yenne, P.E.
Principal Engineer

cc: Michael Manuel, Climax Molybdenum Company
Tom Brown, Climax Molybdenum Company
Mike Waldron, Climax Molybdenum Company

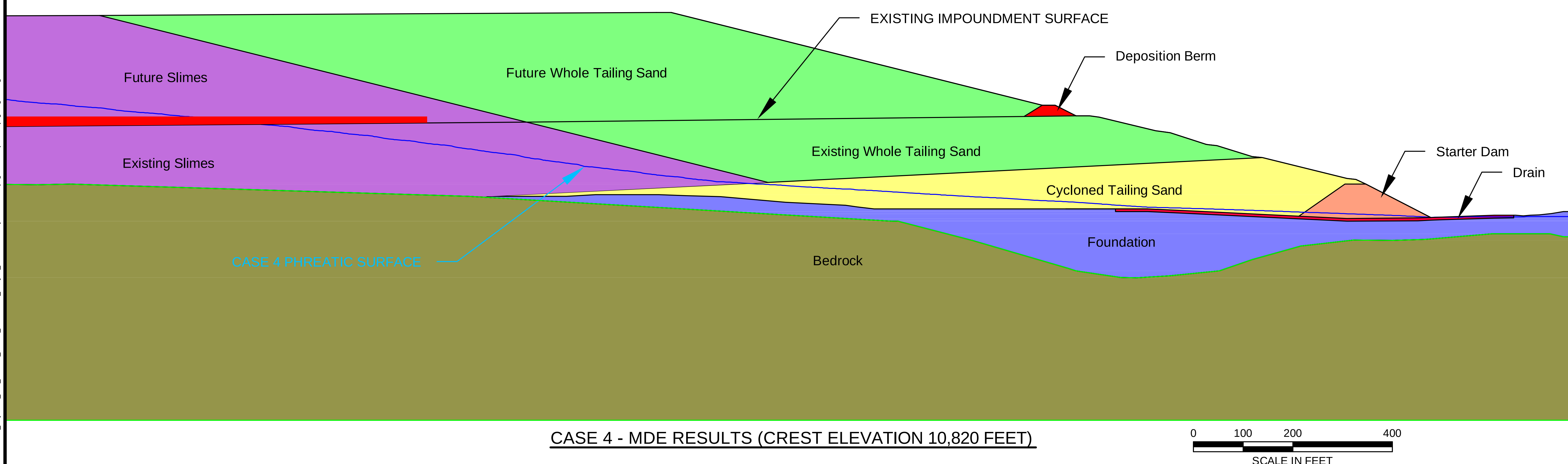
Attachments:

Figure 1	MDE Seepage Analysis Results, Mayflower Tailing Dam
Figure 2	MDE Liquefaction Triggering Results, Mayflower Tailing Dam
Figure 3	Mayflower Tailing Dam Stability Analysis, Estimated Future Conditions, Post-Earthquake (MDE)
A	Earthquake Design Criterion – State of Practice Memorandum
B	PSHA Update Summary Letter

Figures



CASE 4 - MDE MODEL (CREST ELEVATION 10,820 FEET)



CASE 4 - MDE RESULTS (CREST ELEVATION 10,820 FEET)

NOTE: SLUDGE LOCATION IS SHOWN FOR INFORMATIONAL PURPOSES BUT WAS NOT DIFFERENTIATED FROM SLIMES IN THESE ANALYSES.

Job No. : 22243088	MDE SEEPAGE ANALYSIS RESULTS MAYFLOWER TAILING DAM
Prepared By : KMM	
Date : MARCH 2014	

FIG. 1

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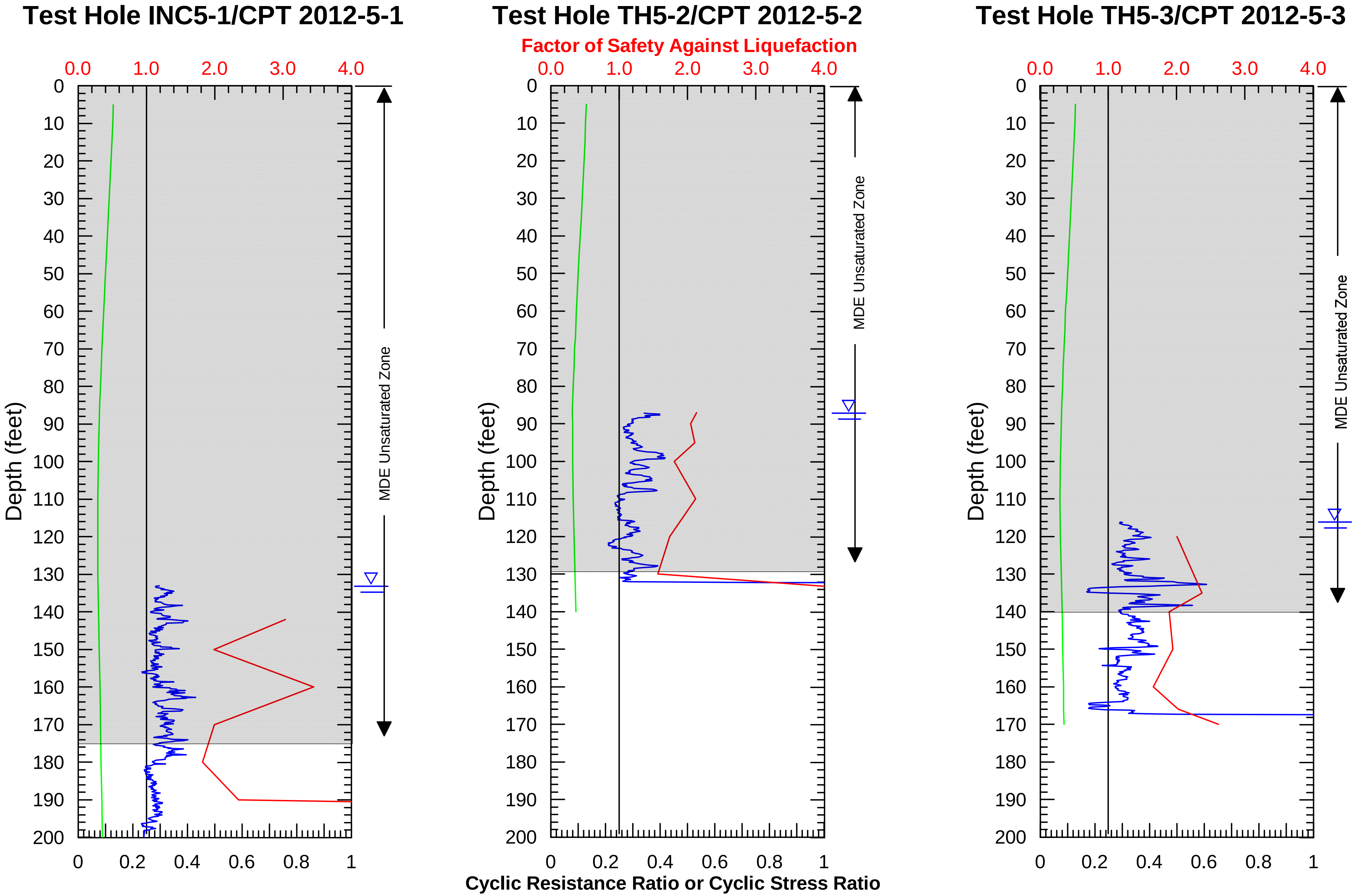


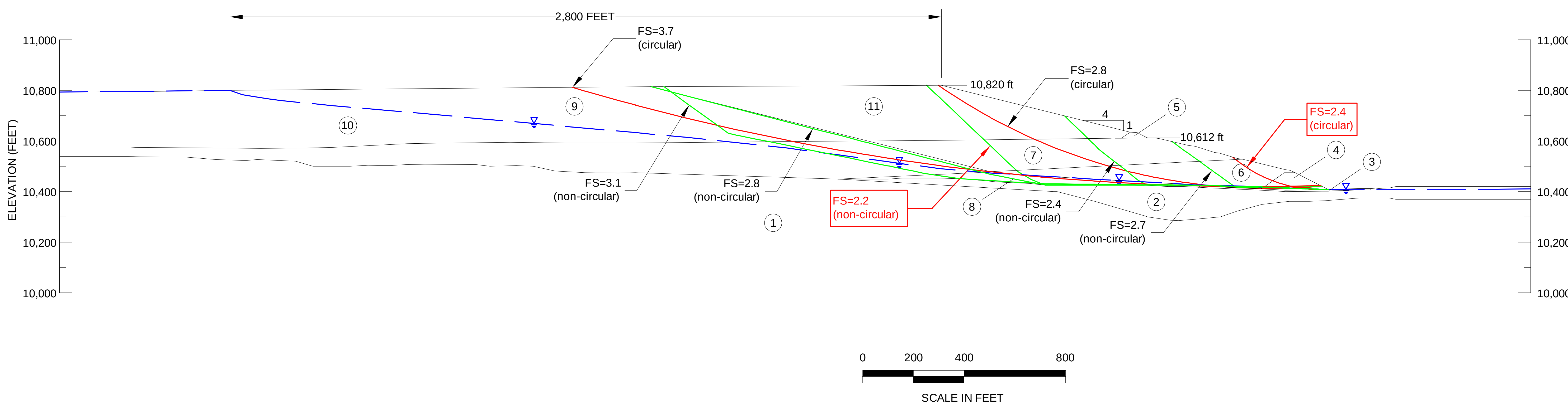
Approximate water level during exploration
Cyclic Stress Ratio
SPT Factor of Safety
CPT Factor of Safety

Note: Future calculated depth to phreatic surface is deeper than established correlations account for.
For analysis purposes, liquefaction calculations were conservatively based on existing saturated zone.

