APPENDIX K
Paleontological Resources Memorandum
MEMORANDUM

To: Chuck Miller
From: Sarah Siren, M.S., GISP, Senior Paleontologist
Subject: Paleontological Resources Review – Otay Ranch Village 4 Project
Date: 9/16/16
cc: Adam Giacinto, M.A., RPA
Attachment(s): Geological Map ; Paleontological Records Search Results Letter

Dudek is providing this memo after completing a review of the potential for impacts to paleontological resources during construction of the Otay Ranch Village 4 Project located in the City of Chula Vista, San Diego County, California. The project site is relatively undeveloped. The majority of the project site is mapped as Oligocene age Otay Formation (approximately 29 million years old [Ma]) overlying early Cretaceous age (approximately 120-130 Ma) Santiago Peak Volcanics bedrock (Artim and Pickney, 1973; Deméré, 1988; Herzig and Kimbrough, 1991; Todd et al., 2004; Tan and Kennedy, 2002; Walsh and Deméré, 1991; see attached Geological Map). According to the San Diego County guidelines for paleontology (County of San Diego, 2007; Deméré and Walsh, 1993), and the records search results received from the San Diego Natural History Museum on August 29, 2016, the Oligocene age deposits have a moderate to high potential to yield paleontological resources (i.e. moderate to high resource importance), whereas Cretaceous age bedrock has a no potential to yield paleontological resources (McComas, 2016).

According to the records search conducted at the San Diego Natural History Museum (SDNHM), 39 paleontological localities are documented within a one-mile radius of the project boundaries (McComas, 2016; see attached Paleontological Records Search Results Letter). A large number of these localities (17) are documented nearby from the same geological units that occur beneath portions of the project site; specifically, the Oligocene age Otay Formation. These sedimentary deposits have the potential to yield scientifically significant vertebrate fossils.

The Otay Formation consists of three informal members, of which, the middle gritstone member has been observed within the project site. There is also the potential to impact the upper sandstone-mudstone member during the construction activities within the project site. Both of
these members within the Otay Formation have yielded fossil localities during development for nearby construction projects (e.g., SR-125 Toll Road and Otay Ranch Village 7; McComas, 2016). These terrestrial deposits typically contain extinct vertebrate taxa, and other fauna characteristic of the Arikareean North American Land Mammal Age. Although no vertebrate fossils are documented within the project site, the undeveloped nature of the site and the depositional environment of the gritstone and sandstone-mudstone members would be conducive to preserve such remains. Prehistoric vertebrates recovered from the Otay Formation in this region include: reptiles (e.g., tortoises, lizards, and snakes), birds, and mammals (e.g., shrews, rodents, rabbits, dogs, foxes, nimravids, rhinoceros, camels, mouse-deer, and oreodonts; Deméré, 1988; Walsh and Deméré, 1991; McComas, 2016). There is also the potential to impact mapped, moderate sensitivity deposits within the Mission Valley Formation and unnamed Quaternary terrace deposits located at the southernmost extent of the project site. If encountered during construction, the Mission Valley Formation and Quaternary terrace deposits would require part-time paleontological monitoring, in addition to the full-time monitoring conducted during any excavations within the Otay Formation.

A paleontological resources mitigation program is recommended for excavation within moderate to high sensitivity geological units (e.g., Otay Formation, Mission Valley, and Pleistocene age terrace deposits) and should be implemented in accordance with the mitigation measures included at the end of this report. Excavation within lower sensitivity units (e.g., Holocene age alluvium and Santiago Peak Volcanics) does not require mitigation.

If you have any questions regarding this memo, please feel free to contact me (760.846.9326 or ssiren@dudek.com).

Sincerely,

Sarah A. Siren, M.S., GISP
Senior Paleontologist, Dudek

Enc. Geological Map; Paleontological Records Search Results Letter
Memorandum
Subject: Paleontological Resources Review – Otay Ranch Village 4 Project

Mitigation Measures:

Prior to the issuance of grading permits, the Applicant shall provide written confirmation to the City that a qualified paleontologist has been retained to carry out an appropriate mitigation program. (A qualified paleontologist is defined as an individual with an M.S. or Ph.D. in paleontology or geology who is familiar with paleontological procedures and techniques). A pre grade meeting shall be held among the paleontologist and the grading and excavation contractors.

