APPENDIX F - PALEONTOLOGICAL RESOURCES

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Don Mitchell
ECORP Consulting, Inc.
215 North 5th Street
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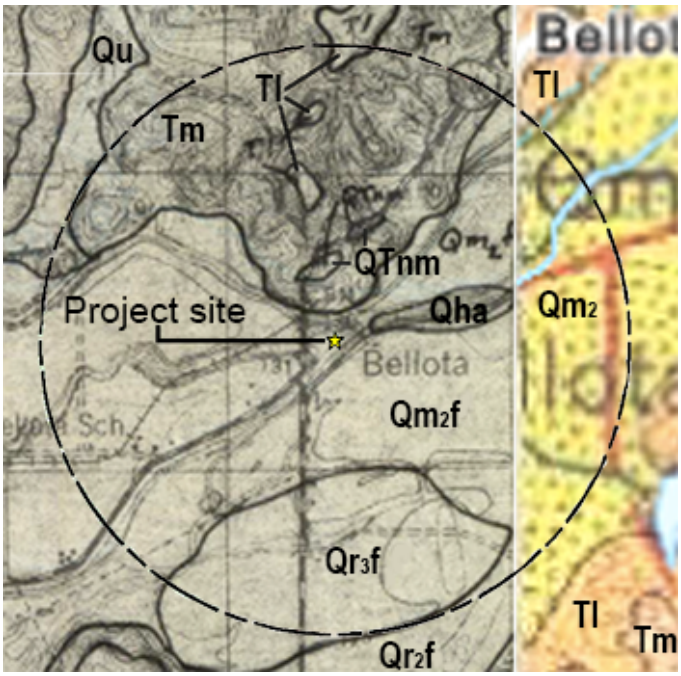
Re: Paleontological Records Search: Bellota Fish Screen Project (2019-225/004), Bellota, San Joaquin County

Dear Mr. Mitchell:

As per your request, I have performed a records search on the University of California Museum of Paleontology (UCMP) database for the proposed Bellota Fish Screen Project located in Bellota. The project site is situated on the wedge between SR26, the Calaveras River, and Duck Creek. Its Public Land Survey (PLS) location is NW, NE¼, SW¼, Sec. 5, T2N, R9E, Linden quadrangle (USGS 7.5-series topographic map). Google Earth imagery shows the surface of the site is undeveloped with some trees and vehicular tracks.

Geologic Units

According to the geologic maps by Marchant and Bartow (1979) and Wagner et al (1981) the project site (tiny yellow star at center) is entirely on the the Pleistocene Modesto Formation (Qm_2f). The one-mile search area (dashed black outline) also includes Holocene alluvium (Qha), the Pleistocene Riverbank Formation (Qr_3, Qr_2), the Pliocene–Pleistocene North Merced Gravel (Qtl), the Pliocene Laguna Formation (Tl), and the Miocene–Pliocene Mehrten Formation.



Geologic Units Shown on Adjacent Map

Qha	Alluvium (Holocene)
Qu	Undifferentiated alluvium & colluvium (Holocene)
Qm	Modesto Formation (Pleistocene)
Qm2f,	Qm2, Modesto Fm, upper member (Pleistocene)
Qr3f	Riverbank Formation, upper unit (Pleistocene)
Qr2f	Riverbank Formation, middle unit (Pleistocene)
QTnm	North Merced Gravel (Pliocene–Pleistocene)
Tl	Laguna Formation (Pliocene)
Tm	Merhten Formation (Miocene–Pliocene)

Records Search Results

All six units in the search area are sedi-

mentary and could therefore contain vertebrate or plant remains. Holocene deposits, however, are too young to be fossiliferous. As shown in the tabulation of records search results below, the North Merced Gravel and Laguna Formation have not yielded any significant paleontological resources. The records search therefore focused on the Modesto, Riverbank, and Mehrten formations.

		Number & Type of Localities	
Geologic Unit	Age	All Counties	San Joaquin County
Modesto	late Pleistocene	9 vertebrate	3 vertebrate
Riverbank	Pleistocene	9 vertebrate, 1 plant	none
North Merced Gravel	Pliocene–Pleistocene	none	none
Laguna	Pliocene	none	none
Mehrten	Miocene–Pliocene	43 vertebrate, 13 plant	1 vertebrate

Modesto Formation. Nine vertebrate localities in Stanislaus, Yolo, Fresno, and San Joaquin counties are represented by a composite assemblage of 27 specimens, including *Megalonyx* cf. *M. jeffersoni* (Jefferson's ground sloth), *Bison* cf. *B. latifroms* (long-horned bison), *Camelops* (camel), and *Mammuthus* cf. *M. columbi* (Columbian mammoth). The three localities in San Joaquin County are from the recent South Stockton Six-Lane Project approximately 12 miles southwest of the project site, but their specimens have yet to be entered into the database. Next closest to the site are two localities are 15 miles to the south (near Modesto), where ground sloth, mammoth, and bison were recovered.