Project No. 22243088	Climax Mine Climax, CO	MDE Liquefaction Triggering Results Mayflower Tailing Dam	March 2014
	URS		Prepared by: KMM
			Figure 2

URS

No.	DESCRIPTION	UNIT WEIGHT (pcf)	COHESION (psf)	FRICTION ANGLE (degrees)
1	BEDROCK	150	5,000	50
2	FOUNDATION	145	0	35
3	DRAIN	135	0	35
4	STARTER DAM	145	0	35
5	DEPOSITION BERM	115	0	35
6	EXISTING UNSATURATED CYCLONED SAND	115	0	35
7	EXISTING UNSATURATED WHOLE TAILING SAND	115	0	35
8	EXISTING SATURATED CYCLONED SAND	115	0	35
9	DRAINED SLIMES	110	500	25
10	UNDRAINED SLIMES	110	Cu/p'=0.40 (TXC); Cu/p'=0.30 (DSS)	
11	FUTURE UNSATURATED WHOLE TAILING SAND	115	0	35



LEGEND:

PHREATIC SURFACE
CIRCULAR SHEAR SURFACE
NON-CIRCULAR SHEAR SURFACE

NOTES:

1. "FS" DESIGNATES CALCULATED FACTOR OF SAFETY.
2. THE LOCATION OF THE STUDY SECTION IS SHOWN ON FIGURE 3-1.
3. STABILITY ANALYSES WERE PERFORMED USING UTEXAS4 SOFTWARE.
4. PROCESS SLUDGE LAYER HAS BEEN EXCLUDED FROM ANALYSIS.

Job No. :	22243088
Prepared By :	KMM
Date :	MARCH 2014

MAYFLOWER TAILING DAM
STABILITY ANALYSIS
ESTIMATED FUTURE CONDITIONS
POST-EARTHQUAKE (MDE)

FIG. 3

MURPHY, KENNETH M, 1/15/2009 8:11 AM

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Attachment A

URS

Memorandum

Date: 12 May 2014

To: Christopher Hatton, URS Denver

From: Ivan Wong, URS Oakland

Subject: ***State of the Practice in Probabilistic Seismic Hazard Analyses for Tailing Dams***

In designing new dams or evaluating existing dams, the traditional method to developing earthquake design ground motions (e.g., Maximum Design Earthquake [MDE]) or Safety Evaluation Earthquake (SEE) ground motions has been to use deterministic seismic hazard analysis (DSHA) (e.g., Maximum Credible Earthquake [MCE]). In the past 20 years, in particular for dam safety, probabilistic seismic hazard analysis (PSHA) has become increasingly accepted as a more technically sound approach to develop earthquake ground motions. The U.S. Bureau of Reclamation adopted PSHA and abandoned DSHA in the mid-1990's. However other Federal dam agencies such as the U.S. Army Corps of Engineers and the Federal Energy Regulatory Commission (FERC) and particularly State regulatory agencies have been slow in adopting PSHA in part because of misconceptions and difficulty in understanding PSHA concepts.

In developing probabilistically-based earthquake ground motions for a new dam or existing dam, an annual exceedance probability (AEP) or return period needs to be selected. The U.S. Committee on Large Dams (1998) states that an "AEP between 1/3000 and 1/10,000 is recommended to define input motion representing the MDE, depending on the applicable risk rating". More recently, the International Committee on Large Dams (ICOLD; 2010) have adopted the same range of AEPs. For extreme or high-consequence dams, the SEE ground motions need not have a mean AEP smaller than 1/10,000 according to ICOLD. For moderate-consequence dams, the mean AEP does not need to be smaller than 1/3000. These guidelines have been developed for water retention dams. There have been few explicit efforts, to my knowledge, to develop guidelines specifically for tailing dams. In most states, water retention dams and tailing dams have been treated in the same manner when it comes to regulatory guidance.

The AEP that is most often cited in state dam safety guidance in the western U.S. outside of California for high hazard dams has been 1/5000 including Colorado: Neighboring intermountain states which have similar levels of seismic hazard are New Mexico, Montana, Idaho, and Arizona.

- The State of Colorado *Rules and Regulations for Dam Safety and Dam Construction* state that high hazard dams "shall be designed for the MCE or for an earthquake with a minimum 5000-year return frequency" (note should be return period).

- The New Mexico *Rules and Regulations Governing Dam Design, Construction and Dam Safety* that explicitly includes tailing dams state that "dams classified as high hazard potential other than flood control structures shall be designed for the MCE or for a 1% probability of exceedance in 50 years (approximately 5000-year return frequency)" (should be return period).

- In Montana, active tailing dams are regulated by the Department of Environmental Quality. Although not officially stated in regulations, a return period of 5,000 years is used in defining design ground motions (Michele Lemieux, Montana Dam Safety, written communication, March 2014).

- In both Idaho (Administrative Code Title 42) and Arizona (Department of Environmental Quality BADCT-Best Available Demonstrated Control Technology), the PSHA approach has not been officially adopted in their regulations and so it is stated that the MCE is the event that should be designed for high hazard dams. However, in both states probabilistically-based design ground motions for tailing dams have been accepted by the governing regulatory agency. In Arizona, tailing dams are regulated by the Arizona Department of Environmental Quality. In Idaho, the Department of Water Resources regulates all dams.

- In Utah, which has a higher level of seismic hazards, the State *Administrative Code*, which also covers tailing dams, is rather ambiguous when it comes to seismic regulations. They state both the MCE and Operating Basis Earthquake (OBE) will need to be investigated for all projects. They further state that a PSHA be performed and that the U.S. Geological Survey Interactive Deaggregation tool can be used using a 5000-year return interval (should be return period) to identify magnitude and peak ground motions. They do not explicitly state that a 5000-year return period would be acceptable for defining earthquake ground motions. The code does state that "site-specific evaluations may be performed to define ground motions for this event if the methods used and assumptions made are acceptable to the State Engineer."

In summary, the minimum AEP that appears most applicable to tailing dams that are classified as high hazard is 1/5000. Certainly smaller AEPs can be adopted by the dam owner such as 1/10,000, but that is not required by the Intermountain states that have probabilistically-based dam safety criteria.

Attachment B

URS # Memorandum

Date: 12 May 2014

To: Kelly Ward

From: Patricia Thomas and Ivan Wong

Subject: ***Update to the Probabilistic Seismic Hazard Analysis (PSHA) for Mayflower Tailing 5 Dam, Climax Mine, Colorado***

At the request of FMI, an update of the PSHA for Mayflower Tailing 5 Dam has been performed incorporating new data on seismic sources and ground motion prediction models. In 2007 URS performed a PSHA for Mayflower and Tenmile tailing damsites (Figure 1). Since that time new geological and seismological data have become available and have been used to characterize seismic sources in the region. In addition, an updated version of the ground motion prediction models developed through the Pacific Earthquake Engineering Research (PEER) Center's Next Generation Attenuation (NGA) Project have been released. These NGA-West2 models are based on analysis of a significantly expanded database of recorded events around the world. This memo presents the results of the updated PSHA, in terms of ground motion hazard curves and Uniform Hazard Spectra (UHS).

The characterization of faults within the region has been updated based on additional geologic information. The update includes revisions to the characterization of the Mosquito, Gore Range Frontal, and Sawatch faults, which are the largest contributors to the hazard at 5 Dam. There are also 3 faults that have been added to the seismic source model – Greenhorn Mtn (57 km distance), Steamboat Springs (78 km distance) and Unnamed faults near Burns (71 km distance).

The current study incorporates an updated historical catalog of events in the development of background seismic source zone. Background earthquakes, which are events that do not appear to be associated with known geologic structures, are accommodated in the PSHA through (1) the use of a regional seismic source zone for the Southern Rocky Mountains region, and (2) smoothing the seismicity using a Gaussian filter (gridded source zone). The seismic source zone assumes background seismicity occurs randomly in space, while the gridded seismicity assumes the historical seismicity is stationary.

The NGA-West2 models by Chiou and Youngs (2013), Campbell and Bozorgnia (2013), Abrahamson *et al*. (2013), and Boore *et al*. (2013) were weighted equally in the PSHA. A number of more recent well recorded earthquakes were added to the NGA-West2 database including the Wenchuan, China, numerous moderate magnitude California events down to **M** 3.0, and several Japanese, New Zealand, and Italian earthquakes. In the 2007 study, early versions of the NGA-West1 models were used.

