APPENDIX 4.5-A

PALEONTOLOGICAL RESOURCE ASSESSMENT FOR SALT CREEK SUBSTATION PROPONENT'S ENVIRONMENTAL ASSESSMENT (PEA)

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November 2, 2012

TECHNICAL REPORT
PALEONTOLOGICAL RESOURCE ASSESSMENT
SALT CREEK SUBSTATION & TRANSMISSION LINE IMPROVEMENTS
OTAY RANCH
CITY OF CHULA VISTA
SAN DIEGO COUNTY, CALIFORNIA

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TECHNICAL REPORT
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INTRODUCTION

The San Diego Gas & Electric Company (SDG&E) proposes to construct the Salt Creek Substation on an approximately 12-acre site within the community of Otay Ranch in the City of Chula Vista, San Diego County, California. Also proposed are improvements to the existing 69kV transmission line TL 6965, which will connect the new substation with the existing Miguel Substation, as well as improvements to selected staging yards (Hunte Parkway, Olympic Training Facility, and Miguel). The proposed Salt Creek Substation project site is located east of State Route (SR) 125 and northeast of the intersection of Hunte Parkway and Exploration Falls Drive (Figures 1 and 2). TL 6965 extends northwest from the new substation site to the Miguel Substation located southeast of the intersection of SR 125 and San Miguel Road.

This technical report provides an assessment of issues related to paleontological resources within the project area. The purpose of this report is to assist SDG&E in planning and design efforts for the purposed project as related to paleontological resource issues. Specifically, this report is intended to summarize existing paleontological resource data in the project area and vicinity; assess potential impacts to paleontological resources from construction of the project; and identify mitigation measures to avoid or reduce project-related impacts to fossils wherever feasible. Additional discussion of report methodology is provided below. This report was prepared by Sarah A. Siren and Thomas A. Deméré of the Department of PaleoServices, San Diego Natural History Museum (SDNHM), San Diego, California.

As defined here, paleontological resources (i.e., fossils) are the remains and/or traces of prehistoric (i.e., 10,000 years or older) plant and animal life. Fossil remains such as bones, teeth, shells, leaves, and wood are found in the geologic deposits (rock formations) within which they were originally buried. For the purposes of this report, paleontological resources can be thought of as including not only the actual fossil remains but also the collecting localities and the geologic formations containing those localities.

METHODOLOGY

A review was conducted of relevant published and unpublished geologic reports (Kennedy and Tan, 1977; Tan and Kennedy, 2002; Todd, 2004, Kleinfelder West, Inc., 2007), published and unpublished paleontological reports (Deméré, 1988; Deméré and Walsh, 1993), and museum paleontological locality data (SDNHM, Department of Paleontology). This approach was followed in recognition of the direct relationship between paleontological resources and the geologic formations within which they are found. Knowing the geology of a particular area and the fossil productivity of formations that occur in that area, it is possible to predict where fossils will, or will not, be encountered.

