PALEONTOLOGICAL MONITORING REPORT
SUNRISE POWERLINK TRANSMISSION LINE
SAN DIEGO AND IMPERIAL COUNTIES CALIFORNIA

CONFIDENTIAL

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PROJECT SUMMARY

This document presents the results of the paleontological monitoring program conducted during construction of San Diego Gas & Electric Company's Sunrise Powerlink Transmission Line project (SRPL) within San Diego and Imperial counties, California. The 118 mile alignment included construction of 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. Earthwork activities associated with these various construction elements included grading of access roads and tower pads, drilling of tower footing boreholes, and trenching for undergrounding of transmission lines. Paleontological monitoring work was performed by staff members of the Department of PaleoServices, San Diego Natural History Museum under contract to Burns and McDonnell Engineering Company, Inc.

The monitoring program included construction monitoring, fossil salvage, laboratory preparation of salvaged fossil specimens, curation of prepared specimens, and storage of curated specimens. Excavation operations were monitored between September 17, 2010 and April 3, 2012. Initial field work began along Link 1 in the eastern portion of the SRPL right-of-way (ROW). The Imperial Valley portion of Link 1 crossed a variety of geologic rock units that preserve portions of the past seven million years of Earth history in the region. Sandstones of the Latrania Formation record the initial flooding of the Salton Trough by tropical marine waters of the ancestral Gulf of California during the Late Miocene (~7 million years ago; Ma). Mudstones, siltstones, and oyster-shell coquinas of the Deguynos Formation document the beginning of Colorado River deposition in the region during the Early Pliocene (~5 Ma). Siltstones and fine-grained sandstones of the Arroyo Diablo Formation record the east to west progradation of the ancestral Colorado River delta across the head of the proto-Gulf to form a sediment dam during the mid-Pliocene (~3-4 Ma). Eventually, the growing delta forced the repositioning of the northern shoreline of the proto-Gulf southward to near its present position. Mudstones of the Brawley Formation document the development of a series of large freshwater lakes that occupied the Salton Trough during the Middle Pleistocene (~1 Ma). Fanglomerates of the Octotillo Conglomerate record the initiation of regional uplift in the Salton Trough and the formation of alluvial fans that extended from the newly emergent highlands into the ephemeral freshwater lakes during the Middle Pleistocene (~1 Ma). Mudstones and siltstones informally referred to as Lake Cahuilla deposits document the most recent series of ephemeral, freshwater lakes to occupy the Salton Trough from latest Pleistocene time through most of the Holocene (~12,000 to 500 years ago).

The upland portion of Link 1 crossed a series of rock units that record short segments of the geologic history of a much broader interval of time spanning the from the late Mesozoic to the Quaternary (~125 Ma to 10,000 years ago). Plutonic igneous rocks of the Peninsular Range Batholith document the mass emplacement of huge volumes of subduction-derived magmas along the ancient western margin of North America during the Cretaceous (~125 to 95 Ma). Coarse-grained fanglomerates and muddy sandstones of the Anza Formation record a rarely documented period of history in our region during the early Miocene (~18 to 16 Ma). These sedimentary rocks are preserved beneath a resistant cap of volcanic flow rocks of the Jacumba Volcanics that record a period of regional crustal extension during the Early to Middle Miocene (~16 Ma). A time gap of about 16 Ma is represented by the ancient erosion surface that separates the Miocene rocks of the Anza Formation and Jacumba Volcanics from the overlying Quaternary

alluvial strata that was deposited by local alluvial fans and washes beginning at least 120,000 years ago.

The majority of Links 2, 3, and 4 of the SRPL ROW cross terrain eroded into the plutonic igneous rocks of the Peninsular Range Batholith. There are patchy occurrences of older metasedimentary rocks of the Julian Schist along these links, as well as areas marked by thin veneers of Quaternary alluvial deposits. Similar geologic conditions exist along the majority of Link 5, although the westernmost portion of this link crosses a thick series of sedimentary rocks that record a time of large scale deposition of river-transported sand, cobble, and boulder material during the Eocene (~50 to 40 Ma). These deposits built a broad, river-dominated delta that prograded out across the adjacent tropical coastal plain and out into the nearshore and deeper marine environments of the ancient eastern Pacific Ocean.

Given the ancient and diverse geologic record preserved in the sedimentary rock units crossed by the SRPL ROW, it is not surprising that paleontological monitoring of construction activities resulted in the discovery of fossil remains. Fossils recovered from Link 1 include isolated bones of large marine mammals found in the Latrania Formation, relatively diverse assemblages of offshore marine mollusks and low diversity assemblages of tidal flat mollusks found in the Deguynos Formation, mixed assemblages of estuarine mollusks, freshwater bony fish, and terrestrial mammals and plants found in the Arroyo Diablo Formation, moderately diverse freshwater molluscan and vertebrate assemblages found in the Brawley Formation, and relatively diverse assemblages of freshwater mollusks, vertebrates, and plants found in the Lake Cahuilla deposits. Fossils recovered from Link 5 include small, but significant teeth and bones of a variety of early land mammals including extinct species of opossums, hedgehogs, bats, primates, and rodents. Importantly, the bat fossils may represent a species new to science.

The fossil collections recovered as a result of the Sunrise Powerlink Transmission Line project increase our understanding of the diversity and evolution of Eocene through Quaternary faunas of San Diego and Imperial counties. These assemblages have the potential to clarify and answer a number of interesting research questions concerning the geologic and biological history of southern California.

INTRODUCTION

PROJECT DESCRIPTION

This report summarizes the results of the paleontological monitoring program conducted during excavation activities associated with construction of the Sunrise Powerlink (SRPL) project in San Diego and Imperial counties, California (Figure 1). This monitoring program included monitoring of excavation operations (access road grading, utility trenches, tower footings), fossil salvage, laboratory preparation of salvaged specimens, curation of prepared specimens, and storage of curated specimens as directed by the Paleontological Monitoring and Treatment Plan prepared by the San Diego Natural History Museum (SDNHM) as required by Mitigation Measure PAL-1b. The monitoring program was conducted in accordance with city, county, and state guidelines. The monitoring work was performed for the San Diego Gas & Electric Company (SDG&E). This report was prepared by Thomas A. Deméré and Sarah A. Siren of the Department of PaleoServices, San Diego Natural History Museum, San Diego, California.

The SRPL Final Environmentally Superior Southern Route (FESSR, Figure 1) is a 118-mile long 230 kV/500 kV transmission line extending from the SDG&E Imperial Valley Substation near El Centro, Imperial County, to the SDG&E Sycamore Canyon Substation near Interstate 15 in coastal San Diego County. The project was approved by the California Public Utilities Commission (CPUC) in December 2008 and by the United States Department of the Interior Bureau of Land Management (BLM) in January 2009. The approved SRPL primarily consists of 110 miles of overhead 500kV and 230kV transmission towers and conductors, 6.2 miles of underground 230kV cable, and a new 40-acre, 500kV/230kV transmission Suncrest Substation. The project right-of-way (ROW) extends from the central portion of the Imperial Valley to the western portion of the SDG&E service area in the City of San Diego. The project also involved other system upgrades and modifications including reconductoring of several 69kV tielines (TL 639, TL 6915, TL 6916, and TL 6924) servicing the Scripps Ranch, Tierrasanta, and Mission Gorge communities.

The SRPL FESSR was constructed on public and private land. The project begins at the Sycamore Substation, which is near Interstate 15 and State Route 67. The line then turns south past San Vicente Reservoir, along the north side of El Monte Valley, and across the western end of El Capitan Reservoir. It crosses Interstate 8, where it will be constructed underground along Alpine Boulevard through Alpine until it turns south opposite Viejas Mountain. At this point, the route is south of Interstate 8, and it continues south to Barrett, running near State Route 94. Just beyond Barrett, again following State Route 94, the route goes east to Cameron, where it turns north to cross Interstate 8 just west of La Posta Reservation. The line continues north, and then turns south before it reaches the Ewiiaapaayp Reservation. It runs southeast through McCain Valley until it reaches Interstate 8; the line crosses Interstate 8 near the community of Boulevard and continues south to meet with the Southwest Powerlink. From this point, the line parallels the Southwest Powerlink as it follows Interstate 8 and continues north from Ocotillo. These lines swing south again just west of Plaster City, cross Interstate 8, and end at the Imperial Valley substation west of El Centro.

The SRPL FESSR crosses 18 California United States Geological Survey (USGS) 7.5-minute topographic quadrangles (Alpine, Barrett Lake, Cameron Corners, Carrizo Mountain, El Cajon Mountain, In-Ko-Pah Gorge, Jacumba, Live Oak Springs, Morena Reservoir, Mount Laguna,

Mount Signal, Painted Gorge, Plaster City, Poway, San Vicente Reservoir, Sombrero Peak, Viejas Mountain, and Yuha Basin).

Definition and Significance of Paleontological Resources

As defined here, paleontological resources (i.e., fossils) are the buried remains and/or traces of prehistoric organisms (i.e., animals, plants, and microbes). Body fossils such as bones, teeth, shells, leaves, and wood, as well as trace fossils such as tracks, trails, burrows, and footprints, are found in the geological deposits (formations) within which they were originally buried. The primary factor determining whether an object is a fossil or not, isn't how the organic remain or trace is preserved (e.g., "petrified"), but rather the age of the organic remain or trace. Although typically it is assumed that fossils must be older than ~10,000 years (i.e., the widely accepted end of the last glacial period of the Pleistocene Epoch), organic remains of early Holocene age can also be considered to represent fossils because they are part of the record of past life.

Fossils are considered important scientific and educational resources because they serve as direct and indirect evidence of prehistoric life and are used to understand the history of life on Earth, the nature of past environments and climates, the membership and structure of ancient ecosystems, and the pattern and process of organic evolution and extinction. In addition, fossils are considered to be non-renewable resources because typically the organisms they represent no longer exist. Thus, once destroyed, a particular fossil can never be replaced. And finally, for the purposes of this report, paleontological resources can be thought of as including not only the actual fossil remains and traces, but also the fossil collecting localities and the geological formations containing those localities.

Personnel

Dr. Thomas A. Deméré, Curator of Paleontology and Director of the Department of PaleoServices at the San Diego Natural History Museum, served as Principal Investigator/Qualified Paleontologist and report co-author. The lead paleontological field monitors were Bradford O. Riney and Gino Calvano with additional monitoring conducted by: Shayne A. Boney, Richard A. Cerutti, Rodney M. Hubscher, Carrie E. Lambert, Christopher S. Plouffe, Patrick J. Sena, and Todd A. Wirths. The paleontological monitoring team expended 5160 hours observing ground disturbance activities. Laboratory work, including fossil preparation, identification, and specimen curation, was carried out by Nicolle K. Anderson, Thomas A. Deméré, Joseph El Adli, Kesler A. Randall, and Rodney M. Hubscher. The final monitoring report was prepared by Thomas A. Deméré and Sarah A. Siren.

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The SRPL paleontological monitoring program was conducted for SDG&E under a subcontract to Burns & McDonnell Engineering. Mr. Steve Riggs served as the Environmental Monitoring Manager for Burns & McDonnell Engineering and was assisted in the field by Monitoring Link Leads Don Spires, Jim Gibson, Rebecca Carson, Shannon Ceresola, Rosina Gallego, and Ken Katsuda. SDG&E environmental oversight was managed by Dayle M. Cheever, Senior Environmental Specialist with SDG&E. Bureau of Land Management oversight was provided by Carrie L. Simmons, Archaeologist at the BLM El Centro Field Office. The California Public Utilities Commission was represented by Susan Goldberg of Applied EarthWorks.

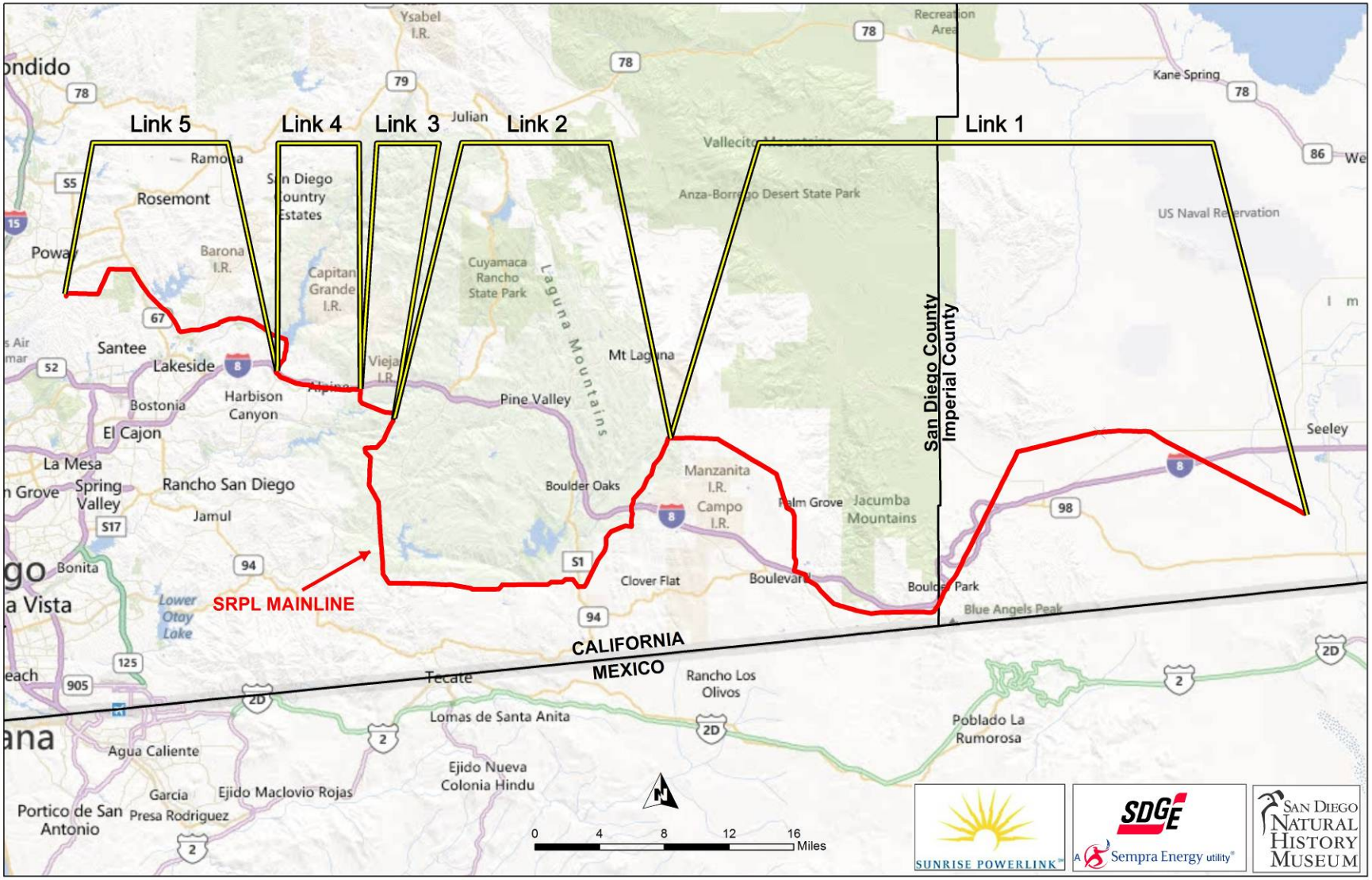

Figure 1. Project location map for the Sunrise Powerlink transmission ROW in San Diego and Imperial counties, California.

METHODS

FIELD METHODS

Field activities included monitoring active excavation operations, examination of excavation spoils and sidewalls, collection of unearthed fossil remains, and the recording of geologic, stratigraphic, and taphonomic contextual data. Specific field methods and techniques are discussed more fully below and were carried out in a manner consistent with the counties of San Diego and Imperial, the California Environmental Quality Act (CEQA), the BLM, and conditions of the Paleontological Monitoring and Treatment Plan prepared by SDNHM.

Monitoring

Prior to the initiation of construction monitoring, an inventory of the potential paleontological localities was completed. This inventory was used to inform the decisions regarding the placement and scheduling of paleontological monitors. Earthwork activities were monitored between September 17, 2010 and April 3, 2012. Given the complex nature of the SRPL project, earthwork activities varied and included trenching for underground utilities at substation locations, grading of access roads, grading of tower pads at transmission tower locations, and drilling of foundation boreholes at transmission tower locations. The location and duration of paleontological monitoring was determined by construction schedules and geologic conditions in the field and varied from link to link. The most extensive monitoring occurred along Links 1 and 5, with only minor levels of monitoring occurring along Links 2 and 3. There was no field monitoring conducted in Link 4 because of the absence of exposed sedimentary rock units along this portion of the project alignment. Monitoring along the other links consisted of on-site inspections of excavations operations for unearthed fossil remains (Figure 2). Ideally, inspection involves examination of every newly exposed stratigraphic surface, but operationally this was not possible. The pace of excavation and equipment activity determined how often the monitor could make inspections.

Substation Improvements- Substation improvement earthwork was monitored at the Imperial Substation (Link 1) and the Sycamore Substation (Link 5). Excavation activities at the Imperial Valley Substation consisted of trenching for underground utilities, excavation of pad footings for transformers, and drilling of boreholes for transmission towers (Figure 2). Monitoring focused on inspection of trench and footing sidewall exposures and spoils.

Access Roads- Access road earthwork was monitored along the Links 1 and 5. This work largely consisted of bulldozer work to pioneer new level dirt roadways (Figure 3). Monitoring primarily consisted of inspection of new bladed roadway surfaces for unearthed fossil remains. Spoils built up along the margins of the new roadways were also inspected.

Tower Pads- Tower pad earthwork was monitored along the Links 1 and 5. This work consisted of grading of level tower pads using bulldozers and drilling of large diameter (approximately 4 feet in diameter) foundation boreholes for each of the four tower legs (Figures 4 and 5). Monitoring consisted of inspection of new bladed tower surfaces and borehole spoils for unearthed fossil remains. Spoils built up along the margins of the new tower pads were also inspected.

69kV tieline reconductoring- Tieline work primarily focused on reconductoring of the existing transmission line, but also included excavations for and placement of replacement power poles (Figure 6). This work involved a combination of borehole drilling and hand digging of pole foundations. Monitoring consisted of inspection of spoils for unearthed fossil remains.

Figure 2. Equipment footing excavation by PAR Electric within the Imperial Valley Substation exposing Lake Cahuilla strata; Link 1.

Figure 3. Grading of access road for EP322 in Recent colluvium overlying strata of the Arroyo Diablo Formation; Link 1.

Figure 4. Grading of tower pad for CP70 in unnamed older alluvium; Link 5.

Figure 5. Drilling for tower footings at EP 341. Older alluvium at the ground surface overlies Palm Spring Group sandstones, siltstones, and mudstones at depth; Link 1.

Figure 6. Drilling for tower footings at CP17 in Eocene strata of the Stadium Conglomerate; Link 5.

Fossil Salvage

Fossil salvage methods employed during paleontological monitoring of earthwork operations for the SRPL project varied depending on the type of excavation being conducted, the kind of heavy equipment in use, and the location of the area of disturbance. In the case of borehole excavations for tower footings, fossil recovery involved collecting unearthed fossil remains from spoils piles (Figure 7). Larger, macroscopic fossils were individually cherry-picked from the spoils matrix, while smaller fossils were recovered by collecting bulk samples of the fossiliferous matrix. For hand-excavated postholes, fossil recovery was similar and in one case involved collecting nearly all of the spoils matrix. Fossil salvage methods employed during trench and vault monitoring also focused on recovering unearthed fossils in the spoil piles, as well as, fossils temporarily exposed in the active excavations. For both boreholes/postholes and trenches, it was important to document the depth from which a particular sampled matrix was derived. In the case of rough grading of access roads and tower pads, fossil recovery involved collecting unearthed fossil remains from freshly exposed cut surfaces, both horizontal scraped surfaces and vertical cut slopes. In the latter case, fossils were collected by digging directly into the exposed sedimentary strata and removing single specimens, as well as, dense fossil concentrations.

Bulk Matrix Sampling & Screen-washing

This salvage technique is used for certain sites that appear in the field to have the potential to produce abundant microvertebrate remains. Microvertebrate sites were sampled by collecting bulk quantities of sedimentary matrix using picks and shovels to loosen material, and using buckets and pick-up trucks to transport this material. Offsite matrix processing involves breaking large blocks of matrix into golf ball-sized pieces to facilitate airdrying; soaking the dried chunks of matrix in water-filled five gallon buckets to break them down; pouring the

resulting slurry through 30 mesh (0.6 mm) stainless steel screens to separate the coarser sand and fossil material from the fine clays and silts; drying the coarse concentrate, and transferring the remaining material into plastic sample bags labeled with all pertinent locality data.

Figure 7. SDNHM Paleontological Monitor Gino Calvano salvaging fossils at SDNHM Locality 6529 discovered during monitoring of spur road grading for EP322; Arroyo Diablo Formation, Link 1.

Stratigraphic Data Collection

Collection of stratigraphic data was an integral part of the monitoring operation. Outcrops exposed in the cut sidewalls were examined and observed geologic features were recorded in field notes and on construction plans. The goals of this work were to delimit the nature of fossiliferous sedimentary rock units exposed along the project ROW, determine their aerial distribution and depositional contacts, and record any evidence of structural deformation. Standard geologic and stratigraphic data collected included lithologic descriptions (color, sorting, texture, structures, and grain size), stratigraphic relationships (bedding type, thickness, and contacts), and topographic position. Measurement of stratigraphic sections was done with a tape measure. Areas containing exposures of fossiliferous sedimentary rocks were studied in detail and fossil localities were recorded on measured stratigraphic sections and mapped using a hand-held Global Positioning System (GPS) unit.

LABORATORY METHODS

Laboratory activities included mechanical preparation of fossil specimens, screenwashing of fossilferous sedimentary matrix, repair and stabilization of broken/damaged specimens, specimen identification, specimen cataloging, and specimen storage. Specific methods are discussed more fully below and were carried out in compliance with professional standards

established by governmental agencies (e.g., County of San Diego Guidelines for Determining Significance of Paleontological Resources [Stephenson et al., 2007], and BLM H-8270-1 [BLM, 1998], BLM Instruction Memorandum 2007-009 [BLM, 2007], BLM Instruction Memorandum 2009-011 [BLM, 2009]).

Mechanical Preparation

Small fossil specimens (<1cm) were prepared by systematically reducing the size of the claystone and siltstone matrix blocks to locate shells of invertebrates and microvertebrates. The matrix was initially left to soak in a water solution overnight. The material was then screenwashed, using 30 and 60 mesh (0.02 and 0.01 inch openings, respectively) screens. Finally, the specimens were rinsed in water to expose the finer morphologic details of the specimens. The fossils were then sorted by species type and skeletal element.

Larger fossil specimens (>1cm) were mechanically prepared using handtools (e.g., X-acto knives, dental picks, and brushes) to remove enclosing sedimentary matrix. In the case of bivalve mollusk shells, as the shell surface was exposed during matrix removal, a small quantity of consolidant was applied to minimize loss of mineralized shell material. The consolidant was also used to seal any exposed cracks in the shell surface. Plant leaf impressions were coated with a very low viscosity consolidant solution to halt oxidation of the preserved carbon film.

Microfossil Picking

Microfossils (< 5 mm) were prepared using a two-step method. The first step involved a heavy liquid separation procedure using tetrabromoethane. When added to the heavy liquid in a large separation funnel, the concentrate of "sand" produced by the screen-washing process was divided into two fractions. The denser, heavier fossil bones and teeth sank in the heavy liquid, while the lighter quartz and feldspar mineral grains floated, and could be ladled off leaving concentrations of microfossils. The second step involved visual inspection of the heavy concentrate under a microscope, followed by manual “picking” of identifiable microfossils (e.g., teeth and bones of small mammals). If necessary, residual amounts of matrix were then removed with a pin vise, and broken fossils were repaired under the microscope.

Fossil Curation

Fossil curation involved the identification of individual fossil specimens, assignment of unique specimen catalog numbers, preparation of locality reports, entry of specimen catalog and locality information into the specimen computer database, printing of specimen labels, writing the catalog numbers on the specimens using India ink on a patch of white acrylic paint, placement of the specimens with labels into appropriate-sized paper specimen trays, and storage of the labeled specimens in the steel “Lane-style” geology storage cabinets in the research collections area of the Museum.

A specimen number can represent a single isolated bone, multiple bones belonging to a single individual, or a batch of fossil invertebrates belonging to a single species. This curation procedure was followed for all medium-sized specimens (1-20 cm in size), but was modified for smaller and larger specimens.

Microfossils, such as small bones or shells, were curated by placing single or multiple specimens in small glass vials. These vials were sealed with corks painted on their top surfaces with white acrylic paint. Locality and specimen catalog numbers were written on the painted surfaces. Individual vials were then placed with their corresponding specimen labels in either a cardboard specimen tray or a specially designed foam base that allowed storage of multiple vials in an upright position. Cataloguing, numbering, and labeling followed the procedures described above.

Fossil remains collected during monitoring of construction activities along Link 1 were all recovered from BLM managed public lands and have been catalogued into the paleontological research collections at SDNHM under an approved curation agreement. These fossils will be held in the public trust by SDNHM and will be made available to interested parties (e.g., students, professional scientists, and members of the public) in perpetuity.

RESULTS

The paleontological monitoring program conducted during construction of the SRPL project resulted in the recovery of fossil remains from temporary exposures of potentially fossil-bearing sedimentary deposits. Also recovered was important stratigraphic and taphonomic information related to the burial and preservation of the fossils. The results of this field work are presented below.

STRATIGRAPHY

The following section is organized by project link and rock unit. Earthwork activities exposed sedimentary deposits of Quaternary-age through Eocene-age. Geological units exposed were (in order from youngest to oldest): Surficial alluvial fan and wash deposits, Lake Cahuilla deposits, Unnamed older alluvial deposits, Ocotillo Conglomerate, Brawley Formation, Arroyo Diablo Formation, Deguynos Formation, Latrania Formation, Friars Formation, and Coyote Mountains basement complex. Stratigraphic details of these geologic rock units are discussed below.

Link 1, Section 10B, Segments 1, 2, and 3

Surficial Alluvial Fan and Wash Deposits- Alluvial fan and wash deposits derived from modern erosion of the Coyote Mountains, Yuha Buttes, and adjacent areas were encountered along major portions of Segments 2 and 3 (Section 10B, Link 1) of the SRPL ROW. These surficial alluvial deposits thicken toward the upland areas, but in most areas of the alignment were less than 5 feet thick. These deposits typically consist of crudely bedded gray to light brown, loosely consolidated, poorly sorted, fine to very coarse-grained sands and pebbly to cobbly gravels (Dibblee, 2008a,c).

Lake Cahuilla Deposits- Lake Cahuilla deposits were encountered in the eastern portion of Segment 2 (Section 10B, Link 1) of the SRPL ROW and at the Imperial Valley Substation. These deposits extended to a maximum depth of about 12 feet, but in most areas were generally less than 5 feet thick. The Lake Cahuilla deposits consisted of very pale brown, massive to laminated, loosely consolidated, fine-grained sandstones interbedded with light brownish gray, friable, medium- to coarse-grained sandstones. Well-preserved shells of freshwater mollusks were observed at several locations in the Lake Cahuilla deposits, both as surface deflation lag accumulations (Figure 8) and as matrix-supported dispersed shell concentrations within buried stratigraphic horizons.

Unnamed Older Alluvial Deposits- Isolated occurrences of older alluvial deposits were encountered in the western portion of Segment 2, Section 10B, Link 1 of the SRPL ROW. These older alluvial deposits typically form the upper portions of roughly linear, flat-topped ridges that extend out from the southern flank of the Coyote Mountains. These ridges were formerly part of a continuous alluvial plain, which because of local tectonic uplift related to the Elsinore Fault Zone has now been dissected by more recent erosion from the ephemeral washes flowing out of the Coyote Mountains. Internally, the older alluvial deposits consist of crudely bedded dark brown to reddish brown, compacted, poorly sorted, fine- to very coarse-grained sandstones and cobble to boulder conglomerates (Figure 9).

Figure 8. Close-up of freshwater bivalve shells (*Anodonta*) discovered in wind-deflated Lake Cahuilla deposits in the vicinity EP360, approximately one mile west of the Imperial Valley Substation.

Figure 9. Natural exposure of dark-colored loosely consolidated Older alluvium overlying lighter-colored moderately indurated and tilted strata of the Deguynos Formation near EP310.

Ocotillo Conglomerate- Uplifted strata of the Ocotillo Conglomerate were encountered in the northern portion of Segment 3 (Section 10B, Link 1) of the SRPL ROW. These strata consisted of whitish to light gray, thickly bedded, compact to calcareoulsy cemented (caliche), cobble to boulder fanglomerates with angular to subangular clasts (Dibblee, 2008b). The majority of the fanglomerate units were clast-supported at the base grading upwards into matrix-supported at the top. In places the fanglomerates were interbedded with coarse-grained, planar-bedded sandstones. As exposed at Sugarloaf Hill, the Ocotillo Conglomerate was approximately 200 feet thick, with strata tilted 5º to 7º northeast towards the Coyote Mountains.

Brawley Formation- Poorly consolidated strata of the Brawley Formation were encountered in the deeper excavations and boreholes drilled at the Imperial Valley Substation (Segment 1, Link 1). These strata were also encountered in the boreholes for tower leg foundations drilled at EP353, EP354, EP355, EP362, and EP363 (Segment 2, Section 10B, Link 1). As temporarily exposed at the Imperial Valley Substation the Brawley Formation generally consisted of light brown, thin beds of interbedded mudstone, siltstone, and fine-grained sandstone. A geotechnical borehole drilled at EP363 penetrated about 40 feet of Brawley Formation light brown, thickly bedded siltstones; light brown, finely interbedded intervals of fine-, medium-, and coarse-grained sandstones; light brown, fine-grained, massive, micaceous sandstones; and light brown, fine-grained, laminated sandstones with dark laminations. At EP353 approximately 30 feet of Brawley Formation strata was exposed and consisted, from bottom to top, of a basal unit of yellowish brown, thinly laminated siltstone that grades upwards into a reddish brown massive claystone paleosol with root casts. This paleosol is overlain by alight brown, fine-grained, ripple drift sandstone that grades upwards into a gray to brown claystone with thin, light gray siltstone interbeds.