The NGA models require the time-averaged shear-wave velocity (V_S) in the upper 30 m (V_S30). No V_S data are known to be available in the vicinity of the site. Geotechnical data for the Mayflower Tailing dam and the Mayflower bypass tunnel were reviewed. The native foundation material is mainly glacial till that varies in thickness from 10 to more than 90 ft beneath the 5 Dam. Beneath the till is quartz monzonite and quartzite, which is locally strong, hard and highly fractured. The hazard was defined at the top of the rock. A site response analysis may be required if the ground motions are required at the top of the till. A range of V_S30 of 1,200 ± 200 m/sec for the rock was selected to accommodate the uncertainty due to the variability in rock and the lack of velocity measurements. In the 2007 study, an average generic V_S30 of 620 m/sec was assumed in lieu of any data.

The hazard curves for peak horizontal ground acceleration (PGA) and 1.0 sec spectral acceleration (SA) are shown on Figures 2 and 3 for a V_S30 of 1,000 m/sec. The hazard curves illustrate the ground motion as a function of annual frequency of exceedance. This frequency is the reciprocal of the average return period. The 5^{th}, 15^{th}, 85^{th} and 95^{th} percentile hazard curves indicate the range of epistemic uncertainty about the mean hazard. At a return period of 5,000 years, the difference between the 5th and 95th percentile PGA values is significant (Figure 2). The epistemic uncertainty in the 1.0 sec SA hazard is slightly less (Figure 3). Note that all hazard results are shown for a V_S30 of 1,000 m/sec, as it controls the hazard for all periods.

The contributions of the various seismic sources to the mean PGA and 1.0 sec SA hazard are shown on Figures 4 and 5. The Mosquito fault controls the PGA hazard for return periods greater than about 3,200 years (Figure 4) and the 1.0 sec SA hazard for return periods greater than 4,000 years (Figure 5). For shorter return periods, the background seismicity controls the hazard. In the 2007 PSHA, the PGA hazard was controlled by the Gore Range Frontal fault up to return periods of about 3,500 years and the Mosquito fault at longer return periods.

By deaggregating the PGA and 1.0 sec SA hazard by magnitude (M) and distance (D) bins, the contributions by events at a return period of 5,000 years can be evaluated (Figures 6 and 7). Most of the hazard at the damsite is from earthquakes of **M** 6.5 to 7.5 at distances less than 30 km representing larger events on the Mosquito and Gore Range Frontal faults.

Figures 8 and 9 illustrate the sensitivity of the mean PGA and 1.0 sec SA hazard to the NGA-West2 ground motion models. At PGA, Abrahamson *et al*. (2013) gives the highest hazard, while Chiou and Youngs (2013) gives the lowest (Figure 8). There is less sensitivity to the ground motion models for the 1.0 sec SA hazard (Figure 9).

The UHS for the return periods of 3,000, 5, 000 and 10,000 years are shown on Figure 10. The PGA and 1.0 sec SA values are provided in Table 1. The envelope of all three spectra for V_S30 of 1,200 ± 200 m/sec is the 1,000 m/sec spectrum. A comparison with the previous UHS for the Mayflower Tailing Dam based on the 2007 calculations is provided on Figure 11. The spectra are similar for very short periods (less than 0.1 sec). At longer periods, the updated UHS are up to 40% lower than the previous UHS. The reduction is due to the combined impacts of the newer ground motion models, and the higher V_S30 (620 to 1,000 m/sec).

Figure 12 shows the sensitivity of the 1.0 sec SA hazard to the new NGA models and the increase in V_S30. Sensitivity case 1 used the NGA-West1 ground motion models to examine difference in hazard due to the updated NGA models. The use of the NGA-West2 models decreases the hazard by approximately 11% at the 5,000-year return period. Sensitivity case 2 used a V_S30 of 620 m/sec to examine the impact on the hazard due to the revised V_S30. The use of 1,000 m/sec in the current study decreases the hazard by approximately 38% at the 5,000-year return period.

In summary, the decrease in hazard at the structural periods of most interest, 0.1 to 3.0 sec is significant using the latest NGA-West2 ground motion prediction models (Figure 11). Whether the impact on the design of the dam is significant is addressed in later analyses.

Table 1. Summary of PGA and 1.0 sec SA Values for Mayflower 5 Dam

Return Period	PGA (g)	1.0 sec SA (g)
3,000 years	0.15	0.07
5,000 years	0.20	0.10
10,000 years	0.28	0.15

REFERENCES

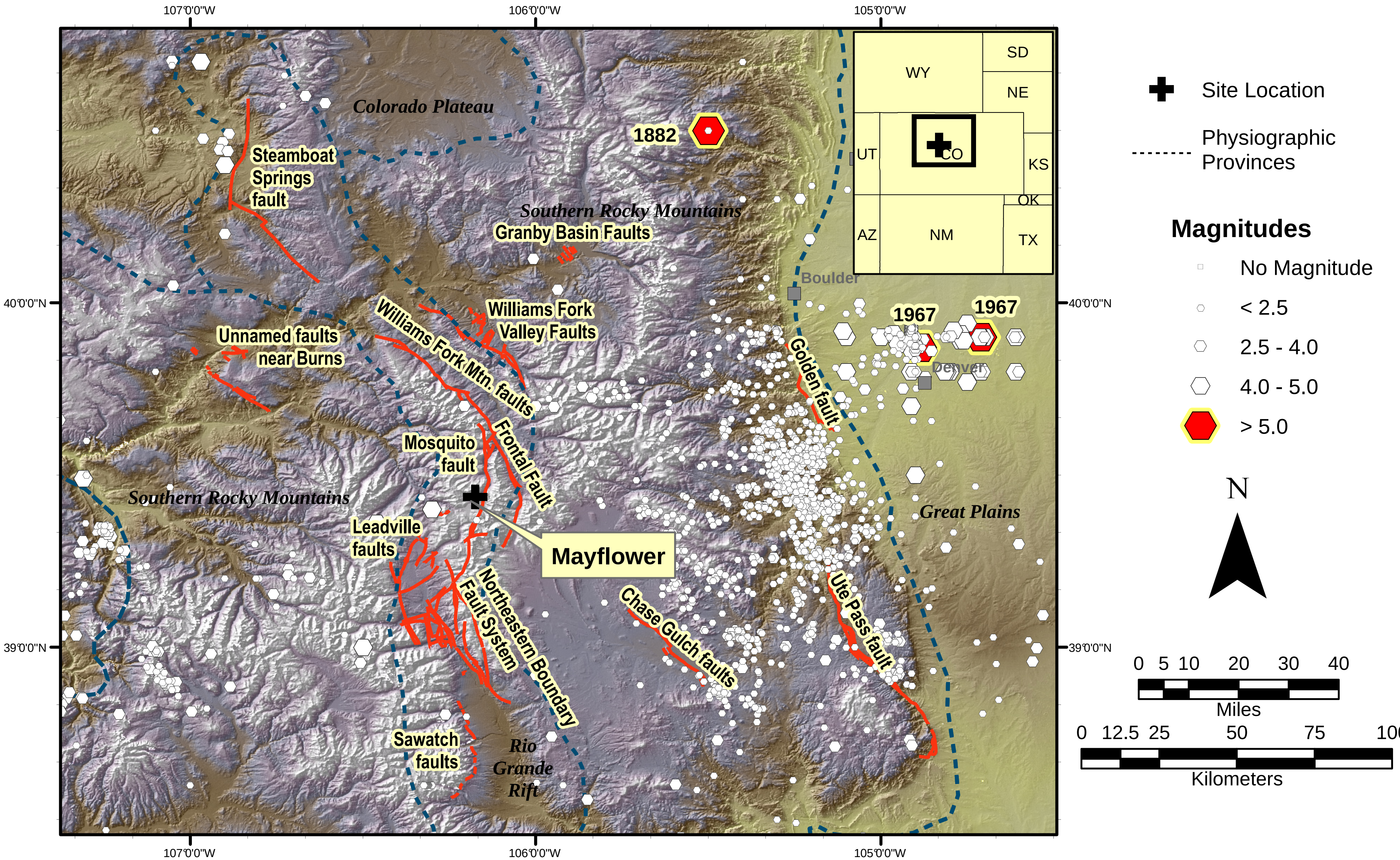
Abrahamson, N.A., Silva, W.J., and Kamai, R., 2013, Update of the AS08 ground-motion prediction equations based on the NGA-West2 data set. PEER Report 2013/04 Pacific Earthquake Engineering Research Center.

Boore, D.M., Stewart, J.P., Seyhan, E., Atkinson, G.M., 2013, NGA-West2 equations for predicting response spectral accelerations for shallow crustal earthquakes. PEER Report 2013/05 Pacific Earthquake Engineering Research Center.

