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A Division of Southwest Research Institute
6220 Culebra Road • San Antonio, Texas, U.S.A. 78228-5166
(210) 522-5160 • Fax (210) 522-5155

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U.S. Nuclear Regulatory Commission
ATTN: Deborah A. DeMarco
Office of Nuclear Material Safety and Safeguards
Two White Flint North
Mail Stop 7 C6
Washington, DC 20555

Subject: Submittal of Abstract: Tectonic Evolution of Crater Flat Basin, Nevada

Dear Mrs. DeMarco:

Enclosed is an abstract for presentation at the 2000 National Geological Society of America Meeting. This abstract is based on work done by John Stamatakos, David Ferrill, Brittain Hill, Peter La Femina, Darrell Sims, and Chuck Connor of the CNWRA; Dr. Mary Beth Gray of Bucknell University; and Alan Morris of University of Texas at San Antonio. The abstract describes CNWRA's current interpretation of the development of the Crater Flat Basin west of Yucca Mountain. Following programmatic acceptance by the NRC, this abstract will be submitted to the GSA Meeting organizing committee for presentation at the National meeting.

If you have any questions please contact Dr. John Stamatakos at (210) 522-5247 or me at (210) 522-5252.

Sincerely,

Budhi Sagar
Technical Director

/rae

Enclosure

cc:	J. Linehan	J. Greeves	D. Brooks	W. Patrick	J. Stamatakos
	W. Reamer	T. Essig	P. Justus	CNWRA Dirs	D. Ferrill
	B. Meehan	S. Wastler	B. Leslie	CNWRA EMs	T. Nagy

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Washington Office • Twinbrook Metro Plaza #210
12300 Twinbrook Parkway • Rockville, Maryland 20852-1606

T15 Cenozoic Basin and Range Tectonics and Geophysical Constraints

TECTONIC EVOLUTION OF THE CRATER FLAT BASIN, NEVADA

STAMATAKOS, John A., (jstam@swri.edu), HILL, B.E., FERRILL, D.A., LA FEMINA, P., SIMS, D.W., and CONNOR, C.B., Center for Nuclear Waste Regulatory Analyses, Southwest Research Institute, San Antonio, TX, 78238; MORRIS, A.P., UTSA, San Antonio, TX 78249; and GRAY, M.B., Bucknell University, Lewisburg, PA 78249.

Geologic and geophysical evidence shows that basin architecture of Crater Flat (CF) is largely controlled by the geometry and Miocene displacement history of the Bare Mountain Fault (BMF). Yucca Mountain (YM) as part of CF is the proposed site for disposal of high-level nuclear waste. We reinterpret the tectonic history of CF in order to evaluate current site characterization studies of YM and to assess the potential for future tectonic deformation. Key elements of our reinterpretation are that intrabasinal normal faulting in CF is attributed to outer-arc extension above a listric BMF and that surface fault dips of the BMF steepen from north to south along strike from 45 to 75 degrees. Under these geometrical conditions, uniform E-W extension of CF produced greater fault displacement and associated clockwise rotation in the BMF hanging wall along and adjacent to the steepest (southern) portions of the BMF. Rock units 11.6 Ma and older show >30 degrees of clockwise vertical axis rotation compared to rock units younger than 11 Ma, which are not rotated. This rotational framework thereby constrains the timing of maximum BMF deformation and basin extension to a brief period in the late Miocene. Additional evidence for rapid extension includes new magnetic and gravity models, which indicate that a thick accumulation of 11.6±0.1 Ma Rainier Mesa Tuff was deposited in the rapidly developed half-graben basin adjacent to the BMF. Rapid extension and basin subsidence also enhanced exposure of the Bare Mountain footwall, resulting in over-steepened topography. These over-steepened exposures collapsed at least three times, producing impressive volumes of rock avalanche deposits in CF. Based on geophysical modeling, cumulative throw across the BMF during the period from12 to 11 Ma was 1 to 2 km, suggesting a fault-slip rate of 1–2 mm/yr. After 11 Ma, this slip rate reduced to present rates of about 0.06 mm/yr. [Work supported by the U.S. NRC (Contract NRC-02-97-009). This abstract is an independent product of CNWRA and does not necessarily reflect the views or regulatory position of the NRC]

Keywords: Deformation, Faulting, Extension, Paleomagentism