A paleontological monitor shall be onsite at all times during the original cutting of previously undisturbed sediments of highly sensitive geologic formations (i.e., Otay Formation and Quaternary alluvial and terrace deposits) to inspect cuts for contained fossils. (A paleontological monitor is defined as an individual who has experience in the collection and salvage of fossil materials.) The paleontological monitor shall work under the direction of a qualified paleontologist. The monitor shall be onsite on at least a half-time basis during the original cutting of previously undisturbed sediments of moderately sensitive geologic formations (e.g., unnamed river terrace deposits and the Mission Valley Formation) to inspect cuts for contained fossils. However, neither of these rock units have been mapped within the project site and are therefore not anticipated to be impacted during construction.

- The monitor shall be onsite on at least a quarter-time basis during the original cutting of previously undisturbed sediments of low sensitivity geologic formations (e.g., Lindavista Formation and Santiago Peak Volcanics [metasedimentary portion only]) to inspect cuts for contained fossils. However, these deposits have not been mapped within the project site and are therefore not anticipated to be impacted during construction. The monitor shall periodically (every several weeks) inspect original cuts in deposits with an unknown resource sensitivity (i.e., Quaternary alluvium).

- In the event that fossils are discovered in unknown, low, or moderately sensitive formations, the Applicant shall increase the per-day field monitoring time. Conversely, if fossils are not discovered, the monitoring, at the discretion of the City’s Deputy City Manager/Development Services Director or its designee, shall be reduced. A paleontological monitor is not needed during grading of rocks with no resource sensitivity (i.e., Santiago Peak Volcanics, metavolcanic portion).

When fossils are discovered, the paleontologist (or paleontological monitor) shall recover them. In most cases, this fossil salvage can be completed in a short period of time. However, some fossil specimens (such as a complete whale skeleton) may require an extended salvage time. In these instances, the paleontologist (or paleontological monitor) shall be allowed to temporarily
direct, divert, or halt grading to allow recovery of fossil remains in a timely manner. Because of
the potential for the recovery of small fossil remains such as isolated mammal teeth, it may be
necessary in certain instances and at the discretion of the paleontological monitor to set up a
screen-washing operation on the site.

Prepared fossils along with copies of all pertinent field notes, photos, and maps shall be
deposited in a scientific institution with paleontological collections such as the San Diego
Natural History Museum. A final summary report shall be completed. This report shall include
discussions of the methods used, stratigraphy exposed, fossils collected, and significance of
recovered fossils.

References Cited:

County of San Diego, 2007. Guidelines for Determining Significance, Paleontological
Resources. Department of Planning and Land Use, Department of Public Works. March
19, Modified January 15, 2009.

Deméré, T.A. 1988. Early Arikareean (late Oligocene) vertebrate fossils and biostratigraphic
correlations of the Otay Formation at EastLake, San Diego County, California. In, M.V.
Society of Economic Paleontologists and Mineralogists, Pacific Section 58:35-43.

for the Department of Public Works, County of San Diego, p. 1-60.

origin for the Santiago Peak Volcanics, northern Santa Ana Mountains, California.
Geological Society of America, Cordilleran Section, Abstracts with Programs 23:35.

p.319.


Tan, S.S. and M.P. Kennedy, 2002. Geologic map of the Otay Mesa 7.5-minute quadrangle, San
Diego County, California: A digital database.: California Geological Survey, Preliminary
Geologic Maps, scale 1:24,000.
Memorandum

Subject: Paleontological Resources Review – Otay Ranch Village 4 Project


29 August 2016

Ms. Sarah Siren Dudek
605 Third Street
Encinitas, CA 92024

RE: Paleontological Record Search – Otay Ranch Village 4 Project

Dear Ms. Siren:

This letter presents the results of a paleontological record search conducted for the Otay Ranch Village 4 project, located in the southeast portion of the City of Chula Vista, San Diego County, CA. The approximately 74-acre project area lies along the northwest slope of Rock Mountain, 1.2 miles west of the South Bay Expressway (SR 125), and 1.7 miles south of the intersection of Olympic Parkway and La Media Road. Published geological reports (e.g., Kennedy and Tan, 1977; Tan and Kennedy, 2002) that cover the project area reveal that the project site is primarily underlain by the Oligocene-age (approximately 29 million years old) Otay Formation. The southeast corner of the project site is underlain by Jurassic- and Cretaceous-age (approximately 201 to 66 million years old) metavolcanic rocks.

The San Diego Natural History Museum (SDNHM) has thirty-nine recorded fossil localities (see attached descriptions) within a mile radius of the project site (see attached map). Seventeen of these localities were discovered in the fluvial deposits of the Otay Formation, and produced trace fossils (e.g., burrows and coprolites) and fossilized remains of terrestrial vertebrates (e.g., reptiles, birds, carnivorous mammals, rodents, rabbits, and artiodactyls). The remaining twenty-two localities are from the Pleistocene-age (approximately 10,000 to 750,000 years old) Bay Point Formation and the late Pliocene to early Pleistocene-age (approximately 3.5 to 1.5 million years old) San Diego Formation; these geologic units are not anticipated to be impacted by construction.