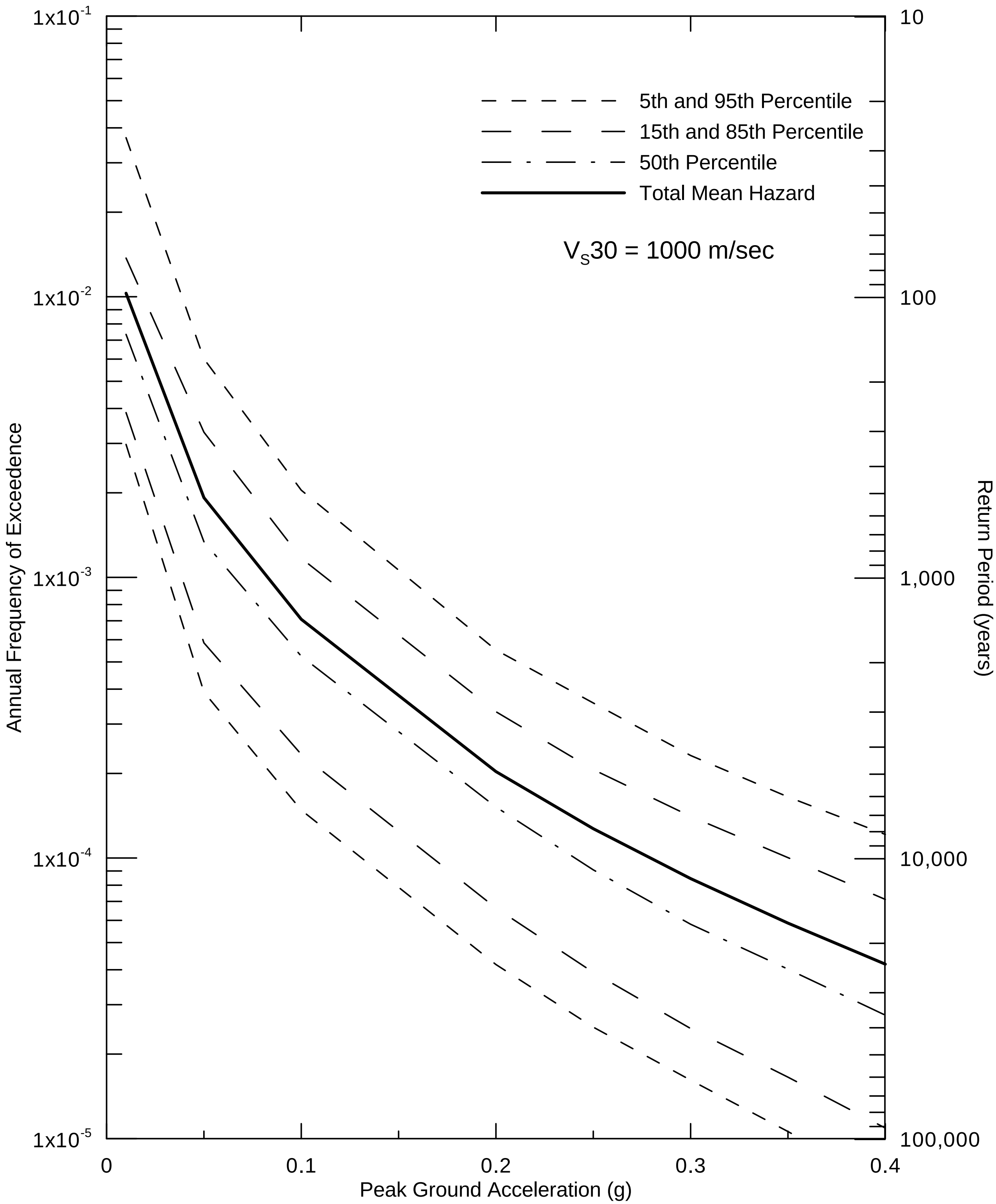
Campbell, K.W. and Bozorgnia, Y., 2013, NGA-West2 Campbell-Bozorgnia ground motion model for the horizontal components of PGA, PGV, and 5%-damped elastic pseudo-acceleration response spectra for periods ranging from 0.01 to 10 sec. PEER Report 2013/06 Pacific Earthquake Engineering Research Center.

Chiou, B.S.J. and Youngs, R.R., 2013, Update of the Chiou and Youngs NGA Ground Motion Model for Average Horizontal Component of Peak Ground Motion and Response Spectra. PEER Report 2013/07 Pacific Earthquake Engineering Research Center.

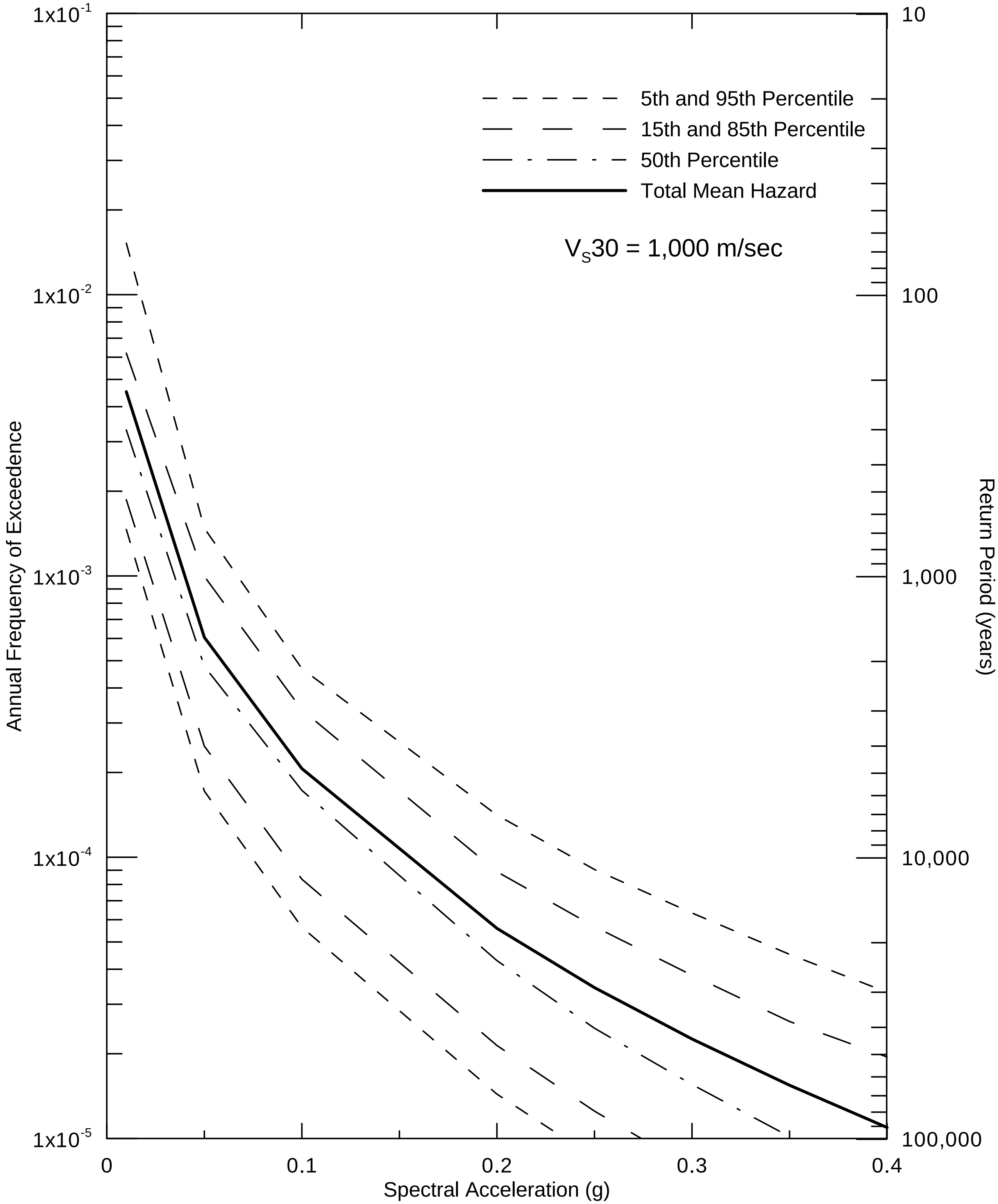
Wong, I., Olig, S., Kirkham, R., Dober, M., and Terra, F., 2007, An update to the probabilistic seismic hazard analysis of the Climax Mine, Colorado: unpublished technical report submitted to Climax Molybdenum Company.