Arroyo Diablo Formation- Well indurated strata of the Arroyo Diablo Formation (Cassiliano, 1999) were encountered along major portions of Segment 2 (Section 10B, Link 1) from EP 316 to EP325. Surface exposures of the Arroyo Diablo Formation varied in composition and character along this ~3 mile long section of the alignment. This variation is the result of the stratigraphic thickness of the Arroyo Diablo Formation, the varied depositional environments preserved in the strata, the folding and faulting of strata related to tectonic uplift of the Coyote Mountains, and the patchy distribution of individual areas of outcrop along the SRPL alignment. Because of the gradational contact between the Arroyo Diablo Formation and the underlying Deguynos Formation, it is not possible to precisely distinguish the base of the Arroyo Diablo Formation. However, the stratigraphically lowest and geologically oldest strata in the Arroyo Diablo Formation encountered along the SRPL ROW occur in the vicinity of EP316. Here the formation consists of thickly interbedded strata of light yellowish brown, fine-grained, cross-bedded sandstones, light gray to brown, weakly laminated mudstones, and light brown, fine-grained, massive sandstones (Figure 10). One mudstone channel sequence in this area measured 22 feet thick and produced impressions of freshwater plants and partial fish skeletons. Higher in the section near EP 319 the Arroyo Diablo Formation consisted of more thinly bedded strata including reddish brown claystones, greenish siltstones, light brown, planar laminated fine-grained sandstones grading up into brown siltstones. Beds here varied from 2 to 5 feet in thickness, with certain fine-grained sandstone strata producing well-preserved shells of mollusks and barnacles. The Arroyo Diablo Formation exposed in the vicinity of EP320 consisted of over 130 feet of northeast titled strata (Figure 11) with thick beds (up to 25 feet thick) of reddish brown, fine-grained sandstones, interbedded with thin beds (3 to 4 feet thick) of yellowish brown

siltstones, pale brown, loosely consolidated shelly sandstones, and reddish brown concretionary sandstones with basal stringers of pebble-sized mudstone rip-up clasts. Isolated bones and teeth of terrestrial mammals are preserved in some of the concretionary sandstone strata, while well-preserved shells of estuarine mollusks and crustaceans are preserved in the shelly sandstone strata.

Figure 10. Natural exposures of tilted strata of the Arroyo Diablo Formation in the vicinity of EP316; Link 1. This area exposes the lower part of the Arroyo Diablo Formation and consists of light yellowish brown, fine-grained, cross-bedded sandstone overlain by light gray to brown, weakly laminated mudstone. SDNHM Locality 6520 is in background at site where SDNHM paleontologists are working (orange shirts).

Figure 11. Tilted strata of the Arroyo Diablo Formation as exposed in the vicinity of EP 320; Link 1.

Deguynos Formation- Well stratified marine sedimentary rocks of the Deguynos Formation (Winker and Kidwell, 1996) were encountered along portions of Segment 2 (Section 10B, Link 1) from about EP305 to EP315. Surface exposures of the Deguynos Formation varied in composition and character along this ~2 mile long section of the alignment. As is the case with the Arroyo Diablo Formation, this variation is the result of the stratigraphic thickness, varied depositional environments preserved in the strata, folding and faulting of strata related to tectonic uplift of the Coyote Mountains, and patchy distribution of individual areas of outcrop along the SRPL alignment. However, unlike the Arroyo Diablo Formation, the Deguynos Formation stratigraphic section showed a relatively consistent change in lithology from the bottom of the section to the top. The lower part of the section exposed between approximately EP305 and EP307 is represented by fairly massive to locally laminated, olive green to greenish brown mudstones. The middle of the section between approximately EP307 and EP309 consisted of relatively thick, monotypic oyster coquinas interbedded with olive green to greenish brown mudstones and siltstones (Figure 12). The upper part of the Deguynos Formation section as exposed between approximately EP309 and EP313 is represented by interbedded reddish brown, fine-grained sandstones and greenish brown siltstones, with occasional thin cemented shell beds. The sandstones in this part of the section generally are up to 10 feet thick, as are many of the siltstone units. Near EP311 the section is punctuated by a distinctly cross-bedded, coarse-grained sandstone channel sequence containing occasional marine vertebrate fossils. Boreholes for the tower at EP313 penetrated a 50 foot thick composite stratigraphic section consisting from bottom to top of ten feet of brown to brownish-gray, fine-grained sandstone capped by a gray, massive, muddy siltstone, overlain by 20 feet of light brown, fine-grained sandstone with isolated oyster clusters, overlain by 15 of brown to olive gray mudstone with a distinctive

horizon containing articulated valves of the large oyster, *Crassostrea columbiensis*. This mudstone is overlain by four feet of light brown, inter-laminated siltstone and fine-grained sandstone, overlain by six feet of brown mudstone.

Figure 12. Tilted, well cemented, shell beds in the middle portion of the Deguynos Formation as exposed in the vicinity of EP 308; Link 1.

Latrania Formation- Well indurated to calcareously-cemented, pale yellow sandstones of the Latrania Formation (Winker and Kidwell, 1996) occur in a limited area at the western end of Segment 2 (Section 10B, Link 1) in the vicinity of EP304. Here the Latrania Formation sandstones directly overlie strongly indurated metamorphic rocks of the Coyote Mountains crystalline basement complex (Figure 13). The very irregular contact between the sandstones and metamorphic rocks represents an unconformity eroded during the period of initial flooding of the ancestral Gulf of California to form the Late Miocene Imperial Sea (Deméré, 2006). Immediately above the unconformity, the Latrania Formation contains several, strongly indurated, very coarse-grained sedimentary breccias containing angular clasts of metamorphic rocks and well cemented shells of Miocene marine mollusks and echnioderms. Higher in the section the Latrania Formation becomes dominated by thicker and more uniform pale yellow, medium- to coarse-grained, generally massive sandstones with occasional horizons of concentrated fossil marine invertebrates.

Figure 13. Nonconformable contact between east-dipping, light yellow sandstones of the Latrania Formation (right) and rust to blue-black, resistant metamorphic rocks of the basement complex (left) in the vicinity of EP304. Two meter-long white staff for scale.

Coyote Mountain Basement Complex- Extremely dense and well indurated metamorphic rocks of the Coyote Mountain basement complex (Winker and Kidwell, 1996) were encountered in a limited area of Link 1 in the vicinity of EP304. These rocks form the core of nearby Carrizo Peak and along the SRPL ROW consist of blue-black to rusty orange gneiss and mica schist with local packets of multicolored marble. Some exposures of the basement complex display intricate intrusions of pegamite veins and dikes. The metamorphic rocks of the basement complex originally formed as marine sedimentary rocks during the early part of the Paleozoic, more than 400 Ma and were later altered by intrusion of plutonic igneous rocks during the later part of the Mesozoic after about 120 Ma.

Link 1, Section 9C, Segment 5

Unnamed Older Alluvium- Isolated occurrences of older alluvial deposits were encountered in the eastern portion of Segment 5, Section 9C, Link 1 of the SRPL ROW. These older alluvial deposits typically form the upper portions of roughly flat-topped ridges that have a patchy distribution in the Jacumba Valley area. These patches of older alluvium presumably were part of a continuous alluvial plain, which because of local tectonic uplift has now been dissected by

more recent erosion from the ephemeral washes flowing out of the surrounding hills. Internally, the older alluvial deposits consist of crudely bedded dark brown to reddish brown, compacted, poorly sorted, fine- to very coarse-grained sandstones and cobble to boulder conglomerates.

Anza Formation- Poorly exposed occurrences of more consolidate angular conglomerates and finer grained sandstones were encountered in just a few places in the eastern portion of Segment 5, Section 9C, Link 1 of the SRPL ROW. These older sedimentary deposits represent the Anza Formation (formerly called the Table Mountain Gravels by Minch and Abbott, 1973), which is a non-marine sedimentary rock unit deposited sometime during the early part of the Miocene (~18-20 Ma). In the Jacumba Valley area the Anza Formation is capped by very resistant basaltic flow rocks of the Jacumba Volcanics (Todd, 2004). The Anza Formation was only observed in boreholes drilled for tower foundations (e.g., EP242, EP251, and EP252). At EP251 approximately six feet of surficial older alluvial deposits rested on approximately 20 feet of Anza Formation consisting from bottom to top of light brownish gray, coarse-grained, matrix-supported, cobble conglomerate with subangular clasts; medium brown, moderately sorted, fine- to medium-grained silty sandstone; light gray, poorly sorted, matrix-supported, pebble to cobble conglomerate with angular to subangular clasts; and light brown, moderately sorted, coarse-grained, muddy to silty sandstone.

Link 2, Section 9B, Segment 7 and Section 8C, Segment 10

Unnamed Older Alluvium- Isolated occurrences of older alluvial deposits were encountered in several mountain stream valleys along Link 2. These older alluvial deposits typically occupy the valley margins and occur as roughly planar surfaces which are elevated above the adjacent active stream channel. The planar surfaces presumably were part of a continuous alluvial plain, which because of local tectonic uplift has now been dissected by the streams that today occupy these drainages. Internally, the older alluvial deposits consist of crudely bedded compacted, poorly sorted, fine- to very coarse-grained sandstones and cobble to boulder conglomerates.

Link 5, Section 5, Segment 16

Unnamed Older Alluvium- Isolated occurrences of older alluvial deposits were encountered in several mountain stream valleys along Link 5. These older alluvial deposits typically occupy the valley margins and occur as roughly planar surfaces which are elevated above the adjacent active stream channel. The planar surfaces presumably were part of a continuous alluvial plain, which because of local tectonic uplift has now been dissected by the streams that today occupy these drainages. Internally, the older alluvial deposits consist of crudely bedded compacted, poorly sorted, fine- to very coarse-grained sandstones and cobble to boulder conglomerates.

Stadium Conglomerate- Poorly exposed, coarse-grained sedimentary rocks of the Stadium Conglomerate (Kennedy, 1975) were encountered in the western portion of Link 5 and consisted of thickly bedded strata of pebble to cobble conglomerate with a coarse-grained sandstone matrix. The majority of the conglomerate strata were clast supported. These conglomerates were deposited on the subaerial (proximal) portion of a large, river-dominated delta plain that was prograding into the tropical marine waters of the eastern Pacific Ocean during the middle and late Eocene approximately 40 to 35 million years ago.

Friars Formation- Poorly exposed, fine-grained sedimentary rocks of the Friars Formation were encountered in the western portion of Link 5 and adjacent tielines (e.g., TL6965) that service the

Tierrasanta community of San Diego. Temporary subsurface exposures of the Friars Formation consisted of thinly bedded, light gray, well sorted, fine-grained sandstones (Figure 14). The Friars Formation is the youngest formation in the La Jolla Group (Kennedy and Moore, 1971; Kennedy, 1975) and overlies the Scripps Formation and underlies by either the Stadium Conglomerate. Walsh et al. (1996) divided the Friars Formation into three informal members: a lower sandstone-mudstone tongue, a middle conglomerate tongue, and an upper sandstone-mudstone tongue. The conglomerate tongue of the Friars is actually the thickest and most widespread conglomerate body within the original Poway Conglomerate of Ellis and Lee (1919) and Hanna (1926), which justifies the assignment of the Friars Formation as a whole to the Poway Group. The conglomerate tongue of the Friars Formation consists mainly of light rusty brown and light gray cobble and boulder conglomerate, with common thin beds and rip-up clasts of multicolored siltstone and mudstone. It is mainly of fluvial origin, but contains marine facies toward the west. It extends from the Miramar Landfill and Los Penasquitos Canyon in the west to Poway, Santee, and Murphy Canyon in the east.

Figure 14. Hand-digging for pole replacement at location Z775593 along the 69 kV TL693, west of Link 5 and south of Tierrasanta Boulevard. Fossils were discovered at a depth of 8 feet below the surface in fine-grained sandstones of the Friars Formation. Bulk sedimentary matrix was screenwashed and heavy liquid separation processed**.** This locality (SDNHM Locality 6302) produced over 100 specimens of Eocene-age, small mammal teeth.

PALEONTOLOGICAL COLLECTING LOCALITIES

Monitoring of construction activities resulted in the discovery of 34 new paleontological collecting localities. The majority of the new localities were found along the eastern portion of Link 1 and include one locality from the Latrania Formation, 15 localities from the Deguynos Formation, 11 localities from the Arroyo Diablo Formation, one locality from the Brawley Formation, and five localities from the Lake Cahuilla deposits. A single locality was discovered in the Friars Formation along TL693 in the western portion of Link 5. Brief descriptions of each of these new fossil collecting localities are provided below, with more complete descriptions provided in Appendix 1.

Link 1

SDSNH Locality 6503 (near EP304)- This locality represents a series of three discovery sites in the lower portion of the Latrania Formation as exposed on the north side of the SRPL ROW in the vicinity of EP304 and EP305. Exposures here consist of pale yellow, fine- to coarse-grained, massive sandstones containing local accumulations of marine invertebrate and vertebrate fossils. The sandstones likely accumulated in a shallow sublittoral benthic marine environment that was receiving periodic coarse-grained sediment from nearby rugged highlands.

SDSNH Locality 6504 (near EP304)- This locality represents a series of seven discovery sites in the lower portion of the Deguynos Formation as exposed within the tower pad and immediately adjacent vicinity of EP304. Exposures here consist of olive green, massive siltstones and claystones with local concentrations of common marine invertebrate and rare vertebrate fossils. The invertebrate fossil assemblage is dominated by internal and external shell molds of infaunal bivalve mollusks and epifaunal decapods crustaceans. These organisms likely lived in the prodelta (seaward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6505 (near EP305)- This locality represents a single discovery site in the lower portion of the Deguynos Formation as exposed along the access road to the tower pad for EP304. Exposures here consist of pale orange, massive, fine-grained, silty sandstones with local concentrations of marine invertebrate fossils. The invertebrate fossil assemblage contains internal and external shell molds of epifaunal gastropod mollusks, as well as some mineralized shells of infaunal bivalve mollusks. These organisms likely lived in the prodelta (seaward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6506 (near EP307)- This locality represents a single discovery site in the middle portion of the Deguynos Formation as exposed within the immediate vicinity of the tower pad for EP307. Exposures here consist of yellowish brown, claystones and siltstones with local concentrations of marine invertebrate fossils. The invertebrate fossil assemblage is dominated poorly preserved shells of infaunal bivalve mollusks. These organisms likely lived in the submerged delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 3507 (near EP307)- This locality represents a single discovery site in the middle portion of the Deguynos Formation as exposed within the immediate vicinity of the tower pad for EP307. Exposures here consist of light brown siltstones with local concentrations of oyster shells. The invertebrate fossil assemblage is dominated by mineralized shells of epifaunal bivalve mollusks. These organisms likely lived in the submerged delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6508 (near EP308)- This locality represents a single discovery site in the middle portion of the Deguynos Formation as exposed on the north side of the SRPL ROW in the vicinity of the tower pad for EP308. Exposures here consist of light yellowish orange, well cemented, cross-bedded, oyster shell coquinas interbedded with more friable massive claystones and siltstones. The invertebrate fossil assemblage is dominated by mineralized shells of epifaunal bivalve mollusks that were transported in distributary channels. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6509 (near EP308)- This locality represents a series of three discovery sites in the middle portion of the Deguynos Formation as temporarily exposed in the borehole drilled for tower leg B at EP308 and during grading of the tower pad and adjacent access road. Exposures here consist of east-dipping (~27º) oyster shell coquinas interbedded with olive greenish gray massive mudstones. The invertebrate fossil assemblage is dominated by mineralized shells of epifaunal bivalve mollusks and acorn barnacles that were transported in distributary channels. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6510 (EP309)- This locality represents a single discovery site in the middle portion of the Deguynos Formation as temporarily exposed in the borehole drilled for tower leg C at EP309. Exposures here consist of light brown massive mudstones and siltstones. The invertebrate fossil assemblage is characterized by internal and external shell molds of infaunal and epifaunal bivalve mollusks and gastropods that lived in interchannel mudflats. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6511 (EP309)- This locality represents two discovery sites in the middle portion of the Deguynos Formation as temporarily exposed in the boreholes drilled for tower legs A and D at EP309. Exposures here consist of well cemented, oyster shell coquinas interbedded with light brown to olive greenish gray massive mudstones and siltstones. The invertebrate fossil assemblage is dominated by mineralized shells of epifaunal bivalve mollusks that were transported in distributary channels. Some shells recovered from this locality preserved borings produced by predatory natcid gastropods. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6512 (EP309)- This locality represents two discovery sites in the middle portion of the Deguynos Formation as temporarily exposed in the borehole drilled for tower leg A at EP309 and during grading of the tower pad (Figure 15). Exposures here consist of olive greenish gray massive mudstones and siltstones. The invertebrate fossil assemblage is dominated by internal and external shell molds of epifaunal bivalve mollusks and gastropods that lived in interchannel mudflats. Also occurring in the recovered fossil assemblage are teeth of several different species of sharks. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

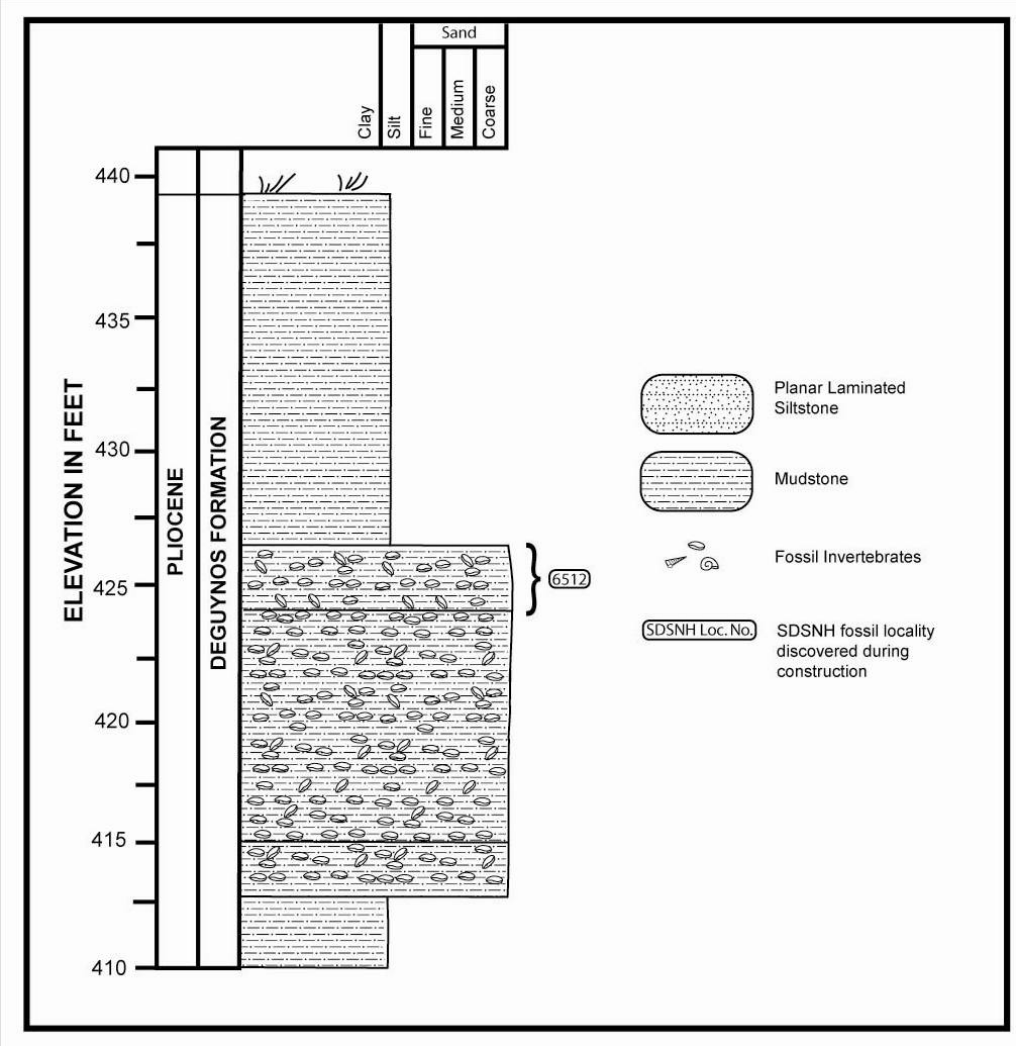

Figure 15. Stratigraphic section measured in borehole drilled for Leg A at EP309 showing marine sedimentary deposits of the Deguynos Formation. Also shown is the stratigraphic position of SDSNH Locality 6512.

SDSNH Locality 6513 (near EP309)- This locality represents a single discovery site in the upper portion of the Deguynos Formation as exposed during grading of the SRPL ROW access road between EP 309 and EP310. Exposures here consist of light brown to olive greenish gray massive mudstones and siltstones. The invertebrate fossil assemblage is dominated by internal and external shell molds of a single species of infaunal bivalve mollusk that lived in interchannel mudflats. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6514 (EP310)- This locality represents a single discovery site in the upper portion of the Deguynos Formation as temporarily exposed in the borehole drilled for tower leg B at EP310 and during grading of the access road to the tower pad. Exposures here consist of well cemented, oyster shell coquinas interbedded with light brown to olive greenish gray massive mudstones and siltstones. The invertebrate fossil assemblage is dominated by internal and external shell molds of infaunal bivalve mollusks and crabs that lived in interchannel mudflats.

These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6515 (EP311)- This locality represents a single discovery site in the upper portion of the Deguynos Formation as temporarily exposed in the borehole drilled for tower leg A at EP311 and during clearing of the tower pad. Exposures here consist of olive green massive mudstone. The invertebrate fossil assemblage is chracterized by internal and external shell molds of infaunal bivalve mollusks and heart urchins that lived in interchannel mudflats. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6516 (near EP311)- This locality represents a single discovery site in the upper portion of the Deguynos Formation as temporarily exposed in the borehole drilled for tower leg A at EP311 and during clearing of the tower pad. Exposures here consist of olive green massive mudstone. The invertebrate fossil assemblage is dominated by mineralized shells of epifaunal bivalve mollusks and acorn banacles that were transported in distributary channels. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6517 (near EP311)- This locality represents a single discovery site in the upper portion of the Deguynos Formation as exposed in a natural arroyo cut bank near EP311. Exposures here consist of dark brownish gray, poorly sorted, fine- to coarse-grained, cross-bedded sandstones. A single shark tooth was collected from this locality and was probably transported into a distributary channel. This marine vertebrate likely lived in the nearshore marine environment immediately offshore of the prograding, ancestral Colorado River delta.

SDSNH Locality 6518 (near EP312)- This locality represents a single discovery site in the upper portion of the Deguynos Formation as exposed just north of the tower pad graded at EP312. Exposures here consist of dark brown, well cemented, fine-grained sandstone. The invertebrate fossil assemblage is dominated by mineralized shells of epifaunal bivalve mollusks and acorn barnacles that were transported in distributary channels. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6519 (near EP313)- This locality represents a single discovery site in the upper portion of the Deguynos Formation as temporarily exposed in the borehole drilled for tower leg D at EP313. The stratigraphic section penetrated in the borehole consisted of brown to brownish-gray, fine-grained sandstone capped by a gray, massive, muddy siltstone, in turn overlain by a light brown, fine-grained sandstone with isolated oyster clusters, a brown to olive gray shelly mudstone, a light brown, inter-laminated siltstone and fine-grained sandstone, and finally a brown massive mudstone (Figure 16). The invertebrate fossil assemblage is dominated by mineralized shells of a single species of oyster. These oysters likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

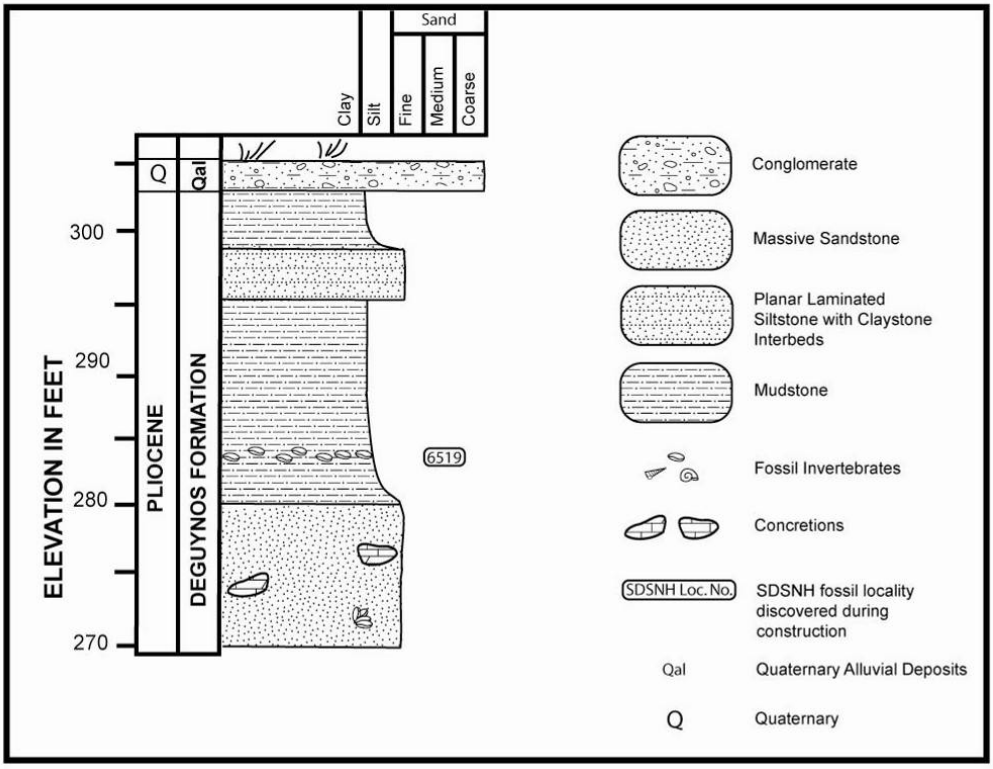

Figure 16. Stratigraphic section measured in borehole drilled for Leg D at EP313 showing marine sedimentary deposits of the Deguynos Formation. Also shown is the stratigraphic position of SDSNH Locality 6519.

SDSNH Locality 6520 (near EP316)- This locality represents a series of four discovery sites in the lower portion of the Arroyo Diablo Formation as exposed south of the tower pad graded at EP316. The stratigraphic section exposed in this area consisted of an interbedded series of thick, faintly laminated mudstones and cross-bedded, fine-grained sandstones (Figure 17). The fossil assemblage recovered from the mudstone strata consists of well-preserved bones of freshwater bony fish, as well as impressions of aquatic plants. These organisms likely lived in the freshwater delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6521 (near EP318)- This locality represents a single discovery site in the lower portion of the Arroyo Diablo Formation during grading of the access road for EP318. The stratigraphic section was poorly exposed in this area, but consisted of interbedded pale red to pinkish white, compact mudstones and siltstones. The fossil assemblage recovered from the mudstone strata consists of mineralized shells of large oysters and scallops. The oysters likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6522 (near EP319)- This locality represents a single discovery site in the middle portion of the Arroyo Diablo Formation as exposed southeast of the tower pad at EP319. The stratigraphic section exposed in this area consisted of yellowish gray, compact, fine-grained sandstones and reddish brown, well cemented, medium-grained sandstones. The fossil assemblage recovered from the cemented sandstone strata consists of mineralized and articulated

shells of acorn barnacles and pieces of petrified wood. These organisms likely lived on and in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

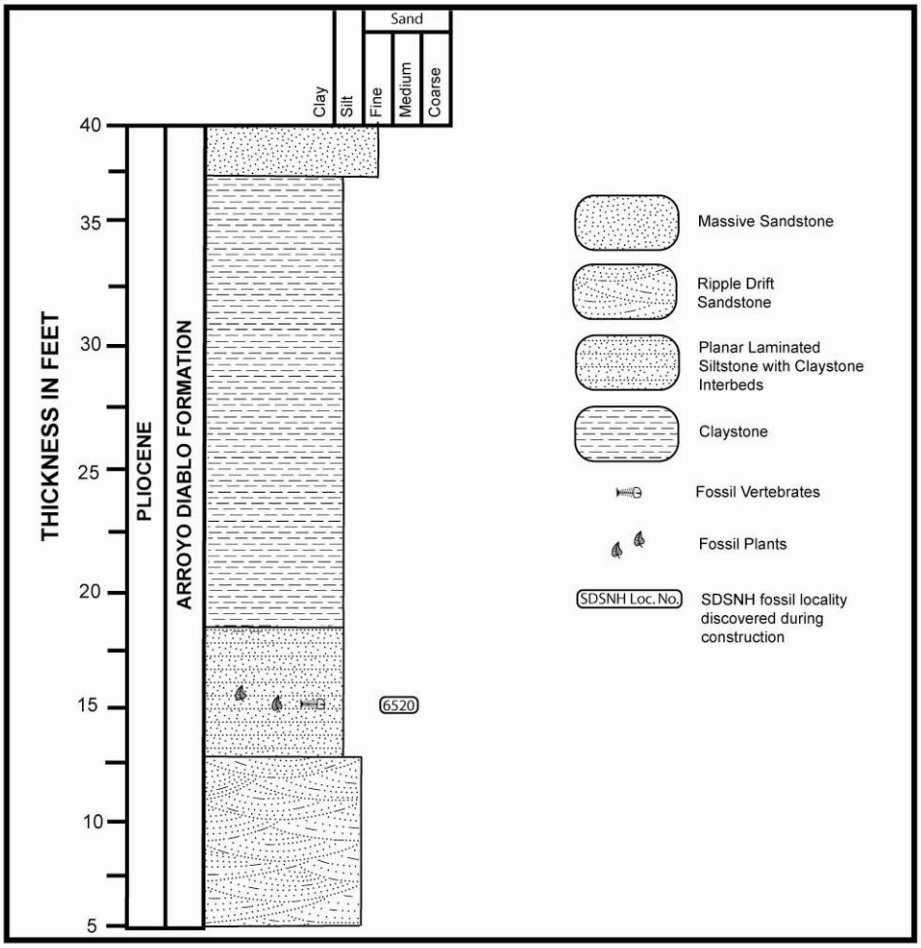

Figure 17. Stratigraphic section measured in the vicinity of EP316 showing fluvial sedimentary deposits of the Arroyo Diablo Formation. Also shown is the stratigraphic position of SDSNH Locality 6520.