Within the Otay Formation, localities are known from both the upper sandstone-mudstone member and the lower gritstone member in the vicinity of the project site. The upper sandstone-mudstone member has produced important vertebrate fossil remains, and is therefore assigned a high paleontological sensitivity. The lower gritstone member has produced fossils at only a few known localities, and is assigned a moderate paleontological sensitivity. The Jurassic- and Cretaceous-age metavolcanic rocks underlying the southeast corner of the project site have no paleontological sensitivity due to the high temperature and pressure conditions involved in the formation of these rocks. Given the high and moderate paleontological sensitivity of the Otay Formation in San Diego County (Deméré and Walsh, 1993), as well as the known SDNHM fossil localities in close proximity to the project site, any proposed excavation activities that extend deep enough to encounter previously undisturbed Otay Formation deposits have the potential to impact paleontological resources preserved in these deposits. For these reasons,
implementation of a complete paleontological resource mitigation program during ground-
disturbing activities is recommended.

The information contained within this paleontological record search should be considered
private and is the sole property of the San Diego Natural History Museum. Any use or
reprocessing of information contained within this document beyond the scope of the Otay Ranch
Village 4 project is prohibited.

If you have any questions concerning these findings please feel free to contact me at 619-
255-0321 or kmccomas@sdnhm.org.

Sincerely,

Katie McComas
Paleontology Collections Assistant
Department of Paleontology

Enc:  Figure 1
Appendix

Literature Cited:

for the San Diego Planning Commission: 1-68.

Kennedy, M.P. and Tan, S.S. 1977. Geology of National City, Imperial Beach, and Otay Mesa
quadrangles, southern San Diego metropolitan area, California. California Division of
Mines and Geology, Map Sheet 29, 1:24,000 scale.