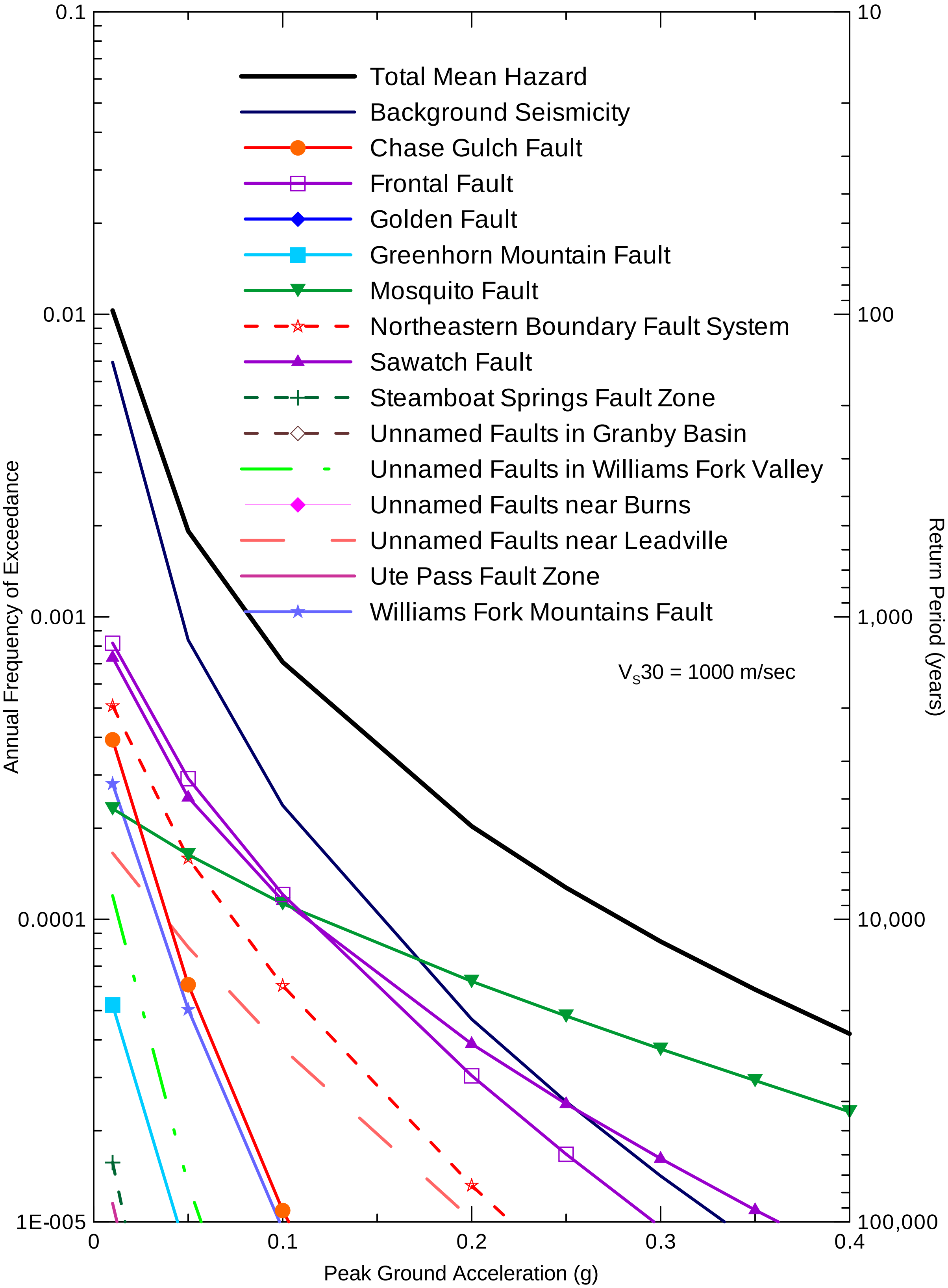
URS	Project No. 22243088 Mayflower Tailing Dam Climax Mine	HISTORICAL SEISMICITY OF CENTRAL COLORADO, 1850-2012	Figure 1



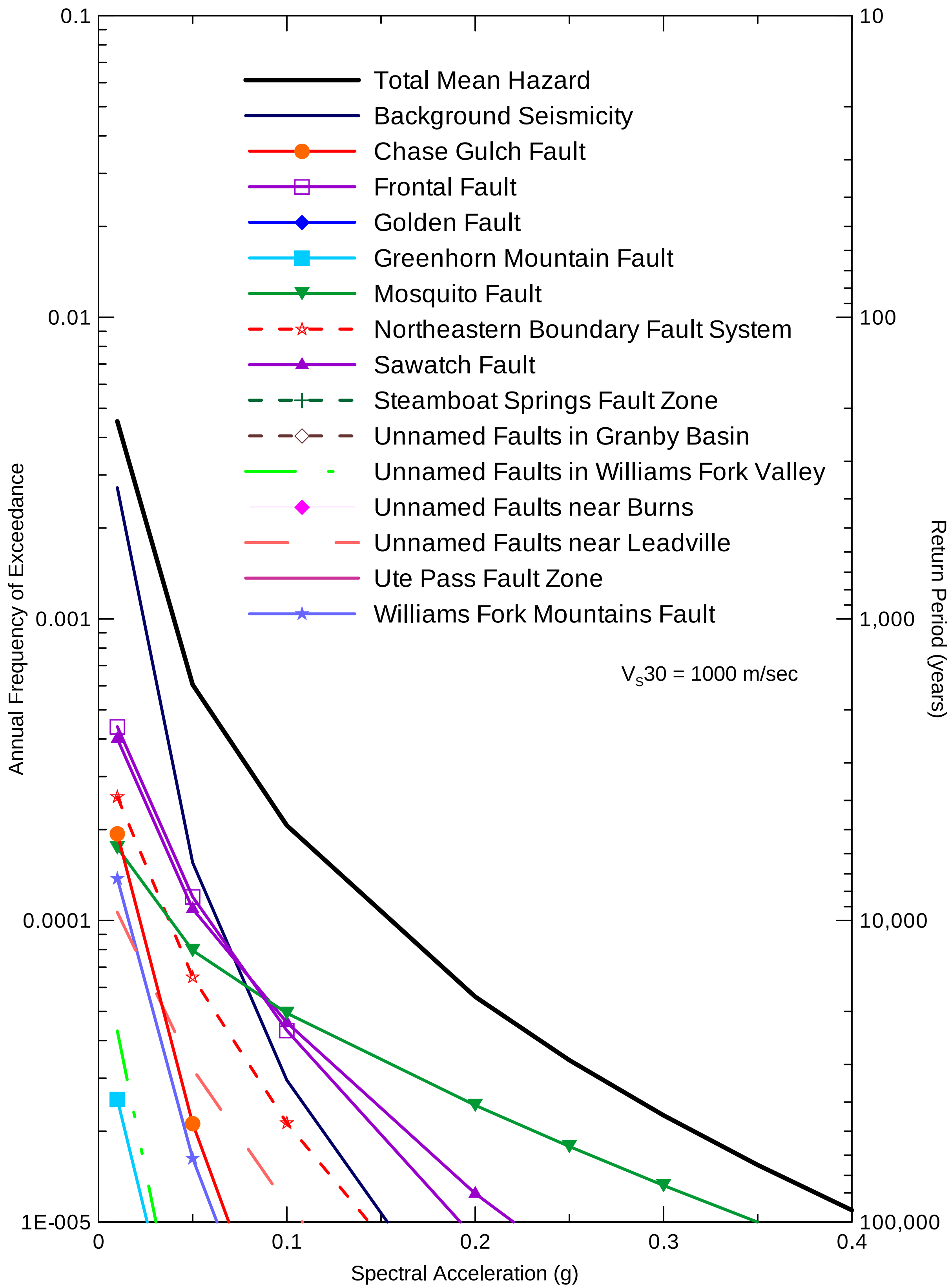
URS	Project No. 22243088 Mayflower Tailings Dam Climax Mine,Colorado	SEISMIC HAZARD CURVES FOR PEAK HORIZONTAL ACCELERATION	Figure 2