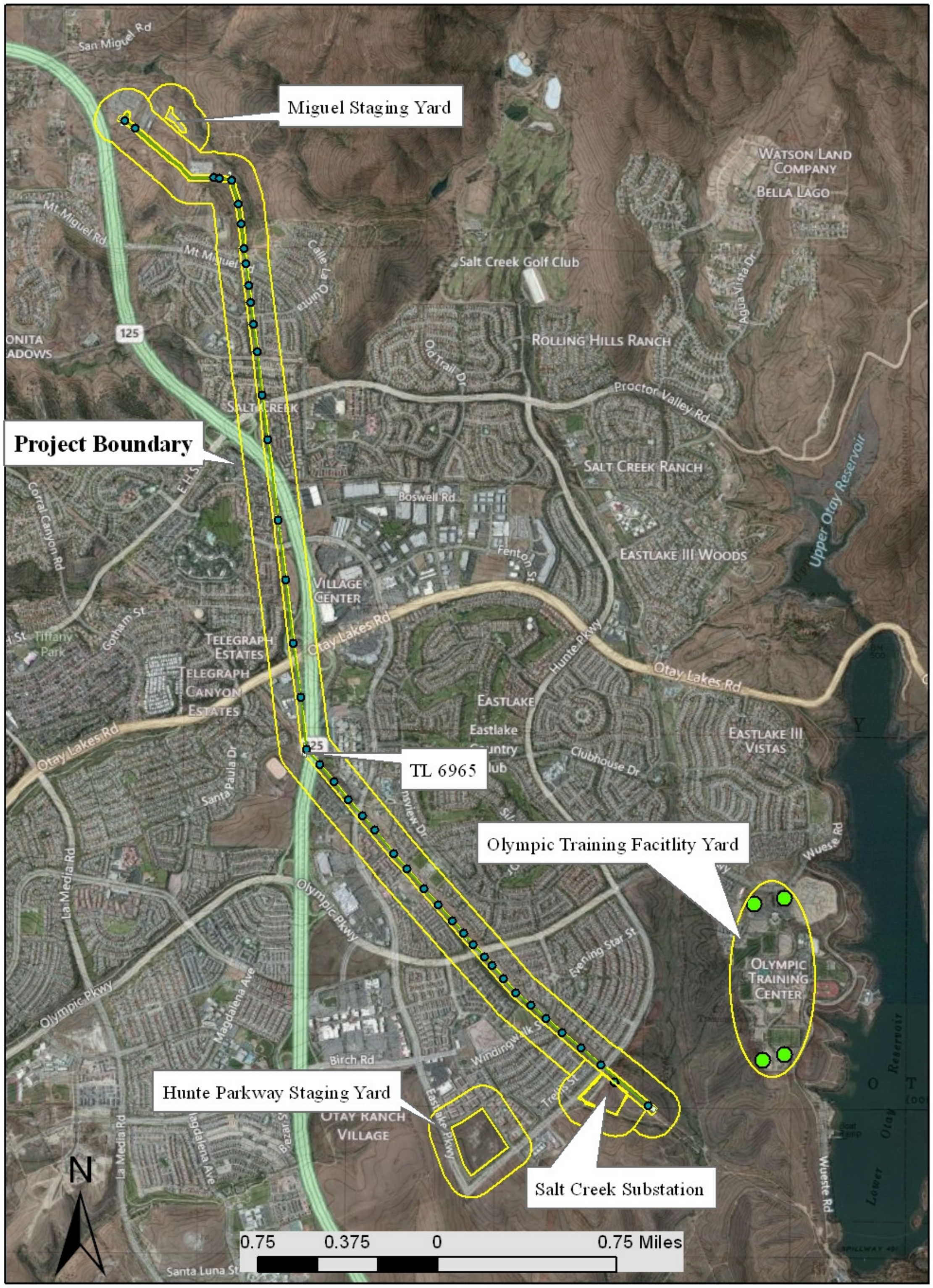

Figure 1. Project location map showing the proposed construction project elements in yellow (courtesy of SDG&E, 2012).