SDSNH Locality 6523 (near EP319)- This locality represents a single discovery site in the middle portion of the Arroyo Diablo Formation as exposed just north of the tower pad at EP319. The stratigraphic section exposed in this area consisted of yellowish gray, compact, fine-grained sandstones and reddish brown, well cemented, medium-grained sandstones. The fossil assemblage recovered from the cemented sandstone strata is characterized by well-mineralized pieces of wood. These organisms likely lived in riparian and upland portions of the delta plain region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6524 (near EP319)- This locality represents a single discovery site in the middle portion of the Arroyo Diablo Formation as exposed south of the tower pad at EP319 during grading of the associated access road. The stratigraphic section exposed in this area consisted of mottled maroon and green massive siltstones. The fossil assemblage recovered from siltstone strata consists of disarticulated fish skeletons, charophyte gyrogonites, and stem

impressions of aquatic plants. These organisms likely lived in the freshwater delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6525 (near EP320)- This locality represents a single discovery site in the middle portion of the Arroyo Diablo Formation as exposed northeast of the tower pad at EP320. The stratigraphic section exposed in this area consisted of over 140 feet of grayish brown, massive to faintly laminated, fine-grained sandstones (Figure 18). At the base of this local section was a unit of yellowish orange to yellowish gray, planar laminated claystones and mudstones with fine-grained sandstone interbeds. Above this unit was a siltstone rip-up clast, cobble conglomerate overlain by a planar laminated, fine-grained sandstone unit that is cut by a light brown, massive, claystone-filled channel sequence containing disperse shells of estuarine mollusks. Approximately 30 feet of sandstone separated this mudstone from a 20 foot thick sequence of yellowish brown, well cemented, concretionary and locally pebbly sandstones with sparse terrestrial vertebrate remains and shell-rich sandstone stringers. Above this is a 60 foot thick sandstone sequence capped by a five foot thick bed of dark reddish brown, cemented, coarse-grained and cross-bedded, shelly sandstone. The fossil assemblage recovered from the lower, light brown mudstone stratum consists of disarticulated, internal and external shell molds of infaunal and epifaunal bivalve mollusks. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6526 (near EP320)- This locality represents a single discovery site in the middle portion of the Arroyo Diablo Formation as exposed northeast of the tower pad at EP320. The stratigraphic section exposed in this area consisted of over 140 feet of grayish brown, massive to faintly laminated, fine-grained sandstones (Figure 18). At the base of this local section was a unit of yellowish orange to yellowish gray, planar laminated claystones and mudstones with fine-grained sandstone interbeds. Above this unit was a siltstone rip-up clast, cobble conglomerate overlain by a planar laminated, fine-grained sandstone unit that is cut by a light brown, massive, claystone-filled channel sequence containing disperse shells of estuarine mollusks. Approximately 30 feet of sandstone separated this mudstone from a 20 foot thick sequence of yellowish brown, well cemented, concretionary and locally pebbly sandstones with sparse terrestrial vertebrate remains and shell-rich sandstone stringers. Above this is a 60 foot thick sandstone sequence capped by a five foot thick bed of dark reddish brown, cemented, coarse-grained and cross-bedded, shelly sandstone. The fossil assemblage recovered from the fine-grained sandstone just below the cemented concretionary sandstone unit consists of mineralized shells of epifaunal bivalve mollusks and acorn barnacles. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6527 (near EP320)- This locality represents a series of seven discovery sites in the middle portion of the Arroyo Diablo Formation as exposed northeast of the tower pad at EP320. The stratigraphic section exposed in this area consisted of over 140 feet of grayish brown, massive to faintly laminated, fine-grained sandstones (Figure 18). At the base of this local section was a unit of yellowish orange to yellowish gray, planar laminated claystones and mudstones with fine-grained sandstone interbeds. Above this unit was a siltstone rip-up clast, cobble conglomerate overlain by a planar laminated, fine-grained sandstone unit that is cut by a light brown, massive, claystone-filled channel sequence containing disperse shells of estuarine mollusks. Approximately 30 feet of sandstone separated this mudstone from a 20 foot thick sequence of yellowish brown, well cemented, concretionary and locally pebbly sandstones with

sparse terrestrial vertebrate remains and shell-rich sandstone stringers. Above this is a 60 foot thick sandstone sequence capped by a five foot thick bed of dark reddish brown, cemented, coarse-grained and cross-bedded, shelly sandstone. The fossil assemblage recovered from the cemented concretionary sandstone unit consists of premineralized bones of terrestrial and marine mammals, internal molds of epifaunal bivalve mollusks, gastropods, acorn barnacles, and decapod crustaceans. This ecologically diverse fossil assemblage suggests mixing of skeletal remains in distributary channels, likely in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6528 (near EP320)- This locality represents a single discovery site in the middle portion of the Arroyo Diablo Formation as exposed northeast of the tower pad at EP320. The stratigraphic section exposed in this area consisted of over 140 feet of grayish brown, massive to faintly laminated, fine-grained sandstones (Figure 18). At the base of this local section was a unit of yellowish orange to yellowish gray, planar laminated claystones and mudstones with fine-grained sandstone interbeds. Above this unit was a siltstone rip-up clast, cobble conglomerate overlain by a planar laminated, fine-grained sandstone unit that is cut by a light brown, massive, claystone-filled channel sequence containing disperse shells of estuarine mollusks. Approximately 30 feet of sandstone separated this mudstone from a 20 foot thick sequence of yellowish brown, well cemented, concretionary and locally pebbly sandstones with sparse terrestrial vertebrate remains and shell-rich sandstone stringers. Above this is a 60 foot thick sandstone sequence capped by a five foot thick bed of dark reddish brown, cemented, coarse-grained and cross-bedded, shelly sandstone. The fossil assemblage recovered from the upper, cross-bedded, shelly sandstone stratum consists of disarticulated, mineralized shells of epifaunal bivalve mollusks and acorn barnacles. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6529 (near EP322)- This locality represents a pair of discovery sites in the middle portion of the Arroyo Diablo Formation as exposed during grading of the access road to the tower pad at EP319. The stratigraphic section exposed in this area consisted of light brownish gray, fine-grained compact, shelly sandstones and massive siltstones. The fossil assemblage recovered from the sandstone strata consists of mineralized shells of epifaunal bivalve mollusks and acorn barnacles. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

SDSNH Locality 6530 (EP326)- This locality represents a single discovery site in the upper portion of the Arroyo Diablo Formation as temporarily exposed in the borehole drilled for tower leg A at EP326. The stratigraphic section exposed in the borehole consisted of light brownish gray, fine-grained compact, shelly sandstones and massive siltstones. The fossil assemblage recovered from the sandstone strata consists of oxidized impressions of vascular plant stems. These organisms likely lived along distributary channels in the delta plain (landward) region of the prograding, ancestral Colorado River delta.

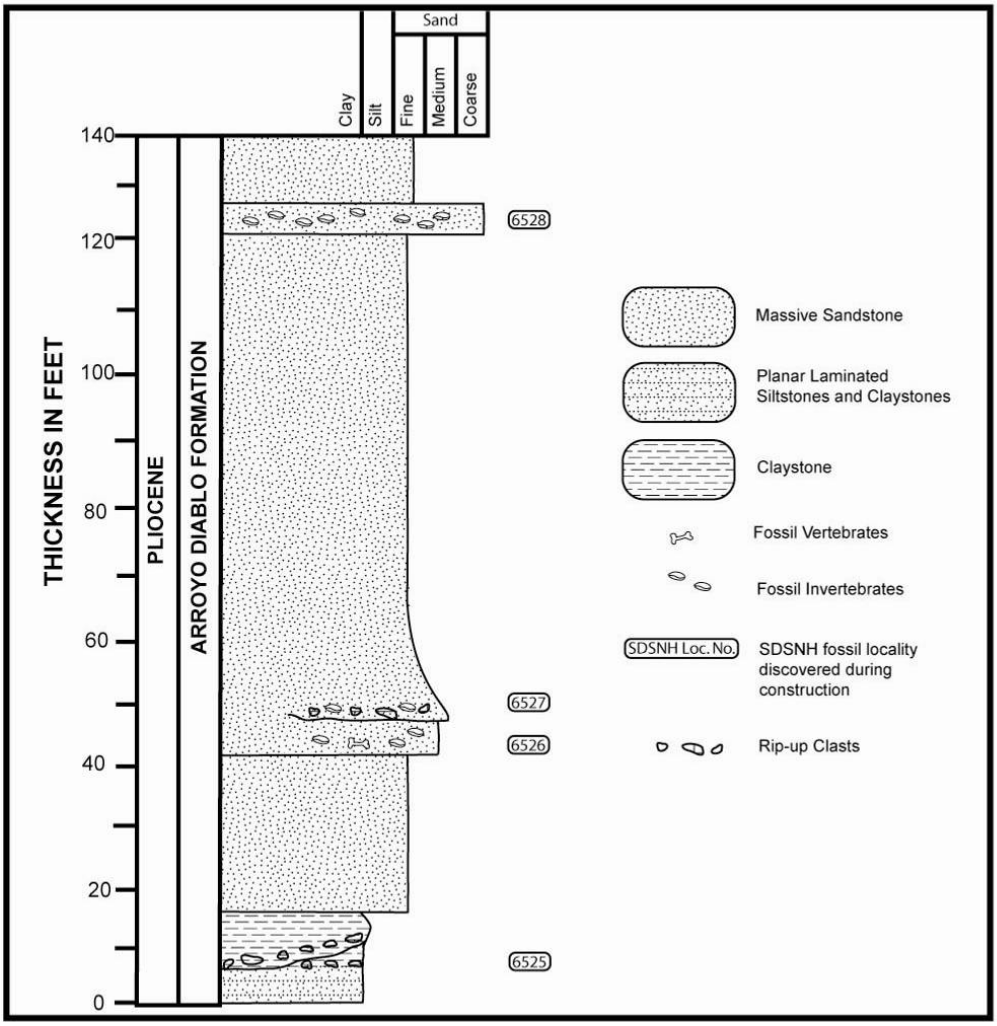

Figure 18. Stratigraphic section measured in the vicinity of EP320 showing delta plain sedimentary deposits of the Arroyo Diablo Formation. Also shown are the stratigraphic positions of SDNHM localities 6525, 6526, 6527, and 6528.

SDSNH Locality 6531 (EP353)- This locality represents a single discovery site in the Brawley Formation as temporarily exposed in the borehole drilled for tower leg A at EP353. The Brawley Formation stratigraphic section exposed in the borehole consisted of (from bottom to top) a basal unit of yellowish brown, thinly laminated siltstone that grades upwards into a reddish brown massive claystone paleosol with root casts. This paleosol is overlain by a light brown, fine-grained, ripple drift sandstone that grades upwards into a gray to brown claystone with thin, light gray siltstone interbeds (Figure 19). The fossil assemblage recovered from the mudstone strata consists of well-preserved bones and teeth of freshwater bony fish, as well as internal and external molds of freshwater mollusks. These organisms likely lived in the water column and on the floor of the large, Pleistocene freshwater lake that formerly occupied this area of the Salton Trough.

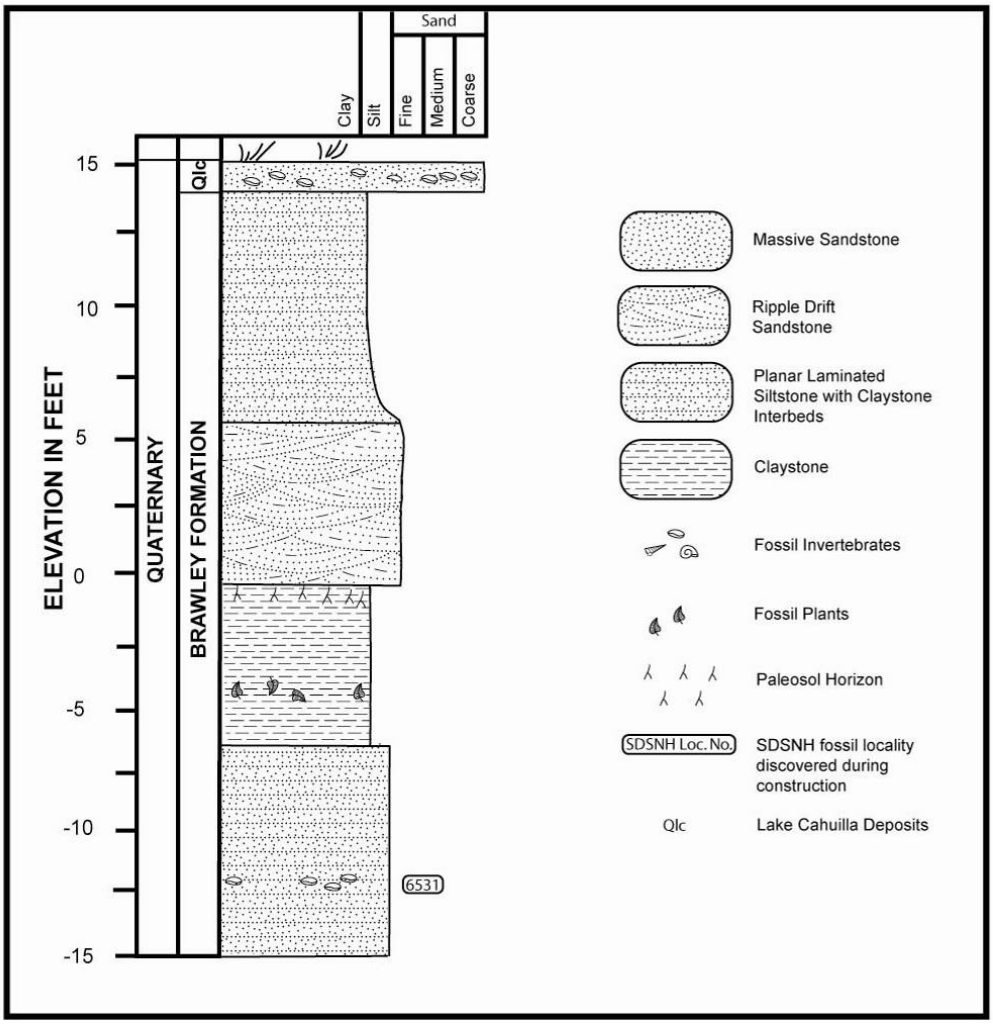

Figure 19. Stratigraphic section measured in borehole drilled for Leg A at EP353 showing lacustrine sedimentary deposits of the Brawley Formation capped by a thin stratum of Lake Cahuilla deposits. Also shown is the stratigraphic position of SDSNH Locality 6531.

SDSNH Locality 6532 (EP362)- This locality represents a single discovery site in the Lake Cahuilla deposits as temporarily exposed in the borehole drilled for tower leg D at EP362. The stratigraphic section exposed in the borehole consisted of 25 feet of light gray to light brown, fine- to medium-grained, locally laminated, friable sandstone with occasional stringers of coarse-grained friable sandstone and claystone rip-up clast cobble conglomerates. Capping this section was two foot thick horizon of light brown, fine-grained, micaceous, silty, friable sandstone with articulated shells of freshwater bivalve mollusks in life position. The fossil assemblage recovered from a claystone rip-up clast cobble conglomerate stratum encountered 18 feet below ground surface consists of well-preserved shells of freshwater mollusks. These organisms likely lived on the floor of ancient Lake Cahuilla.

SDSNH Locality 6533 (Imperial Valley Substation)- This locality represents a single discovery site in the Lake Cahuilla deposits(?) as temporarily exposed in a borehole drilled in the central portion of the Imperial Valley Substation. The stratigraphic section exposed in the borehole consisted of approximately three feet of lacustrine Lake Cahuilla deposits overlying an

older sequence of light yellowish orange, poorly sorted, coarse- to very coarse-grained fluvial sandstones. These fluvial sandstones may represent a distinctly different time period that the more widely exposed Lake Cahuilla deposits. The low diversity fossil assemblage recovered from the fluvial coarse-grained sandstone stratum consists of poorly-preserved shells of freshwater mollusks. These organisms likely lived in an ephemeral stream that flowed into one of the large freshwater lakes that formerly occupied this area of the Salton Trough.

SDSNH Locality 6534 (Imperial Valley Substation)- This locality represents a single discovery site in the Lake Cahuilla deposits as temporarily exposed in a borehole drilled in the southwestern portion of the Imperial Valley Substation near the main entrance. The stratigraphic section exposed in the borehole consisted of approximately two feet of coarse-grained sandy fluvial Lake Cahuilla deposits overlying an older sequence of light brown, fine-grained laminated lacustrine sandstones. The fossil assemblage recovered from the lacustrine sandstones consists of well-preserved shells of freshwater mollusks. These organisms likely lived on the floor of ancient Lake Cahuilla.

SDSNH Locality 6535 (Imperial Valley Substation)- This locality represents a single discovery site in the Lake Cahuilla deposits as temporarily exposed in a borehole drilled in the southwestern portion of the Imperial Valley Substation in BSP-3. The stratigraphic section exposed in the borehole consisted of an upper 9 foot thick stratum of light brown, well sorted, fine-grained, friable lacustrine sandstones. The fossil assemblage recovered from the lacustrine sandstones consists of well-preserved shells of freshwater mollusks. These organisms likely lived on the floor of ancient Lake Cahuilla.

SDSNH Locality 6536 (Imperial Valley Substation)- This locality represents a single discovery site in the Lake Cahuilla deposits as temporarily exposed in a borehole drilled in the central portion of the Imperial Valley Substation. The stratigraphic section exposed in the borehole consisted of an upper two-foot thick unit of artificial fill overlying about one foot of light brown, poorly sorted, coarse-grained, friable fluvial sandstones of light brown, well sorted, fine-grained, friable lacustrine sandstones. The fossil assemblage recovered from the fluvial sandstones consists of well-preserved shells of freshwater mollusks. in an ephemeral stream that flowed into one of the large freshwater lakes that formerly occupied this area of the Salton Trough.

Link 5

SDSNH Locality 6502- This locality represents a single discovery site in the Friars Formation as temporarily exposed in a posthole hand dug for a new transmission pole (Z775593) along TL639; Link 5 (Figure 22). The stratigraphic section exposed in the posthole consisted of 12 feet of Eocene sedimentary rocks including (from bottom to top) a basal foot of brown mudstone, a one thick unit of white siltstone, four feet of pale green, fine sandy siltstone, two feet of light gray claystone, two feet of cobble conglomerate, and three feet of yellowish-brown claystone. Approximately 2800 pounds of pale green siltstone matrix was collected from the posthole spoils and yielded over 100 well-preserved, isolated teeth and bones of small-bodied terrestrial mammals. These organisms likely lived in the forest and lowlands area of a tropical, coastal floodplain.

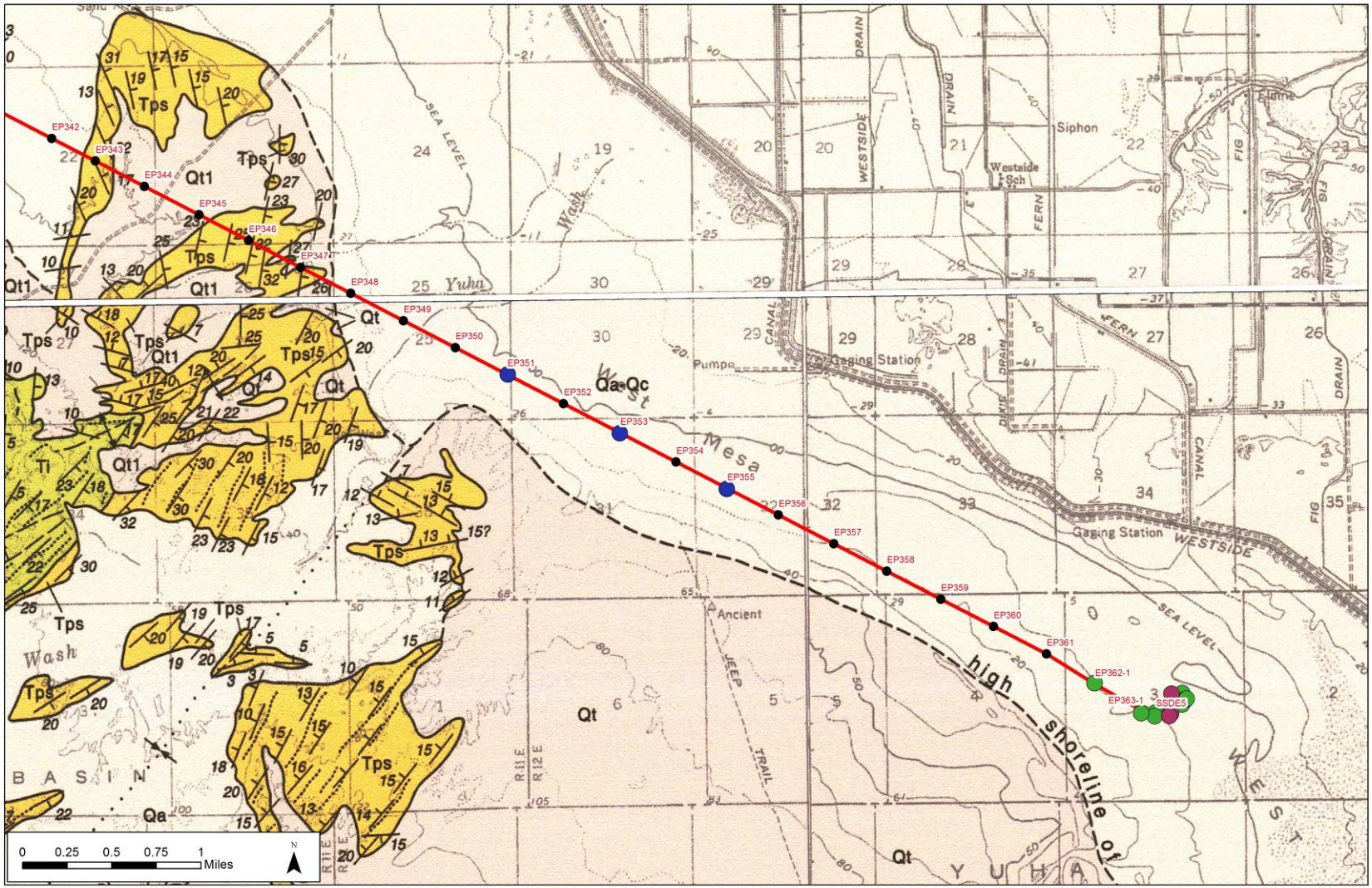

Figure 20. Geologic map of eastern portion of Link 1 showing fossil localities (blue, green, and maroon circles) discovered during monitoring of excavation activities in strata of the Quaternary-age Lake Cahuilla deposits (green) and Brawley Formation (maroon) and the Pliocene-age Arroyo Diablo Formation (blue). Base map: portions of the Coyote Wells & Heber, CA, and Plaster City & Brawley, CA 15 minute quadrangles (Dibblee, 2008a,c).

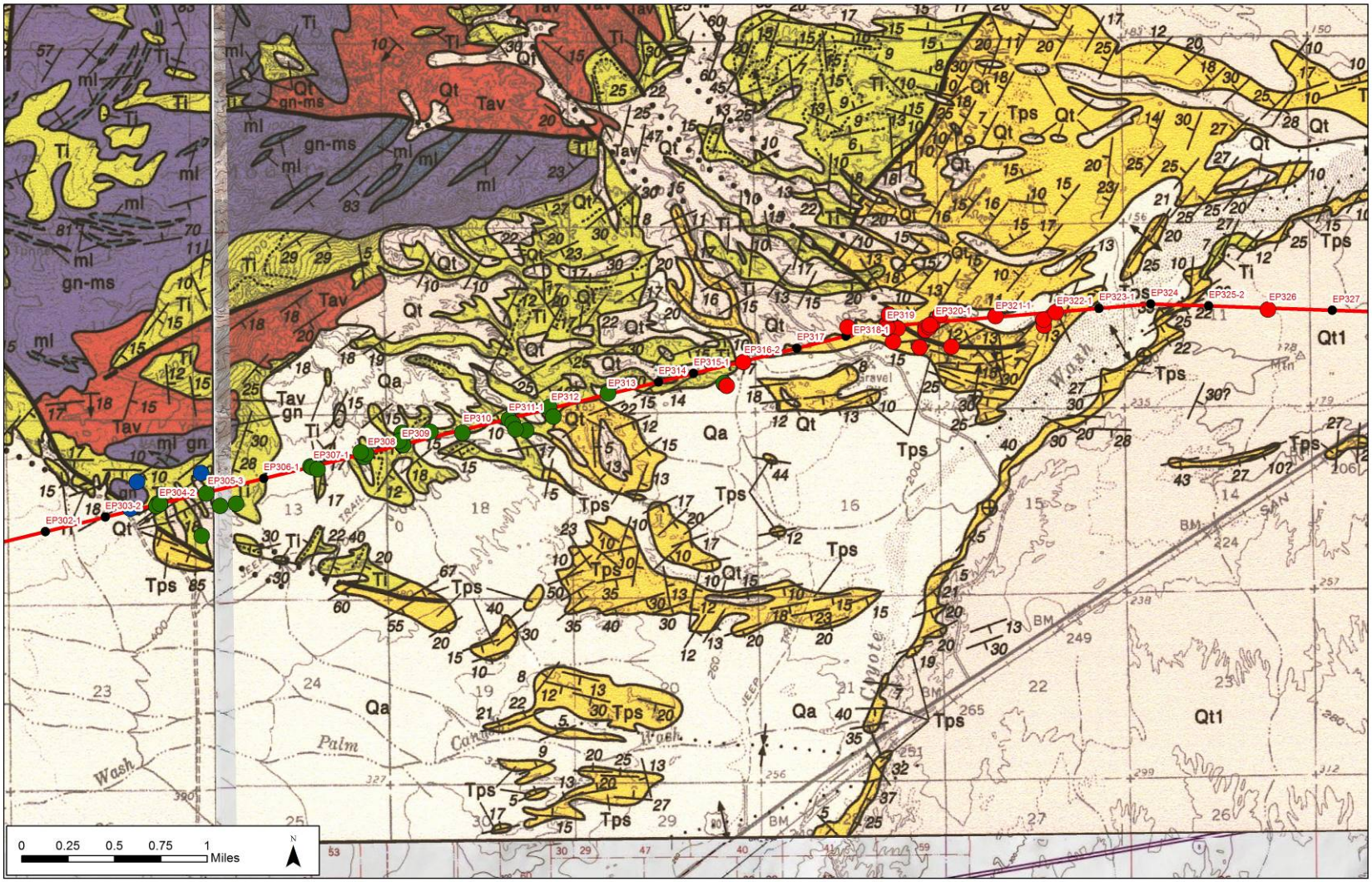

Figure 21. Geologic map of the central portion of Link 1 showing fossil localities (blue, green, and red circles) discovered during monitoring of excavation activities in strata of the Pliocene-age Arroyo Diablo Formation (red) and Deguynos Formation (green) and Miocene-age strata of the Latrania Formation (blue). Base map: portions of the Plaster City & Brawley and Mount Laguna & Carrizo Mountain (Dibblee, 2008b,c).

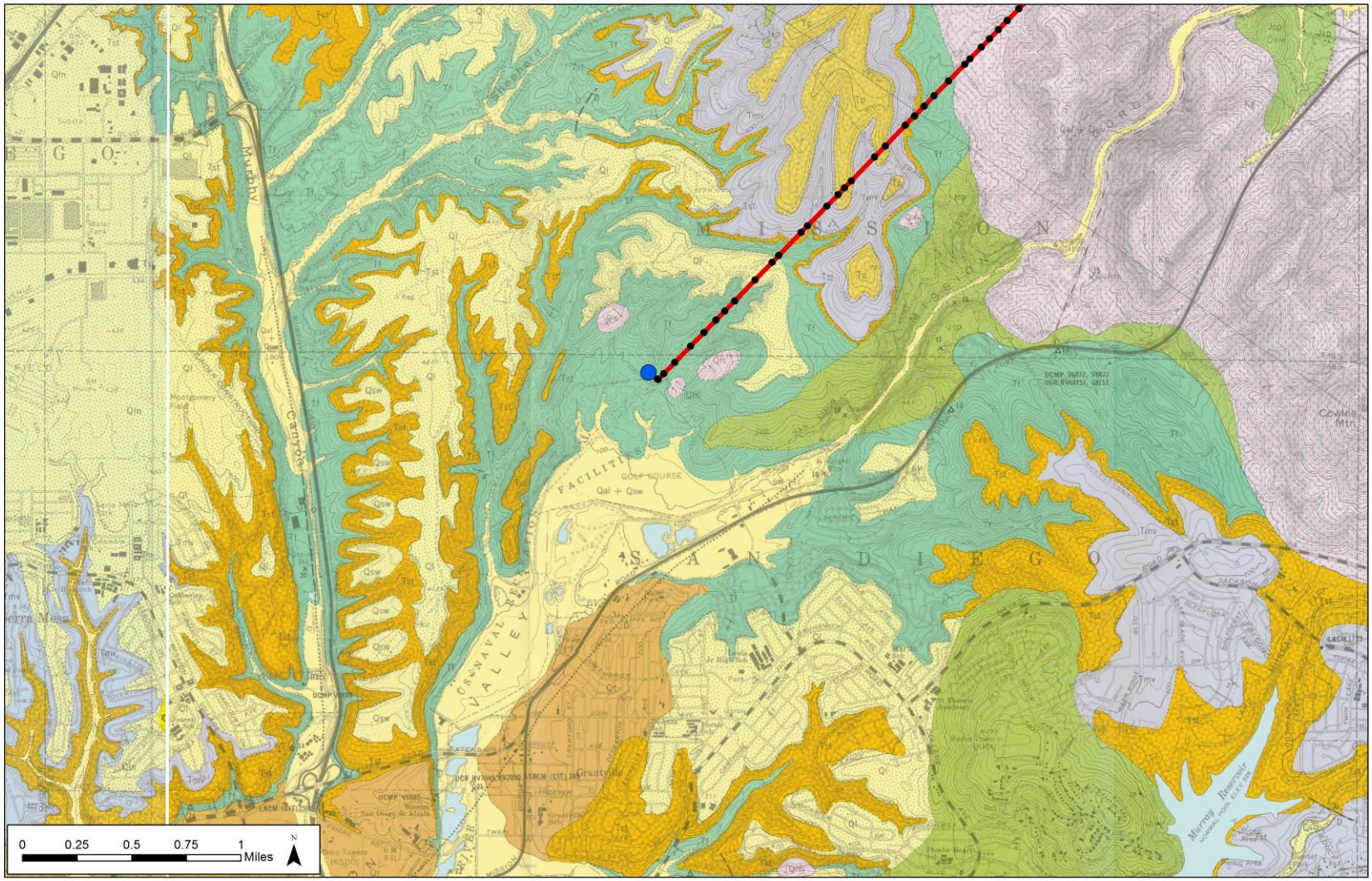

Figure 22. Geologic map of the western end of Link 5 (TL639) showing fossil locality (light blue dot) discovered in strata of the Eocene-age Friars Formation (blue circle). Base map: portions of the La Jolla and La Mesa, CA 7.5' USGS quadrangles.