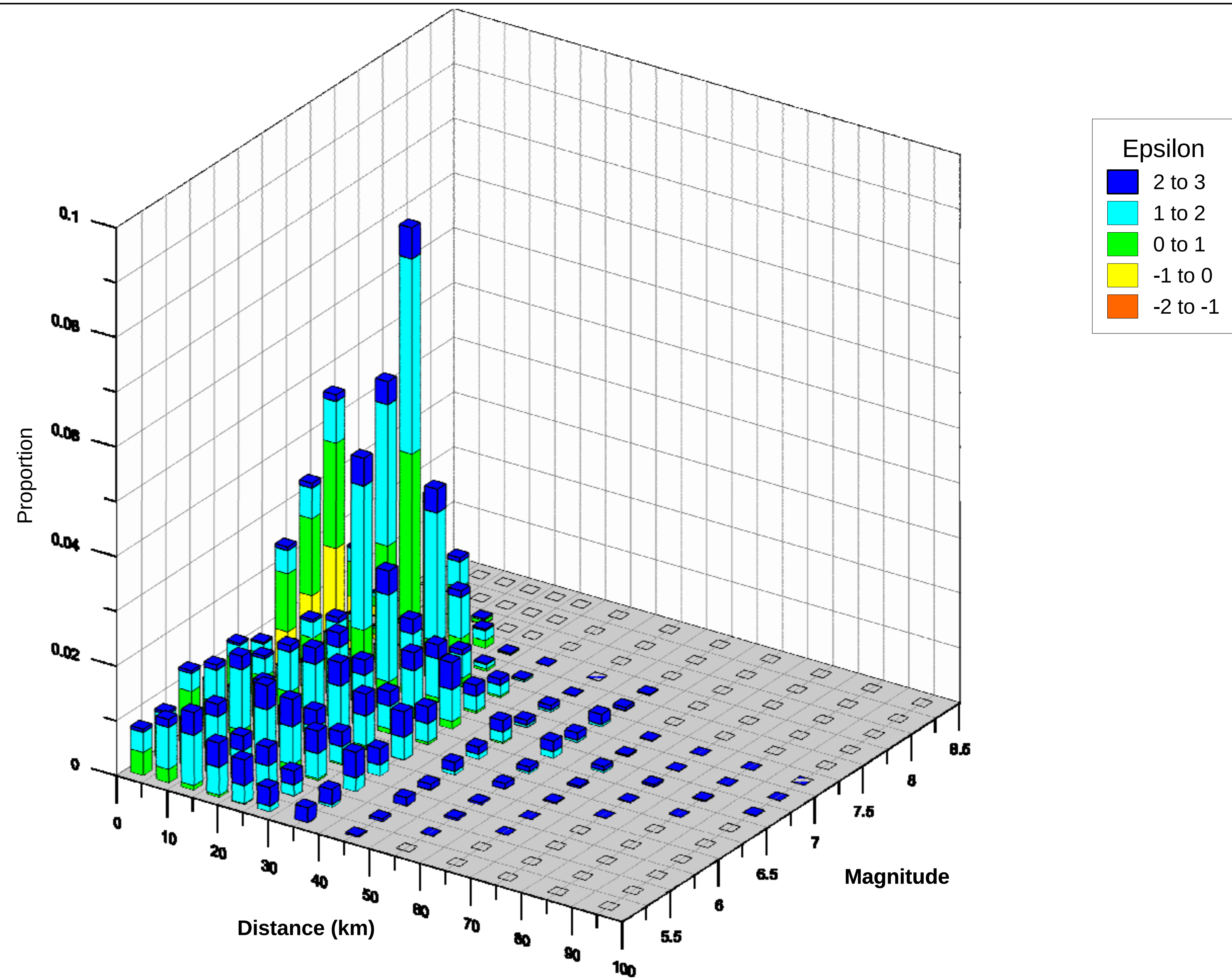
URS	Project No. 22243088 Mayflower Tailings Dam Climax Mine,Colorado	SEISMIC HAZARD CURVES FOR 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION	Figure 3



URS	Project No. 22243088 Mayflower Tailings Dam Climax Mine,Colorado	SEISMIC SOURCE CONTRIBUTIONS TO PEAK HORIZONTAL ACCELERATION HAZARD	Figure 4



URS	Project No. 22243088 Mayflower Tailings Dam Climax Mine,Colorado	SEISMIC SOURCE CONTRIBUTIONS TO 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD	Figure 5



V_S30 = 1,000 m/sec

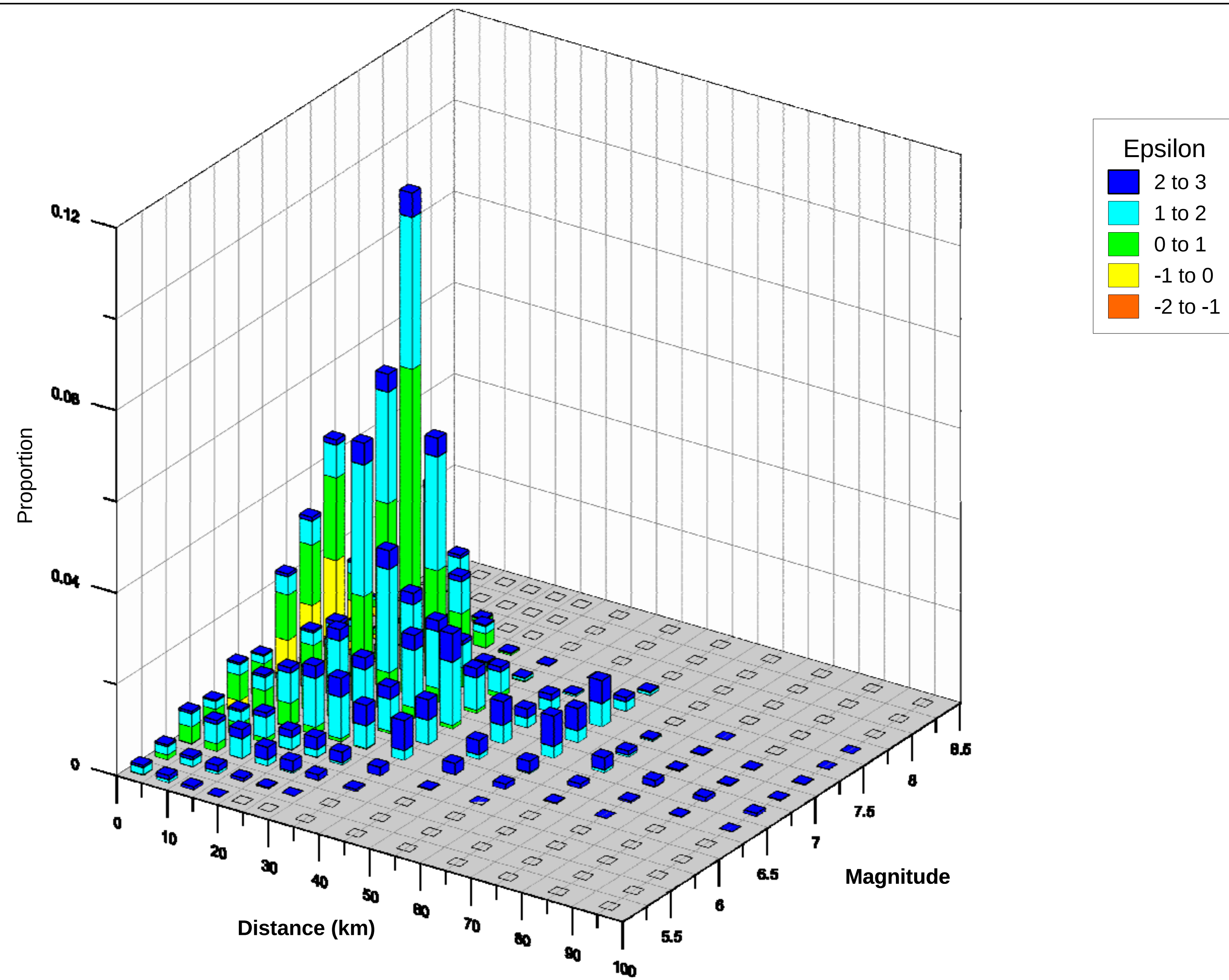
URS

Project No. 22243088

Mayflower Tailings Dam
Climax Mine,Colorado

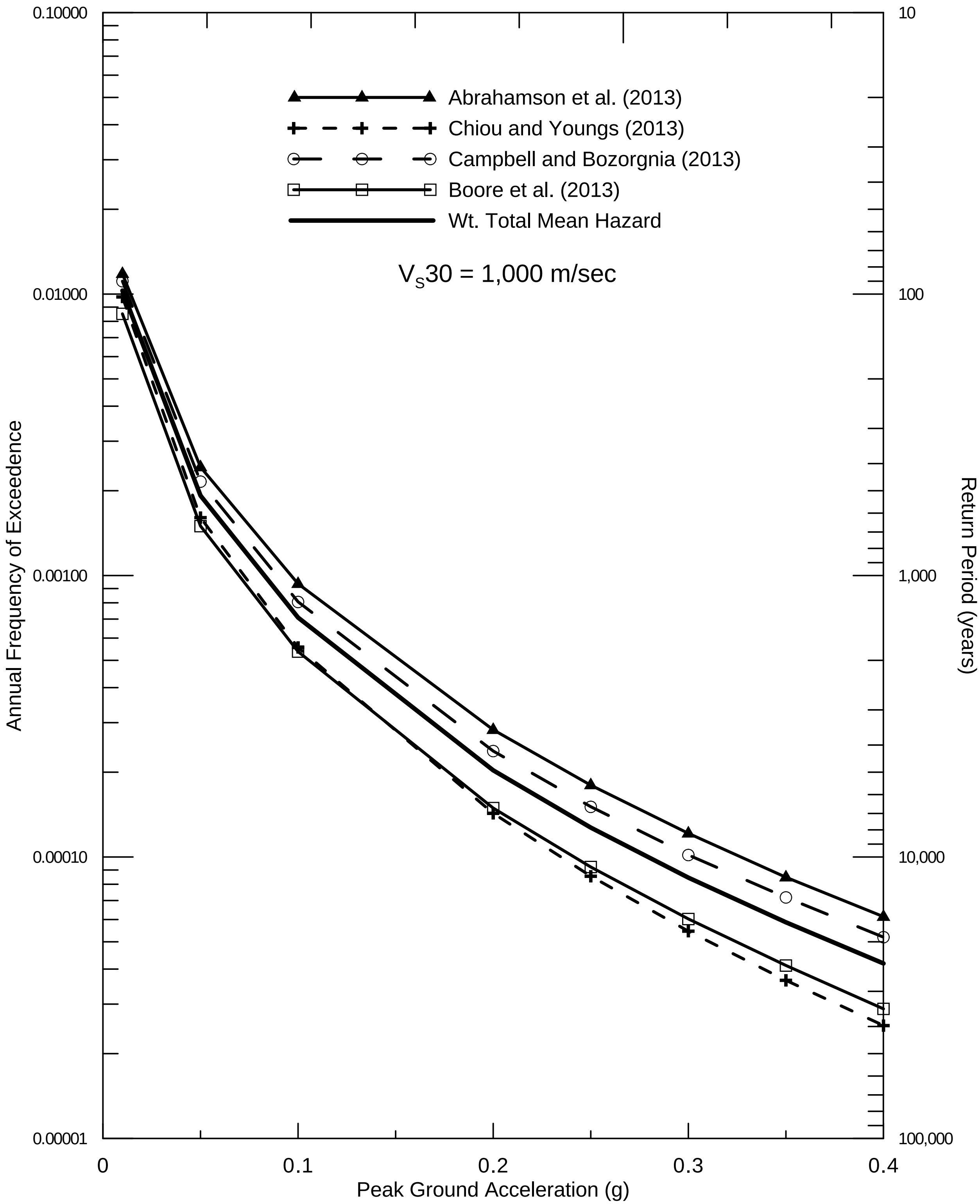
MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT 5,000-YEAR RETURN PERIOD