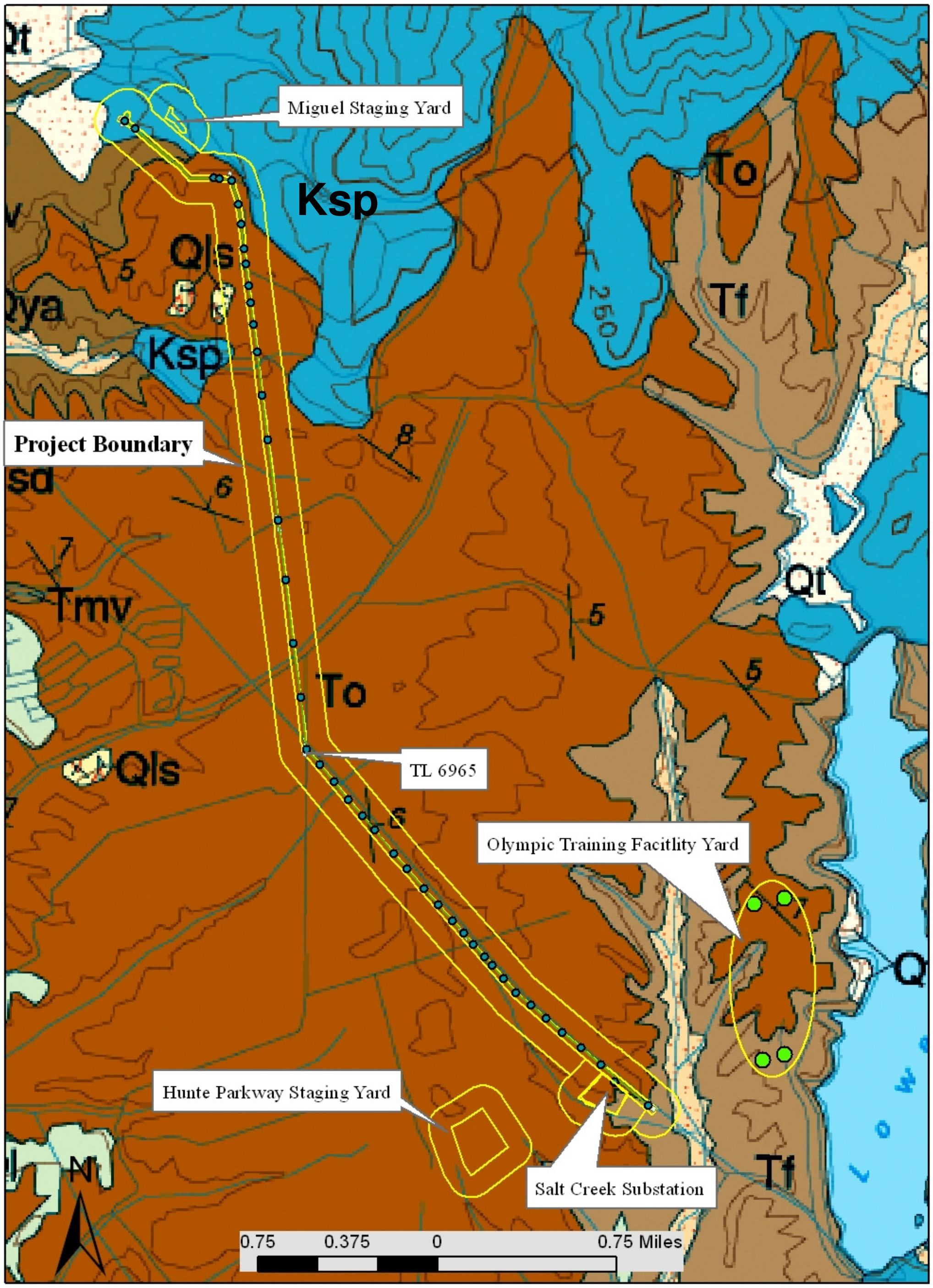

Figure 2. Portion of the El Cajon, CA geologic map (Todd, 2004) showing the geologic setting of the proposed Salt Creek Substation, staging yards, and TL 6965 (yellow boundaries). The majority of the project area is underlain by sandstone-mudstone strata of the Oligocene Otay Formation (To), with the fanglomerate facies occurring to the southeast (Tf). Other rock units identified on the map include: Quaternary landslide deposits (Qls), Quaternary terrace deposits (Qt), Eocene Mission Valley Formation (Tmv), and Jurassic-Cretaceous Santiago Peak Volcanics (Ksp). Base map; El Cajon, CA 30’ x 60’ USGS topographic quadrangle, scale 1:100,000.

EXISTING CONDITIONS

GEOLOGICAL SETTING

The proposed Salt Creek Substation site, TL 6965, and related project elements are located within the southern portion of the Peninsular Ranges Geomorphic Province, which is dominated by plutonic igneous rocks of late Mesozoic age (~125 to 90 million years old [Ma]) and pre-batholithic metamorphic rocks of middle Mesozoic age (~200 to 140 Ma). Along the coastal plain of San Diego County these crystalline basement rocks are overlain by younger sedimentary deposits of Cenozoic age (~45 Ma to 10,000 years old) (Walawender, 2000).

The majority of the Salt Creek Substation project site, as well as the TL 6965 alignment are underlain by sedimentary rocks of the Oligocene-age (~29 Ma) Otay Formation (Artim and Pickney, 1973; Deméré, 1988; Walsh and Deméré, 1991). Minor occurrences of the Cretaceous-age (~120-130 Ma) Santiago Peak Volcanics are exposed at the northern extent of TL 6965, with a small portion to the south overlain by Eocene-age (~42 Ma) sedimentary rocks of the Mission Valley Formation (Figure 2).