PALEONTOLOGY

Fossil remains collected during the paleontological monitoring and salvage phases of the SRPL monitoring program were recovered from a variety of geologic rock units representing Eocene, Miocene, Pleistocene, and Holocene time. Along Link 1 in the eastern portion of the SRPL ROW rock units that produced fossils included the Miocene-age Latrania Formation, Pliocene-age Deguynos Formation, Pliocene-age Arroyo Diablo Formation, Pleistocene-age Brawley Formation, Pleistocene-Holocene-age Lake Cahuilla deposits. Along Link 5 rock units that produced fossils included the Eocene-age Friars Formation. The following section discusses the recovered fossils within the context of higher biological taxa (e.g., plants, mollusks, crustaceans, echinoderms, and vertebrates) and geologic age (e.g., Eocene, Miocene, Pliocene, and Pleistocene). Fossil identifications were provided by Thomas A. Deméré, Rodney M. Hubscher, Kesler A. Randall, and Mark. A. Roeder.

Link 1 Paleontology

Lake Cahuilla deposits (Pleistocene-Holocene) —

Mollusca (clams, snails, tusk shells, squids, etc.) Abundant specimens of the small, freshwater gastropod *Tryonia protea*, were recovered from sedimentary matrix samples collected from each of the Lake Cahuilla deposit localities. The majority of the shells of this species were complete and preserved as original shell material (Figure 23). An extinct species endemic to prehistoric Lake Cahuilla, *Tryonia protea* was limited to Holocene- and possibly late Pleistocene and older age sedimentary rocks such as those associated with deposits of the Brawley Formation and Borrego Formation. Apparently, this species became extinct following the last high stand of Lake Cahuilla approximately 500 years ago. A close, modern day relative, *Tryonia imitator* (California Brackish Water Snail), occurs along the coast in a variety of sediment types and environments, from Sonoma County south to San Diego County and into Baja California, Mexico. This particular species primarily is limited to areas that are permanently submerged; however, it can tolerate a wide range of salinities. Three additional species of freshwater snails were found in this fossil assemblage, although in far fewer numbers than *Tryonia protea*. These include *Fontelicella longinqua* (Figure 24), *Physella humerosa* (Figure 25), and *Gyraulus* sp. cf. *G. parvus*. The spring snail, *Fontelicella longinqua*, is a diminutive, regularly-coiled, aquatic snail that is widespread in freshwater habitats of Great Basin and Pacific Slope drainages where it lives as a grazer feeding on aquatic plant material (Gregg and Taylor, 1965). The corkscrew physa, *Physella humerosa*, is a distinctive species of relatively large (up to 1cm tall), freshwater snail that possess a sinistrally coiled shell (i.e., the aperture is on the left side of the shell rather than on the right; Figure 25). The ram's horn snail *Gyraulus parvus* lives today in a variety of freshwater habitats including pools, ponds, and lakes, but is most common in lakes where it is commonly associated with small, aquatic plants. Other specimens of gastropods recovered from the Imperial Substation site could not be more specifically identified at this time.

Delicate specimens of the freshwater mussel *Anodonta californiensis* (Figure 26), were recovered from several collecting localities and add to the overall diversity of freshwater mollusks within the Lake Cahuilla fossil assemblage. This species is known to live in freshwater habitats with mud or sand substrates as an infaunal filter feeder consuming plankton and other particulate matter that is suspended in the water column. Historically, *A. californiensis* occupied low elevation lakes and slow moving rivers throughout western North America (Taylor, 1981).

Today, the species is threatened by habitat loss and has been extirpated from much of its former biogeographic range.

Figure 23. Well-preserved shells of the freshwater pulmonate snail *Tryonia protea* collected from Lake Cahuilla deposits as encountered at SDSNH Locality 6533.

Figure 24. Well-preserved shells of the freshwater pulmonate snail *Fontelicella longinqua* collected from Lake Cahuilla deposits as encountered at SDSNH Locality 6533.

Figure 25. Well-preserved shells of the freshwater pulmonate snail *Physella humerosa* collected from Lake Cahuilla deposits as encountered at SDSNH Locality 6533.

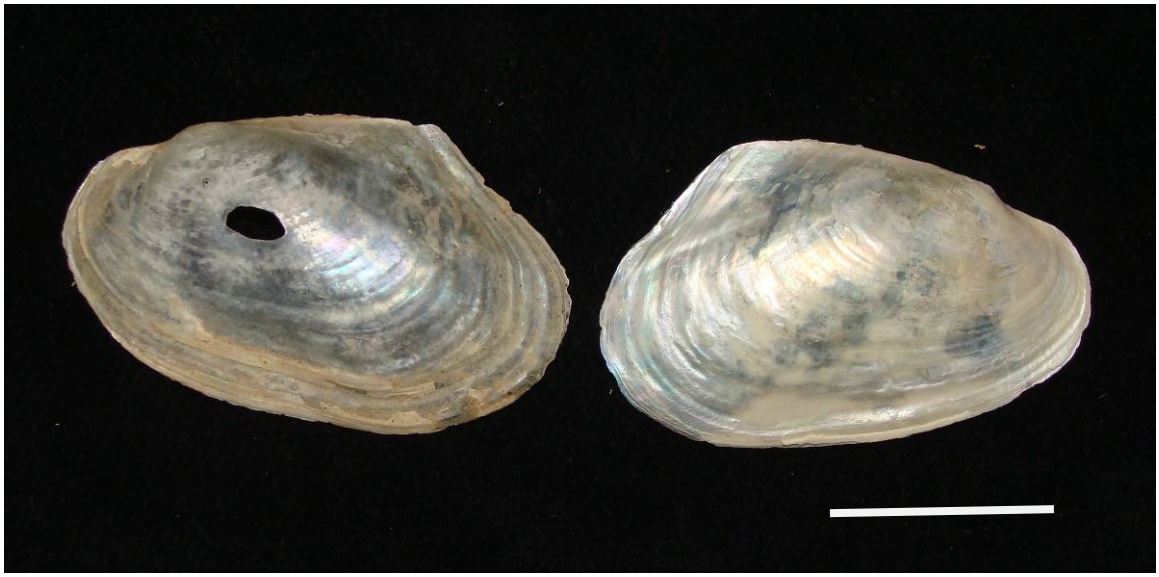

Figure 26. Well-preserved shells of the freshwater mussel *Anodonta californiensis* collected from Lake Cahuilla deposits as encountered at SDSNH Locality 6533.

Crustacea (ostracods barnacles, decapods, etc.) Several different types of freshwater ostracods, were recovered from sedimentary matrix samples screenwashed from the Lake

Cahuilla deposits. The most common form by far is the brackish to freshwater species *Cyprideis beaconensis*. This species survives today in the Salton Sea where it lives in algal mats and in the lake floor sediments. Its geographic range extends from California, through Mexico, to Chile (Sandberg, 1964). The other specimens of ostracods were not specifically identified at this time. It has been shown that the relative abundance of different varieties of ostracods can be useful in determining the paleo-salinity of particular paleoenvironments (Finger et al., 2004).

Brawley Formation (Pleistocene) —

Mollusca (clams, snails, tusk shells, squids, etc.) Well-preserved shells of the small, freshwater gastropod, *Tryonia protea*, were recovered from sedimentary matrix samples collected at SDSNH Locality 6531. As mentioned above, this extinct species was endemic to prehistoric Lake Cahuilla and possibly lived in older, Pleistocene regional lakes such as those associated with deposits of the Brawley Formation and Borrego Formation.

Internal and external molds of a freshwater mussel *Anodonta sp. cf. A. californiensis*, were recovered from SDSNH Locality 6531and add to the overall diversity of the Brawley Formation fossil assemblage.

Vertebrata (fish, amphibians, reptiles, mammals, etc.)

Pharyngeal (throat) bones and teeth of a freshwater bony fish assignable to the bonytail chub *Gila elegans*, and the razorback sucker *Xyrauchen texanus*, were recovered from mudstone strata of the Brawley Formation. The bonytail chub and razorback sucker are relatively large species of freshwater fish that can still be found today in the Colorado River drainage system of the western United States. Once widespread, these fish species are listed as endangered and considered functionally extinct in the lower reaches of the Colorado River drainage system.

Arroyo Diablo Formation (Pliocene) —

Plantae (charophytes, flowering plants gymnosperms, etc.)

Numerous specimens of charophytes were collected from the Arroyo Diablo Formation as exposed at EP 319 (SDSNH Locality 6524) on Link 1 (Figure 27). Charophytes are freshwater, aquatic plants that are closely related to the earliest vascular land plants. Also known as pondweeds, charophytes produce a hard, lime-shell around their oospores and these lime-shells (called gyrogonites) can be relatively common as fossils in lacustrine deposits. Although the SRPL charophyte fossils have only been identified to the Order Charales and to a family or genus taxonomic level, they nonetheless do provide useful information concerning the paleoenvironment of the Arroyo Diablo Formation.

Other plant fossils discovered in strata of the Arroyo Diablo Formation include impressions of stems of reed-like aquatic plants, as well as unidentified fragmentary impressions of terrestrial plants. Pieces of permineralized logs were also recovered from several localities. Remeika et al. (1988), Remeika (1994), and Remeika (2006) described fossil wood recovered from the Arroyo Diablo Formation in the Vallecito Creek-Fish Creek area and reported that the composite flora included 5 families of broad-leaved riparian forest trees (buckeye, walnut, bay laurel, avocado, cottonwood, willow, and ash), one family of fan palm, and one family of cone-bearing tree (cedar or juniper). Although inhabiting at least three separate habitats on the Pliocene delta plain, the overall flora suggests a temperate climate with ocean influence and predominantly winter rainfall. Unfortunately, the SRPL petrified wood fossils may be too fragmentary to allow for more precise taxonomic identification (i.e., to the family, genus, or species level).

Figure 27. Mineralized charophyte gyrogonites collected from strata of the Arroyo Diablo Formation as encountered at SDSNH Locality 6524.

Bryozoa (encrusting and branching bryozoans)

Well-preserved bryozoan colonies were collected from several localities in the Arroyo Diablo Formation. Bryozoans are a group of primarily marine organisms that typically secrete tiny calcium carbonate skeletons to form dense colonial structures like certain corals. The bryozoa animal, called a zooid, feeds on suspended organic matter in the water column using a frilled appendage called a lophophore. In marine environments the most common group of bryozoans today are the cheilostomes, which form both encrusting, mat-like colonies and erect, branching colonies. Encrusting bryozoan colonies were collected from several different localities in the Arroyo Diablo Formation. At SDSNH Locality 6527 successive generations of encrusting bryozoan colonies of *Biflustra commensale* formed dense concentric layers around gastropod shells (Figure 28). Such nucleated bryozoan structures are called bryoliths and their formation has been linked to complex histories involving not only the snail that made the original gastropod shell, but also the hermit crab that eventually inherited the shell and the successive generations of bryozoan colonies that encrusted the shell (Kidwell and Gyllenhaal, 1998).

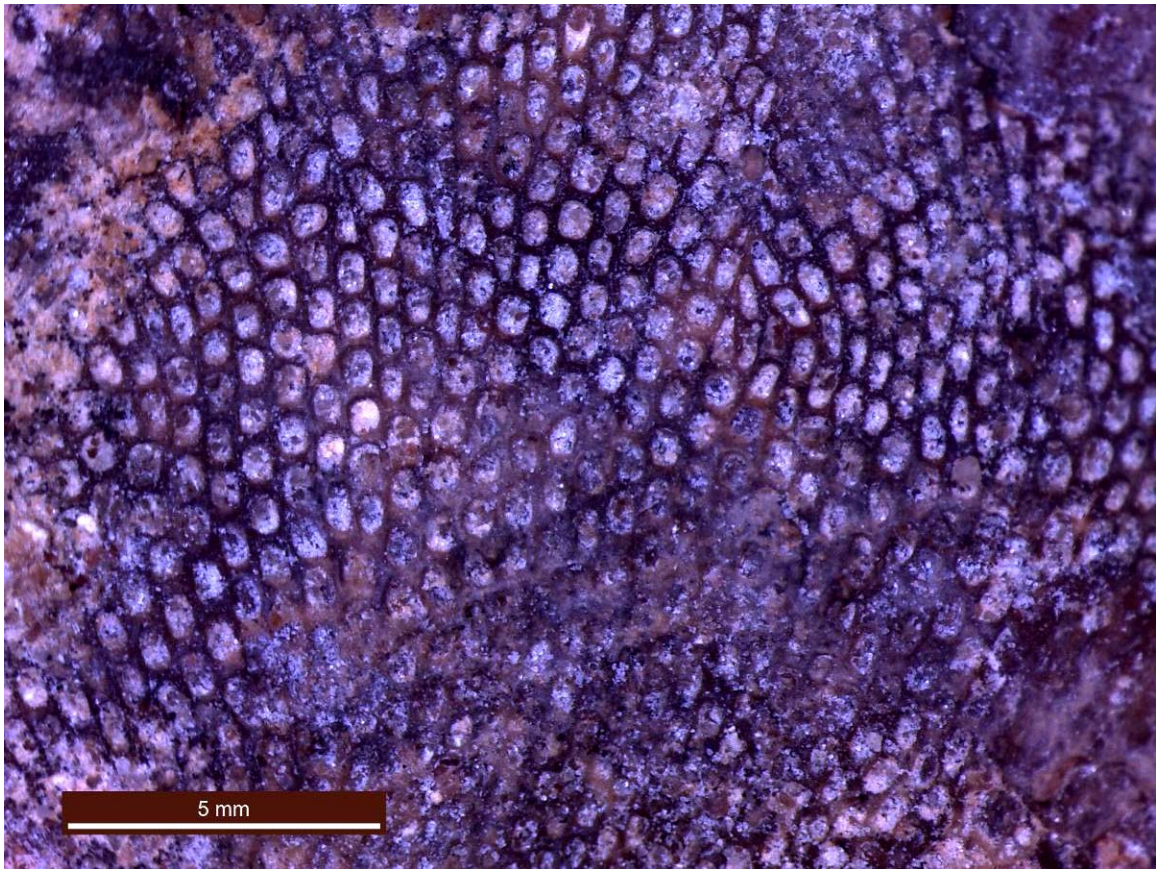

Figure 28. Mineralized mat of the encrusting bryozoan *Biflustra commensale,* collected from a bryolith preserved in strata of the Arroyo Diablo Formation as encountered at SDSNH Locality 6528.

Mollusca (clams, snails, tusk shells, squids, etc.)

Although the Arroyo Diablo Formation generally is considered to have been deposited on the subaerial part of the ancestral Colorado River delta, there are reports of marine and brackish water molluscan fossils from this rock unit (Winker and Kidwell, 1998). This fact suggests that deposition likely occurred across a zone of depositional and ecological transition on the ancestral delta plain, where freshwater distributary streams flowed into the more paralic paleoenvironments near the former shoreline. The most common molluscan fossils recovered from exposures of the Arroyo Diablo Formation during construction of the SRPL consist of mineralized shells of epifaunal bivalves including the small scallop *Argopecten deserti*, the jingle shell *Anomia subcostata*, and the gregarious oyster *Dendostrea vespertina* (Figure 29). Other species of bivlaves here reported from the Arroyo Diablo Formation include the large oyster *Crassostrea columbiensis* (Figure 30), the lions paw scallop *Lyropecten* sp., and the angel wing clam *Cyrtopleura costata*. Species of gastropod mollusks collected from the Arroyo Diablo Formation include several epifaunal carnivorous snails (e.g., the buccinid snail *Solenosteira* sp., the olive shell *Oliva* sp., and the mud snail *Nassarius* sp.), as well as a couple of epifaunal grazing snails (e.g., the small snail *Pedipes* sp. and an unidentified limpet Acmaeidae).

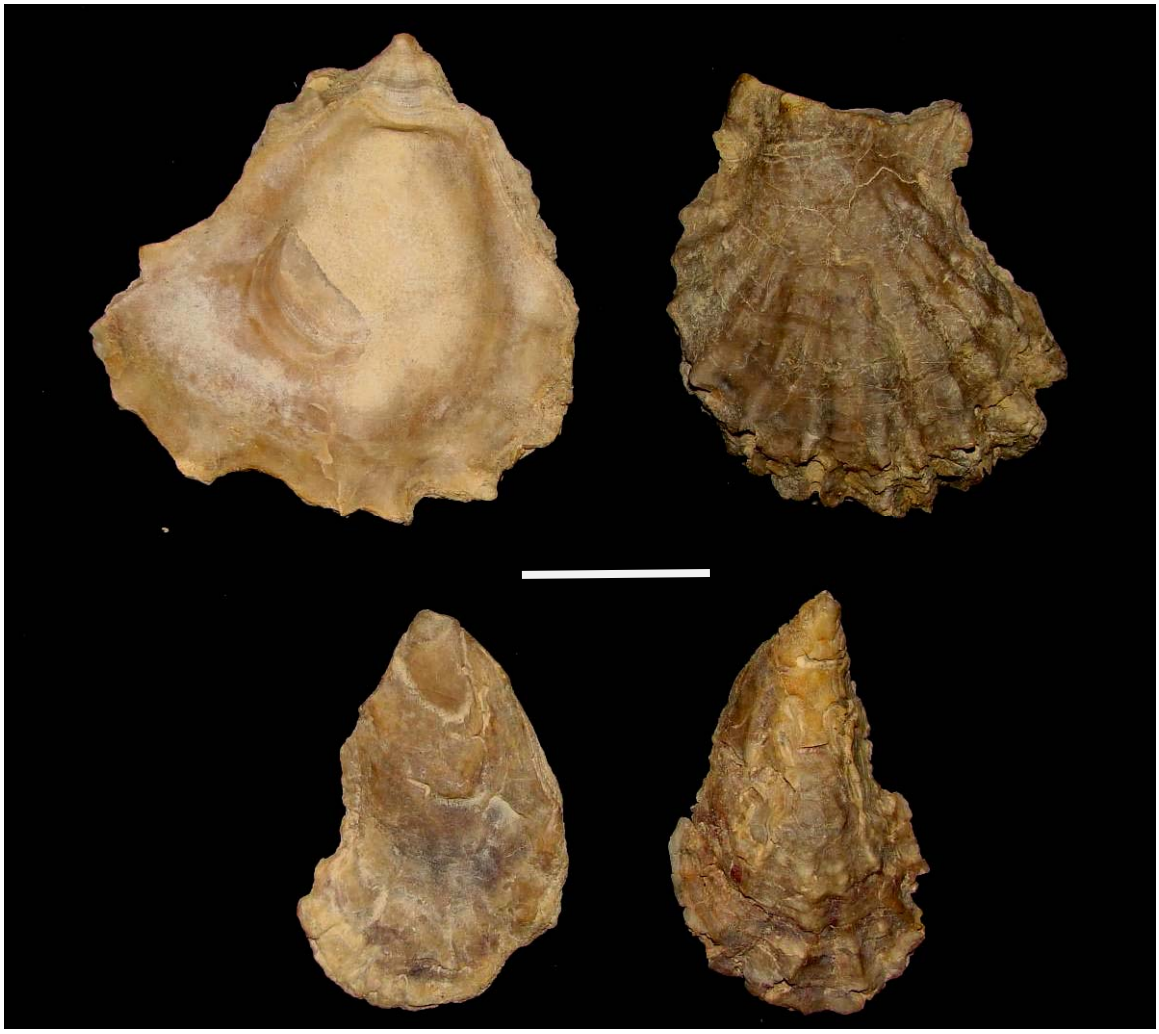

Figure 29. Mineralized shells of the small, tropical oyster, *Dendostrea vespertina*, collected from strata of the Arroyo Diablo Formation as encountered at SDSNH Locality 6522. Scale bar equals 2 cm.

Crustacea (ostracods, barnacles, decapods, etc.)

Fossil remains of crustaceans collected from the Arroyo Diablo Formation include articulated and isolated carapace valves of tiny ostracods, articulated and isolated wall plates of acorn barnacles, and disarticulated carapaces and appendages of decapods. Ostracods were collected from SDSNH Locality 6524 and represent several presently unidentified species of benthic marine taxa. These fossils indicate normal marine salinities.

Barnacles were collected from five localities, where they primarily occur as articulated but unattached shells of single individuals. Most specimens retain all of their wall plates, however, no opercular plates were found. Ross and Newman (1996) report at least four species of barnacles from the Imperial Formation (= Deguynos Formation and Arroyo Diablo Formation of this report) including a coral barnacle *Ceratoconcha* sp., a brackish water barnacle *Balanus canabus*, a concavine barnacle *Arossia* sp., and the new balanid barnacle *Zulloa imperialensis*.

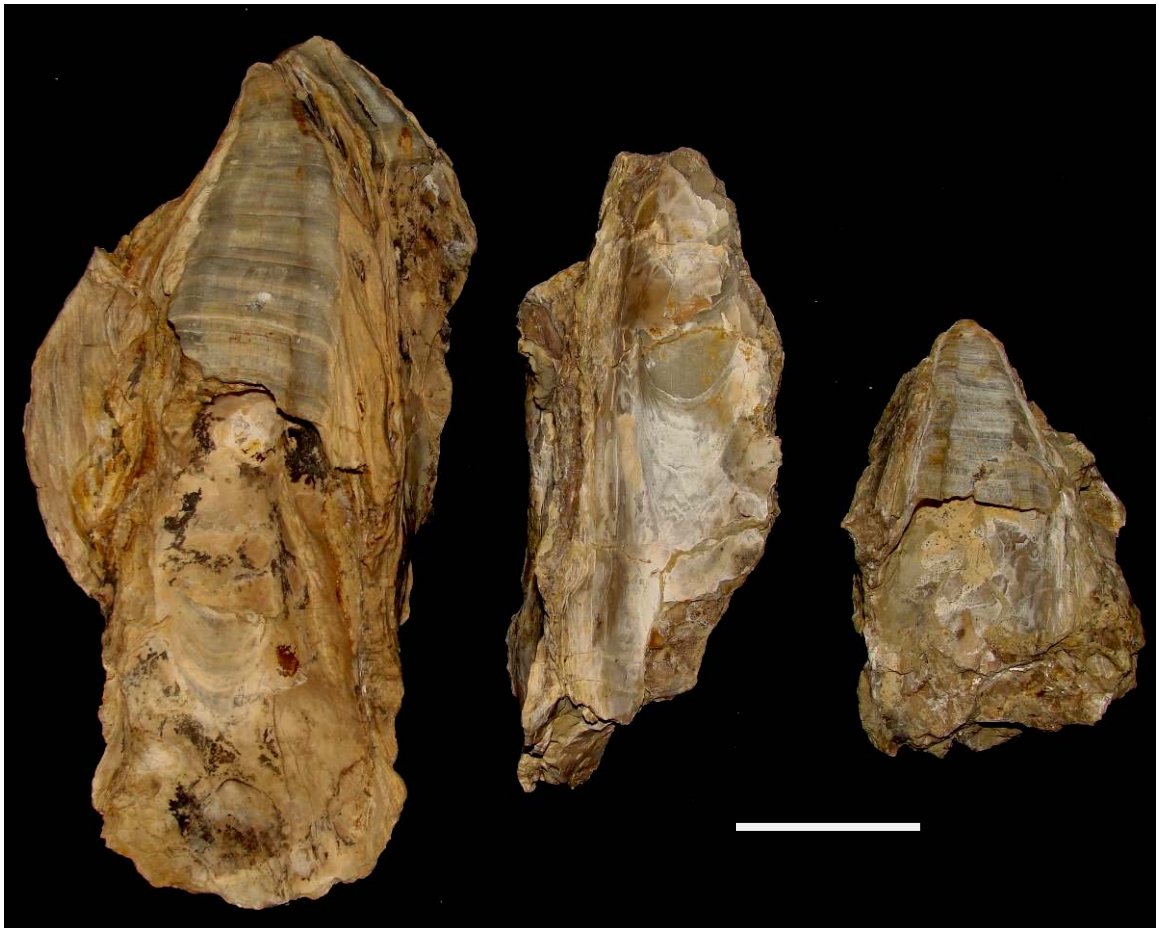

Figure 30. Mineralized shells of the large, tropical oyster, *Crassostrea columbiensis*, collected from strata of the Arroyo Diablo Formation as encountered at SDSNH Locality 6519. Scale bar equals 4 cm.

Disarticulated remains of decapod crustaceans were collected at SDSNH Locality 6527 and include internal molds of partial and complete carapaces of a swimmer crab *Callinectes* sp. (Figure 31). Partially articulated appendages with pincers collected from this locality are probably also assignable to this genus. *Callinectes arcuatus* is a common species of swimming crab that lives in the Gulf of California today, where it inhabits coastal lagoons, estuaries, and mangrove swamps. Less complete decapod fossils from the Arroyo Diablo Formation include isolated fingers and cannot be more precisely identified at this time.

Vertebrata (fish, amphibians, reptiles, mammals, etc.)

The disarticulated and crushed skull of a razorback sucker *Xyrauchen texanus* was collected from SDSNH Locality 6520 (Figure 32). As mentioned above, this relatively large species of fish was once widespread throughout the Colorado River drainage system but is now restricted to the upper reaches of the river and considered extirpated from the river below Lake Havasu. Razorbacks can live in a variety of different river habitats from mainstream channels to backwaters and feed on algae, insect larvae, plankton, and detritus.

A fragmentary long bone was recovered from SDSNH Locality 6527 that measures over 80 mm in length and has a mid-shaft diameter of 4.5 mm. Unfortunately, the diagnostic proximal and

distal articular portions of the fossil are not preserved. However, the overall morphology of the bone suggests that it represents the tibiotarsus of an unidentified species of bird.

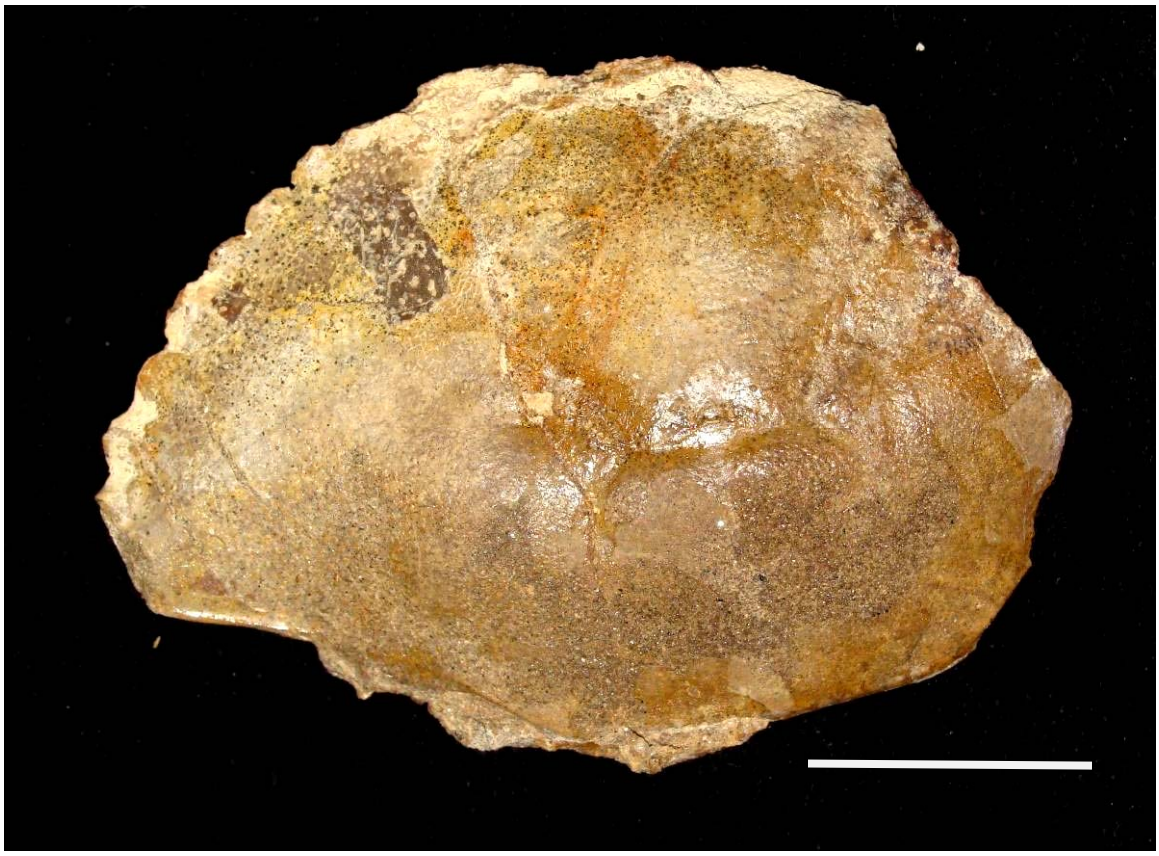

Figure 31. Internal mold of the carapace of the swimmer crab *Callinectes* sp. collected from strata of the Arroyo Diablo Formation as encountered at SDSNH Locality 6527. Scale bar equals 2 cm.

An incomplete first phalanx of a camelid artiodactyl (Figure 33) was also recovered from SDSNH Locality 6527 and measures 97 mm in length, with a proximal transverse width of at least 41 mm and a distal transverse width of 33.8 mm. These dimensions combined with the morphology preserved on the proximal and distal articular portions of the fossil suggest a possible affinity with the extinct llama *Hemiauchenia* sp. A second camelid fossil from SDSNH Locality 6527 is represented by a badly damaged right maxilla with very fragmentary cheek teeth. Unfortunately, the morphology of the tooth crowns is not sufficiently preserved to allow identification to genus or species level. However, the gross dimensions of the teeth suggest an animal within the size range of the extinct llama *Hemiauchenia* sp.

The camelid fossils were found in displaced sandstone concretions that had weathered out of the Arroyo Diablo Formation as exposed in the vicinity of EP320. Because of this it was not possible to determine the exact stratum from which the fossils were derived. Other sandstone concretions found in this area contained additional vertebrate fossil remains including several concretions with fragmentary, but well-mineralized, vertebrae of cetaceans. Because of their fragmentary nature, these fossils could not be identified to the family or genus level. However,

based on size and general morphology, one specimen can be assigned to the baleen whale suborder Mysticeti.