Riverbank Formation. Nine vertebrate localities are in are Sacramento, Merced, Madera, and Fresno counties, and are represented by a composite assemblage of 546 specimens (see Appendix 1), the majority having been collected from the Fairmead Landfill in Chowchilla, Madera County (Dundas et al, 1996; Dundas and Chatters, 2013). One plant locality is in Fresno County and is represented by a single palynological slide. The nearest Riverbank vertbrate locality is about 35 miles south of the project site. Although Davis and Hall (1959) differentiated the Pleistocene alluvial deposits in the northern San Joaquin Valley as the Turlock Lake, Riverbank, and Modesto formations, the full extension of the Riverbank Formation wasn't realized until the 1970s (Marchand and Allwardt, 1981). As a result, many of the older UCMP Pleistocene localities in the region are recorded as being in an unnamed unit.

Mehrten Formation. Forty-three vertebrate localities in the Tuolumne, Stanislaus, Calaveras, and Merced counties are represented by 338 specimens (see Appendix 2a). The sole locality is San Joaquin County yielded *Pliohippus* (Pliocene horse). All 13 plant localities are in Stanislaus County and they yielded a total of 177 specimens (see Appendix 2b).

Remarks and Recommendations

Although the geologic units in the search area have yielded an abundance of significant paleontological resources, none has been recovered within 10 miles of Bellota; hence, the probability of this project encountering any significant paleontological resources appears to be very low. At this time, therefore, I do not recommend a paleontological monitoring program. Prior to any earth-disturbing activities, however, it would be prudent to have a professional paleontologist provide the construction crew with a brief orientation to the fossils that could be unearthed and the appropriate action that should be taken should that occur. During that visit to the site, and preferably prior to orientation session, the paleontologist should also perform a paleontological walkover survey.

Should any significant paleontological resources be found, construction activities should be diverted at least 15 feet away from the discovery until a professional paleontologist assesses the find for possible salvage. The construction crew should not attempt to remove such finds as they could be quite fragile, in which case they would require special treatment for their intact recovery. The paleontologist will then reconsider whether a monitoring program would be appropriate. Recovered fossils should be deposited in an appropriate repository, such as the UCMP, for curation and availability for future research.

Sincerely,

Ken Finger

References Cited

Davis, S. N., and Hall, F. R., 1959, Water quality of eastern Stanislaus and northern Merced Counties, California: Stanford University Publications in Geological Sciences 6(1), 112 p.

Dundas, R.G., and Chatters, J.C., 2013, The mid-Irvingtonian Fairmead Landfill fossil site, Madera County paleontology collection, and Fossil Discovery Center of Madera County, California, *in* Putirka, K. (ed.), Geologic Excursions from Fresno, California, and the Central Valley: A Tour of California's Iconic Geology. The Geological Society of America, Field Guide 32: 1–16.

Dundas, R.G., Smith, R.B., and Verosub, K.L., 1996, The Fairmead Landfill locality (Pleistocene, Irvingtonian), Madera County, California: preliminary report and significance. PaleoBios 17: 50–58.

Marchand, D.E., and Allwardt, A., 1981, Late Cenozoic stratigraphic units, northeastern San Joaquin Valley, California. Geological Survey Bulletin 1470: 67–70.

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Wagner, D.L., Jennings, C.W., Bedrossian, T.L., and Bortugno, E.J., 1981, Geologic map of the Sacramento quadrangle, California, 1:250,000. California Division of Mines and Geology, Regional Geologic Map 1A.