The site-specific geotechnical report prepared by Kleinfelder West, Inc. (2007) for the Salt Creek Substation site provides detailed information about subsurface conditions and indicates that fine-grained, stratified deposits of clayey sandstone and silty sandstones underlie major portions of the area. Minor occurrences of coarser-grained pebble and cobble conglomerate layers were also noted in the geotechnical reports. These lithologies are typical of the sandstone-mudstone member of the Otay Formation as defined by Walsh and Deméré (1991). The geotechnical reports also indicate that up to 90 feet of artificial fill material underlies the extreme southwestern portion of the project site, immediately adjacent to Hunte Parkway. This engineered fill material was placed in here as part of the construction of Hunte Parkway and does not extend into the main area of the proposed substation site. The geotechnical report prepared by Kleinfelder West, Inc. (2012) for the TL 6965 alignment notes that similar conditions exist along the majority of the transmission line, with the exception of the northern area in the vicinity of the Miguel Substation. This area is underlain by older, metavolcanic rocks of the Santiago Peak Volcanics capped in places by Eocene sedimentary rocks of the Mission Valley Formation (Figure 2).

PALEONTOLOGICAL RESOURCES

The following section provides a general overview of the types of geologic deposits located within the project area (in order from oldest to youngest).

Stratigraphic Rock Units

Santiago Peak Volcanics (Ksp)
Description: Metavolcanic rocks mapped by Todd (2004) as the late Jurassic to early Cretaceous Santiago Peak Volcanics occur in the northernmost portion of the project site, underlying the northern terminus of TL 6965 and the Miguel Staging Yard (Figure 2). The Santiago Peak Volcanics is mainly composed of volcanic breccias, with lesser amounts of volcanic tuffs and flows. In some areas, slightly-to-moderately metamorphosed marine mudstones and sandstones appear to be interbedded with the volcanic rocks (Fife et al., 1967). Radiometric dates on the

volcanic flow-rocks of the Santiago Peak Volcanics have yielded earliest Cretaceous ages, approximately 120-130 Ma (Herzig and Kimbrough, 1991). The Santiago Peak Volcanics were altered during emplacement of the vast volumes of magma generated by early Cretaceous subduction of a large lithospheric plate. These magmas subsequently cooled to form the plutonic ("granitic") rocks of the Peninsular Ranges Batholith.

Paleontology: In general, the molten origin of the Santiago Peak Volcanics precludes the possible discovery of fossil remains. However, some of the volcanic breccias contain petrified wood, as in Mira Mesa and near Rancho Santa Fe (D'Vincent, 1967). In addition, certain exposures of the metasedimentary portion of this formation have produced important remains of siliceous microfossils (e.g., radiolarians: Jones and Miller 1982) and marine macroinvertebrates including belemnites and clams (Jones and Miller, 1982). There are currently no records of any paleontological collecting sites in these rocks as exposed south of San Clemente Canyon in the City of San Diego.

Site Specific Assessment: Metavolcanic rocks of the Santiago Peak Volcanics occur only at the northern terminus of TL 6965 and the Miguel Staging Yard, and have been assigned a zero paleontological resource sensitivity.

<u>Mission Valley</u> (Tmv)

Description: Sedimentary rocks of the Mission Valley Formation directly overlie metavolcanic rocks of the Santiago Peak Volcanics in the northern northernmost portion of the project site, underlying the northern terminus of TL 6965 and the Miguel Staging Yard (Figure 2). The Mission Valley Formation consists of fine- to very fine-grained marine sandstone in its type area along SR-163 on the south side of Mission Valley. Eastern and southern exposures of the formation consist of fine- to medium-grained, fluvial sandstones, as well as green and brown non-marine siltstone and mudstone. The maximum thickness of the formation is 200 feet near its type location in Mission Valley, although it only reaches a thickness of 60 feet at Scripps Ranch and 45 feet in Tierrasanta (Deméré and Walsh, 1993). Strata of the Mission Valley Formation have been dated at 42.83 million years, using the Ar-Ar radiometric dating method, placing the formation within the Middle Eocene Epoch (Walsh, 1996). In fact, this formation is the only Eocene rock unit in southern California to contain fossil mammal localities that are directly associated with a radiometric date (Deméré and Walsh, 1993).

