

19 June 2008

PaleoResource Consultants
attn: Stephen Blakely
550 High Street, Suite #108
Auburn, CA 95603

re: **PALEONTOLOGY LITERATURE AND RECORDS REVIEW, "THE HECA PROJECT", ELK HILLS REGION, KERN COUNTY, CALIFORNIA**

Dear Mr. Blakely,

The Division of Geological Sciences of the San Bernardino County Museum (SBCM) has completed a literature review and records search for the above-named project in the Elk Hills region of Kern County, California. The proposed study areas are located within portions of the following United States Geological Survey 7.5' topographic quadrangle maps: Buttonwillow, California; East Elk Hills, California; Lokern, California; West Elk Hills, California; Stevens, California; and Tupman, California (1954 editions, photorevised 1973).

Previous geologic mapping (Smith, 1964) indicates that the proposed project is situated upon Pliocene continental deposits of the Tulare Formation (= unit **Qp**) Holocene (recent) alluvial fan deposits (= **Qf**), and Holocene (recent) basin deposits (= **Qb**). Of these, the Tulare Formation has high potential to contain significant fossil resources, and so is assigned high paleontologic sensitivity. The Holocene sediments are too young geologically to have potential to contain significant fossil resources, and so are assigned low paleontologic sensitivity. However, these recent sediments very likely form a thin sedimentary veneer overlying older, potentially fossiliferous rock units. These units may include the continental Tulare Formation and/or continental Pleistocene older alluvium. All of these subsurface units have high potential to contain significant nonrenewable paleontologic resources, and so are assigned high paleontologic sensitivity.

The terrestrial Tulare Formation is highly fossiliferous throughout its extent. Fossil remains from the Tulare Formation include algal stromatolites (vertically layered mat-like growths), diatom tests, petrified wood of terrestrial plants, brackish water bivalves, freshwater bivalves and snails, land snails, bony fish, amphibians, turtles, lizards, snakes, birds, and a broad diversity of extinct land mammals. The latter group includes extinct sabre-toothed cats, dogs, zebras, horses, peccaries, camels, ground sloths, rabbits, squirrels, gophers, pocket mice, kangaroo rats, pack rats, deer mice, cotton rats and moles (Merriam, 1903, 1905, 1914, 1915, 1917; Arnold and Johnson, 1910; Gester, 1917; Woodring and others, 1932; Stirton and Vanderhoof, 1933; Porter, 1943; Hoots and others,

1954; Wood and Davis, 1959; Taylor, 1966; Foss and Blaisdell, 1968; Maher and others, 1975; Repenning, 1980).

Quaternary alluvium in the vicinity of the study area has yielded specimens of fossil wood and small vertebrates recovered from depths ranging between 18' and 35' below the present ground surface. These fossil specimens are scientifically significant in that they provide data on a period of geologic time not otherwise represented in the fossil record from this region, as well as demonstrating that Quaternary alluvium in the area does have the potential to contain fossil resources. The proximity of these previously recorded resource localities to the study area suggests that there is an undetermined (probably high) potential for fossils to be present at depth in those areas mapped as Quaternary alluvium. Such subsurface fossil resources would be subject to adverse impacts by development-related excavation.

For this review, Craig R. Manker of the Division of Geological Sciences, SBCM conducted a search of the Regional Paleontologic Locality Inventory (RPLI). The results of this search indicate that no previously-known paleontologic resource localities are recorded by the SBCM from within the boundaries of the study area. However, paleontologic resource locality SBCM 8.9.55, recorded within one half mile of the proposed water and gas pipeline in the Elk Hills (section 31, T 31S, R 25E), yielded remains of extinct zebra-like horse as well as numerous small vertebrate mammals and amphibians from surface exposures of the Tulare Formation. Additionally, paleontologic resource localities SBCM 8.9.47 - 8.9.50, 8.9.59, and 8.9.60 are recorded in the RPLI from within ½ - 1½ miles of the proposed water pipeline (intersection of T 29/30S, R 23/24E). These localities yielded plant and small vertebrate remains from Quaternary alluvial sediments at depths ranging between 18' and 27' below the surface.

Finally, the RPLI at the SBCM records dozens of additional fossil localities from the Tulare Formation in the Elk Hills further to the south and west of the study area. These localities yielded plants, bivalves, snails, bony fish, amphibians, reptiles, birds, and numerous land mammals dating to the Pliocene Epoch.

Recommendations

The results of the literature review and the check of the RPLI at the SBCM demonstrate that excavation in surficial exposures of the fossiliferous Tulare Formation within the boundaries of the proposed project has high potential to adversely impact significant nonrenewable paleontologic resources. Additionally, in the event that any sediments of the Tulare Formation and/or Pleistocene older alluvium having a lithology conducive to the preservation of significant paleontologic resources are exposed at depth within areas mapped at the surface as recent alluvium, or if excavation is anticipated to extend to depths greater than ~6' below the present ground surface, or if fossils are encountered at any time during development-related excavation in this area, a qualified vertebrate paleontologist must be retained to develop a program to mitigate impacts to nonrenewable paleontologic resources. This mitigation program must be consistent with the provisions of the California Environmental Quality Act (Scott and Springer, 2003), as well as with regulations

implemented by the County of Kern and with the proposed guidelines of the Society of Vertebrate Paleontology. This program should include, but not be limited to:

1. Monitoring of excavation into rock units having high potential to contain significant nonrenewable paleontologic resources. Based upon the results of this review, areas of concern would include any and all previously-undisturbed sediments of the Tulare Formation, and/or Pleistocene older alluvium present within the boundaries of the property. Pleistocene older alluvium is not present at the surface, but is very likely present at depth. Paleontologic monitors should be equipped to salvage fossils as they are unearthed, to avoid construction delays, and to remove samples of sediments that are likely to contain the remains of small fossil invertebrates and vertebrates. Monitors must be empowered to temporarily halt or divert equipment to allow removal of abundant or large specimens.
2. Preparation of all recovered specimens to a point of identification and permanent preservation, including washing of sediments to recover small invertebrates and vertebrates. Preparation and stabilization of all recovered fossils are essential in order to fully mitigate adverse impacts to the resources (Scott and others, 2004).
3. Identification and curation of specimens into an established, accredited museum repository with permanent retrievable paleontologic storage (e.g., SBCM). These procedures are also essential steps in effective paleontologic mitigation (Scott and others, 2004) and CEQA compliance (Scott and Springer, 2003). The paleontologist must have a written repository agreement in hand prior to the initiation of mitigation activities. Mitigation of adverse impacts to significant paleontologic resources is not considered complete until such curation into an established museum repository has been fully completed and documented.
4. Preparation of a report of findings with an appended itemized inventory of specimens. The report and inventory, when submitted to the appropriate Lead Agency along with confirmation of the curation of recovered specimens into an established, accredited museum repository, would signify completion of the program to mitigate impacts to paleontologic resources.

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Please do not hesitate to contact us with any further questions you may have.

Sincerely,

Eric Scott, Curator of Paleontology
Division of Geological Sciences
San Bernardino County Museum