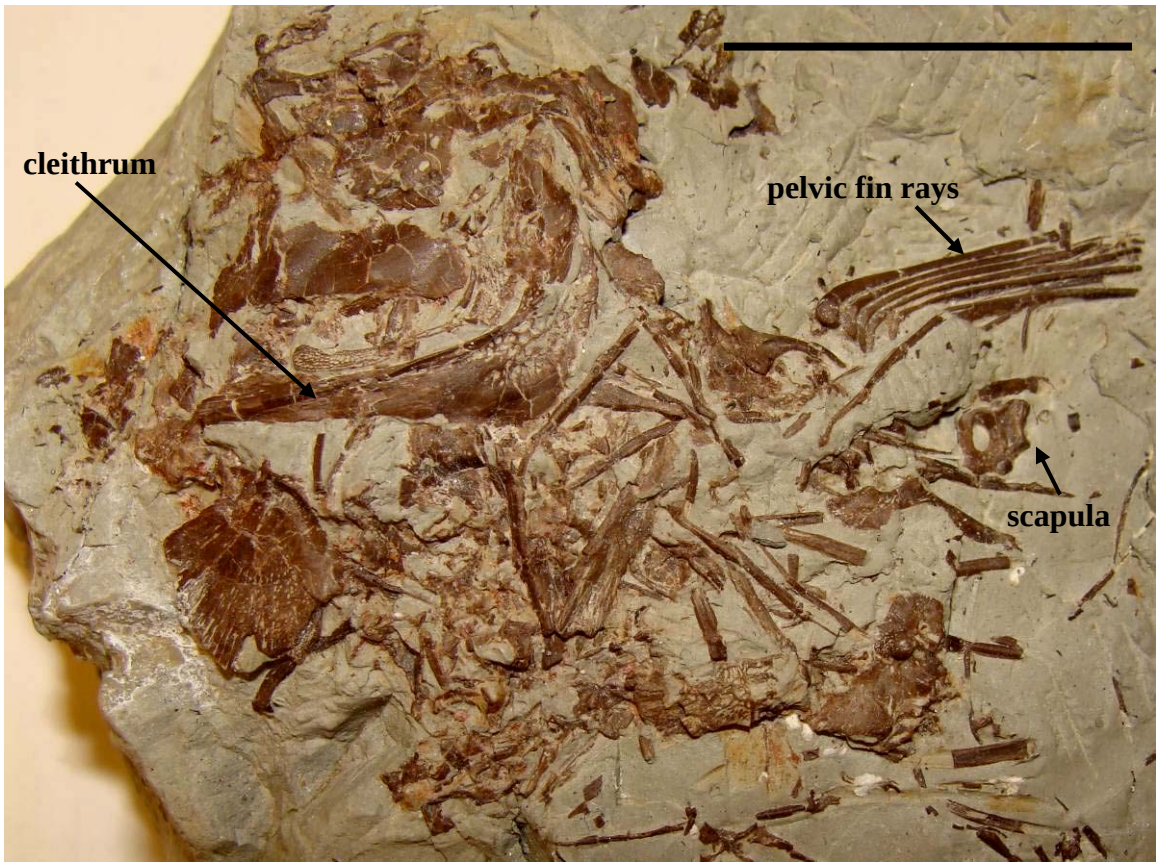

Figure 32. Disarticulate skull a razorback sucker, *Xyrauchen texanus* collected from strata of the Arroyo Diablo Formation as encountered at SDSNH Locality 6520. Scale bar equals 2 cm.

Deguynos Formation (Pliocene) —
Mollusca (clams, snails, tusk shells, squids, etc.)

Because the Dequynos Formation was deposited in the zone of ecological transition between prodelta, deep marine and delta plain estuarine paleoenvironments, this rock unit contains a wide variety of fossil groups ranging from molluscan species living in open marine habitats to species living in estuarine to brackish habitats. The prodelta and delta front molluscan assemblages typically were recovered from mudstone strata and are represented by internal and external molds of leached shells. These assemblages contain a relatively diverse fauna (Figures 34, 35, and 36) consisting of infaunal bivalve mollusks (e.g., *Nuculana*, sp., *Cyrtopleura costata*, *Corbula* sp., *Siliqua* sp., and an unidentified venerid), epifaunal bivalve mollusks (e.g., cf. *Delectopecten* sp.), and small low-spired epifaunal gastropods (e.g., cf. Acteocinidae). In contrast, the delta plain molluscan assemblages typically were recovered from sandstone strata and are represented by well-mineralized, whole shells. These assemblages typically have a low diversity and are dominated by only a few species of epifaunal bivalves (e.g., *Anomia subcostata*, *Argopecten deserti*, *Dendostrea vespertina*, and *Pycnodonte heermanni*). Two localities represent exceptions to this pattern. SDSNH Locality 6505 contains common internal and external molds of the extinct turritellid gastropod *Turritella imperialis* in association with

shells of the jingle shell bivalve *Anomia subcostata*. SDSNH Locality 6519 produced a monotypic molluscan fauna that consists solely of mineralized whole shells of the large oyster *Crassostrea columbiensis*.

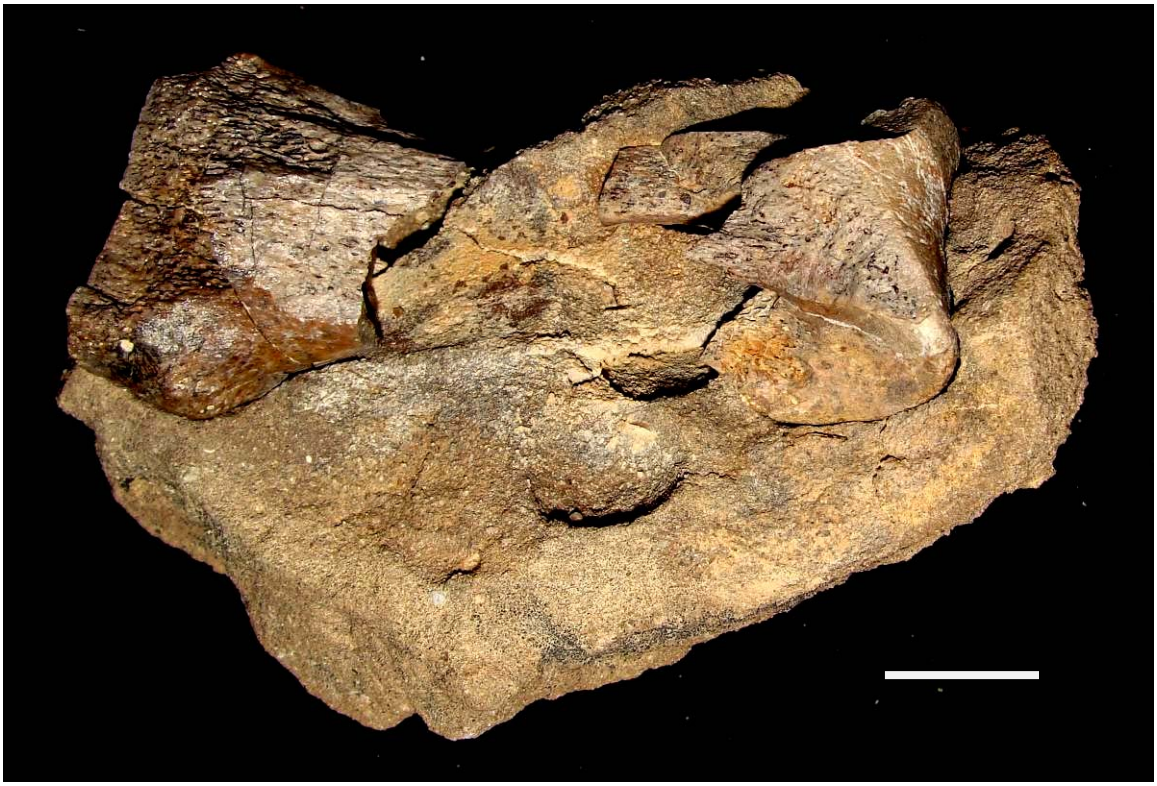

Figure 33. Nearly complete proximal phalanx (in sandstone matrix) of a medium sized camelid, possibly referable to the extinct llama, *Hemiauchenia* sp. Specimen was collected from strata of the Arroyo Diablo Formation as encountered at SDSNH Locality 6527. Scale bar equals 2 cm.

Crustacea (ostracods, barnacles, decapods, etc.)

The barnacle fossils collected from the Deguynos Formation occur in association with the delta plain molluscan assemblages described above. These assemblages, characterized by well-mineralized shells, are typically dominated by the small oyster *Dendostrea vespertina*, some shells of which occur with attached barnacles. Also occurring in these well-mineralized assemblages are detached and articulated, whole shells of larger acorn barnacles, tentatively identified as Balaninae.

A few fossil specimens of decapod crustaceans were recovered from the prodelta mudstones of the Deguynos Formation. These fossils consist of internal molds of small rectangular carapaces, as well as internal and external molds of appendages with pincers.

Echinodermata (sea urchins, sand dollars, sea stars, etc.)

Crushed and fragmentary tests of a small heart urchin were recovered from SDSNH Localities 6504 and 6515. These localities also produced the more diverse prodelta and delta front molluscan assemblages described above. Some of the urchin specimens preserve delicate spines, still articulated with the urchin test. The general morphology of these specimens suggests a taxonomic affinity to the heart urchin *Schizaster* sp. Species of *Schizaster* inhabit relatively

shallow, sublittoral marine waters, where they live partially buried in silty sea floor sediments and feed on detritus.

Vertebrata (fish, amphibians, reptiles, mammals, etc.)
Teeth assignable to four different species of marine sharks were recovered from SDSNH Localities 6512 and 6517 and include a horn shark (*Heterodontus* sp.), a requiem shark (*Carcharhinus* sp.), a white shark (*Carcharias* sp.), and a mako shark (*Isurus* sp.; Figure 37). All of these sharks still live today in the warm, tropical waters of the Gulf of California.

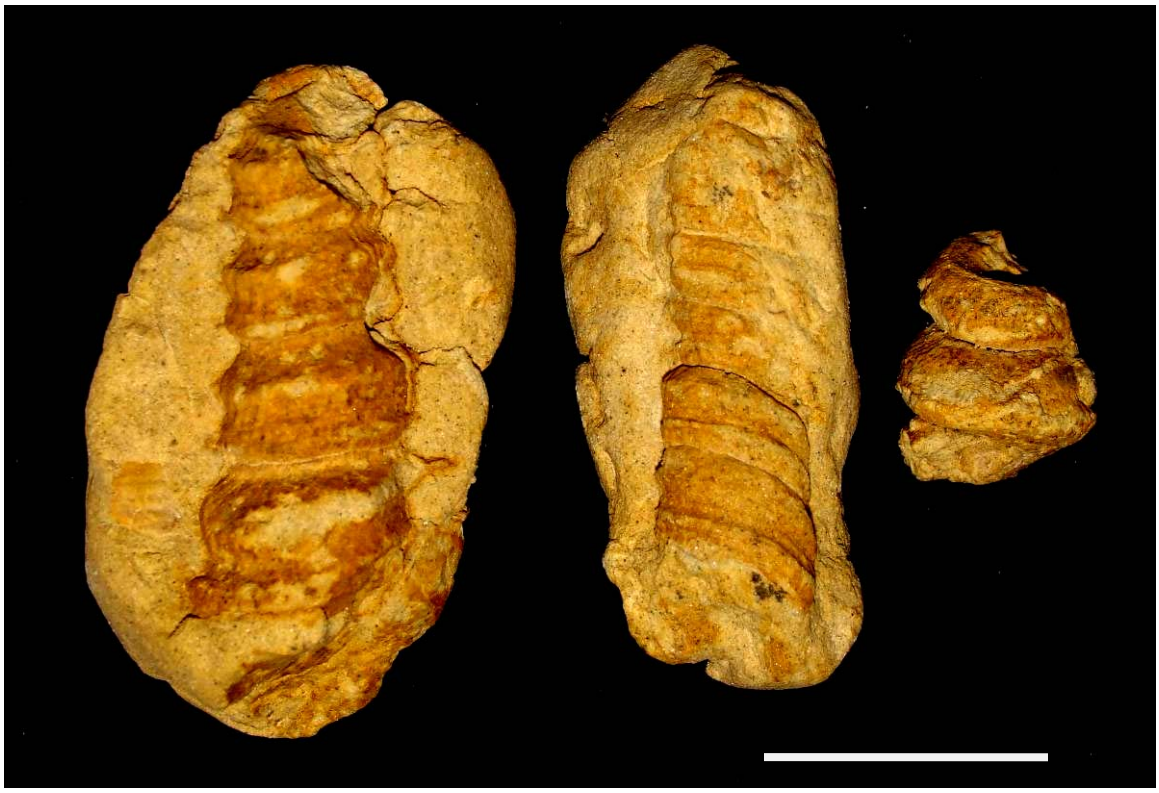

Figure 34. Internal molds of the extinct, tropical turret snail, *Turritella imperialis*, collected from strata of the Deguynos Formation as encountered at SDSNH Locality 6505. Scale bar = 2 cm.

Latrania Formation (Miocene) —
Mollusca (clams, snails, tusk shells, squids, etc.)
Although the Latrania Formation is known for its high diversity of molluscan fossils, only a few specimens were collected during the paleontological monitoring work. This primarily is due to paucity of exposures of the Latrania Formation, which were limited to a small area near EP304. The exposures here produced very well-mineralized shells of large, marine gastropods like *Strombus galeatus*. One incomplete specimen of this large, tropical conch measures 207 mm in length. *Strombus galeatus* still lives today in the warm waters of the Gulf of California where it inhabits shallow marine benthic environments and feeds as an omnivorous grazer.

Vertebrata (fish, amphibians, reptiles, mammals, etc.)
A partial tooth of a mako shark (*Isurus* sp.) was collected from SDSNH Locality 6503 along with several teeth of bony fish including a sheephead (*Semicossyphus* sp.). A crushed and deformed partial vertebra of a large species of marine mammal was also recovered from this

locality and most likely represents a posterior lumbar or anterior caudal vertebra of a mysticete cetacean.

Figure 35. Mineralized shells of the extinct, tropical scallop, *Argopecten deserti*, collected from strata of the Deguynos Formation as encountered at SDSNH Locality 6512. Scale bar = 2 cm.

Figure 36. Internal mold of the extant, tropical boring clam, *Cyrtopleura costata*, collected from strata of the Deguynos Formation as encountered at SDSNH Locality 6514. Scale bar = 2 cm.

Figure 37. Lower, medial tooth of an extinct mako shark, *Isurus* sp. collected from strata of the Deguynos Formation as encountered at SDSNH Locality 6512.

Link 5 Paleontology

Friars Formation (Eocene) —
Vertebrata (fish, amphibians, reptiles, and mammals)

A relatively diverse collection of vertebrate fossils was recovered from strata of the Friars Formation as exposed at SDSNH Locality 6502. This collection primarily consists of small, isolated teeth and bones representing species of bony fish, amphibians, lizards, snakes, and mammals. A few larger vertebrate fossil remains were also collected from this locality (e.g., crocodile teeth).

Osteichthyes (bony fishes) are represented by a single vertebra (centrum) and a single vertebral spine. Amphibians are represented by a single maxilla assignable to Anura (frogs and toads). A number of squamate reptile fossils were recovered from the assemblage, including dentaries of xantusiids (night lizards), anguimorphs (includes the anguids: alligator lizards, glass lizards, galliwasps and legless lizards), iguanids (iguanas), and varanids (monitor lizards); and vertebrae of varanids (monitor lizards) and snakes. Archosaur reptiles are represented by several isolated teeth of the running crocodile *Pristichampsus* sp.

Mammalian fossils recovered from SDSNH Locality 6502 far outnumber those of fish, amphibians, and reptiles and include over 130 isolated bones and teeth. Marsupials are represented by 10 dental specimens of the Eocene didelphid opossum *Peratherium* sp. cf. *P. knighti*. Insectivores are represented in the assemblage by the following species of Eocene hedgehogs, *Aethomylos simplicidens, Crypholestes vaughni, Patriolestes novaceki, Scenopagus*

cf. *S. priscus*, *Apatemys* sp., *Centetodon aztecus*, *Centetodon* cf. *C. bembicophagus*, *Nyctitherium* sp. Additional insectivore fossils were too incomplete to allow identification below the level of Soricomorpha or Insectivora.

Remains of primates were also collected from SDSNH Locality 6502 and include the omomyid prosimian *Washakius woodringii* and the plesiadapiform primate *Uintasorex montezumicus*. These species are characteristic of early Uintan-age faunas of southern California and serve to confirm the middle Eocene age of the Friars Formation.

Eocene rodent teeth recovered from SDSNH Locality 6502 include specimens of the characteristic early Unitan eomyid rodent *Metanoiamys agorus* and the sciuravid rodent *Sciuravus powayensis*. Ischyromid rodents were found in comparable numbers to the sciuravids in this assemblage. However, this unknown ischyromyid rodent, having similar tooth morphology as *Thisbemys*, has not reported yet from San Diego (Paul Murphey, pers. comm., 2012). In the SRPL locality, there is a relatively high number of these larger and more crenulated ischyromid molars as compared to the proportions observed at other early Uintan localities elsewhere in San Diego County. Other ischyromid rodents in the collection include *Leptotomus* sp. cf. *L. caryophilus* and cf. *Microparamys* sp. Other taxa were either referable to Rodentia or compared favorably with Rodentia. Additional specimens were referable to Mammalia, but were not further identifiable.

This diverse collection of small mammals also included sparse teeth (Figure 38) of possible new species of Eocene bat tentatively referred to as cf. Paleochiropterygidae *incertae sedis*, which is similar in morphology to the European Eocene bat, *Paleochiropteryx* (Gregg Gunnell, pers. comm., 2012).

Figure 38. Paleochiropterygid bat molar tooth (M1 or M2) recovered from the Friars Formation during excavation for the 69 kV Line, west of Link 5. Scale bar = 1mm.

DISCUSSION

INTRODUCTION

The following section is limited to a general discussion of the results of the paleontological monitoring program completed for the SRPL project. Although academic research questions dictated the field methods and types of data recorded, the overall goal of this monitoring report was not to produce a research paper but rather to summarize the results of the field and laboratory work, to discuss the types of fossils recovered and their broader paleontological and geologic context, and to provide a detailed inventory of catalogued and curated fossil remains. The important distinction is that the recovery and conservation of the fossils is a separate endeavor from their eventual scientific study.

LINK 1

Geologic Setting

The Link 1 portion of the SRPL ROW is within the western part of the Salton Trough, an area of active seismic and geothermal activity situated in the western portion of the Colorado Desert Geomorphic Province (Morton, 1977). The Salton Trough can be thought of as the northern, landward extension of the Gulf of California and is undergoing active deformation related to transform faulting along the San Andreas Fault Zone and related faults of the San Jacinto and Elsinore fault zones (Figure 39). Compressional deformation is also occurring in this area due to the presence of deeply buried spreading centers. In turn these regional faults and spreading centers are related to larger tectonic processes associated with the complex plate boundary between the continental North American Plate to the east and the largely oceanic Pacific Plate to the west. Spreading centers of the East Pacific Rise extend as transform fault-bounded segments up the axis of the Gulf of California, which is widening as a result (Figure 39). At the same time, the peninsula of Baja California and adjoining areas of western southern California are moving northwest relative to areas east of the San Andreas Fault and its sister transform faults in the Gulf region.

Thick accumulations of Colorado River sediments continue to bury the active spreading centers located at the head of the gulf and beneath the southern portion of the Salton Trough. High heat flow in the form of geothermal activity within the shallow crustal rocks in this region provide clear evidence of the presence of these active spreading centers. Associated with the deeply buried spreading centers are a series of *en echelon* regional transform faults that translate the oblique strike-slip plate motion and rifting to the San Andreas Fault Zone.

It is in this setting that the eastern portion of the SRPL is situated; a setting that has a fascinating geologic history that is well preserved in the sedimentary rocks underlying the SRPL ROW. The following section summarizes this history by focusing on the more paleontologically significant rock units occurring along the alignment.

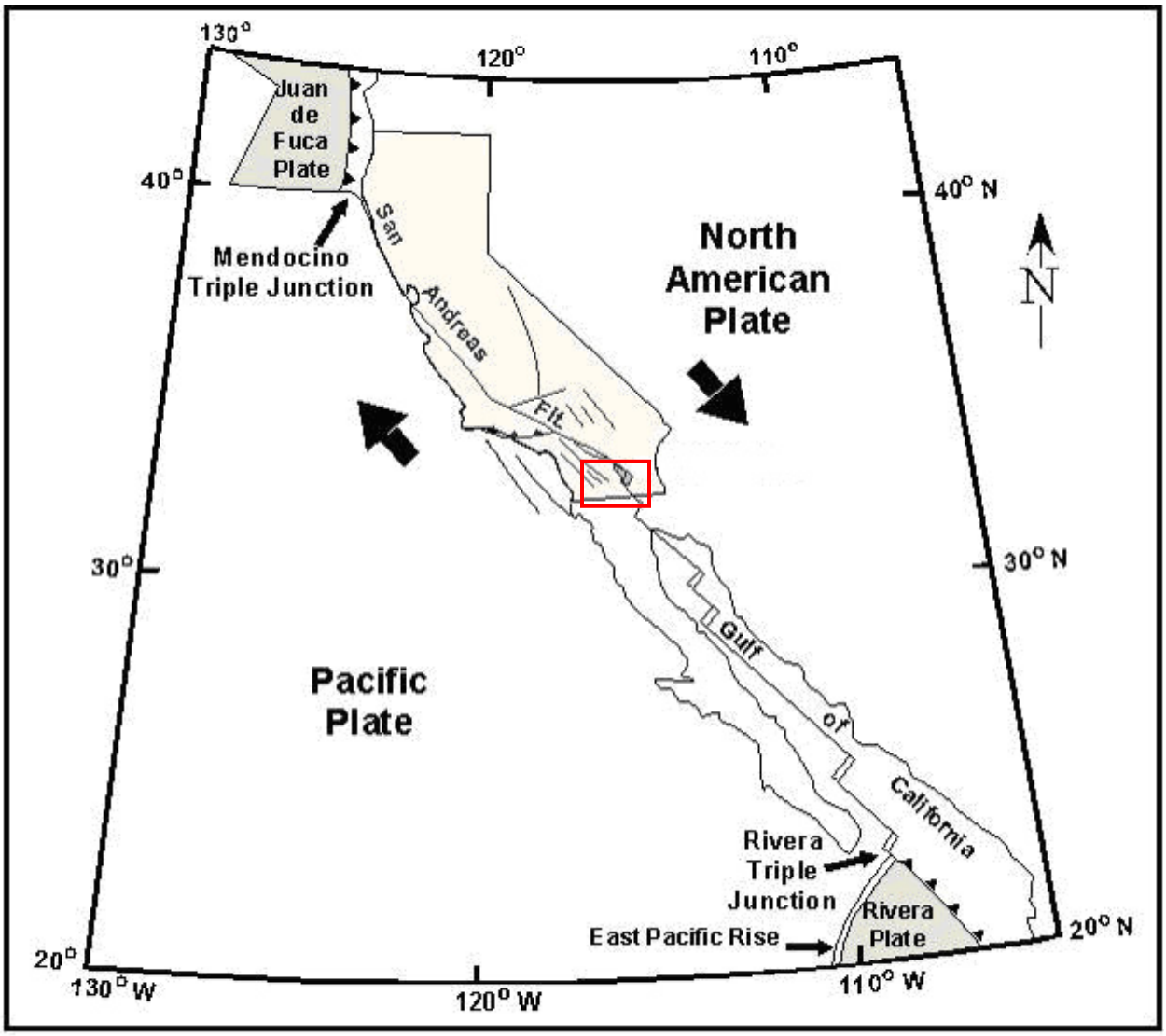

Figure 39. Plate tectonic setting of the Salton Trough (red rectangle) in relation to major plate boundaries along the west coast of North America (modified from Frost et al., 1996).

Geologic History

As mentioned above, the Link 1 portion of the SRPL ROW is within a tectonically complex region experiencing strike-slip faulting, oblique rifting, and transpressional folding (Kirby et al., 2007). Today, and for at least the last 3 million years, the area has been near the boundary between the Pacific Plate and the North American Plate (Dorsey, 2002). The initial transtensional tectonic setting (oblique rifting and extension) of the Late Miocene (~7 million years ago) was responsible for formation of the proto-gulf, which extended northward several hundred miles into what is today northern Riverside County (Figure 40). First locally derived marine sedimentary rocks began filling the proto-gulf, but by about 5 Ma the ancestral Colorado River started depositing huge volumes of fluvial sediments in a large, westward prograding delta system (Figure 40). Eventually, this delta prograded from east to west across the entire width of the Salton Trough forcing the marine waters of the gulf to retreat southward to their current location at the head of the Gulf of California (Figure 40). Associated with the prograding delta

was the periodic formation and desiccation of large perennial lakes in the low lying areas north of the delta. Although episodic, this history of large perennial lakes began about 2.5 Ma and continued throughout the entire Pleistocene and into the Holocene. It is interesting to note that although the modern day Salton Sea is the result of a breach in artificial levees, the process that filled the lake is actually a continuation of processes that have been active in the region since the Early Pleistocene.

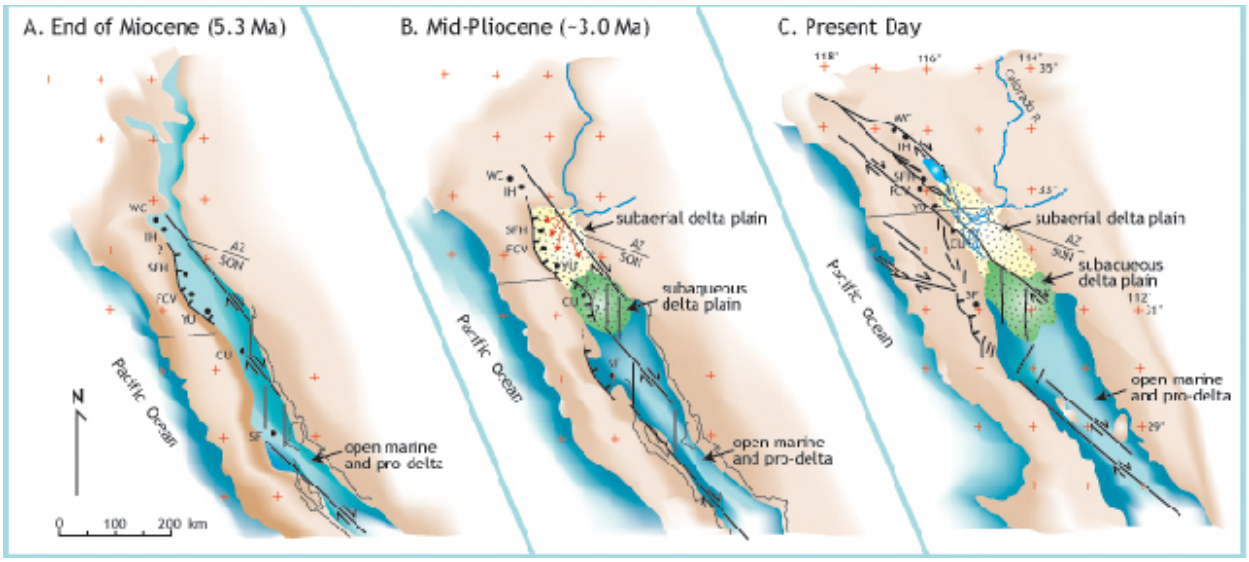

Figure 40. Paleogeographic maps showing the end-Miocene proto-Gulf of California (A), the mid-Pliocene ancestral Colorado River Delta (B), and the geography of the present day delta and gulf (C) (original illustration from Dorsey, 2006).

The transition from the proto-gulf marine conditions of the Late Miocene and Early Pliocene to the fluvial and fluvial deltaic conditions of the later Pliocene and Pleistocene and the episodic lacustrine conditions of the Pleistocene and Holocene was a gradual process that was driven by the complex interactions of plate tectonics, regional faulting and folding, and Colorado River deposition (Dorsey, 2006; Kirby et al., 2007). The history of this transition is well recorded in the thick sequence of sedimentary rocks exposed today in the Coyote Mountain-Yuha Buttes area of the Imperial Valley. Previous and ongoing geological work here and surrounding areas has divided this sedimentary sequence into a series of named and unnamed geological rock units that can be recognized in the field based on characteristic lithological and paleontological features of each rock unit. From youngest to oldest these include the Lake Cahuilla deposits, Brawley Formation, Arroyo Diablo Formation, Deguynos Formation, and Latrania Formation.

Lake Cahuilla sediments

Introduction- Lake Cahuilla was a former freshwater lake that periodically occupied a major portion of the Salton Trough during the Late Pleistocene through Holocene (~37,000 to 240 years ago). There is some debate in the scientific literature over the exact timing and duration of the periods of inundation. For example, Waters (1983) proposes that the main period of lake formation was very recent, the last high water stand being dated at only 240 years ago. In contrast, Hubbs and Miller (1948) and Norris et al. (1979) suggest that the main period of inundation was much older, perhaps as long as 10,000 to 37,000 years ago. Hubbs and Miller

(1948) do recognize more recent intervals of lake formation, but suggest that these were of short duration and minimal impact to the valley floor (i.e., limited erosion and shoreline formation). These authors also suggested that higher precipitation at the close of the last glacial period (or during a substage of this glacial period) may have contributed to a prolonged duration of Lake Cahuilla.

Regardless of the exact timing of inundation, the former shoreline marking the maximum high stand for Lake Cahuilla is well-preserved around the margins of the Imperial Valley at an elevation of approximately 40 to 48 feet above sea level (Blake, 1914; Stanley, 1962). At this maximum lake level Lake Cahuilla (Figure 41) would have been over 300 feet deep, 105 miles long and at its widest point, some 35 miles across (Hubbs and Miller, 1948; Norris et al. 1979). The depth and area of the lake was primarily determined by the elevation of the Colorado River delta to the south, which formed a sill or divide separating the Salton Basin from the Gulf of California.

As previously mentioned, filling of Lake Cahuilla occurred several times during the Holocene (Waters, 1983). Each time the filling was the result of a natural diversion of the course of the Colorado River from a southward course towards the Gulf of California to a new, northward course into the below sea level Salton Basin. The change in course occurred at the apex of the Colorado River Delta near Yuma, Arizona and was probably initiated by flash flood events within the Colorado River drainage system, which in turn caused the river to erode through its natural levees on the upper delta plain and flow down the northern slope of the delta into the Salton Basin. It is estimated that at historic discharge levels it would take 12 to 20 years for the full flow of the Colorado River to fill the area of Lake Cahuilla. Once filled, the lake would eventually overflow its natural levee to the south allowing the Colorado River to reestablish its southward flow into the Gulf of California. Over time as the natural levees were rebuilt on the northern side of the delta apex, the river would entirely bypass the lake, which now cutoff from recharge would gradually dry up. Estimates suggest that full desiccation of the lake would have taken approximately 60 years (Maloney, 1986). This cycle of flooding and desiccation is proposed to have occurred several times in the prehistoric past, perhaps beginning as far back as 37,000 years ago (Norris et al., 1979).