APPENDIX 1

UCMP Pleistocene Vertebrates from the Riverbank Formation

(excluding those recorded earlier from an "unnamed" unit)

Class Osteichthyes (boney fish)
- Order Cypriniformes
  - Family Cyprinidae
    - *Orthodon* (blackfish)
- Order Perciformes
  - Family Centrarchidae
    - *Archoplites* (perch)

Class Amphibia
- Order Anura
  - Family Pelobatidae
    - *Scaphiopus* (southern spadefoot toad)
  - Family Ranidae
    - *Rana* (bullfrog)
- Order Caudata (salamanders & newts)

Class Reptilia
- Order Serpentes
  - Family Colubridae
    - *Thamnophis* (garter snake)
- Order Testudines
  - Family Emydidae
    - *Actinemys marmorata* (western pond turtle)

Class Aves (birds)
- Order Anseriformes
  - Family Anatidae
    - *Aytha* (diving duck)
    - *Tadorna tadorna* (common shellduck)

Class Mammalia
- Order Artiodactyla
  - Family Antilocapridae
    - *Capromeryx* (dwarf pronghorn)
    - *Tetrameryx irvingtonensis* (4-horned deer)
  - Family Bovidae
    - *Bison* (bison)
  - Family Camelidae
    - *Camelops hesternus* (Yesterday's camel)
    - *Hemiauchenia* (lamine camel)
  - Family Cervidae
    - *Odocoileus* (mule deer)
- Order Carnivora
  - Family Canidae
    - *Canis dirus* (dire wolf)
    - *Canis latrans* (coyote)
    - *Vulpes velox* (swift fox)
  - Family Felidae
    - *Homotherium serum* (scimitar-toothed cat)
    - *Miracinonyx* (American cheetah)
    - *Smilodon fatalis* (sabretooth cat)
  - Family Mustelidae
    - *Taxidea taxus* (badger)
- Order Lagomorpha
  - Family Leporidae
    - *Lepus* (jackrabbit))
    - *Sylvilagus* (cottontail rabbit)
- Order Lipotyphla
  - Family Talpidae
    - *Scapanus latimanus* (broad-footed mole)
- Order Perissodactyla
  - Family Equidae
    - *Equus* (horse)
- Order Proboscidea
  - Family Elephantidae
    - *Mammuthus columbi* (Columbian mammoth)
- Order Rodentia
  - Family Cricetidae
    - *Microtus* (vole)
    - *Neotoma* (wood rat)
    - *Reithrodontomys* (harvest mouse)
  - Family Geomyidae
    - *Thomomys* (pocket gopher)
  - Family Heteromyidae
    - *Dipodomys* (kangaroo rat)
  - Family Sciuridae
    - *Spermophilus* (ground squirrel)
- Order Xenarthra
  - Family Megalonychidae
    - *Megalonyx wheatleyi* (flat-footed ground sloth)
  - Family Mylodontidaes
    - *Glossotherium harlani* (Harlan's ground sloth)
  - Family Nothrotheriidae
    - *Nothriotherium shastensis* (Shasta ground sloth)

APPENDIX 2A

UCMP Miocene Vertebrates from the Mehrten Formation

- Class Osteichthyes
  - Order Salmoniformes
    - Family Salmonidae (salmon)
      - *Oncorhynchus rastrosus*
- Class Amphibia
  - Order Caudata (salamanders, newts)
    - Family Ambystomatidae (mole salamanders)
      - *Dicampto*don
    - Family Plethodontidae (lungless salamanders)
      - *Aneides lugubris*
      - *Batrachoseps*
    - Family Salamandridae (advanced salamanders)
      - *Taricha*
- Class Reptilia
  - Order Testudines
    - Family Emydidae (turtles)
      - *Actinemys marmorata*
      - *Clemmys*
    - Family Testudinidae (tortoises)
      - *Geochelone*
      - *Hesperotestudo orthopygia*
- Class Mammalia
  - Order Artiodactyla
    - Family Antilocapridae (pronghorns, etc.)
      - *Garberoceras*
      - *Merycodus*
      - cf. *Sphenophalos*
      - *Tetrameryx*
    - Family Camelidae (camels)
      - *Paracamelus*
      - *Pliauchenia* cf. *P. edensis*
      - cf. *Procamelus*
    - Family Cervidae (deer)
      - *Odocoileus*
      - *Pediomeryx*
    - Family Tayassuidae (peccaries)
      - *Prosthennops*
  - Order Carnivora
    - Family Canidae (dogs)
      - *Borophagus parvus*
      - *Borophagus secundus*
      - *Eucyon davisi*
      - *Osteoborus*
      - *Vulpes stenognathus*
    - Family Felidae (cats)
      - *Felis*
      - *Machairodus coloradensis*
      - *Pseudaelurus*
    - Family Mustelidae (skunks, weasels)
      - *Pliotaxidea garberi*
      - cf. *Sminthosimis*
    - Family Procyonidae (raccoon, coati, ringtail)
      - *Procyon*?
  - Order Lagomorpha
    - Family Leporidae (rabbits & hares)
      - *Hypolagus*
  - Order Insectivora
    - Family Soricidae (shrews)
  - Order Perissodactyla
    - Family Equidae (horses)
      - *Dinohippus* cf. *D. coalingensis*
      - "*Dinohippus*" *interpolatus*
      - *Equus*
      - *Hipparion* cf. *H. mohavense*
      - *Nannippus* cf. *N. tehonensis*
      - *Neohipparion* cf. *N. molle*
      - *Pliohippus coalingensis*
      - *Pliohippus* cf. *P. interpolatus*
      - *Pliohippus tantalus*
    - Family Rhinocerotidae (rhinos)
      - *Aphelops*
      - *Teleoceras*
  - Order Proboscidea
    - Family Gomphotheriidae (gomphotheres)
      - *Gomphotherium*
      - *Platybelodon*
    - Family Mammutidae (mastodons)
      - *Mammut americanum*
  - Order Rodentia (rodents)
    - Family Castoridae (beavers)
      - *Castor*?
      - *Dipoides* cf. *D. williamsi*
    - Family Cricetidae (mice)
      - *Copemys*?
    - Family Heteromyidae (kangaroo rats)
      - *Cupidinimus*
      - *Dipodomys*
    - Family Sciuridae (squirrels)
      - *Otospermophilus argonotus*
  - Order Xenarthra
    - Family Megalonychidae (ground sloths)
      - *Megalonyx mathisi*
      - *Pliometanastes protistus*