Paleontology: Well-preserved fossils of microorganisms (e.g., foraminiferans), clams, snails, crabs, sea urchins, sharks, rays, and bony fish have been collected from the marine strata of the Mission Valley Formation (Kern, 1978; Givens and Kennedy, 1979; Deméré et al., 1979; Roeder, 1991). In addition, fluvial deposits of the formation have produced well-preserved fossil remains of wood, as well as a diverse assemblage of terrestrial mammals, including opossums, insectivores, bats, rodents, primates, artiodactyls, and perissodactyls (Golz and Lillegraven, 1977; Walsh, 1996). The combined marine and non-marine fossil assemblages that have been recovered from the formation allow for direct correlation of marine and terrestrial faunas of the Eocene of southern California. In this respect, the Mission Valley Formation is scientifically important, and it serves as one of a few instances within North America from which such correlations can be ascertained (Golz and Lillegraven, 1977; Flynn, 1986; Walsh, 1996). The Mission Valley Formation is discontinuously exposed between Otay Valley in the south, Scripps Ranch in the north, Old Town in the west, and Spring Valley, Fletcher Hills, and Santee in the east (Deméré and Walsh, 1993). Several distinctive sandstone out crops in the regions of Rancho Bernardo, Rancho Peñasquitos, and Carmel Mountain Ranch that contain vertebrate fossil remains that have been mapped as the Mission Valley Formation more likely belong to the upper sandstone tongue of the Friars Formation, based on paleontology (Walsh, 1996; Walsh et al., 1996).

Site Specific Assessment: Because diverse fossil assemblages of marine invertebrates and non-marine vertebrates have been recovered from the Mission Valley Formation, this rock unit is assigned a high paleontological resource sensitivity.

Otay Formation (To)
Description: The majority of the project area, including the Salt Creek Substation, Hunte Parkway Staging Yard, Olympic Center Facility Yard, and most of TL 6965, is underlain by sedimentary rocks underlying mapped by Todd (2004) as fluvial and alluvial fan strata of the Oligocene-age Otay Formation (Figure 2). The Otay Formation in this area is correlative with the Arikareean North American Land Mammal Age and has been radiometrically dated at approximately 29 Ma. The formation has been divided into three members by Walsh and Deméré (1991) who recognize a basal angular conglomerate (fanglomerate) unit, a middle gritstone unit, and an upper sandstone-mudstone unit. Typical exposures of the upper member consist of gray-white, medium-grained, tuffaceous sandstone, with interbeds of brown and red-brown claystones and white bentonite layers (Walsh and Deméré, 1991). The middle member consists of interbedded coarse-grained sandstones and angular gravels (gritstone). The lower member is a poorly-sorted, cobble to boulder fanglomerate, largely composed of angular blocks of locally-derived metavolcanic and plutonic igneous rock (Walsh and Deméré, 1991; Tan and Kennedy, 2002; Todd, 2004). In general the formation becomes finer grained from bottom to top with the basal angular conglomerate unit grading upward and westward into the gritstone member, which in turn grades upward and westward into the sandstone-mudstone member. Taken together, the Otay Formation may be as much as 400 feet thick, but at any one location the formation is typically less than 120 feet thick.

Paleontology: Numerous fossil localities have been discovered in the Otay Formation in the EastLake, Otay Ranch, and Otay Mesa areas of southwestern San Diego County (Appendix). These localities have produced well-preserved remains of a diverse assemblage of terrestrial vertebrates which includes tortoises, lizards, snakes, birds, shrews, rodents, rabbits, dogs, foxes, cat-like nimravids, rhinoceros, camels, mouse-deer, and oreodonts. Based on these fossil discoveries, the Otay Formation is considered to be the richest source of late Oligocene terrestrial vertebrates in California (Deméré, 1988; Walsh and Deméré, 1991).

Site Specific Assessment: Because of its proven paleontological richness, the sandstone-mudstone member of the Otay Formation is assigned a high paleontological resource sensitivity.

Results of Record Search
Numerous, previously recorded fossil collecting localities are documented in paleontological records housed at SDNHM. Over 20 recorded fossil collecting localities occur within the project area, including the 180 ft buffer along the TL 6965 alignment, the proposed Salt Creek Substation site, and associated yards (Figure 3 and Appendix). All of these localities were discovered in sedimentary deposits of the sandstone-mudstone member of the Oligocene-age

Otay Formation, during mass grading of the EastLake and Winding Walk developments. Fossils recovered from the localities mentioned above include impressions of aquatic plants; shells of freshwater invertebrates, and isolated bones and teeth as well as whole and partial skeletons of terrestrial vertebrates, including lizards (iguanid), opossums (cf. *Nanodelphys* sp.), insectivore (cf. *Centetodon* sp.), hedgehog (cf. *Ocajila* sp.), early rodents (*Heliscomys* sp., *Leidymys* sp., *Pleurolicus* sp., *Protospermophilus* sp., and *Meniscomys* sp.), rhinoceros (cf. *Subhyracodon* sp.), mouse deer (*Hypertragulus* sp.), and oreodont (*Sespia californica*). As subsurface excavation is not anticipated within the proposed yards (e.g. Hunte Parkway, Miguel, and Olympic Training Facility), paleontological monitoring is not recommended for these areas.