It is interesting to note that similar, but manmade events were also responsible for formation of the present Salton Sea. During 1905 and 1906 a series of flash flood events on the Colorado River caused repeated breaches in the manmade levee system constructed to carry Colorado River water northwestward from the delta to agricultural lands in the Salton Basin. As a result of the breaches the majority of the river's discharge flowed north causing catastrophic erosion of the valley floor and forming the incised channels of the New and Alamo rivers. The river continued to flow into the Salton Basin until the levee system was finally repaired in early 1907. The end result of these flood events was the formation of California's largest freshwater lake, the Salton Sea.

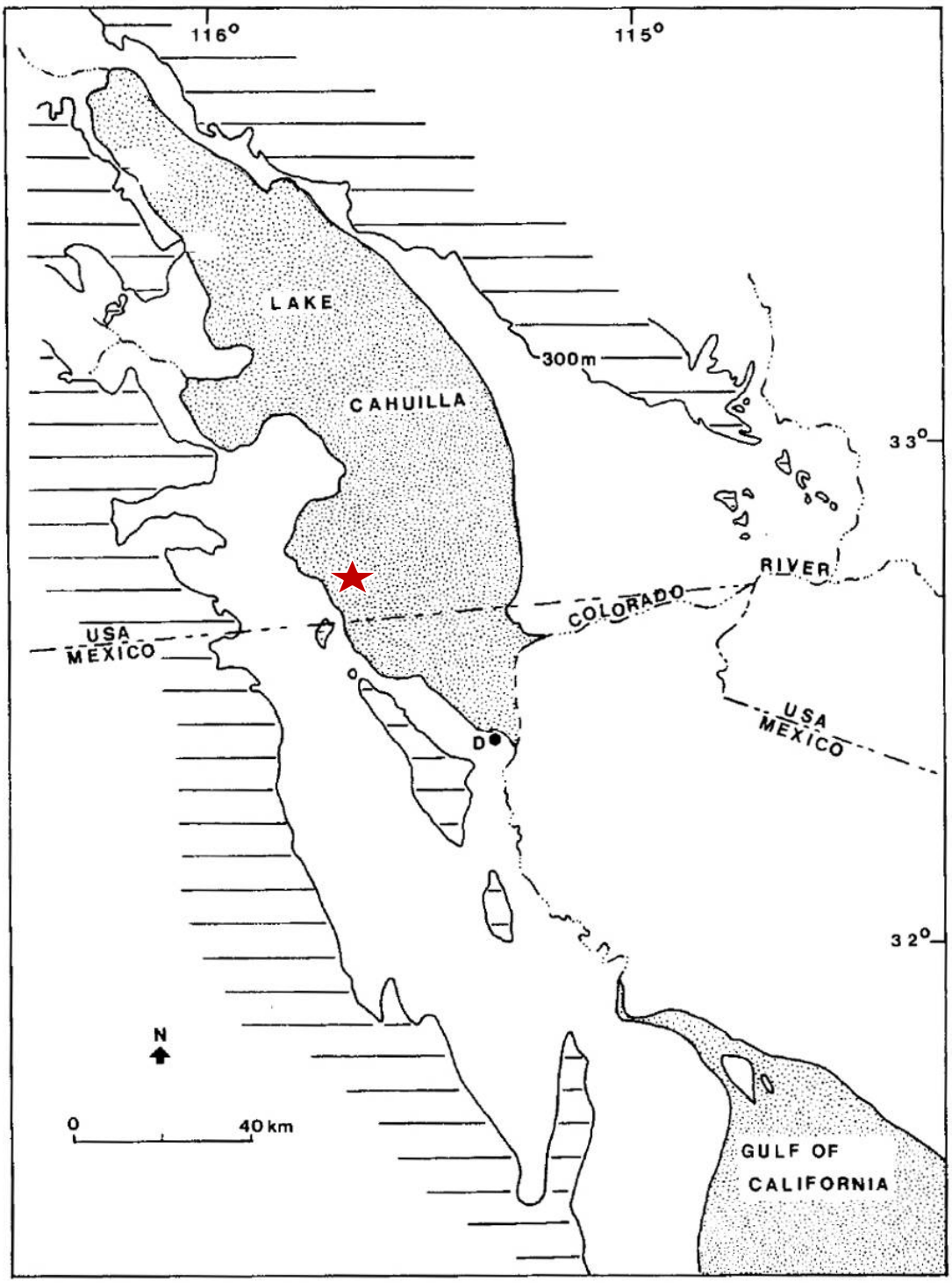

Figure 41. Map showing hypothetical extent of ancient Lake Cahuilla at its level of maximum inundation (i.e., lake surface at ~40 feet above sea level). The general location of present day the Imperial Substation (MP 0, Link 1) is indicated by the red star along the lake's western shoreline (modified from Waters, 1983).

Paleontology- Each time that Lake Cahuilla formed, it became home to a variety of freshwater animals and plants. In addition, terrestrial animals lived in and adjacent to the streams that flowed into the lake. The first mention of fossils in these lake and river deposits was by Blake (1854, 1857) who noted the widespread occurrence of shells of various kinds of freshwater mollusks (clams and snails). Since then, numerous writers have discussed the occurrence of these molluscan fossils (Orcutt 1890; Stearns 1901; Ingram 1947; Hubbs and Miller 1948; Whistler et al. 1995; Bowersox 2003). The occurrence of fossil fish remains (desert pupfish, bonytail chub, and razorback sucker) in these Holocene lake deposits has been reported by Hubbs and Miller (1948), Hubbs et al. (1960), and Whistler et al. (1995).

Whistler et al. (1995) documented freshwater molluscan assemblages from an interbedded sequence of lacustrine and fluvial sediments associated with at least four cycles of Lake Cahuilla inundation and desiccation. Molluscan diversity was high in both the lake and river sediments, suggesting sustained freshwater conditions. Diatoms recovered from the younger lacustrine sediments indicate that some of the former lakes probably persisted for sustained periods of time. Bowersox (2003) examined shells of the freshwater mussel *Anodonta californiensis* from Lake Cahuilla sediments and found that as the ancient lake desiccated, salinity levels slowly increased from 0.7 parts per thousand (ppt) at highstand, to 6 ppt at -180 feet (180 feet below highstand), then rapidly increased to >35 ppt at -280 feet (the surface level of the modern Salton Sea).

Whistler et al. (1995) also reported on terrestrial vertebrate fossils recovered from Lake Cahuilla sediments, noting the occurrence of skeletal remains of both reptiles (horned lizard, spiny lizard, brush lizard, shovel-nosed snake, night snake, gopher snake, ground snake, sidewinder, and rattlesnake) and mammals (e.g., cottontail rabbit, pocket mouse, kangaroo rat, ground squirrel, and wood rat) in the fluvial strata.

The moderately diverse fossil assemblages recovered from the prehistoric Lake Cahuilla deposits exposed in and around the Imperial Substation serves to expand our knowledge of the stratigraphic and geographic distribution of Holocene freshwater environments and biotas of the region. Further, the small collection of aquatic vertebrate fossil remains recovered from these deposits represents a significant increase in the number of known species of fossil fish and amphibians.

Brawley Formation

Introduction- The Pleistocene-age deposits of the Brawley Formation were originally named by Dibblee (1954) for a thick sequence of light gray claystones and pale yellow brown sandstones exposed in the eastern San Felipe Hills north of SR 78 and east of SR 86. These strata accumulated in a variety of depositional environments including freshwater lakes, fluvial deltas, fluvial channels, and subaerial sand dunes (Kirby et al. 2007). The occurrence of caliche-rich paleosols (i.e., ancient soils), mudstones containing large desiccation cracks, nearly pure layers of gypsum, and cross bedded dune sands suggests that the Brawley Formation accumulated in a semiarid to arid climate. Subaerial conditions alternated with periods of lake inundation over a period of time ranging from approximately 1.1 to 0.5 million years ago (Middle to Late Pleistocene) based on magnetostratigraphic studies conducted in the Borrego Badlands (Lutz et al., 2006), Ocotillo Badlands (Brown et al., 1991), and San Felipe Hills (Kirby et al., 2007). These fluctuations in fluvial and lacustrine conditions resulted from episodic inundation (filling) and desiccation (drying) of the Pleistocene "Brawley Lake" basin, which was caused by periodic major northward diversions of surface water flowing into the basin from the ancestral Colorado

River (Kirby et al. 2007). The alternation between periods of lake filling and desiccation is similar to the conditions responsible for the successive Holocene lake levels associated with ancient Lake Cahuilla as previously described. The generally fine-grained sedimentary rocks of the Brawley Formation grade laterally (to the west) into coarse-grained alluvial strata of the coeval Ocotillo Conglomerate (Figure 42). These two rock units accumulated in adjacent, but distinct, depositional settings; the Brawley Formation in streams and a large lake located in the eastern part of the Park and the Ocotillo Conglomerate in alluvial fans primarily located to the west in the Borrego Badlands (Kirby et al., 2007).

Paleontology- Fossils recovered from strata of the Brawley Formation primarily consist of well-preserved shells of freshwater (lacustrine) mollusks, ostracods, and diatoms (Kirby et al., 2007), as well as rare remains of freshwater vertebrates (Dibblee, 1954) and terrestrial plants (Kirby et al., 2007). Rare tests of brackish benthic foraminifers have also been reported from the Brawley Formation (Kirby et al., 2007) and indicate that the "Brawley Lake" basin possibly had periodic connections to the ancestral Gulf of California during the Middle Pleistocene.

The small, low diversity fossil assemblage recovered from the Brawley Formation as exposed in and around the Imperial Substation, although similar to other fossil assemblages reported from this rock unit, does represent the only known occurrence of Brawley Formation fossils in this area of the Imperial Valley. As such the SRPL fossils serve to expand our understanding of the distribution and biota of this large, Pleistocene freshwater lake.

Arroyo Diablo Formation

Introduction- Cassiliano (2002) revised the stratigraphic nomenclature of sedimentary rock units that have traditionally been mapped as the Palm Spring Formation (Dibblee 2005a,b). In doing so he elevated the Palm Spring Formation to group status (Palm Spring Group) and subdivided it into five formations based on color, lithology, bedding type, sedimentary structures, sediment provenance, and fossil content. The thickest and most widespread of these formations is the Arroyo Diablo Formation (Figure 42), a rock unit gets its name from characteristic exposures in Arroyo Seco del Diablo in the Fish Creek area of Anza Borrego Desert State Park (ABDSP). Sedimentary rocks assigned to the Arroyo Diablo Formation have previously been mapped under the name Diablo Formation, but as shown by Cassiliano (2002) this name is unavailable because of prior usage. Strata of the Arroyo Diablo Formation typically are dominated by pale orange or pink siltstones and sandstones, with lesser amounts of reddish-brown mudstones and claystones marked by thin green-gray to blue-gray interbeds (Cassiliano, 2002).

Deposition of the Arroyo Diablo Formation began over 4 Ma as the westward prograding delta reached the western side of the Salton Trough. Depositional conditions on the subaerial portion of the delta plain occurred in active distributary channels, floodplains, and marginal levees. Sediments in this part of the delta typically consist of coarser grained sandstones and gravels. River water flowed through the distributary channels and into nearshore marshes characterized by broad tidal flats, tidal creeks, barrier islands, and sand bars. Fine grained sands, as well as mud accumulated in this setting. Farther offshore, on the submerged portion of the delta plain, currents and wave action reworked the deltaic sediments in the benthic marine depositional environments of the delta front (Deguynos Formation). Here, fine-grained sandy siltstones typically dominate, while in deeper water environments of the prodelta, finely laminated mudstones and claystones are the dominant sediment type. In this regional depositional setting

the fluvial deltaic sediments of the Arroyo Diablo Formation graded downward into the lagoonal, shallow marine, and offshore marine sediments of the Lower Pliocene Deguynos Formation.

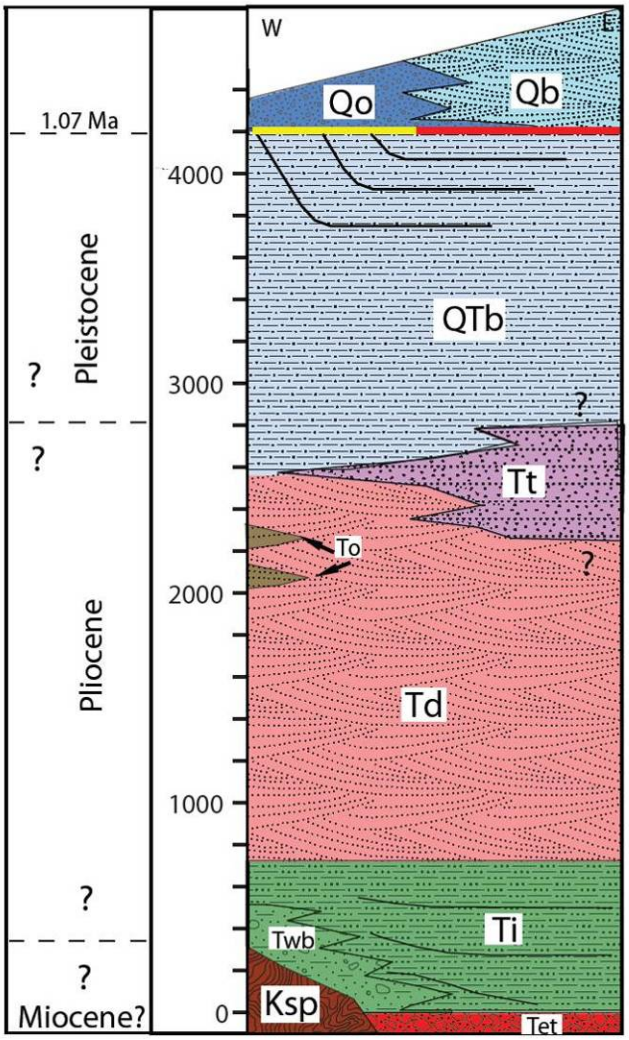

Figure 42. Generalized stratigraphic column showing geologic age, stratigraphic thickness (in meters), and geologic rock units exposed on Link 1. Qo= Ocotillo Conglomerate, Qb= Brawley Formation, QTb= Borrego Formation, Tt= Transitional unit, Td= Arroyo Diablo Formation, Ti= Imperial Group, Ksp= Squaw Peak Gneiss (modified from section published in Kirby et al., 2007).

Paleontology- Fossils known from strata of the Arroyo Diablo Formation consist of permineralized logs of temperate woodland trees (Remeika, 2006), shells of estuarine mollusks (Winker and Kidwell, 1996), skeletons and isolated bones of freshwater fishes and turtles (Stewart and Roeder, 1993; Hoetker and Gobalet, 1999; Gensler et al., 2006), and isolated bones and teeth of marine terrestrial mammals (Winker and Kidwell, 1996; Cassiliano, 1999). Remeika and others (1988), Remeika (1994), and Remeika (2006) in describing fossil wood recovered from the Arroyo Diablo Formation in the Vallecito Creek-Fish Creek area of ABDSP reported that the composite flora included 5 families of broad-leaved riparian forest trees (buckeye, walnut, bay laurel, avocado, cottonwood, willow, and ash), one family of fan palm,

and one family of cone-bearing tree (cedar or juniper). Although inhabiting at least three separate habitats on the Pliocene delta plain, the overall flora suggests a temperate climate with ocean influence and predominantly winter rainfall.

As reported by Gensler et al. (2006) fossils of freshwater bony fishes have been collected from deposits of the Arroyo Diablo Formation including a complete, articulated skeleton of a Razorback sucker (*Xyrauchen texanus*) found in a sandstone concretion collected from the San Felipe Hills near Ocotillo Wells.

Cassiliano (1999) reported that bones and teeth of fossil mammals are present but relatively rare in the Arroyo Diablo Formation as exposed in the Vallecito Creek-Fish Creek area of ABDSP. The composite assemblage included rabbit (*Hypolagus* sp.), bobcat (*Lynx* sp.), horse (*Dinohippus* sp. and *Equus* sp.), and llama (*Hemiauchenia* sp.). Cassiliano (1997) went on to suggest that the paucity of vertebrate specimens was due to breakup of skeletons on the Pliocene delta floodplain followed by reworking during flood conditions and eventual transport and deposition of isolated skeletal elements in distributary channels.

The diverse fossil assemblages recovered from the Arroyo Diablo Formation as exposed along Link 1 fall into two main categories; those representing marine/estuarine communities and those representing freshwater stream communities. Grouped with the latter are some strictly terrestrial species whose remains were likely washed into and transported in freshwater stream systems. The marine/estuarine fossil assemblage shares many similarities with that collected from the transitional tidal flat and tidal creek strata of the underlying Deguynos Formation. This assemblage includes species of estuarine oysters, scallops, gastropods, barnacles, and crabs. The freshwater stream fossil assemblage includes species of freshwater fish and aquatic plants together with isolated skeletal remains of land mammals and riparian vascular plants. These diverse fossil assemblages collected during paleontological monitoring of SRPL construction activities represent the most southeastern record of Arroyo Diablo fossils and thus have the potential to provide new information critical to understanding the distribution of environments and biologic communities on this portion of the ancestral Colorado River delta plain.

Deguynos Formation

Introduction- The Deguynos Formation was originally named by Winker and Kidwell (1996) for a thick sequence of fine-grained, Colorado River derived, marine deltaic deposits that conformably overlie the coarser-grained, locally derived, marine pre-delta deposits of the Latrania Formation. Together these two formations comprise the more inclusive Imperial Group (Figure 42). In a vertical section, the Deguynos Formation preserves a prograding sequence of deltaic sedimentary rock units, with prodelta greenish-gray to grayish-olive mudstones at the base, successively overlain by intervals of delta front greenish-gray to grayish-olive mudstone and yellowish-gray laminated siltstones, followed by delta plain grayish, very fine-grained sandstones and skeletal oyster coquina beds. The coquina beds are typically cross-bedded with foresets dipping in the direction of the paleocurrent. This vertical series represents a shallowing upward sequence from deeper marine benthic paleoenvironments at the base, up through shallow sublittoral marine paleoenvironments, which in turn are capped by brackish to littoral tidal flat and tidal creek paleoenvironments. These various paleoenvironments characterized the submerged, marine portion of the ancestral Colorado River delta and typically transition upsection and laterally into the subaerial fluvial and fluvial delta paleoenvironments preserved in the Arroyo Diablo Formation.

In the Carrizo Badlands and Painted Gorge area, the Deguynos Formation is characterized by pale gray to olive green massive mudstones; yellowish brown laminated siltstones, yellowish brown, very fine- to fine-grained laminated sandstones; and dark gray to olive brown, well-cemented oyster shell coquinas. The Deguynos Formation makes up distinctive landforms known as hogbacks or cuestas which are the result of differential erosion between calcite-cemented beds of fossil rich sandstone and underlying sequences of soft laminated mudstones with thin interbeds of very fine-grained silty sandstones. Typically overlying the resistant shell beds are thick sequences of soft siltstones interbedded with thin compacted sandstones. These stratigraphic sequences are often deformed and steeply dipping (~30º) and as the area erodes the more resistant fossil beds stand out in relief as a caprock, while the softer underlying and overlying deposits erode more quickly. Although typically referred to as oyster "reefs," these resistant shell beds technically are not fossilized reefs composed of marine organisms that lived together on the ancient sea floor. Instead, the resistant beds represent tidal creek channel deposits where shells of dead oysters and scallops were scoured, transported, and concentrated by river water flowing across the tidal flats of the ancestral Colorado River delta where it entered the Pliocene precursor of the Gulf of California. Internally, the resistant "reef" beds are composed of closely packed, flat lying, and disarticulated whole and broken shell valves of oysters. In an actual reef the shell valves would be articulated as right and left pairs and the whole shells would be clustered together in life position (i.e., shells vertically arranged).

The sedimentary rocks of the Imperial Group record a dramatic change in the geological history of the Salton Trough, which occurred when the ancestral Colorado River began flowing into the basin approximately 5 Ma (Deméré, 2006). Prior to that time the proto-Gulf of California extended throughout the Salton Trough as far north as modern-day Riverside County. The marine waters of the proto-gulf were clear and warm, and fed by local streams carrying sediment from the adjacent mountains. These conditions changed, however, when the ancestral Colorado River started flowing into the region, bringing with it huge volumes of sediment derived from erosion of the Colorado Plateau (including sediment scoured as the river began cutting the Grand Canyon). A large delta began forming as the sediment-choked waters of the river reached the still waters of proto-gulf. In the Imperial Group, locally derived sandstones of the Latrania Formation record the clear, pre-deltaic marine conditions of the proto-gulf, while the siltstones and claystones of the overlying Deguynos Formation document more turbid, deltaic marine conditions.

Paleontology- Fossils reported from strata of the Deguynos Formation as exposed in ABDSP (e.g., Vallecito Creek, Fish Creek, and Carrizo Creek areas), north of Link 1, consist of permineralized logs (Remeika, 2006), remains of colonial corals (Deméré and Rugh, 2006), shells of estuarine and shallow marine mollusks (Watkins, 1990; Winker and Kidwell, 1996; Deméré and Rugh, 2006), clusters of barnacles and isolated decapod body parts (Deméré and Rugh, 2006), isolated bones and teeth of marine sharks, rays, and bony fishes (Winker and Kidwell, 1996), and isolated bones and teeth of marine mammals, including walrus and dolphin (Deméré, 1993, 2006).

Closer to Link 1 in the Painted Gorge region on the southeast side of the Coyote Mountains are fossil locations reported by Watkins (1990) that occur in both delta front and delta plain sedimentary rock units similar to those encountered during monitoring of SRPL construction activities. The most common fossil occurrences consist of dense concentrations of well-preserved shells of the small Pliocene oyster, *Dendostrea vespertina*, in association with less

abundant shells of scallops (*Argopecten deserti*) and jingle shell clams (*Anomia subcostata*), as well as rare shells of marine gastropods (*Solenosteira* sp. and Cerithidae indet.). These shell concentrations were formed through processes of current scour and transport of dead shells followed by deposition of the shells in tidal creek channels on the submerged, distal portion of the delta plain of the ancestral Colorado River.

Not all of the Deguynos Formation fossils, however, occur in these resistant shell beds. In areas where deeper water, laminated siltstone and mudstone strata dominate the Deguynos Formation, shells are more dispersed through the layers and include a more diverse assemblage of marine invertebrate fossils. In still other areas, such as those near the gradational contact between the Deguynos Formation and the overlying Arroyo Diablo Formation, specimens of permineralized wood characterize some strata and, like the Arroyo Diablo Formation, contain "log jams" of nearly intact fossil trees, as well as heavily fragmented logs consisting of numerous sharply splintered pieces.

The relatively diverse fossil assemblages recovered from the Deguynos Formation can be grouped into at least two distinct faunas. One represents a deep water marine prodelta and delta front fauna characterized by a moderately diverse assemblage of marine infaunal bivalve mollusks and heart urchins, marine epifaunal molluscan snails and crabs, and marine neritic sharks. The other Deguynos Formation fauna is similar to the transitional delta plain fossil assemblage recovered from the Arroyo Diablo Formation, which is characterized by species of estuarine oysters, scallops, gastropods, barnacles, and crabs. The deep water marine fossil fauna collected during paleontological monitoring of SRPL construction activities represents the first report of this assemblage from this area of the Salton Trough and provides new information critical to understanding the distribution of paleoenvironments and biologic communities of the Deguynos Formation.

Latrania Formation

Introduction- The Latrania Formation was named by Winker and Kidwell (1996) for a transgressive sequence of coarse-grained, locally derived, sublittoral marine deposits, which rest unconformably atop crystalline volcanic and/or metamorphic rocks that form the core of the Coyote and Fish Creek mountains in the southern part of ABDSP. The Latrania Formation is overlain by fine-grained deposits of the Deguynos Formation and together these two rock units comprise the Imperial Group (Figure 42). The Latrania Formation in the south consists of a sequence of primarily coarse-grained strata that include gray to red-brown, medium-grained, massive, micaceous sandstones; gray, fine-grained, laminated and cross-stratified, micaceous sandstones; red-brown bioclastic sandstones; and pale yellow skeletal (shelly) limestones (Deméré, 2006). This stratigraphic sequence was deposited during the initial inundation of the Salton Trough by transgressing marine waters of the proto-gulf. Deposition of the Latrania Formation began during the Late Miocene approximately 7 Ma and ended near the beginning of the Pliocene (~5 Ma) when deposition of marine deltaic sediments of the Deguynos Formation commenced. The near absence of clay and silt in the Latrania Formation suggests that the marine waters of the proto-gulf would have been relatively clear. The types of sand grains found in the Latrania Formation suggest that the proto-gulf waters were only fed by local streams carrying sediment from the adjacent mountains. This condition is in marked contrast to the silt and clay rich sedimentary rocks of the Deguynos Formation, which suggest that the proto-gulf waters became more turbid once the ancestral Colorado River started building its delta.

Paleontology- Locally diverse and abundant assemblages of fossil marine mollusks, echinoderms, and colonial corals have been recovered from strata of the Latrania Formation in the Coyote and Fish Creek mountains (Kidwell, 1988; Winker and Kidwell, 1996; Deméré, 2006). Many of the fossils found in the Latrania Formation are closely related to living and fossil species found in the Caribbean region. This similarity in biota results from a once direct marine connection to the Caribbean and the tropical eastern Pacific via a seaway across southern Costa Rica, central Panama, and western Columbia. This seaway passage, called the Central American Seaway, was cut off 3.5 to 3.1 Ma by uplifting of the Isthmus of Panama which established a land bridge between North America and the former island continent of South America.

Typically marine invertebrate fossils within the Latrania Formation are preserved as internal and external molds and lack actual shell material. This condition is due to the fact that most of the fossil species built their shells using the mineral aragonite, which is a form of calcium carbonate that is highly susceptible to dissolution by slightly acidic groundwater. Although preservation of the original shell material is lost, the internal and external molds can still express enough of the original form to allow for taxonomic identification (Deméré, 2006; Deméré and Rugh, 2006). Rare vertebrate fossils have also been reported from the Latrania Formation and consist of teeth of marine sharks, rays, and bony fishes, as well as bones of marine mammals including dolphins, baleen whales, and sea cows (Deméré, 1993, 2006).

The relatively low diversity fossil assemblage recovered from the Latrania Formation represents a shallow water marine fauna that lived in the proto-Gulf of California prior to the beginning of Colorado River deposition in the Salton Trough. The Latrania Formation fauna collected during paleontological monitoring of SRPL construction activities consists of one species of epifaunal molluscan snail together with species of marine neritic sharks and whales. Although this assemblage contains only a small fraction of the biological diversity actually known from the Latrania Formation, it does provide new information about the paleontology of strata at the very base of this rock unit as exposed on the southern flanks of the Coyote Mountains.

LINK 5

Geologic Setting

The mesa and canyon lands that characterize the Link 5 portion of the SRPL ROW are underlain by a layer cake sequence of stratigraphic units including from oldest to youngest: the Friars Formation, Stadium Conglomerate, Mission Valley Formation, and Pomerado Conglomerate. This sequence of sedimentary rocks was deposited in the central portion of the Eocene San Diego Embayment, a large depositional basin which actively accumulated sediments in the San Diego area during the middle portion of the Eocene Epoch between 49 and 40 million years ago (Kennedy 1975; Walsh et al. 1996). A major river system flowed into the eastern portion of the embayment (Figure 43). To the west, the alluvial and fluvial paleoenvironments mixed with nearshore marine paleoenvironments in a river-dominated delta. Farther west were continental shelf and slope paleoenvironments. The Eocene sedimentary rocks of the Friars Formation, Stadium Conglomerate, and Pomerado Conglomerate encountered along Link 5 originally accumulated in the alluvial and fluvial portion of this Eocene depositional system. In contrast, the sedimentary rocks of the Mission Valley Formation occurring west of the ROW, accumulated in the benthic marine paleoenvironments on the Eocene continental shelf. To the east, the Eocene sedimentary rocks abut and overlie older crystalline basement rocks of the Peninsular

Ranges Batholith and the Santiago Peak Volcanics. The contact between the Eocene sedimentary rocks and crystalline basement rocks is an irregular erosion surface with considerable topographic relief that demonstrates the rugged nature of the pre-Eocene landscape.

Friars Formation

Introduction- The Friars Formation was originally named by Kennedy and Moore (1971) for a sequence of yellowish-gray to pale gray, medium-grained, friable sandstones exposed along Friars Road in Mission Valley. Elsewhere, the Friars Formation consists mainly of light gray, medium-grained sandstones; greenish, reddish, and brown siltstones and mudstones; and common lenses of cobble conglomerate. The Friars Formation overlies the Scripps Formation, and is in turn disconformably overlain by either the Stadium Conglomerate or the Mission Valley Formation. Walsh et al. (1996) subdivided the formation into three informal members: a lower sandstone-mudstone tongue, a middle conglomerate tongue, and an upper sandstone-mudstone tongue. In the Mission Valley area, where the conglomerate tongue is absent, the Friars Formation cannot be divided into separate lower and upper tongues, and these outcrops are referred to as the Friars Formation, undifferentiated (Walsh et al., 1996).

The upper tongue of the Friars Formation consists mainly of light gray, fine-to-medium-grained sandstones and greenish and reddish siltstones and mudstones. The upper tongue is mainly terrestrial in origin (Kennedy, 1975), with marginal marine facies occurring toward the western end of its outcrop area (Givens and Kennedy 1979), where it appears to grade into what Kennedy (1975) mapped as the upper tongue of the Scripps Formation (Walsh et al., 1996). The upper tongue of the Friars Formation reaches a maximum thickness of about 200 feet, and extends from Mira Mesa and Carmel Valley in the west to Carmel Mountain Ranch, Scripps Ranch, and Murphy Canyon in the east.

The middle conglomerate tongue of the Friars is actually the thickest and most widespread conglomerate body within the original Poway Conglomerate of Ellis and Lee (1919) and Hanna (1926), which justifies the assignment of the Friars Formation as a whole to the Poway Group. The conglomerate tongue of the Friars consists mainly of light rusty brown and light gray cobble and boulder conglomerate, with common thin beds and rip-up clasts of multicolored siltstone and mudstone. It is mainly of fluvial origin, but contains marine facies toward the west. The conglomerate tongue of the Friars reaches a maximum thickness of about 200 feet. It extends from the Miramar Landfill and Los Penasquitos Canyon in the west to Poway, Santee, and Murphy Canyon in the east.