Figure 6

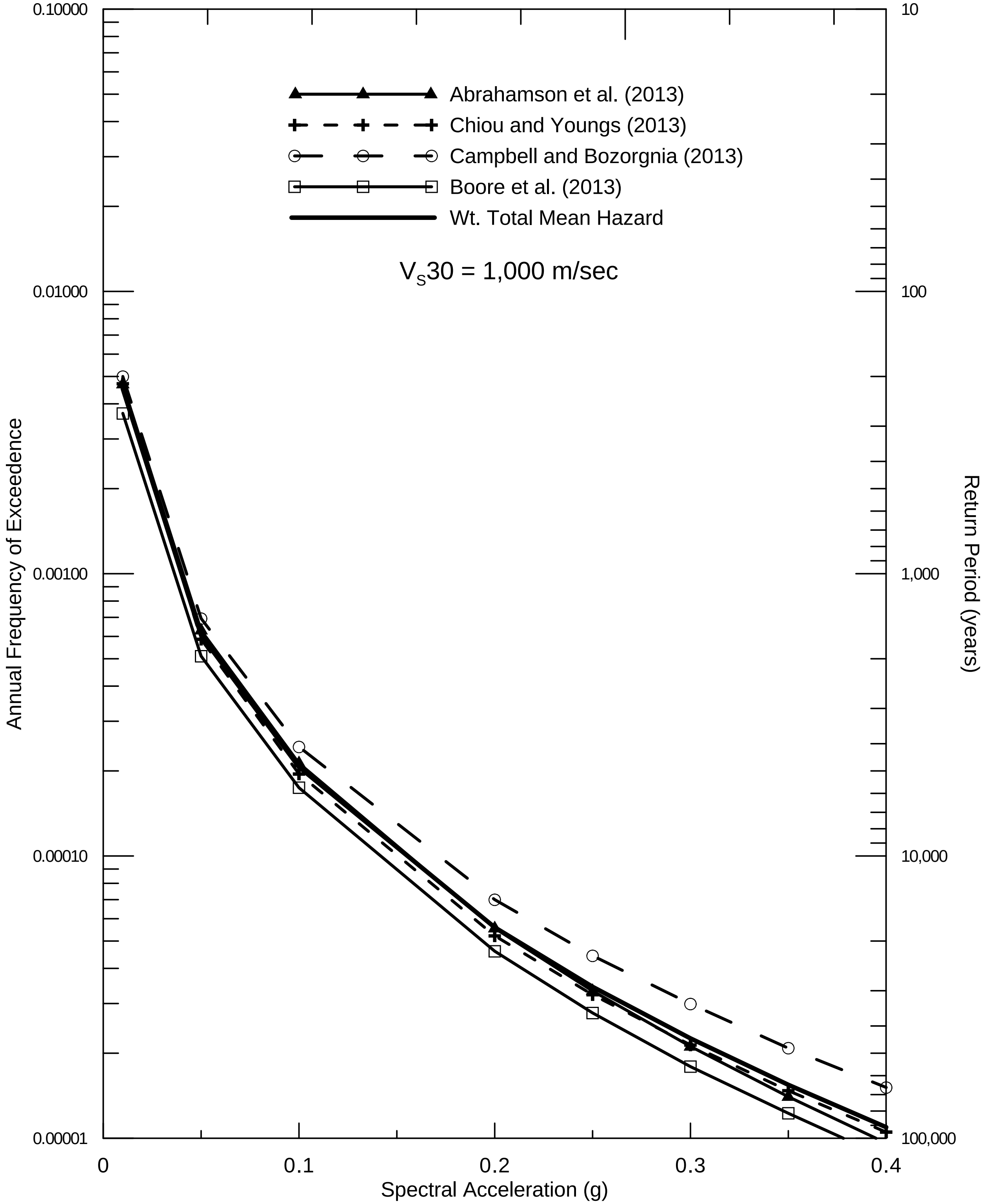


V_S30 = 1,000 m/sec

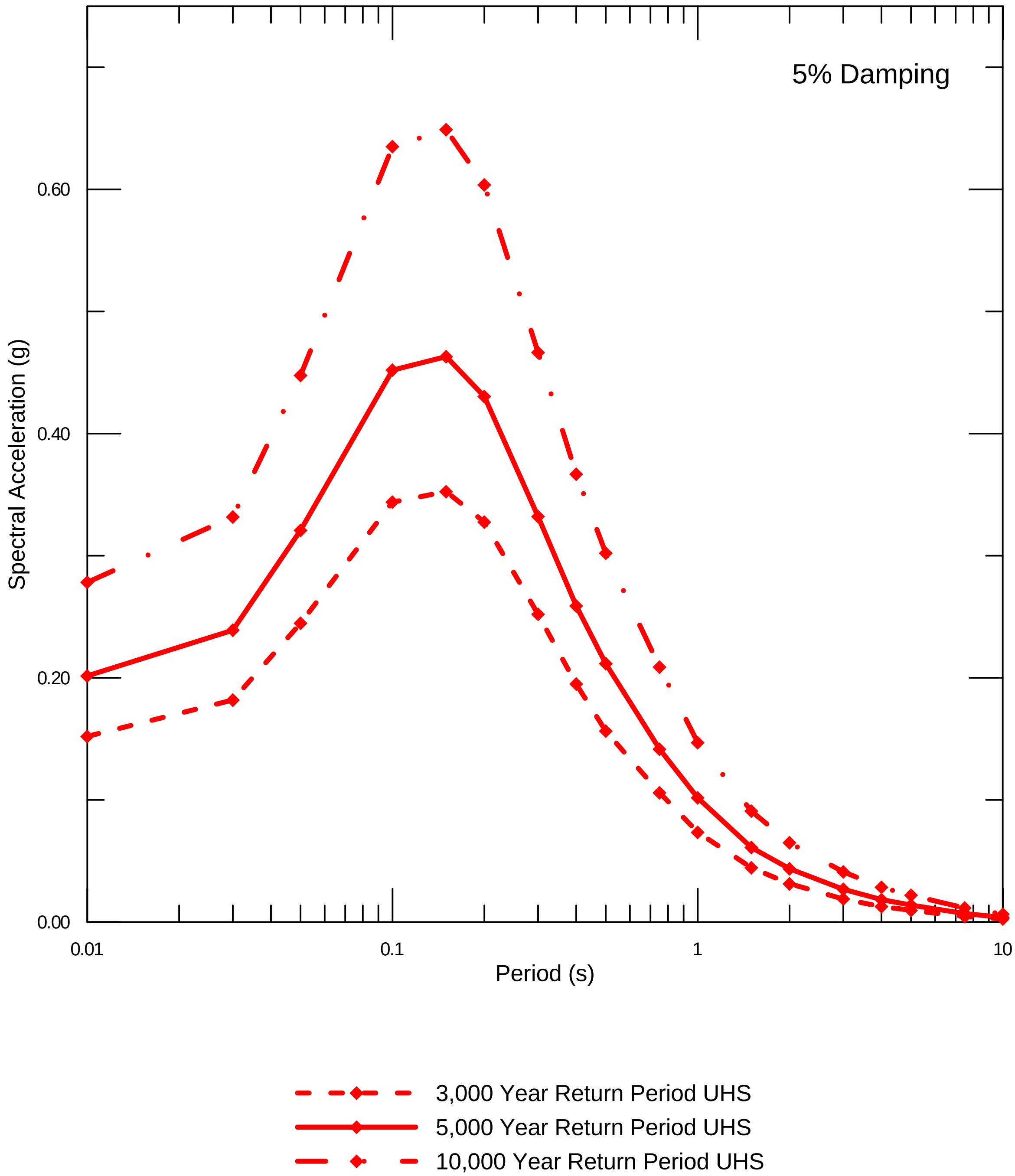
URS	Project No. 22243088 Mayflower Tailings Dam Climax Mine,Colorado	MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT 5,000-YEAR RETURN PERIOD	Figure 7



