PDR

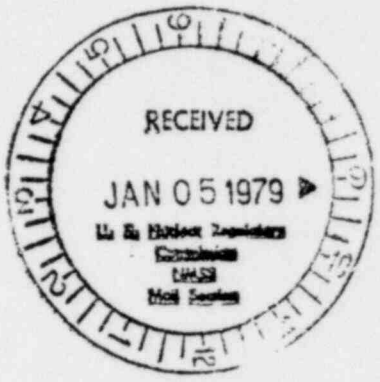
M-3

[redacted]

TERA

TEKNEKRON ENERGY RESOURCE ANALYSTS CORPORATION

December 19, 1978



U.S. Nuclear Regulatory Commission
OMNSS
Washington, DC 20555

Attn: Mr. Winston Burkhardt

Dear Winston:

We hope that the attached information will assist you in your decision making.

Very truly yours,

Larry Wight

Lawrence H. Wight
Project Manager

LHW:pw
Attachment

cc: C. Marshall Payne, w/a

13502

7902090279

ENERGY AND ENVIRONMENTAL ENGINEERING
2150 SHATTUCK AVENUE BERKELEY, CALIFORNIA 94704 415·845·5200

PRELIMINARY SITE CHARACTERIZATION SUMMARY

The following discussion summarizes TERA Corporation preliminary findings with regard to possible active faulting and/or mass landsliding at General Electric Company, Vallecitos Atomic Laboratory. From the available data review and basic research conducted, it is our opinion that the evidence to date is strongly in favor of faulting. We do have some reservation for the mass landslide theory due to some uncertainties. Models can be constructed to help demonstrate the remote possibility of landslide-derived features on the site, but these require critical scrutinization. Because the site is located in a region of known active landsliding, one cannot discount the possibility that both mass-gravity and tectonic mechanism may have produced the present landscape and, further, may be interrelated to each other.

The shear features examined in Trenches H, H1 and H2 near Building 102 are similar geologically to other obvious shears observed in Trenches B1, B2 and B3 plus some of the slit trenches near Trench B2. The shears are probably related to each other through the common tectonic process of thrust faulting. Landsliding also can create shears but, due to the geometry of the shears, materials displaced and the amount of displacement, it is difficult to accept the landslide process. Uncertainties arise from the geomorphic features and distribution of materials on the site. Some can be explained by either process of faulting or landsliding.

The evidence in favor of thrust faulting near Building 102 (Trenches H, H1 and H2) can be summarized as:

1. There has been more than one episode of uplift. Multiple events as little as one to three feet, as measured in Trench B2, are typical of thrust faulting. Landsliding usually results in a single catastrophic event.

2. The shear features observed in Trench H dip to the northeast at moderate angles with apparent dip-slip movement and with the north block overriding the south block.

3. Bedding north of the shear zone has not been drastically deformed (broken or mixed), though some chaotic mixing does occur immediately north of the main shear in Trench H. Bedding dips consistently and uninterruptedly to the south, perhaps more typical of tectonic deformation (folding or tilting).

4. Photo lineaments along the northeast and southwest side of the hill east of Building 102 might suggest it is a pressure ridge derived from thrust faulting. Whether these two lineaments merge or not is unknown.

5. Based on the materials displaced, there appears to have been prolonged periods of quiescence which is not unusual for faulting. Reactivation of a landslide mass some 3400 feet from the probable source area and with such a low valley surface gradient is difficult to explain.

The evidence in favor of mass landsliding near Building 102 (Trenches H, H1 and H2) can be summarized as follows:

1. The topographic configuration of the hill next to Building 102 is irregular in plan view though relatively symmetrical in profile. The shape of the hill does not conform to the shape of a typical fault bounded pressure ridge. If the hill is a landslide mass (block glide mass) such a configuration might be created. The low relief knolls in the vicinity of Trench B2 are more typical physiographically of a landslide mass. The knolls display an arcuate-lobate distal edge with hummocky terrain north of shear zone.

2. An anomolous topographic discontinuity (indentation) exists at the toe of the Vallecitos Hills about 3400 feet northeast of the small hill adjacent to Building 102. This could have been the source area for a landslide mass. The inferred slide mass is essentially in line with the indentation and down slope of the feature.

3. The north dipping shears examined in Trench H can be explained as landslide created shears, though this is not a normal condition. Due to friction and drag at the distal edge of a landslide, the slide plane could surface or daylight upward resulting in a north dipping shear plane.