The lower tongue of the Friars Formation is very similar in lithology to the upper tongue, consisting mainly of light gray, fine-to-medium-grained sandstones and greenish and reddish siltstones and mudstones. The lower tongue is mainly terrestrial in origin (Kennedy 1975), although substantial lagoonal facies occur toward the western end of its outcrop area (Givens and Kennedy 1979; Walsh et al., 1996). The lower tongue of the Friars Formation reaches a maximum thickness of about 180 feet, and extends from Mira Mesa in the west to El Cajon, Santee, and Poway in the east.

Deposition of the Friars Formation began during the Middle Eocene approximately 47 Ma and represents the earliest occurrence of nonmarine deltaic deposits in the San Diego Eocene. Although Kennedy and Moore (1971) assigned the Friars Formation to the La Jolla Group of rock units, the inferred nonmarine depositional environment coupled with the extensive

occurrence of coarse-grained lithologies in the middle conglomerate tongue indicates that the Friars Formation should actually be assigned to the younger, Poway Group. This idea was originally proposed by Walsh et al. (1996) and is supported by the common occurrence of Middle Eocene terrestrial mammals correlative with the early portion of the Uintan North American land Mammal Age.

Paleontology- Strata of the Friars Formation have produced locally diverse assemblages of terrestrial vertebrate fossils that collectively have been named by the Poway Fauna by Walsh (1996). This composite assemblage includes over 50 named genera containing approximately 61 species. A noted by Walsh (1996) the Poway Fauna is dominated by the Opossum, *Peratherium* sp. cf. *P. knighti*, the hedgehog *Crypholestes vaughni* and the rodents *Microparamys* sp. cf. *M. minutes* and *Sciuravus powayensis*. Also characteristic of this composite assemblage are species of primates including *Hesperolemur actius* and *Washakius woodringi*, species of rodents including *Pseudotomus californiicus* and *Metanoiamys agorus*, species of miacid carnivorans including *Tapocyon occidentalis*, species of brontotheres including *Metarhinus*? *pater*, species of rhinocerotoid perissodactyls including *Amynodon reedi*, and species of early artiodactlys including *Merycobunodon littoralis* and *Leptoreodon major*. This composite fauna represents the most diverse and well-preserved early Uintan mammalian assemblage known from the west coast of North America (Walsh, 1996).

The relatively diverse vertebrate fossil assemblage recovered from the Friars Formation during paleontological monitoring of SRPL construction activities represents the most eastern reported occurrence of fossils from this rock unit. This assemblage consists of seven named species and up to 12 distinct taxa. Especially significant are the specimens of fossil primates and one bat. The bat specimens appear to represent a species new to science and will be the subject of future scientific research.

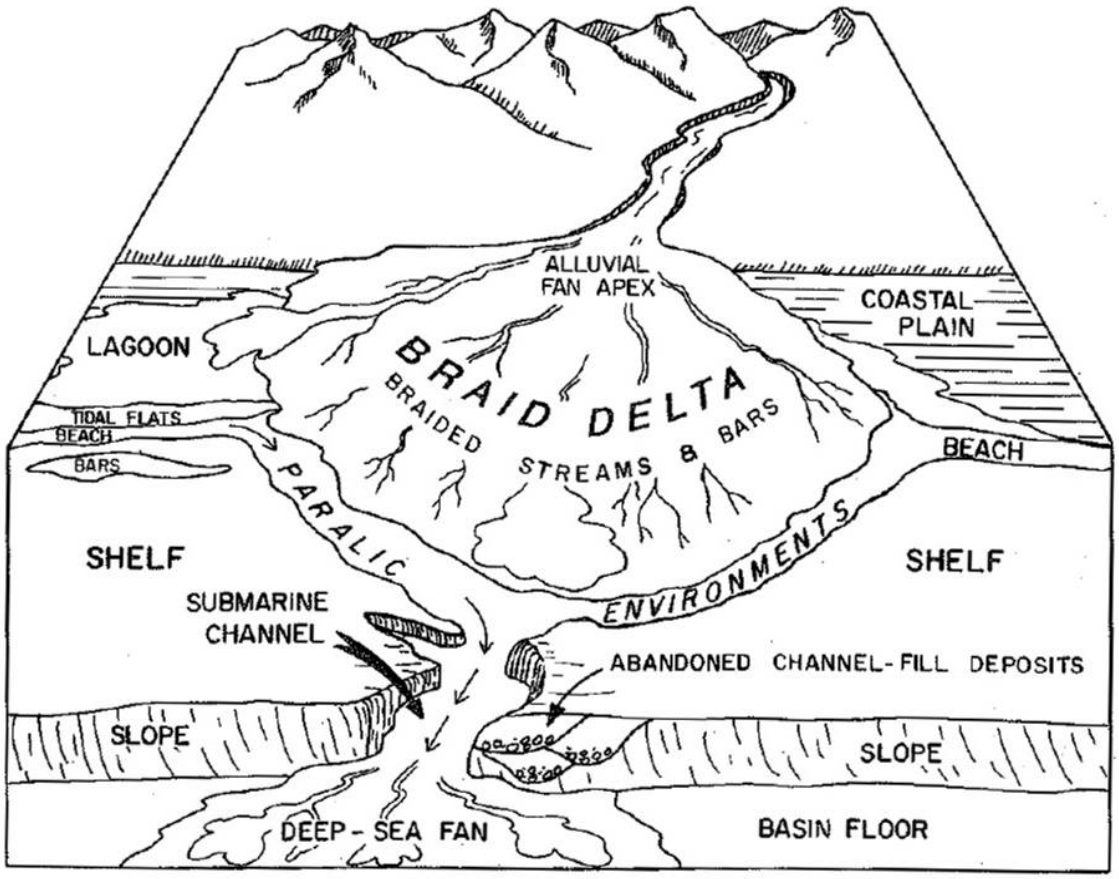

Figure 43. Depositional model for the Eocene sedimentary rocks of coastal San Diego County showing large river system flowing west out of the ancestral Peninsular Ranges and building a large prograding river-dominated delta across the coastal plain and out onto the Eocene continental shelf, slope, and basin floor (from Abbott and Link, 1991).

DISCUSSION OF SRPL PALEONTOLOGICAL RESOURCES

Taxonomic Diversity

The paleontological resources recovered during monitoring of Link 1 SRPL construction activities consist of fossil remains representing a variety of taxonomic groups including marine benthic microfossils (e.g., foraminifers and ostracods), marine invertebrates (e.g., oysters, scallops clams, snails, barnacles, and crabs), marine vertebrates (e.g., sharks, bony fish, and marine mammals), freshwater benthic invertebrates (e.g., mussels and snails), freshwater vertebrates (e.g., bony fish and amphibians), terrestrial plants (e.g., woodland trees), and terrestrial vertebrates (e.g., llama). This level of prehistoric biodiversity is especially impressive given the narrowness of the SRPL alignment and the wide spacing between individual transmission tower locations. The greater taxonomic diversity reported for similar geological rock units exposed in the adjacent Coyote Mountain Wilderness Area and the nearby Carrizo Badlands is the result of a much greater level of routine prospecting for fossils that has occurred in those areas over the past 50 years. In this context, the SRPL fossils have the potential to test paleontological and stratigraphical models developed for these areas.

The paleontological resources recovered during monitoring of Link 5 SRPL construction activities consist of fossil remains representing a variety of Eocene-age vertebrate taxa including, amphibians, lizards, snakes, crocodiles, and mammals. The mammalian fossil assemblage is especially diverse and includes opossums, hedgehogs, primates, and rodents. This assemblage lived in a tropical coastal setting with hardwood forests in riparian habitats and mangrove marshes in more coastal habitats.

Stratigraphic Distribution

The paleontological resources recovered during monitoring of SRPL construction activities along Link 1 occur in sedimentary rock units ranging in age from Late Miocene (~7 Ma) to Holocene (<10,000 years). Certain rock units contain more fossils than other rock units. Certain portions of the Deguynos Formation, for example, contain dense shell concentrations of marine invertebrate fossils. Some of the more resistant shell beds, such as ones exposed at Shell Reef, probably are made up of millions of individual fossil oyster shells. The Lake Cahuilla sediments also contain locally dense shell concentrations and certain strata in the Arroyo Diablo Formation are known to contain hundreds of fossil logs. In contrast the fluvial and lacustrine beds of the Borrego Formation and Brawley Formation contain rare and sparsely distributed fossils. Certain portions of these rock units, however, do contain some concentrations of fossil shells and plants, which suggests that a greater fossil potential for these deposits. The older Quaternary alluvium deposits exposed along the SRPL alignment have not produced any fossils to date, but have the potential to do so because of their age and sedimentary origin.

Along Link 5 construction activities affected sedimentary rocks of Eocene age including strata of the Friars Formation and Stadium Conglomerate. These rock units accumulated in the subaerial portion of a large river-dominated delta that extended from the foothills of the ancestral Peninsular Ranges to the warm, tropical marine waters of the Eocene Pacific Ocean.

CONCLUSIONS

The paleontological resource monitoring program conducted during construction of the Sunrise Powerlink Transmission Line project reduced adverse impacts to paleontological resources to a level below significance through construction monitoring, fossil salvage, fossil preparation, and fossil curation. The work resulted in the recovery of paleontological resources from fossil localities in both San Diego and Imperial counties as exposed at numerous work areas along the project ROW. These localities were discovered as a direct result of the monitoring of excavation activities during construction.

The fossil assemblages recovered from Link 1 represent a diverse series of paleoenvironments ranging from clear, tropical marine waters of the proto-gulf, through more turbid marine deltaic, brackish marsh, and freshwater stream waters of the ancestral Colorado River delta. Also represented are freshwater lake and stream paleoenvironments of a series of large, perennial lakes that waxed and waned in the Salton Trough over the past 1.5 million years. The Link 1 fossil assemblages also represent a diversity of paleocommunities including epifaunal and infaunal benthic marine communities, epifaunal estuarine brackish water communities, riparian terrestrial communities, and epifaunal and infaunal benthic lacustrine communities.

The fossil collections recovered as a result of the Sunrise Powerlink Transmission Line project increase our understanding of the diversity and evolution of Eocene through Quaternary faunas of San Diego and Imperial counties. These assemblages have the potential of clarifying and answering a number of interesting research questions concerning the geologic and biological history of southern California.

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APPENDIX

DATE 03/25/13
TIME 19:29:33

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6502

LOCALITY # 6502
LOCALITY NAME: Sunrise Powerlink - Eocene Micro Site
FIELD NUMBER: GC28Jul11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY San Diego
CITY San Diego

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 228 FT

LATITUDE 32°48'57"N VARIANCE
LONGITUDE 117° 5'14"W

UTM 11 491834 3630675 VARIANCE

MAP NAME La Mesa, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1967(1975)

STRATIGRAPHIC POSITION
GROUP Poway Group
FORMATION Friars Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Paleogene
SER/EPOCH middle Eocene
AGE/STAGE
NALMA early Uintan
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT fluvial
CITATION

DONATED BY
BLM 28 Jul 2011

FIELD NOTES
GC #2, pg 148, 149
COLLECTOR
G. Calvano 28 Jul 2011
COMPILED BY
K.A. Randall 12 Sep 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 12 Sep 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6502 represents a single discovery site that was exposed during hand digging of a hole at the southern end of Tie Line 639. This reconductoring line extended from the Link 5 of the mainline in the northern portion of Scripps Ranch southwest to a substation in the southwestern portion Tierrasanta. This was located at approximately 11063 Tierrasanta Boulevard, on the southwestern side of the street, immediately east of the substation.

Locality 6502 was discovered at the top of 4 foot thick bed of green coarse-grained, silty sandstone. This was overlain by a 2 foot thick conglomerate in a claystone matrix. The underlying unit was a 0.5 foot thick white, chalky siltstone. The borehole dug at this site exposed a total of 12 feet of strata, between 236 feet and 224 feet in elevation. Based on elevation, lithology, and recovered fossil fauna (early Uintan), this unit is believed to be part of the Friars Formation. Walsh et al. (1996) delineated the lower, conglomerate, and upper tongues of the Friars Formation in the Scripps Ranch and northern portion of the Tierrasanta neighborhoods of San Diego. In the Serra Mesa, Grantville, and southern portion of Tierrasanta neighborhoods, the Friars Formation was defined as undifferentiated. Owing to the location of this locality within the Walsh et al. regional model of the Friars Formation, the absence of other SDNHM Friars Formation localities within a mile of locality 6502, the shallow depth of the borehole, and lack of stratigraphic context for this site, the strata here has been assigned to the Friars Formation, undifferentiated.

Fossils from this locality were collected as a 2,800 pound bulk sample from the Friars Formation, undifferentiaed and processing it through screen washing, heavy liquid separation, and picking. The micro fossil assemblage includes small skeletal elements of fish, xantusid, anguid, varanid, and iguanid squamates, and the crocodylid Pristichampsus. Small mammals were recovered, mostly in the form of isolated teeth. These include marsupials (Peratherium knighti), insectivores (Crypholestes vaughni and Scenopagus priscus), rodents (Metanoiamys agorus, Sciuravus powayensis), primates (Washakius woodringi), Dermopterans (Uintasorex montezumicus), and bats (Palaeochiropterygidae).

The locality is no longer accessible as the borehole has been buried in concrete.

LOCALITY 6502

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6502
Sunrise Powerlink - Eocene Micro Site

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
132850	1	spine	Osteichthyes
132851	1	vertebra	Osteichthyes
132852	1	maxilla	Anura
132853	7	dentaries	Iguanidae
132854	2	dentaries	Palaeoxantusia sp.
132855	2	dentaries	Xantusiidae
132857	200	osteoderms	Anguidae
132858	10	osteoderms	Anguidae
132859	2	cranial bones	Anguidae
132860	6	dentaries	Lacertilia
132861	1	tooth	Varanidae
132862	2	vertebrae, caudal	Varanidae
132863	26	dentaries	Lacertilia
132864	11	teeth	Serpentes
132865	1	vertebra, mid trunk	Serpentes
132866	7	vertebrae, fragments	Serpentes
132867	1	vertebra	Serpentes
132868	7	vertebrae	Squamata
132869	1	tooth	Pristichampsus sp.
132870	1	tooth	Crocodilidae
132871	12	teeth	Crocodylia
132872	1	M1, right	Peratherium sp. cf. P. knighti McGrew, 1959
132873	1	M2, left	Peratherium sp. cf. P. knighti McGrew, 1959
132874	1	m1, right	Peratherium sp. cf. P. knighti McGrew, 1959
132875	1	p3, left	Peratherium sp. cf. P. knighti McGrew, 1959
132876	1	p3, left	Peratherium sp. cf. P. knighti McGrew, 1959
132877	1	p3, left	Peratherium sp. cf. P. knighti McGrew, 1959
132878	1	m1, left	Peratherium sp. cf. P. knighti McGrew, 1959
132879	1	m3, left	Peratherium sp. cf. P. knighti McGrew, 1959
132880	1	m3, left	Peratherium sp. cf. P. knighti McGrew, 1959
132881	1	p3, left	Peratherium sp. cf. P. knighti McGrew, 1959
132882	1	M2, right?	Aethomylos simplicidens Novacek, 1976
132883	1	M3, right	Aethomylos simplicidens Novacek, 1976
132884	1	m1, right	Aethomylos sp.
132885	1	m1, left	Aethomylos sp.

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Sunrise Powerlink - Eocene Micro Site

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
132886	1	Mx, right	cf. Aethomylos sp.
132887	1	DP3, right	Crypholestes vaughni (Novacek, 1976)
132888	1	M3, right	Crypholestes vaughni (Novacek, 1976)
132889	1	M2, left	Crypholestes vaughni (Novacek, 1976)
132890	1	M2, left	Crypholestes vaughni (Novacek, 1976)
132891	1	M3, left	Crypholestes vaughni (Novacek, 1976)
132892	1	M3, left	Crypholestes vaughni (Novacek, 1976)
132893	1	M3, left, broken	Crypholestes vaughni (Novacek, 1976)
132894	1	dentary frag, with p4 - m1, right	Crypholestes vaughni (Novacek, 1976)
132895	1	dentary frag, with m1-m2, right	Crypholestes vaughni (Novacek, 1976)
132896	1	dentary frag, with m2, right	Crypholestes vaughni (Novacek, 1976)
132897	1	p4, right	Crypholestes vaughni (Novacek, 1976)
132898	1	p4, right	Crypholestes vaughni (Novacek, 1976)
132899	1	m1, right	Crypholestes vaughni (Novacek, 1976)
132900	1	m1, right	cf. Crypholestes vaughni (Novacek, 1976)
132901	1	m1, right, worn	cf. Crypholestes vaughni (Novacek, 1976)
132902	1	m2, right	Crypholestes vaughni (Novacek, 1976)
132903	1	m3, right	Crypholestes vaughni (Novacek, 1976)
132904	1	mx, right, trigonid	Crypholestes vaughni (Novacek, 1976)
132905	1	dentary fragment, left with m1	Crypholestes vaughni (Novacek, 1976)
132906	1	m1, left	Crypholestes vaughni (Novacek, 1976)
132907	1	m1, left	Crypholestes vaughni (Novacek, 1976)
132908	1	m1, left	Crypholestes vaughni (Novacek, 1976)
132909	1	m2, left	Crypholestes vaughni (Novacek, 1976)
132910	1	m2, left	Crypholestes vaughni (Novacek, 1976)
132911	1	m2, left, worn	Crypholestes vaughni (Novacek, 1976)
132912	1	m2, left	Crypholestes vaughni (Novacek, 1976)
132913	1	m3, left	Crypholestes vaughni (Novacek, 1976)
132914	1	P4, left	Patriolestes novaceki Walsh, 1998
132915	1	m3, left, worn trigonid	cf. Scenopagus priscus (Marsh, 1872)
132916	1	m3, right	Scenopagus sp. cf. S. priscus (Marsh, 1872)
132917	1	m3, right	Scenopagus sp. cf. S. priscus (Marsh, 1872)
132918	1	m3, right	Scenopagus sp. cf. S. priscus (Marsh, 1872)
132919	1	m3, left, broken trigonid	Scenopagus sp. cf. S. priscus (Marsh, 1872)
132920	1	M1, left	Apatemys sp.

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Sunrise Powerlink - Eocene Micro Site

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
132921	1	m3, left	Centetodon aztecus Lillegraven et al., 1981
132922	1	p4, left, worn	cf. Centetodon bembicophagus Lillegraven et al., 1981
132923	1	m3, right	Nyctitherium sp.
132924	1	M3, left	Soricomorpha
132925	1	Px	Insectivora
132926	1	M3, left	Insectivora
132927	1	Px	Insectivora
132928	1	M1 or M2, right	Ischyromidae
132929	1	M1 or M2, right	Ischyromidae
132930	1	1/2 M1 or M2, right	Ischyromidae
132931	1	M3, right	Ischyromidae
132932	1	M1 or M2, left	Ischyromidae
132933	1	M3, Left	Ischyromidae
132934	1	m2, right	Ischyromidae
132935	1	m3, right	Ischyromidae
132936	1	p4, right	Ischyromidae
132937	1	p4, left	Ischyromidae
132938	1	p4, left	Leptotomus sp. cf. L. caryophilus Wilson, 1940
132939	1	M1 or M2, left, weathered	cf. Microparamys sp.
132940	1	DP4, right	Metanoiamys agorus Chiment and Korth, 1996
132941	1	M1, right	Metanoiamys agorus Chiment and Korth, 1996
132942	1	M1, right	Metanoiamys agorus Chiment and Korth, 1996
132943	1	M1, right	Metanoiamys agorus Chiment and Korth, 1996
132944	1	M1, right	Metanoiamys agorus Chiment and Korth, 1996
132945	1	M2, right	Metanoiamys agorus Chiment and Korth, 1996
132946	1	M2, right	Metanoiamys agorus Chiment and Korth, 1996
132947	1	M2, right	Metanoiamys agorus Chiment and Korth, 1996
132948	1	M1, left	Metanoiamys agorus Chiment and Korth, 1996
132949	1	M2, left	Metanoiamys agorus Chiment and Korth, 1996
132950	1	M3, left	Metanoiamys agorus Chiment and Korth, 1996
132951	1	p4, right	Metanoiamys agorus Chiment and Korth, 1996
132952	1	m1, right	Metanoiamys agorus Chiment and Korth, 1996
132953	1	m1, right	Metanoiamys agorus Chiment and Korth, 1996
132954	1	m1, right, broken trigonid	Metanoiamys agorus Chiment and Korth, 1996
132955	1	m2, right	Metanoiamys agorus Chiment and Korth, 1996

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Sunrise Powerlink - Eocene Micro Site

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
132956	1	m2, right	Metanoiamys agorus Chiment and Korth, 1996
132957	1	m2, right	Metanoiamys agorus Chiment and Korth, 1996
132958	1	p4, left	Metanoiamys agorus Chiment and Korth, 1996
132959	1	m1, left	Metanoiamys agorus Chiment and Korth, 1996
132960	1	m1 or m2, left	Metanoiamys agorus Chiment and Korth, 1996
132961	1	m2, left	Metanoiamys agorus Chiment and Korth, 1996
132962	1	m2, left	Metanoiamys agorus Chiment and Korth, 1996
132963	1	m2, left	Metanoiamys agorus Chiment and Korth, 1996
132964	1	m2, left	Metanoiamys agorus Chiment and Korth, 1996
132965	1	m2, left, trigonid broken	Metanoiamys agorus Chiment and Korth, 1996
132966	1	M1, right	Sciuravus powayensis Wilson, 1940
132967	1	P4, left	Sciuravus powayensis Wilson, 1940
132968	1	P4, left	Sciuravus powayensis Wilson, 1940
132969	1	P4, left, broken	Sciuravus powayensis Wilson, 1940
132970	1	M1, left	Sciuravus powayensis Wilson, 1940
132971	1	m2, right	Sciuravus powayensis Wilson, 1940
132972	1	m1, right, broken trigonid	Sciuravus powayensis Wilson, 1940
132973	1	m1 or m2, right, worn	Sciuravus powayensis Wilson, 1940
132974	1	m2, right	Sciuravus powayensis Wilson, 1940
132975	1	m2, right	Sciuravus powayensis Wilson, 1940
132976	1	m3, right	Sciuravus powayensis Wilson, 1940
132977	1	m1, left	Sciuravus powayensis Wilson, 1940
132978	1	M3, left	Sciuravus powayensis Wilson, 1940
132979	1	dpx, right	Rodentia
132980	1	tooth	Rodentia
132981	1	p4, right	Rodentia?
132982	1	talonid, right	Rodentia?
132983	1	lower molar fragment	Rodentia?
132984	1	M2, right	Washakius woodringi (Stock, 1938)
132985	1	M2, right	Washakius woodringi (Stock, 1938)
132986	1	M1, right	Uintasorex montezumicus Lillegraven, 1976
132987	1	M1 or M2, right	Uintasorex montezumicus Lillegraven, 1976
132988	1	M1, left	Uintasorex montezumicus Lillegraven, 1976
132989	1	M1 or M2, left	Uintasorex montezumicus Lillegraven, 1976
132990	1	m1 or m2, left	Uintasorex montezumicus Lillegraven, 1976

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FAUNAL LIST FOR LOCALITY 6502
Sunrise Powerlink - Eocene Micro Site

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
132991	1	M1 or M2, left	Palaeochiropterygidae?
132992	1	incisor	Mammalia
132993	1	Px, right	Mammalia
132994	1	px, right	Mammalia
132995	1	px, right	Mammalia
132996	1	px, left	Mammalia
132997	1	px, left	Mammalia
132998	1	Px	Mammalia
132999	1	Px	Mammalia
133000	1	broken antemolar	Mammalia
133001	1	lower antemolar, worn	Mammalia
133002	1	tooth frag	Mammalia
133003	1	astragalus	Mammalia
133004	110	teeth, broken	Mammalia
133005	29	incisors	Mammalia
133006	1	tooth	Mammalia
133007	19	phalanges, carpal, tarsals, metapodials	Mammalia
133008	2	sesamoids	Mammalia
133009	1	vertebra	Mammalia
133010	1	vertebra	Chordata

DATE 03/25/13
TIME 19:29:34

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6503

LOCALITY # 6503
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
see below

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 480 FT

LATITUDE 32°46'41"N VARIANCE
LONGITUDE 116°66'18"W

UTM 11 593213 3626909 VARIANCE

MAP NAME Carrizo Mtn, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Latrania Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH late Miocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT shallow marine, pre-delta
CITATION

DONATED BY
BLM 28 Nov 2011

FIELD NOTES
BOR #37, pg 111, 116; GC #3 pg 59
COLLECTOR
BOR, PJS, GC 28 Nov 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 118 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6503 represents a series of three discovery sites that were exposed on the southern end of the Coyote Mountains, approximately 3 miles north of Interstate 8 and the town of Ocotillo. The sites were on the north side of the SRPL mainline in the vicinity of EP 304/305.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Fossils from locality 6503 were recovered from the lower portion of the Latrania Formation. Generally, exposures in the vicinity of this locality consisted of pale yellow, fine- to coarse-grained, massive sandstones containing local accumulations of marine invertebrate and vertebrate fossils. The sandstones likely accumulated in a shallow sublittoral benthic marine environment that was receiving periodic coarse-grained sediment from nearby rugged highlands. The Latrania Formation across these three sites ranged from a medium- to fine-grained, pale yellow brown (10YR6/2) to yellowish gray (5Y7/2) cemented sandstone. These marine sandstone beds were resting on shelly breccia or unconformably on schist basement rocks.

Fossils were collected by prospecting natural exposures north of the mainline and through hand excavating from the ground surface or canyon walls. Specimens recovered include a partial, poorly preserved vertebra of a baleen whale (BOR 28Nov11-1), a large partial shell of the gastropod Strombus and a pecten (BOR29Nov11-1), and a complete shark tooth (GC3Dec11-1)

Field Numbers: BOR28Nov11-1, BOR26Jul11-1, GC3Dec11-1

Collecting Dates: 28 Nov 11, 29 Nov 11, 3 Dec 11

Elevations: 620, 480, 488

LOCALITY 6503

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6503
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134419	1	tooth, partial, crown	cf. Isurus sp.
134420	1	tooth plate, partial	Myliobatiformes
134421	1	jaw tooth, premax or dentary	Semicossyphus sp.
134422	19	pharyngeal teeth	Osteichthyes
134423	1	palate	Osteichthyes
134424	9	vertebra?	Mysticeti
134817	10	molds, internal w/ some original shell	Strombus galeatus Swainson, 1823
134818	1	valve, partial, attached to matrix	Euvola keepi (Arnold, 1906)
134819	1	spine, near complete	Cidaridae

DATE 03/25/13
TIME 19:29:35

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6504

LOCALITY # 6504 | LOCALITY NAME Sunrise Powerlink | FIELD NUMBER see below

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 492 FT

LATITUDE 32°46'37"N VARIANCE
LONGITUDE 116° 0'20"W

UTM 11 593130 3626803 VARIANCE

MAP NAME Carrizo Mtn, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Mud Hill Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY mdst | DEPOSITIONAL ENVIRONMENT Pro-delta

CITATION

DONATED BY
BLM 5 Jul 2011

FIELD NOTES
BOR #37, pg 12; GC #3, pg 58, 127, 129
COLLECTOR
BOR, PJS, GC 5 Jul 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6504 represents a series of four discovery sites that were exposed on the southern end of the Coyote Mountains which is approximately 3 miles north of Interstate 8 and town of Ocotillo. These sites were collected and re-collected over six different days within the tower pad and immediately adjacent vicinity of EP304 on the SRPL mainline.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Strata from this locality (6504) are believed be the Mud Hills Member of the Deguynos Formation. Exposures here consist of olive green, massive siltstones and claystones. Fossils were collected from a massive yellow gray (5Y7/2), massive mudstone unit.

The invertebrate fossil assemblage is dominated by internal and external molds of infaunal bivalve mollusks and epifaunal decapods crustaceans. BOR26Jul11-1, crab claws and shells, were collected by prospecting spoils dug from leg A of EP304. GC26Jul11-1, 6 flats of matrix blocks containing crabs, fish bones, scales, plant material, and bivalve steinkerns were quarried from a fresh exposures on a slope on the east side of tower EP304. GC5Jul11-1, fish bones, scales, bivalve steinkerns, and plant hash, and a bulk sample of 45 lbs were collected from the spoils of a fault trench near EP304. GC8Jul11-1, 5 flats of matrix blocks containing gastropod and bivalve steinkerns, fish scales and bone, and a possible crab claw were quarried near EP304.

Most of these localities are still accessible.