IMPACT ANALYSIS

INTRODUCTION

Direct impacts to paleontological resources occur when earthwork activities, such as mass grading, drilling, or trenching activities, cut into the geological deposits (formations) within which fossils are buried. These direct impacts have the potential to destroy fossilized remains. Since fossils are the remains of prehistoric animal and plant life they are considered to be nonrenewable. Such impacts can be significant and, under California Environmental Quality Act (CEQA) guidelines, require mitigation.

Impacts to paleontological resources are typically rated from high to zero depending upon the resource sensitivity of impacted formations.

High significance
Impacts to high sensitivity formations (Mission Valley Formation and Otay Formation).

Moderate significance
Impacts to moderate sensitivity formations (none within the project site).

Low significance
Impacts to low sensitivity formations (none within the project site).

Zero significance
Impacts to formations with no fossil potential (Santiago Peak Volcanics).

SITE SPECIFIC IMPACTS

Mission Valley Formation
Only a small portion of the northern extent of TL 6965 is underlain by the Mission Valley Formation. However, the paleontological sensitivity of this formation is high due to the number of fossil-bearing localities in this region of San Diego County. Because Eocene-age bedrock occurs at the surface in the northern portion of TL 6965, even shallow excavations and minor grading activities in this area could adversely impact paleontological resources.

Otay Formation
Preliminary grading plans for the Salt Creek Substation indicate that excavations into the Otay Formation will likely occur over the majority of the project site. In certain areas these cuts will result in removal of up to 30 feet of previously undisturbed Otay Formation strata. Additionally,

improvements to TL 6965 may encounter Otay Formation during subsurface operations (e.g. drilling and trenching). These potential negative impacts to paleontological resources can be reduced to below the level of significance through implementation of the mitigation plan as outlined below.

MITIGATION MEASURES

1. Prior to the issuance of grading permits, SDG&E shall provide written confirmation to the City of Chula Vista 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.
2. A paleontological monitor shall be onsite at all times during the original cutting of previously undisturbed sediments of highly sensitive geologic formations (i.e., Mission Valley and Otay formations) 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.
3. In the event that fossils are discovered, the qualified 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 rhinoceros skeleton) may require an extended salvage time. In these instances, the qualified 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 qualified paleontological monitor to set up a screen-washing operation on the site.
4. 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. The report shall also include an itemized inventory of all collected, prepared, and catalogued fossil specimens.

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Appendix: SDNHM Locality Data