Diego County, California. California Geological Survey, Preliminary Geologic Map
Series, 1:24,000 scale.
SDNHM fossil localities within one mile of the Otay Ranch Village 4 Project, City of Chula Vista (Base maps: USGS Topographic Maps of the Otay Mesa and Imperial Beach 7.5' Quadrangles, CA).
<table>
<thead>
<tr>
<th>Locality Number</th>
<th>Locality Name</th>
<th>Location</th>
<th>Elevation</th>
<th>Geologic Unit</th>
<th>Era</th>
<th>Period</th>
<th>Epoch</th>
<th>North American Land Mammal Age</th>
<th>Depositional Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>6699</td>
<td>Flat Rock</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>171</td>
<td>Bay Point Formation, unnamed nonmarine deposit</td>
<td>Cenozoic</td>
<td>Quaternary</td>
<td>late Pleistocene</td>
<td>marine</td>
<td>fluxual</td>
</tr>
<tr>
<td>5524</td>
<td>Otay Landfill, Canyon 3, Phase 3B-Vert Site</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>453</td>
<td>San Diego Formation</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>Pliocene</td>
<td>marine</td>
<td>fluxual</td>
</tr>
<tr>
<td>6060</td>
<td>Otay Ranch Village 2 North</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>460</td>
<td>San Diego Formation</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>late Pliocene</td>
<td>marine</td>
<td>shallow sandy bottom</td>
</tr>
<tr>
<td>4824</td>
<td>Otay Landfill, Canyon 3-Boring clam locality</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>445</td>
<td>San Diego Formation, member 1</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>Pliocene</td>
<td>marine</td>
<td>marine</td>
</tr>
<tr>
<td>6052</td>
<td>Otay Landfill Canyon 3, Phase 3C</td>
<td>City of San Diego, San Diego County, CA</td>
<td>439</td>
<td>San Diego Formation, member 1</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>Pliocene</td>
<td>marine</td>
<td>marine</td>
</tr>
<tr>
<td>6063</td>
<td>Otay Ranch Village 2 North</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>440</td>
<td>San Diego Formation, member 1</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>late Pliocene</td>
<td>marine</td>
<td>Blanca</td>
</tr>
<tr>
<td>6065</td>
<td>Otay Ranch Village 2 North</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>442</td>
<td>San Diego Formation, member 1</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>late Pliocene</td>
<td>Blanca</td>
<td>near shore rocky bottom</td>
</tr>
<tr>
<td>6066</td>
<td>Otay Ranch Village 2 North</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>445</td>
<td>San Diego Formation, member 1</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>late Pliocene</td>
<td>Blanca</td>
<td>continental shelf</td>
</tr>
<tr>
<td>6067</td>
<td>Otay Ranch Village 2 North</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>450</td>
<td>San Diego Formation, member 1</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>late Pliocene</td>
<td>Blanca</td>
<td></td>
</tr>
<tr>
<td>6053</td>
<td>Otay Landfill Canyon 3, Phase 3C</td>
<td>City of San Diego, San Diego County, CA</td>
<td>452</td>
<td>San Diego Formation, member 2a</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>Pliocene</td>
<td>marine</td>
<td></td>
</tr>
<tr>
<td>6068</td>
<td>Otay Ranch Village 2 North</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>450</td>
<td>San Diego Formation, member 2a</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>late Pliocene</td>
<td>Blanca</td>
<td></td>
</tr>
<tr>
<td>6017</td>
<td>Otay Ranch Village 2 East</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>478</td>
<td>San Diego Formation, member 2b</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>Pliocene</td>
<td>marine, nearshore</td>
<td></td>
</tr>
<tr>
<td>6017</td>
<td>Otay Ranch Village 2 East</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>478</td>
<td>San Diego Formation, member 2b</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>late Pliocene</td>
<td>marine, nearshore</td>
<td></td>
</tr>
<tr>
<td>6033</td>
<td>Otay Ranch Heritage Road</td>
<td>City of San Diego, San Diego County, CA</td>
<td>473</td>
<td>San Diego Formation, member 2b</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>Pliocene</td>
<td>marine</td>
<td></td>
</tr>
<tr>
<td>6054</td>
<td>Otay Landfill Canyon 3, Phase 3C</td>
<td>City of San Diego, San Diego County, CA</td>
<td>469</td>
<td>San Diego Formation, member 2b</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>Pliocene</td>
<td>marine</td>
<td></td>
</tr>
<tr>
<td>6055</td>
<td>Otay Landfill Canyon 3, Phase 3C</td>
<td>City of San Diego, San Diego County, CA</td>
<td>471</td>
<td>San Diego Formation, member 2b</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>Pliocene</td>
<td>marine</td>
<td></td>
</tr>
<tr>
<td>6056</td>
<td>Otay Landfill Canyon 3, Phase 3C</td>
<td>City of San Diego, San Diego County, CA</td>
<td>473</td>
<td>San Diego Formation, member 2b</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>Pliocene</td>
<td>marine</td>
<td></td>
</tr>
<tr>
<td>6071</td>
<td>Otay Ranch Village 2 North - Oyster Bed</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>460</td>
<td>San Diego Formation, member 2b</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>late Pliocene</td>
<td>Blanca</td>
<td></td>
</tr>
<tr>
<td>6014</td>
<td>Otay Ranch Village 2 East</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>483</td>
<td>San Diego Formation, member 2</td>
<td>Cenozoic</td>
<td>Neogene</td>
<td>late Arikareean</td>
<td>marine</td>
<td></td>
</tr>
<tr>
<td>5700</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>553</td>
<td>Otay Formation</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5698</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>425</td>
<td>Otay Formation, gristone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5946</td>
<td>SR 125 Toll Road</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>407</td>
<td>Otay Formation, gristone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>4857</td>
<td>Otay Landfill Canyon 3 Phase 3A, Microsite</td>
<td>San Diego County, CA</td>
<td>412</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5697</td>
<td>Otay Ranch Village 7 - Micro Site</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>530</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5699</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>507</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5700</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>595</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5701</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>444</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5702</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>489</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5703</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>527</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5704</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>485</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5705</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>570</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5706</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>588</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>5707</td>
<td>Otay Ranch Village 7</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>591</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>6014</td>
<td>Otay Ranch Village 2 East</td>
<td>City of Chula Vista, San Diego County, CA</td>
<td>483</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>early Arikareean</td>
<td>fluxual</td>
</tr>
<tr>
<td>6050</td>
<td>Otay Landfill Canyon 3, Phase 3C</td>
<td>City of San Diego, San Diego County, CA</td>
<td>350</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>fluxual</td>
<td>fluxual</td>
</tr>
<tr>
<td>6051</td>
<td>Otay Landfill Canyon 3, Phase 3C</td>
<td>City of San Diego, San Diego County, CA</td>
<td>398</td>
<td>Otay Formation, sandstone-mudstone member</td>
<td>Cenozoic</td>
<td>Paleogene</td>
<td>late Oligocene</td>
<td>fluxual</td>
<td>fluxual</td>
</tr>
</tbody>
</table>