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2240 Northpoint Parkway
Santa Rosa, CA
95407-5009

p| 707.571.1883
f | 707.571.7813

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July 24, 2008
Project 67929-1

Mr. Henry Martinez
Sr. Project Manager
Lawrence Berkeley National Laboratory
One Cyclotron Road
Berkeley, CA 94720

**Subject: Response to WLA Peer Review Comments**
**Fault Investigation**
**Computation Research and Theory Building**
**Lawrence Berkeley National Laboratory**
**Berkeley, California (Kleinfelder Report Dated 9/17/06)**

Dear Mr. Martinez:

As requested, Kleinfelder is pleased to provide our response to the peer review comments presented by William Lettis & Associates, Inc. (WLA) in their letter dated July 3, 2008. The peer review letter addresses our Fault Investigation report for the Computational Research and Theory (CRT) Building at the Lawrence Berkeley National Laboratory located in Berkeley, California. **WLA indicates that they are in agreement with our conclusions that active faulting does not exist beneath the CRT building site. They further state that our study was performed adequately for the purposes of the proposed project and that *"The study, as well as previous studies, document that the primary active fault zone of the Hayward fault lies west of the proposed CRT footprint."***

The WLA peer review letter does present eight comments which we will address in the order that they appear in their letter.

(1) *The first page of the document states that the report is "Draft" whereas the title page does not. This discrepancy should be clarified prior to final submittal.*

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The inclusion of the word "Draft" on the first page was a clerical error and the report submitted is the final version. For clarity, we have corrected the first page and present corrected versions of the report (enclosed).

(2) *Age of Deposits. There is no discussion on the age of the landslide material and overlying Holocene colluvium. The basis of an A-P surface-fault rupture investigation is to document the presence or absence of Holocene faulting (i.e. within the last 11,000 years). Typically A-P studies provide information on the relative or absolute age of the overlying Holocene/Pleistocene material in order to document the absence of Holocene fault activity.*

We did not include a discussion of relative age of the colluvial or landslide deposits, because they were indeed considered to be Holocene (less than 11,000 years old) but more importantly there was no evidence of active faulting in the Late Cretaceous bedrock beneath the colluvial deposits (which we used for our determination of no active faulting on the site) or fault offsets in the basal colluvial layer. Hence, a discussion regarding the age of surficial deposits is not required. For clarity sake, it is our opinion that, based on the soil development (i.e clay films, partial rubification of color to 10YR4/6 in the lowermost colluvial layer, Unit 3), the basal colluvial layer is several thousands of years old and may actually approach the Holocene/Pleistocene age boundary.

(3) *The presence of inferred landslide-related shearing in the trenches complicates this analysis. Because the landslide features are interpreted throughout much of the site trenches, one must consider if the landslide material has removed or obscured evidence of past surface fault rupture. Furthermore, structural and kinematic data are usually described in more detail in the text or logs in order to provide a basis for differentiating landslide-related features from tectonic faulting. This type of information is not provided in the report. It also would be useful for geotechnical design and considerations.*

We consider the landslide-related features to be quite unique and easily discernible from tectonic and/or active fault-related features. Again, we did not observe any active fault-related features in the underlying bedrock, whether overlain by colluvium or by landslide deposits, so it would be irrelevant if landslide material has removed other deposits.

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The relevance of the subsurface geologic conditions has been addressed in a separate geotechnical investigation report.

(4) *The log of trench KT-1 (Plates 3a-3c) exhibits numerous shallow east- and west-dipping shear planes that are interpreted as landslide-related by Kleinfelder (2006). Between Station 40 and 50 ft, a set of clay seams extend across the bedrock-colluvial contact and are shown to be intersecting the basal colluvium. In addition, near Station 130 ft a younger colluvium is interpreted as infilling a buried landslide headscarp. This planar slip surface and inferred buried headscarp align with a topographic break in slope that trends northwest through the western part of the CRT footprint. Furthermore, trench KT-2 also exhibits a colluvial deposit offset by a similar planar shear surface suggesting lateral continuity of landsliding along this break in slope. The presence of these discontinuities and geomorphic relations suggest that the landsliding present beneath the footprint of the CRT may be relatively young and should be mitigated or designed for prior to construction of the CRT.*

We agree with these comments; however, these are not comments commonly presented in a peer review of a fault investigation. The presence of landsliding on this site is acknowledged and design recommendations are presented in our geotechnical investigation report for this site.

(5) *We strongly recommend that a site geologic map be prepared that depicts the surficial geology with respect to: (a) the features interpreted in the trenches (i.e. landslides), (b) the previous slope repairs alluded to in the northern part of the site (see page 3 of Kleinfelder, 2006) and (c) the steep ravine located along the southern margin of the site. A site geologic map would have aided in the interpretation of subsurface data and provided guidance in any further geotechnical studies prior to site development.*

Geology has been added to Plate 2 of the report.

(6) *Recent studies indicate that the inferred 1836 Oakland earthquake (M6+) did not occur on the Hayward fault (see Toppozada and Borchardt, 1998).*

Reference noted.

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(7) *Page 10 notes: No shears or offsets of the layers/geologic contacts were observed in the trench. This is an incorrect statement based on the shears shown in the trench logs, and with respect to the offset colluvium in trenches KT-1 and KT-2.*

While we agree grammatically with the reviewer's statement, the intent of the phrase was to imply shears or offset of these layers due to active faulting.

(8) *Page 10 notes: The bedrock unit displays zones of sheared material associated with tectonic activity. These shear zones and clay shear seams are not consistent with the trend of the Hayward fault. It is unclear where these features were encountered in the excavation and what orientations were obtained. Only a single clay shear from the trenches is described, and it has an orientation trending northeast (e.g. inconsistent with the northwest-trending Hayward fault). Usually this type of structural information is provided for several to any of the discontinuities and forms the basis for the interpretation of landsliding verses faulting, or alternatively, older inactive tectonic-related faulting.*

We agree that more bedrock structural data would have helped to demonstrate to readers of the report the overall structural characteristics of the bedrock unit; however, it was clear to us in the field, based on our experience with numerous fault investigations, that features in these trenches were not related to active faulting or relatively recent ground rupture.

While the reviewer's constructive comments have been noted, we point out that they are in agreement with us that there is no evidence for active faulting to cross the footprint of the CRT building site and that our report has met the criteria for a fault investigation.

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We trust that this letter adequately addresses your needs. If you have any questions or concerns, please contact the undersigned.

Respectfully Submitted,

**KLEINFELDER**

William V. McCormick, CEG 1673
Principal Engineering Geologist

WVM\jkd