APPENDIX 2B

UCMP Miocene Plants from the Mehrten Formation

Class Liliopsida
- Subclass Commelinidae
  - Order Cyperales
    - Family Cyperaceae (sedges)
      - *Cyperus*
  - Order Juncales
    - Family Juncaceae (rushes)
      - *Juncus*
  - Order Typhales
    - Family Typhaceae (cattails)
      - *Typha lesquereuxi*
- Subclass Liliidae
  - Order Liliales
    - Family Smilacaceae (greenbriers)
      - *Smilax remingtonii*

Class Magnoliopsida
- Subclass Asteridae
  - Order Scrophulariales
    - Family Oleaceae (olives)
      - *Forestiera buchananensis*
- Subclass Dilleniidae
  - Order Ericales
    - Family Ericaceae (heathers)
      - *Arbutus matthesii*
      - *Arctostaphylos oakdalensis*
- Subclass Hamamelidae
  - Order Urticales
    - Family Ulmaceae (elms)
      - *Celtis kansana*
- Subclass Magnoliidae
  - Order Ranunculales
    - Family Berberidaceae (barberry)
      - *Mahonia marginata*
  - Order Laurales
    - Family Lauraceae (laurels)
      - *Persea coalingensis*
      - *Umbellularia salicifolia*
- Subclass Rosidae
  - Order Fabales
    - Family Fabaceae (legumes)
      - *Amorpha condoni*
      - *Robinia californica*
  - Order Fagales
    - Family Fagaceae (oaks)
      - *Quercus dispersa*
      - *Quercus douglasoides*
      - *Quercus pliopalmeri*
      - *Quercus prelobata*
      - *Quercus pseudolyrata*
      - *Quercus remingtonii*
      - *Quercus wislizenoides*
  - Order Malpighiales
    - Family Salicaceae (willows)
      - *Populus alexanderi*
      - *Populus garberii*
      - *Populus parcedentata*
      - *Populus pliotremuloides*
      - *Salix edenensis*
      - *Salix hesperia*
      - *Salix laevigatoides*
      - *Salix wildcatensis*
  - Order Proteales
    - Family Platanaceae (plane-trees)
      - *Platanus paucidentata*
  - Order Rhamnales
    - Family Rhamnaceae (buckhorns)
      - *Ceanothus precuneatus*
      - *Ceanothus tuolumnensis*
      - *Ceanothus turlockensis*
      - *Rhamnus moragensis*
      - *Rhamnus precalifornica*
  - Order Rosales
    - Family Grossulariaceae (gooseberries)
      - *Ribes mehrtensis*
    - Family Rosaceae (roses)
      - *Photinia sonomensis*
      - *Prunus turlockensis*
  - Order Sapindales
    - Family Anacardiaceae (sumacs)
      - *Toxicodendron (Rhus)*
    - Family Sapindaceae (soapberries)
      - *Sapindus oklahomensis*

Class Pinopsida
- Order Pinidae
  - Suborder Pinales
    - Family Cupressaceae (cypresses)
      - *Sequoia*
    - Family Pinaceae (pines)
      - *Pinus sturgisi*