NUMBER	LOCALITY NAME AND GEOGRAPHIC LOCATION	ROCK AND TIME UNITS-ROCK TYPE-FIELD NOTES	COLLECTORS-COMPILED BY-ENTERED BY-DONOR
3566	EastLake Salt Creek 1 Chula Vista San Diego Co. CA U.S.A. 32°39'29"N--116°58'24"W Jamul Mountains, CA 1:24000 USGS 1955/1971	Otay Formation gritstone member Cenozoic Paleogene late Oligocene early Arikareean gritstone-fluvial	R.A. Cerutti and D.R. Swanson 10 Jan 1991 S.L. Walsh 20 Feb 1992 H.P. Don Vito 31 Mar 1995 The Baldwin Company 10 Jan 1991
3576	EastLake Salt Creek 1 Chula Vista San Diego Co. CA U.S.A. 32°39'31"N--116°58'30"W Jamul Mountains, CA 1:24000 USGS 1955/1971	Otay Formation gritstone member Cenozoic Paleogene late Oligocene early Arikareean sdst-fluvial	R.A. Cerutti 17 Jan 1991 S.L. Walsh 20 Feb 1992 H.P. Don Vito 31 Mar 1995 The Baldwin Company 17 Jan 1991
3578	EastLake Salt Creek 1 Chula Vista San Diego Co. CA U.S.A. 32°39'36"N--116°58'26"W Jamul Mountains, CA 1:24000 USGS 1955/1971	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean slst-fluvial	R.A. Cerutti, D.R. Swanson and B.O. Riney 2 Jan 1991 S.L. Walsh 20 Feb 1992 H.P. Don Vito 31 Mar 1995 The Baldwin Company 2 Jan 1991
3579	EastLake Salt Creek 1 Chula Vista San Diego Co. CA U.S.A. 32°39'33"N--116°58'29"W Jamul Mountains, CA 1:24000 USGS 1955/1971	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean slst-fluvial	R.A. Cerutti, D.R. Swanson and B.O. Riney 2 Jan 1991 S.L. Walsh 20 Feb 1992 H.P. Don Vito 31 Mar 1995 The Baldwin Company 2 Jan 1991
3580	EastLake Salt Creek 1 Chula Vista San Diego Co. CA U.S.A. 32°39'30"N--116°58'25"W Jamul Mountains, CA 1:24000 USGS 1955/1971	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean slst-fluvial	R.A. Cerutti, D.R. Swanson and S.L. Walsh 11 Jan 1991 S.L. Walsh 20 Feb 1992 H.P. Don Vito 31 Mar 1995 The Baldwin Company 11 Jan 1991
4000	EastLake Olympic Training Center Chula Vista San Diego Co. CA U.S.A. 32°37'55"N--116°56'12"W Jamul Mountains, CA 1:24000 USGS 1967(75PR)	Otay Formation Cenozoic Paleogene late Oligocene early Arikareean congl-fluvial R.A. Cerutti	R.A. Cerutti 23 Dec 1991 C.P. Majors 5 Feb 1996 C.P. Majors 12 Feb 1996 Koll Construction Co. 23 Dec 1991
4001	EastLake Olympic Training Center Chula Vista San Diego Co. CA U.S.A. 32°37'55"N--116°56'10"W Jamul Mountains, CA 1:24000 USGS 1967(75PR)	Otay Formation Cenozoic Paleogene late Oligocene early Arikareean congl-fluvial R.A. Cerutti	R.A. Cerutti 16 Dec 1991 C.P. Majors 5 Feb 1996 C.P. Majors 12 Feb 1996 Koll Construction Co. 16 Dec 1991
4002	East Orange Avenue San Diego San Diego Co. CA U.S.A. 32°37'55"N--116°56'10"W Jamul Mountains, CA 1:24000 USGS 1967(75PR)	Otay Formation Cenozoic Paleogene late Oligocene early Arikareean congl-fluvial R.A. Cerutti	R.A. Cerutti 13 Sep 1995 C.P. Majors 5 Feb 1996 C.P. Majors 12 Feb 1996 EastLake Development Company 13 Sep 1995
3500	EastLake Chula Vista San Diego Co. CA U.S.A. 32°39' 7"N--116°58'17"W Jamul Mountains, CA 1:24000 USGS 1955(1975)	Otay Formation Cenozoic Paleogene late Oligocene early Arikareean sltst-nonmarine R.A. Cerutti	R.A. Cerutti 1 Nov 1988 0 0 H.Wagner 1 Nov 1999 0 0
4838	EastLake Business Center Chula Vista San Diego Co. CA U.S.A. 32°38'46"N--116°58'11"W Jamul Mountains, CA 1:24000 USGS 1955(1975)	Otay Formation gritstone member Cenozoic Paleogene late Oligocene early Arikareean sdst-fluvial	R.A. Cerutti, M.A. Roeder 18 Feb 1986 K.A. Randall 4 Feb 2003 K.A. Randall 5 Feb 2003 EastLake Development 18 Feb 1986
5733	Winding Walk Phase III Chula Vista San Diego Co. CA USA 32°37'16"N--116°57' 0"N Otay Mesa, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean sdst-fluvial PJS book #4 pgs 7-8	P.J. Sena, B.O. Riney, S.L. Walsh 19 Jan 2005 P.J. Sena 1 Dec 2005 K.A. Randall 19 Dec 2005 Brookfield Homes 19 Jan 2005
5735	Winding Walk Phase III - Bird Egg Hill Chula Vista San Diego Co. CA USA 32°37' 7"N--116°57'33"N Otay Mesa, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean sdst-fluvial PJS book #4 pgs 19 & 21	P.J. Sena 27 Apr 2005 P.J. Sena 1 Dec 2005 K.A. Randall 19 Dec 2005 Brookfield Homes 27 Apr 2005
5736	Winding Walk Phase III Chula Vista San Diego Co. CA USA 32°37' 7"N--116°57'33"N Otay Mesa, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean sdst-fluvial PJS book #4 pgs 32 & 19	P.J. Sena 27 Apr 2005 P.J. Sena 1 Dec 2005 K.A. Randall 19 Dec 2005 Brookfield Homes 27 Apr 2005