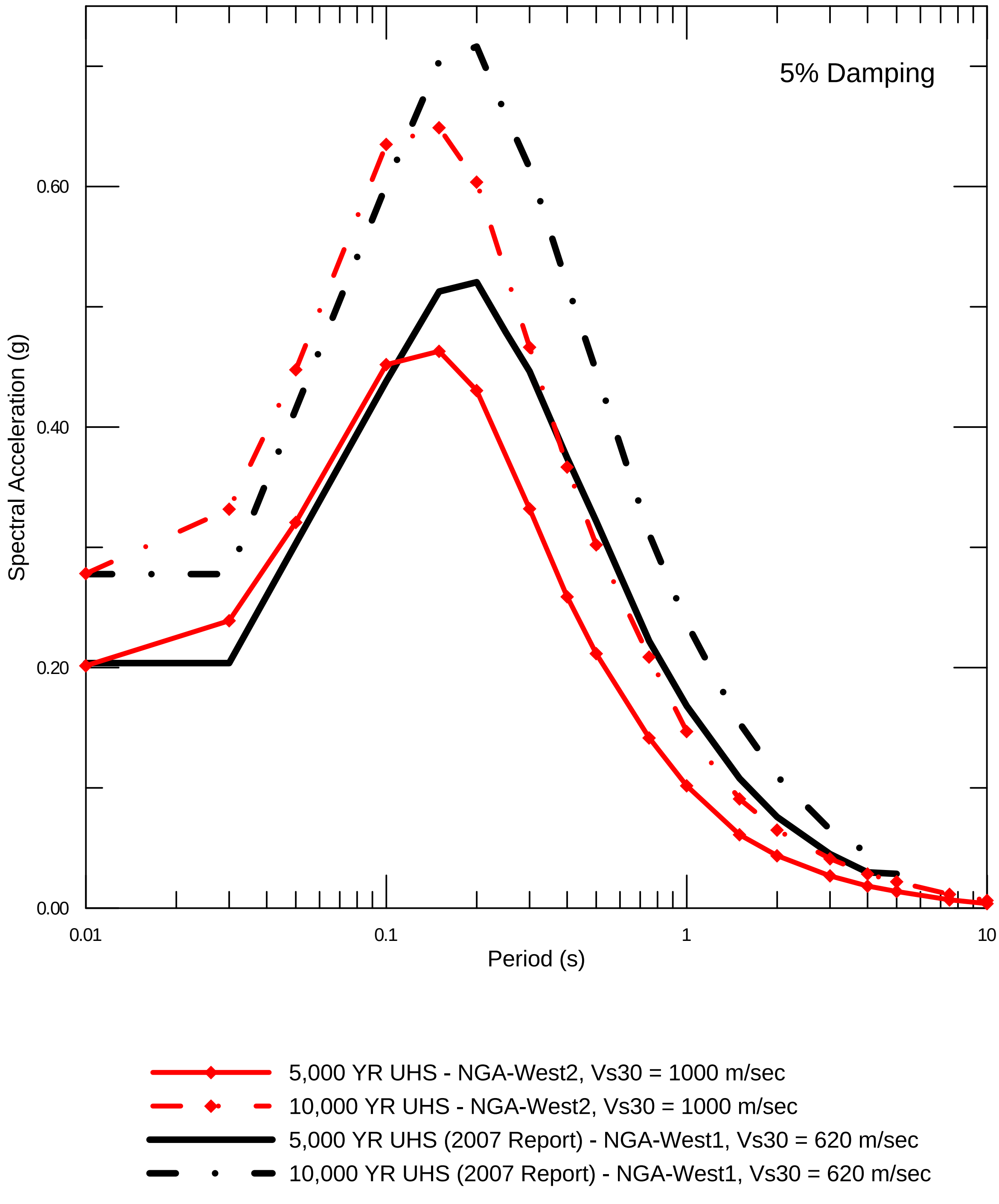
URS	Project No. 22243088	SENSITIVITY OF THE PEAK HORIZONTAL ACCELERATION HAZARD TO GROUND MOTION MODELS	Figure 8
	Mayflower Tailing Dam Climax Mine,Colorado		



URS	Project No. 22243088 Mayflower Tailing Dam Climax Mine,Colorado	SENSITIVITY OF THE 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD TO GROUND MOTION MODELS	Figure 9



URS	Project No. 22243088 Mayflower Tailings Dam Climax Mine, Colorado	5%-DAMPED UNIFORM HAZARD SPECTRA	Figure 10



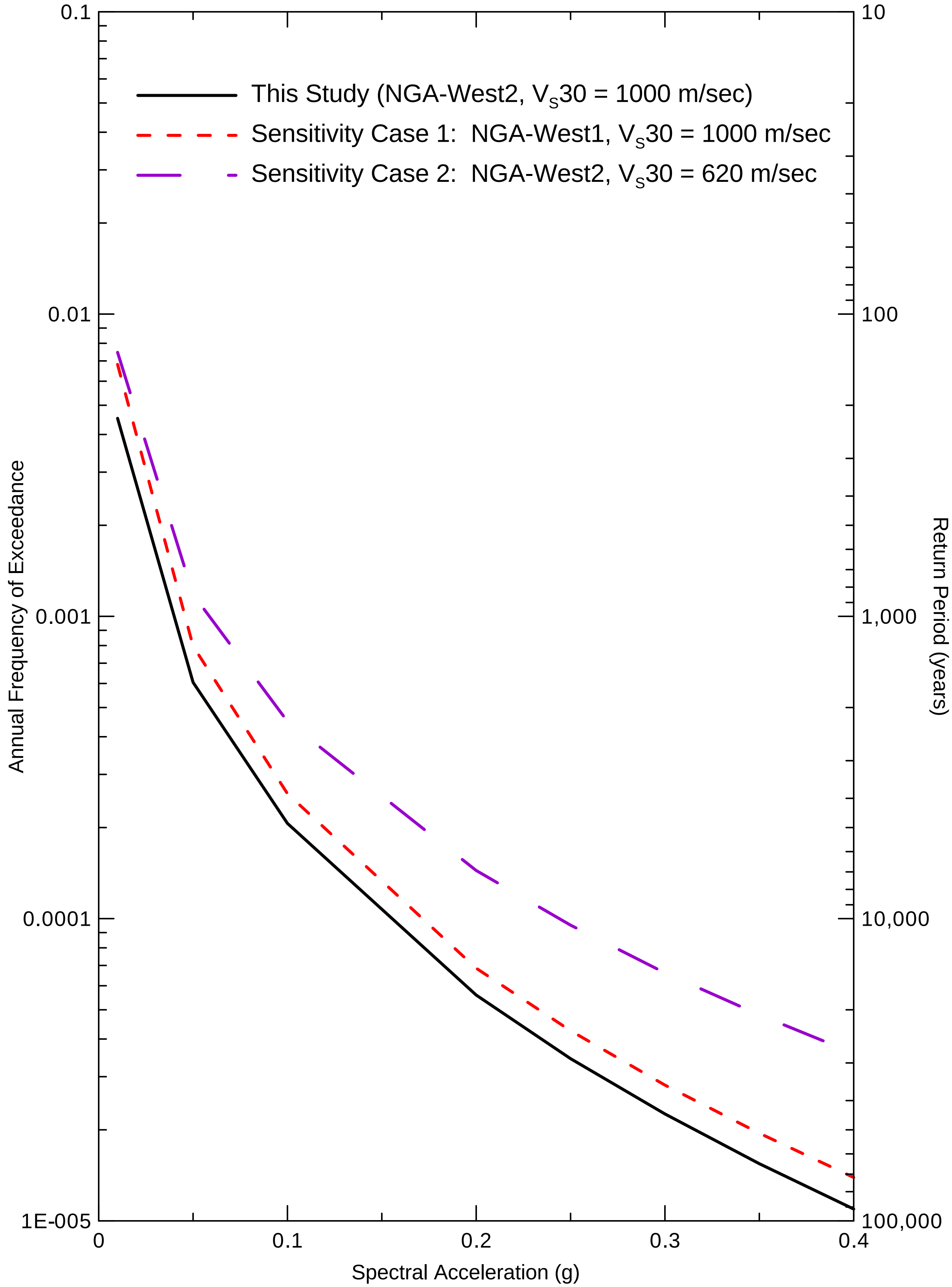
URS

Project No. 22243088

Mayflower Tailings Dam
Climax Mine, Colorado

UNIFORM HAZARD SPECTRA COMPARED TO 2007 UNIFORM HAZARD SPECTRA

Figure 11



URS	Project No. 22243088 Mayflower Tailing Dam Climax Mine,Colorado	SENSITIVITY OF 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD TO GROUND MOTION MODELS AND V_S30	Figure 12