4. Landslide masses are capable of being reactivated for numerous reasons and even with a very low slip plane angle. In that there may have been long periods between movements might favor a possible slide theory. Earthquake induced landsliding is indeed possible.

5. The known length of the shear feature (photo lineament) noted in Trench H is relatively short (1000± feet long). It is difficult to project the lineament west of Building 102 or east of Highway 84. The short length of the feature is easier explained by landsliding than by faulting.

6. The site is in a region of known small and large scale landsliding. Rocks and soil materials on the site are conducive to possible sliding.

The question of whether the shear feature traverses through or around Building 102 or terminates has not been answered fully. Air photos dated 1954 (1" = 1000') show a small ridge or knoll that pre-existed immediately southwest of the building. This was presumably an extension of the existing hill east of the subject building. The small knoll formed a continuation of the photo lineament. If the lineament is representative of the shear feature, then the feature would trend to the south of the building, missing it by an estimated 200 feet. The hills west of the building make it very difficult to project the lineament any further west than the building itself.

Possible Investigations

To help answer the uncertainties related to the shear feature noted near Building 102, several tests can be performed to characterize the feature and determine its cause. The following discussion serves to outline to you the scope of our services to perform these investigations. The anticipated costs for these studies could be furnished when the details of each phase of the possible investigations are finally established.

In order for you to fully understand what is involved in conducting these investigations, the following outlines the general scope and succession of work.

PHASE I

1. Have produced a detailed topographic map (1"= 400') of the area in the vicinity of Building 102 using the 1954 or older air photos.

2. Airphoto geologic analysis of available air photos dating from 1940 to the present. Inclusion of color, black and white, high altitude and oblique photography.

3. Low sun angle air photography utilizing a specialist in this field.

4. An in-depth review of all available literature and studies pertaining to the site and region inclusive of all geophysical work.

5. Detailed field mapping of the Quaternary geology on and near the site. This would include the field checking of existing geologic maps of the area, re-evaluation of the geology logged in Trenches H, H1 and H2. Several hand dug excavations would be made and evaluated. These excavations would be located along 1) the road cut of Highway 84, 2) the drainage channel cut next to Building 102 and 3) the cut above Trench H.

6. Preparation of a detailed geologic map and cross-sections necessary to define the distribution of soil and rock units, significant topography, and structural elements inclusive of possible landslide masses. An evaluation of the surface and subsurface conditions to characterize the local geologic conditions and upon which to proceed if necessary with Phases II and/or III.

PHASE II

1. Perform a ground magnetics survey using a hand held proton magnetometer. A survey grid (about 200 feet) would be established through the areas where the shear feature and/or lineaments have been mapped.

2. High resolution seismic reflection survey would be conducted near Building 102 and in the vicinity of Trenches B1 and B2. About two miles of profiling would be needed for three to four seismic lines. Dr. McEvilly, from the University of California, Berkeley, would be retained to perform the interpretation. Dr. McEvilly has developed a reflection technique capable of providing a good definition of the near surface materials, which would be extremely useful in this study.

3. High resolution microseismic survey to be conducted along and across the shear feature and/or lineaments mapped or projected extent. The objective is to establish if any anomalous zones of seismic activity exist and if they delineate a fault zone when compared with the ambient background level of activity.

4. Interpretation and evaluation of the data collected from survey techniques 1, 2 and 3 above. These three techniques are considered the most reliable, for which to delineate geophysical anomalies, if they exist. If faulting is the major process acting near or beneath the site, it would be hoped that these tools would define the fault plane at depth.

PHASE III

1. Additional subsurface investigation may be needed depending on the results of Phases I and II. Trenches would be utilized to locate the shear feature and characterize and date its movement(s). These data would be useful for determining slip rates, recurrence intervals, and the magnitude of earthquake events. Absolute or relative age dating methods would be employed to bracket events.

   It is anticipated that about three trenches 20 feet deep and 100 feet long would be required. The trenches would be logged in detail for documentation purposes.

2. A deep bucket auger hole drilled immediately above Trench H would help confirm the existence of a fault plane or landslide plane. The boring would have to be about 100 feet deep in order to intersect the shear mapped in Trench H.

We emphasize that not all phases or portions of them may be necessary to answer the desired question. It would be hoped that enough information from Phase I would be sufficient. The need for additional work after Phase I will naturally depend on the results of the first phase.