NUMBER	---LOCALITY NAME AND GEOGRAPHIC LOCATION---	----------ROCK AND TIME UNITS-ROCK TYPE-FIELD NOTES----------	-----------COLLECTORS-COMPILED BY-ENTERED BY-DONOR----------
5737	Winding Walk Phase III Chula Vista San Diego Co. CA USA 32°37' 0"N--116°57'29"N Otay Mesa, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean mdst-fluvial PJS book #4 pgs 81-83	C.M. Redman 6 Sep 2005 P.J. Sena 1 Dec 2005 K.A. Randall 19 Dec 2005 Brookfield Homes 6 Sep 2005
5740	Winding Walk Phase III Chula Vista San Diego Co. CA USA 32°36'52"N--116°57'25"N Otay Mesa, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean mdst-fluvial PJS book #4 pgs 17	P.J. Sena 14 Mar 2005 P.J. Sena 1 Dec 2005 K.A. Randall 19 Dec 2005 Brookfield Homes 14 Mar 2005
5741	Winding Walk Phase III Chula Vista San Diego Co. CA USA 32°36'56"N--116°57'26"N Otay Mesa, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean mdst-fluvial PJS book #4 pgs 15, 26	P.J. Sena 4 Feb 2005 P.J. Sena 1 Dec 2005 K.A. Randall 19 Dec 2005 Brookfield Homes 4 Feb 2005
5742	Winding Walk Phase III Chula Vista San Diego Co. CA USA 32°36'56"N--116°57'29"N Otay Mesa, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean mdst-fluvial PJS book #4 pgs 20, 26	P.J. Sena 8 Apr 2005 P.J. Sena 15 Dec 2005 K.A. Randall 19 Dec 2005 Brookfield Homes 8 Apr 2005
5743	Winding Walk Phase III Chula Vista San Diego Co. CA USA 32°37' 3"N--116°57'37"N Otay Mesa, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean mdst-fluvial PJS book #4 pgs 32	P.J. Sena 9 May 2005 P.J. Sena 15 Dec 2005 K.A. Randall 19 Dec 2005 Brookfield Homes 9 May 2005
5942	SR 125 Toll Road Chula Vista San Diego Co. CA USA 32°39'13"N--116°58'15"W Jamul Mountains, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean sdst-fluvial PJS book4, pg 74	P.J. Sena 28 Dec 2006 P.J. Sena 3 Oct 2006 K.A. Randall 16 Jan 2007 Otay River Constructors 28 Dec 2006
5943	SR 125 Toll Road Chula Vista San Diego Co. CA USA 32°39'11"N--116°58'16"W Jamul Mountains, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean sdst-fluvial PJS book 5, pg 2, book 4 pg 147	P.J. Sena 7 Jun 2006 P.J. Sena 3 Oct 2006 K.A. Randall 16 Jan 2007 Otay River Constructors 7 Jun 2006
5944	SR 125 Toll Road Chula Vista San Diego Co. CA USA 32°39' 4"N--116°58'13"W Jamul Mountains, CA 1:24000 USGS 1975	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean sdst-fluvial PJS book 5, pg 21, 22, 43, 45	P.J. Sena, R.A. Cerutti 7 Jul 2006 P.J. Sena 3 Oct 2006 K.A. Randall 16 Jan 2007 Otay River Constructors 7 Jul 2006
5945	SR 125 Toll Road Chula Vista San Diego Co. CA USA 32°38' 4"N--116°58'13"W Jamul Mountains, CA 1:24000 USGS 1955(1975)	Otay Formation sandstone-mudstone member Cenozoic Paleogene late Oligocene early Arikareean sdst-fluvial PJS book 5 pg 45-46	P.J. Sena 14 Aug 2006 P.J. Sena 3 Oct 2006 K.A. Randall 18 Jan 2006 Otay River Constructors 14 Aug 2006