Field Numbers: GC26Jul11-1, GC8Jul11-1, GC5Jul11-1, BOR26Jul11-1
Collecting Dates: 5 Jul 11, 8 Jul 11, 14 Jul 11, 26 Jul 1, 28 Nov 11, 29 Nov 11
Elevations: 485-492, 513, 502, 503
LOCALITY 6504

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6504
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134226	1	test, within matrix	Foraminiferida
134227	21	tests,	Foraminiferida
134228	2	molds, part/counterpart	Neogastropoda
134229	2	molds, part/counterpart	Neogastropoda
134230	2	valve & mold, part/counterpart	cf. Amusium sp.
134231	2	valve & mold, part/counterpart	cf. Amusium sp.
134232	4	valves, partial & fragments	cf. Amusium sp.
134233	2	molds, part/counterpart	Tellinidae
134234	1	mold, internal	Tellinidae
134235	2	molds, part/counterpart	Macoma sp.
134236	2	molds, butterflied, part/counterpart	Macoma sp.
134237	2	molds, part/counterpart	Macoma sp.
134238	2	molds, part/counterpart	Macoma sp.
134239	2	molds, part/counterpart	Tellinidae
134240	2	molds, part/counterpart	Macoma sp.
134241	2	molds, part/counterpart	Tellinidae
134242	2	molds, internal	Tellinidae
134243	2	molds, butterflied, part/counterpart	Veneroida
134244	2	molds, part/counterpart	Tellinidae
134245	2	molds, part/counterpart	Veneroida
134246	2	molds, part/counterpart	Veneroida
134247	1	mold, butterflied	Macoma sp.
134248	2	molds, part/counterpart	Veneroida
134249	3	molds, internal	Tellinidae
134250	1	mold, internal	cf. Miltha sp.
134251	2	molds, part/counterpart	Pelecypoda
134252	2	molds, part/counterpart	Pelecypoda
134253	2	molds, part/counterpart	Pelecypoda
134254	2	carapace & claw, part/ counterpart	Decapoda
134255	2	molds, part/counterpart	Decapoda
134256	1	carapace w/ cheliped	Decapoda
134257	1	Carapace w/ chelipeds, articulated	Decapoda
134258	2	cheliped, part/counterpart	Decapoda
134259	2	dactyl, part/counterpart	Decapoda
134260	2	merus, part/counterpart	Decapoda

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6504
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134261	1	dactyl	Decapoda
134262	2	body parts, part/counterpart	Malacostraca
134263	2	body parts	Malacostraca
134264	2	impression of test, part/counterpart	Schizaster morlini Grant & Hertlein, 1956
134265	2	impression of test, part/counterpart	Lovenia sp.
134266	2	impression of test, part/counterpart	Lovenia sp.
134267	2	impression of test, part/counterpart	Lovenia sp.
134268	1	impression of test w/spines	Lovenia sp.
134269	5	impressions of test fragments, crushed	Lovenia sp.
134270	1	spine, fragment	Lovenia sp.
134271	2	impression of test, part/counterpart	Spatangoida
134272	2	impression of test, part/counterpart	Spatangoida
134273	2	impression of test, part/counterpart	Spatangoida
134274	3	impressions of tests, partial	Echinoidea
134275	2	spines, part/counterpart	Echinoidea
134276	2	spine, fragments	Echinoidea
134277	2	burrow, backfilled	Ichnofossil
134278	1	burrow, backfilled	Ichnofossil
134279	1	borrings into a peleycopoda valve	Ichnofossil
134280	2	impression, steam, part/counterpart	Tracheophyta
134425	1	tooth	Osteichthyes
134426	1	tooth	Osteichthyes
134427	1	vertebra	Osteichthyes
134428	1	urohyal or hyplural fan	Osteichthyes
134429	1	cleithrum?	Osteichthyes
134430	1	cleithrum	Osteichthyes
134431	2	vertebra, part-counter part,	Osteichthyes
134432	3	bone fragments	Osteichthyes
134433	2	bone, part-counterpart	Osteichthyes
134434	1	scale	Osteichthyes
134435	1	scale	Osteichthyes
134436	1	scales	Osteichthyes
134437	2	scales	Osteichthyes
134438	1	scale	Osteichthyes
134439	1	scale?	Osteichthyes

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6504
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134440	1	scales?	Osteichthyes
134441	1	scale	Osteichthyes
134442	1	scale	Osteichthyes
134443	2	scale, part and counterpart	Osteichthyes
134444	1	scale	Osteichthyes
134445	1	tooth	Serpentes

DATE 03/25/13
TIME 19:29:36

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6505

LOCALITY # 6505 | LOCALITY NAME Sunrise Powerlink | FIELD NUMBER GC6Jul11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 440 FT

LATITUDE 32°46'28"N VARIANCE
LONGITUDE 116° 0' 5"W

UTM 11 593518 3626530 VARIANCE

MAP NAME Carrizo Mtn, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Mud Hill Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst | DEPOSITIONAL ENVIRONMENT Pro-delta
CITATION

DONATED BY
BLM 6 Jul 2011

FIELD NOTES
GC#2, pg 128
COLLECTOR
GC 6 Jul 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6505 represents a single discovery site that was exposed on the southern end of the Coyote Mountains, which is approximately 3 miles north of Interstate 8 and town of Ocotillo. The Locality collected was along the access road to the tower pad for EP304 on the SRPL mainline and was approximately 1200 feet southest of the tower pad EP305.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

The fossil locality 6505 was recovered from lower portion of the Deguynos Formation in strata believed to be the Mud Hill Member. Exposures here consist of pale orange, massive, fine-grained, silty sandstones with local concentrations of marine invertebrate fossils.

The invertebrate fossil assemblage is dominated by mineralized shells of infaunal bivalve mollusks. These organisms likely lived in the prodelta (seaward) region of the prograding, ancestral Colorado River delta.

Fossils were recovered by excavating half of a bucket of blocks containing oysters and scallops from the slope adjacent to the access road.

The locality is still accessible

LOCALITY 6505

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6505
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134281	1	mold, internal	Archeogastropoda
134282	3	molds, part/counterparts	Turritella imperialis Hanna, 1926
134283	2	molds, part/counterpart	Turritella imperialis Hanna, 1926
134284	5	molds, internal	Turritella imperialis Hanna, 1926
134285	1	mold, internal	Turritella sp.
134286	5	valves, partial & fragments	Ostreidae
134287	2	valves, partial	Anomia subcostata Conrad, 1855
134288	5	molds, internal & external	Trachycardium sp. cf. T. pristileura (Dall, 1901)
134289	8	molds, internal	Tellina sp.
134290	2	molds, part/counterpart	Pitar sp.
134291	2	molds, part/counterpart	Pitar sp.
134292	2	molds, part/counterpart	Pitar sp.
134293	1	moldinternal	Pitar sp.
134294	1	mold, internal	Teredinidae
134295	2	molds, part/counterpart	Pelecypoda
134296	2	molds, part/counterpart	Pelecypoda
134297	1	burrows	Ichnofossil

DATE 03/25/13
TIME 19:31:10

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6506

LOCALITY # 6506 | LOCALITY NAME Sunrise Powerlink | FIELD NUMBER GC30Jul11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 454 FT

LATITUDE 32°46'47"N VARIANCE
LONGITUDE 115°59'29"W

UTM 11 594462 3627133 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Yuha Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY mdst | DEPOSITIONAL ENVIRONMENT delta-front
CITATION

DONATED BY
BLM 30 Jun 2011

FIELD NOTES
GC#2, pg 125
COLLECTOR
GC 30 Jun 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6506 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 3 miles north of Interstate 8 and town of Ocotillo. This site was inside of the temporary grading limits of EP307.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Exposures in the vicinity of locality 6506 consist of yellowish brown, claystones and siltstones with local concentrations of marine invertebrate fossils. The invertebrate fossil assemblage at this locality was collected from a bed of yellowish gray (5Y8/1) very fine-grained sandstone. These strata are presumably from the Yuha Member (delta front) portion of the Deguynos Formation.

The locality was dominated by mineralized shells of infaunal bivalve mollusks and epifaunal gastropod mollusks. These organisms likely lived in the submerged delta plain (landward) region of the prograding, ancestral Colorado River delta. A single flat of oyster shells and steinkerns of the gastropod Turritella were collected at the site.

The locality is still accessible.

LOCALITY 6506

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6506
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134298	10	valves, left & right, whole & partial	Pycnodonte heermanni (Conrad, 1855)

DATE 03/25/13
TIME 19:31:12

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6507

LOCALITY # 6507
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
BOR2Dec11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 453 FT

LATITUDE 32°46'47"N VARIANCE
LONGITUDE 115°59'26"W

UTM 11 594523 3627110 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Yuha Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY mdst
DEPOSITIONAL ENVIRONMENT delta-front
CITATION

DONATED BY
BLM 2 Dec 2011

FIELD NOTES
BOR #37, pg 13
COLLECTOR
BOR 2 Dec 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. This locality represents a single discovery that was exposed on the southern end of the Coyote Mountains which is approximately 3 miles north of Interstate 8 and town of Ocotillo. This locality was collected from the north facing slope of a small hill 150 feet southeast and on the opposite side of the access road from EP307 of the SRPL mainline.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Fossils were collected from a cemented, crossbedded, oyster coquina resistant bed within light yellowish siltstone matrix. This bed was one of several channel deposits in the area which were typified by the occurrence of dense concentrations of transported isolated oyster shells. This bed is within the Yuha Member of the Deguynos Formation.

The invertebrate fossil assemblage is dominated by mineralized shells of infaunal bivalve mollusks. These organisms likely lived in the submerged delta plain (landward) region of the prograding, ancestral Colorado River delta. Fossils were recovered by hand digging into the natural exposure and collecting a bulk sample of 50 lbs.

The locality is still accessible.

LOCALITY 6507

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6507
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134299	1	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134300	1	valves, partial & fragments	Anomia subcostata Conrad, 1855
134301	1	valves, partial & fragments	Argopecten sp.
134302	1	wall plates attached to shell	Balanidae

DATE 03/25/13
TIME 19:31:13

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6508

LOCALITY # 6508
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
BOR2Dec11-2

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 455 FT

LATITUDE 32°46'51"N VARIANCE
LONGITUDE 115°59'12"W

UTM 11 594898 3627257 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Yuha Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT delta-front
CITATION

DONATED BY
BLM 2 Dec 2011

FIELD NOTES
BOR #37, pg 13
COLLECTOR
BOR 2 Dec 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6508 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 3 miles north of Interstate 8 and town of Ocotillo. The locality was 191 feet northwest of EP308. Fossils were collected from a resistant 10 degree dipping bed represented as a small hogback.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Exposures at this locality consist of light yellowish orange, well cemented, cross-bedded, oyster shell coquinas interbedded with more friable massive claystones and siltstones. Fossils from locality 6508 were collected from a cemented, cross-bedded oyster coquina resistant bed within light yellowish siltstone matrix. This bed was one of several channel deposits in the area which were typified by the occurrence of dense concentrations of transported isolated oyster shells. This bed is within the Yuha Member of the Deguynos Formation.

The invertebrate fossil assemblage is dominated by mineralized shells of infaunal bivalve mollusks that were transported in distributary channels. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

Fossils were recovered by hand digging into the natural exposure and collecting a bulk sample of 50 lbs.

LOCALITY 6508

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6508
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134303	2	encrusting form	Bryozoa
134304	1	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134305	67	valves, partial& fragments	Argopecten sp.
134306	2	valves, partial	Anomia subcostata Conrad, 1855
134307	10	valves, partial, left & right	Pycnodonte heermanni (Conrad, 1855)

DATE 03/25/13
TIME 19:33:45

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6509

LOCALITY # 6509
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
see below

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 445 FT

LATITUDE 32°46'51"N VARIANCE
LONGITUDE 115°59'10"W

UTM 11 594946 3627243 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Yuha Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT delta-front
CITATION

DONATED BY
BLM 27 Jul 2011

FIELD NOTES
BOR #37, pg 14, GC #2, pg 126
COLLECTOR
BOR, GC 27 Jul 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. This locality represents a series of two discovery sites as on the southern end of the Coyote Mountains which is approximately 3 miles north of Interstate 8 this temporarily exposed in the borehole drilled for tower leg B at EP308 and during grading of the tower pad and adjacent access road.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Locality 6509 was discovered in the Yuha Member of the Deguynos Formation. Exposures at this locality were within a yellowish orange (10YR7/6), very fine-grained sandstone. This bed was within east-dipping (~27 degree) oyster shell coquinas interbedded with olive greenish gray massive mudstones.

The invertebrate fossil assemblage is dominated by mineralized shells of infaunal bivalve mollusks that were transported in distributary channels. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

Fossils were collected by prospecting spoils from leg B of EP 308 (BOR27Jul11-1) and from surface collection near spoil pile from pad excavation of EP308. A total of 2 flats of individual urchin spines, crab, barnacles, oysters and scallops were collected. Shells were represented by individual valves that were concordant to bedding and occurred over several horizons.

Field Numbers: BOR27Jul11-1, GC1Jul11-4
Collecting Dates: 27 Jul 11, 1 Jul 11
Elevation Range: 445, 427
LOCALITY 6509

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6509
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134308	5	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134309	2	wall plates articulated	Balanidae
134310	7	wallplates	Balanidae

DATE 03/25/13
TIME 19:33:47

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6510

LOCALITY # 6510
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
BOR30Jul11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 415 FT

LATITUDE 32°46'53"N VARIANCE
LONGITUDE 115°58'58"W

UTM 11 595265 3627320 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Yuha Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT delta-front
CITATION

DONATED BY
BLM 30 Jul 2011

FIELD NOTES
BOR #37, pg 16
COLLECTOR
BOR 30 Jul 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6510 represents a single discovery site that was exposed on the southern end of the Coyote Mountains, approximately 3 miles north of Interstate 8 and town of Ocotillo. The site was exposed in the borehole drilled for tower leg C at EP309.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Fossils from locality 6510 were within a bed of yellowish gray (5Y8/1) mudstone with a series light brown massive mudstones and siltstones. These strata were within the Yuha Member in the middle portion of the Deguynos Formation.

The invertebrate fossil assemblage is dominated by internal and external molds shells of infaunal bivalve mollusks that lived in interchannel mudflats. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

A total of 1 flat of oxidized steinkerns was collected by prospecting spoils from the borehole.

The locality has been buried in concrete.

LOCALITY 6510

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6510
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134889	3	valves, partial & fragments	Ostreidae
134890	1	hinge, partial	cf. Argopecten sp.
134891	1	steinkern of paired valves	cf. Nuculana sp.
134892	2	molds, internal	Tellinidae
134893	2	molds, internal	Veneroida
134894	2	valve, fragments	Pelecypoda
134895	1	possible pelecypoda impression	Inserta sedis

DATE 03/25/13
TIME 20:57:40

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6511

LOCALITY # 6511
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
BOR2Dec11-4

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 438 FT

LATITUDE 32°46'54"N VARIANCE
LONGITUDE 115°58'59"W

UTM 11 595229 3627354 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Yuha Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY mdst
DEPOSITIONAL ENVIRONMENT delta-front
CITATION

DONATED BY
BLM 2 Dec 2011

FIELD NOTES
BOR #37, pg 16
COLLECTOR
BOR 2 Dec 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6511 represents a two discovery sites that were discovered on the southern end of the Coyote Mountains which is approximately 3 miles north of Interstate 8 and town of Ocotillo. These two sites were temporarily exposed in the boreholes drilled for tower leg A and D at EP309.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Locality 6511 was discovered in exposures that consist of well cemented, oyster shell coquinas interbedded with light brown to olive greenish gray massive mudstones and siltstones. These beds were within the Yuha Member of the Deguynos Formation.

The invertebrate fossil assemblage is dominated by mineralized shells of epifaunal bivalve mollusks that were transported in distributary channels. Some shells recovered from this locality preserved borings produced by predatory natcid gastropods. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

Two flats total of isolated oysters were collected from this locality. One from each of the two borehole spoil piles.

The locality has been buried in concrete.

Field Numbers: BOR2Dec11-4, BOR28Jul11-2
Dates Collected: 28 Jul 2011, 2 Dec 2011
Elevations: 425-427 and 438
LOCALITY 6511

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6511
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134896	15	borings in pelecypoda valves	Naticidae
134897	863	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134898	10	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134899	5	valves, whole & partial, left & right	Ostreidae
134900	7	valves, whole & partial, left & right	Argopecten deserti (Conrad, 1855)
134901	119	valve, fragments	Argopecten sp. cf. A. deserti (Conrad, 1855)
134902	2	spine, fragments	Echinoidea

DATE 03/25/13
TIME 19:33:49

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6512

LOCALITY # 6512 — LOCALITY NAME: Sunrise Powerlink

FIELD NUMBER: GC1Jul11-3

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 440 FT

LATITUDE 32°46'53"N VARIANCE
LONGITUDE 115°58'58"W

UTM 11 595255 3627341 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Yuha Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY mdst
DEPOSITIONAL ENVIRONMENT delta-front
CITATION

DONATED BY
BLM 1 Jul 2011

FIELD NOTES
GC #2 pg 126
COLLECTOR
GC 1 Jul 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6512 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 3 miles north of Interstate 8 and town of Ocotillo. Fossils were discovered on the tower pad, 20 feet north of leg D for EP309.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Locality 6512 was discovered in a bed of yellowish orange (10YR7/6) fine to very-fine grained sandstone. Exposures in the general vicinity of fossil locality consist of olive greenish gray massive mudstones and siltstones. These beds are part of Yuha Member of the Deguynos Formation.

The invertebrate fossil assemblage is dominated by preserved shells of oysters and pectens that lived in interchannel mudflats. Also occurring in the recovered fossil assemblage are teeth of several different species of sharks. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

A total of 1 flat and 1 bucket of shell-rich matrix was collected by hand-quarrying into the tower pad.

The locality has been graded away.

LOCALITY 6512

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6512
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134446	1	tooth, lateral posterior	Heterodontus sp.
134447	1	tooth	Carcharhinus sp.
134903	2	steinkerns	Diodora sp. cf. D. cayenensis Lamarck, 1822
134904	1	steinkern	Gastropoda
134905	36	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134906	63	valves, whole & partial, left & right	Ostreidae
134907	2	valves, whole	Argopecten deserti (Conrad, 1855)
134908	66	valve, fragments	Argopecten sp.
134909	3	byssal plugs	Anomia sp.

DATE 03/25/13
TIME 19:37:31

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6513

LOCALITY # 6513 — LOCALITY NAME: Sunrise Powerlink

FIELD NUMBER: GC29Jun11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 434 FT

LATITUDE 32°46'51"N VARIANCE
LONGITUDE 115°58'57"W

UTM 11 595500 3627434 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Camels Head Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY: slst
DEPOSITIONAL ENVIRONMENT: delta-plain
CITATION

DONATED BY
BLM 29 Jun 2011

FIELD NOTES
GC #2 pg 124
COLLECTOR
GC 29 Jun 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6513 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 3 miles northeast of Interstate 8 and town of Ocotillo. This locality was exposed during grading of the mainline access road between EP 309 and EP310 and occurs approximately 200 feet north of the mainline.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Locality 6513 was discovered in a yellowish, light olive gray (5Y6/2) mudstone. Exposures in the vicinity of the site generally consist of light brown to olive greenish gray massive mudstones and siltstones. These strata are believed to be in the Camels Head Member of the upper portion of the Deguynos Formation.

The invertebrate fossil assemblage is dominated by internal and external shell molds of a single species of infaunal bivalve mollusk that lived in interchannel mudflats. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta. Although the assemblage is dominated by internal and external molds, some poorly preserved shell material also occurred.

One flat of steinkern-rich matrix blocks was excavated from a natural out cropping.

The locality is still accessible

LOCALITY 6513

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6513
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134910	15	molds, internal & external	Solecardia sp.

DATE 03/25/13
TIME 19:37:32

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6514

LOCALITY # 6514 LOCALITY NAME Sunrise Powerlink

FIELD NUMBER GC1Jul11-2

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 390 FT

LATITUDE 32°46'57"N VARIANCE
LONGITUDE 115°58'38"W

UTM 11 595780 3627425 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Camels Head Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY clyst
DEPOSITIONAL ENVIRONMENT delta-plain, esturaine channel
CITATION

DONATED BY
BLM 29 Jun 2011

FIELD NOTES
GC #2 pg 126
COLLECTOR
GC 29 Jun 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6514 represents a single discovery site that was collected on two different days. This site is on the southern end of the Coyote Mountains which is approximately 3 miles northeast of Interstate 8 and town of Ocotillo. This locality was temporarily exposed in the borehole drilled for tower leg B and on the pad at EP310, and during grading of the access road to the tower pad.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were

reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Locality 6514 was discovered in a pale orange-yellowish brown (10YR7/2) mudstone bed. The exposures here consist of well cemented, oyster shell coquinas interbedded with light brown to olive greenish gray massive mudstones and siltstones. These beds are presumably within the Camels Head Member in the upper portion of the Deguynos Formation.

The invertebrate fossil assemblage is dominated by internal and external shell molds of infaunal bivalve mollusks and crabs that lived in interchannel mudflats. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

A total of 3 flats of small matrix blocks were collected by prospecting spoils, and graded pad and roadway surfaces. Fossils were hand excavated from the graded surfaces and cherry picked from spoils piles.

The fossil sites have been graded away and buried in concrete.

LOCALITY 6514

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6514
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134911	1	encrusted on pecten valve	Bryozoa
134912	2	molds, internal & external	Ostreidae
134913	2	valve w/ mold, part/counterpart	Argopecten sp. cf. A. deserti (Conrad, 1855)
134914	5	valve, fragments	Argopecten sp.
134915	2	valves, attached to matrix	cf. Anomia sp.
134916	3	molds, internal & external	cf. Nuculana sp.
134917	2	mold, part/counterpart	cf. Tagelus sp.
134918	2	steinkern & molds, part/counterpart	cf. Tagelus sp.
134919	10	molds, internal and external	cf. Tagelus sp.
134920	1	mold, internal of a pair, butterflied	cf. Siliqua sp.
134921	3	molds, external	cf. Siliqua sp.
134922	5	molds, internal	Veneroida
134923	1	mold, exterier	Veneroida
134924	11	molds, interior & exterier	Cyrtopleura costata (Linne, 1758)
134925	2	carapace, part/counterpart	Decapoda
134926	1	dactyl	Decapoda
134927	1	dactyl	Decapoda
134928	2	cheliped	Decapoda
134929	2	impression with spines, part/counterpart	Echinoidea
134930	1	impression	Inserta sedis

DATE 03/25/13
TIME 19:37:34

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6515

LOCALITY # 6515 LOCALITY NAME Sunrise Powerlink

FIELD NUMBER GC1Jul11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 365 FT

LATITUDE 32°46'59"N VARIANCE
LONGITUDE 115°58'22"W

UTM 11 596183 3627544 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Camels Head Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY mdst
DEPOSITIONAL ENVIRONMENT delta-plain
CITATION

DONATED BY
BLM 12 Jul 2011

FIELD NOTES
GC #2 pg 130
COLLECTOR
GC 12 Jul 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6515 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 3 miles northeast of Interstate 8 and town of Ocotillo. This locality was temporarily exposed in the borehole drilled for tower leg A at EP311 and during clearing of the tower pad.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Locality 6515 was within a yellowish gray (5Y7/2) mudstone bed. Exposures at this site generally consist of olive green massive mudstones. These beds are presumably within the Camels Head Member of the upper portion of the Deguynos Formation.

The invertebrate fossil assemblage is chracterized by internal and external shell molds of infaunal bivalve mollusks and heart urchins that lived in interchannel mudflats. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

One flat of small matrix blocks containing shell remains of gastropods and pelecypods was collected by prospecting spoils from the borehole drilling and hand excavating from the floor of the tower pad.

The locality has been graded away and buried in concrete.

LOCALITY 6515

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6515
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134931	1	mold, external	Gastropoda
134932	1	mold, exterier	Gastropoda
134933	3	valve, fragments	cf. Argopecten sp.
134934	3	valve, fragments	Pterioida
134935	1	mold, internal of a pair, butterflied	cf. Gari sp.
134936	1	mold,internal	Veneroida
134937	2	molds, part/counterpart	Veneroida
134938	1	mold, internal	Veneroida
134939	1	mold, internal	Pelecypoda
134940	1	mold, exterier	Pelecypoda
134941	1	mold, interier	Pelecypoda
134942	1	mold, external	Pelecypoda
134943	2	molds, part/counterpart	Pelecypoda
134944	2	impressions of wood or leaf material	Tracheophyta

DATE 03/25/13
TIME 19:37:35

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6516

LOCALITY # 6516
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
GC12Jul11-2

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 375 FT

LATITUDE 32°46'59"N VARIANCE
LONGITUDE 115°58'21"W

UTM 11 596216 3627508 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Camels Head Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY mdst
DEPOSITIONAL ENVIRONMENT delta-plain, intertidal
CITATION

DONATED BY
BLM 12 Jul 2011

FIELD NOTES
GC #2 pg 141
COLLECTOR
GC 12 Aug 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6516 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 3 miles northeast of Interstate 8 and town of Ocotillo. The locality was an exposed oyster bed on the ground surface which was impacted by walkway leading from the access road to tower pad EP311.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Locality 6516 was a densely packed, bioclast supported, oyster bed in a olive green massive mudstone matrix. This bed was within the Camels Head Member of the upper portion of the Deguynos Formation.

The invertebrate fossil assemblage is dominated by mineralized shells of epifaunal bivalve mollusks and acorn barnacles that were transported in distributary channels. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

One half bucket of matrix rich with predominately oyster shells, was collected by using a hoe-pick and shovel to quarry into the ground surface. The assemblage consisted mostly of single oyster valves with occasional paired valves and pectin shells.

The locality is still accessible.

LOCALITY 6516

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6516
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134945	10	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134946	7	valve, fragments	cf. Argopecten sp.
134947	3	paired valves, articulated	Anomia subcostata Conrad, 1855
134948	30	byssal plugs	Anomia subcostata Conrad, 1855
134949	25	valves, whole & partial, left & right	Anomia subcostata Conrad, 1855
134950	1	wall plate	Balanidae

DATE 03/25/13
TIME 19:40:16

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6517

LOCALITY # 6517 | LOCALITY NAME Sunrise Powerlink | FIELD NUMBER BOR29Nov11-2

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 397 FT

LATITUDE 32°46'51"N VARIANCE
LONGITUDE 115°58'20"W

UTM 11 596241 3627456 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Camels Head Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT delta-plain, intertidal
CITATION

DONATED BY
BLM 29 Nov 2011

FIELD NOTES
BOR #37, pg 141
COLLECTOR
BOR 29 Nov 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6517 represents a single discovery site that was were exposed on the southern end of the Coyote Mountains which is approximately 3 miles northeast of Interstate 8 and town of Ocotillo. The locality was exposed in a natural arroyo cut bank 370 feet southwest of EP311.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Locality 6517 was within a dark brownish gray, poorly sorted, fine- to coarse-grained, cross-bedded sandstone. This bed was presumably within the Camels Head Member of the upper portion of the Deguynos Formation. This bed was overlain and underlain by a series of coarse-grained sandstone channel deposits.

A single shark tooth was collected from this locality and was probably transported into a distributary channel. This marine vertebrate likely lived in the nearshore marine environment immediately offshore of the prograding, ancestral Colorado River delta

The locality is still accessible.

LOCALITY 6517

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6517
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
135079	1	tooth	Carcharias sp.

DATE 03/25/13
TIME 19:41:12

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6518

LOCALITY # 6518
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
see below

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 394 FT

LATITUDE 32°47' 1"N VARIANCE
LONGITUDE 115°58'13"W

UTM 11 596429 3627608 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Camels Head Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT delta-plain, intertidal
CITATION

DONATED BY
BLM 1 Jul 2011

FIELD NOTES
GC #2, pg 125, 130
COLLECTOR
GC 1 Jul 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6518 represents two discrete sites (GC11Jul11-1 and GC1Jul11-1), separated by 900 feet of ground surface and collected on three different days. These sites were exposed in natural outcrops on the southern end of the Coyote Mountains which is approximately 3 miles north of Interstate 8 and town of Ocotillo. Most likely the sites are from the same bed, which is part of a repeated section.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were

reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Locality 6518 was discovered in a moderate yellow brown (10YR5/4), poorly sorted, coarse- to very coarse-grained sandstone. Exposures in the vicinity of the locality consist of dark brown, well cemented, fine-grained sandstones. These beds are presumably in the Camels Head Member of the upper portion of the Deguynos Formation.

The invertebrate fossil assemblage is dominated by mineralized shells of epifaunal bivalve mollusks and acorn barnacles that were transported in distributary channels. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

Fossils were exposed as loosely packed shells over the desert surface. Several species of oysters and pectins were present at these sites. One flat of individual oysters, barnacles, scallops, and crab claws were collected at site GC11Jul11-1. One half pound fossil-rich matrix sample and one flat of small isolated gastropods were collected at site GC1Jul11-1.

The localities are still accessible

Field Numbers GC11Jul11-1, GC1Jul11-1

Elevation Range: 394, 397, 369

LOCALITY 6518

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6518
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134448	1	tooth	Osteichthyes
134449	1	tooth	Osteichthyes
134820	1	bryolith, encrusted on buccinid snail	Biflustra sp.
134821	3	valves, partial	Dendostrea vespertina (Conrad, 1854)
134822	2	valves, partial	Dendostrea vespertina (Conrad, 1854)
134823	65	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134824	5	valves, whole & partial, left & right	Argopecten deserti (Conrad, 1855)
134825	8	valves, whole & partial, left & right	Argopecten deserti (Conrad, 1855)
134826	5	valves, partial & fragments	Argopecten sp.
134827	82	valves, whole & partial, left & right	Anomia subcostata Conrad, 1855
134828	18	valves, whole & partial, left & right	Anomia subcostata Conrad, 1855
134829	66	valves, whole & partial, left & right	Anomia subcostata Conrad, 1855
134830	2	valves, fragments	Cyrtopleura costata (Linne, 1758)
134831	1	cheliped	Decapoda
134832	1	cheliped	Decapoda
134833	2	cheliped	Decapoda
134834	1	wall plates attached to Anomia valve	Balanidae
134835	2	wall plates	Balanidae
134836	1	wall plates, articulated	Balanidae
134837	5	wall plates, articulated	Balanidae
134838	1	burrow, internal mold	Ichnofossil

DATE 03/25/13
TIME 19:41:40

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6519

LOCALITY # 6519
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
BOR13Jun11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 286 FT

LATITUDE 32°47' 7"N VARIANCE
LONGITUDE 115°51'49"W

UTM 11 597042 3627769 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Imperial Group
FORMATION Deguynos Formation
MEMBER Camels Head Member
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT delta-plain, intertidal
CITATION

DONATED BY
BLM 13 Bor 2011

FIELD NOTES
BOR #36, pg 119
COLLECTOR
BOR 13 Jun 2011
COMPILED BY
K.A. Randall 28 Oct 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 1 Nov 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6519 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 3 miles north of Interstate 8 and town of Ocotillo. This locality was exposed as temporarily exposed in the borehole drilled for tower leg D at EP313.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Locality 6518 was within a 1 inch, oyster-rich, thick olive green mudstone. The stratigraphic section penetrated in the borehole consisted of brown to brownish-gray, fine-grained sandstone capped by a gray, massive, muddy siltstone, in turn overlain by a light brown, fine-grained sandstone with isolated oyster clusters, a brown to olive gray shelly mudstone, a light brown, inter-laminated siltstone and fine-grained sandstone, and finally a brown massive mudstone. These units exposed were within the Camels Head member of upper portion of the Deguynos Formation.

The invertebrate fossil assemblage is dominated by mineralized shells of a single species of oyster. These oysters likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

Fossils were recovered by collecting 1 flat of shells from bore hole spoils.

The locality has been buried in concrete.

LOCALITY 6519

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6519
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134839	12	valves, whole & partial, left & right	Crassostrea columbiensis (Hanley, 1846)

DATE 03/25/13
TIME 19:41:46

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6520

LOCALITY # 6520
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
see below

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 255 FT

LATITUDE 32°47'12"N VARIANCE
LONGITUDE 115°51' 7"W

UTM 11 598135 3627926 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Palm Spring Group
FORMATION Arroyo Diablo Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT Delta Front
CITATION

DONATED BY
BLM 6 Jun 2011

FIELD NOTES
GC #2,pg 110-111,116;GC #2 p 58; BOR #37,p 119-120
COLLECTOR
GC, BOR, PJS, TAD 6 Jun 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6520 represents a series of 4 discovery sites that were exposed on the southern end of the Coyote Mountains which is 4 miles northeast of town of Ocotillo. GC6Jun11-1 was exposed in leg D of EP 316, while GC30Nov11-1, GC17Jun11-2, and GC1Dec11-2 were from a south-facing slope of a hill south of the access road and 855 feet southwest of the tower pad graded at EP316.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were

reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Fossils from locality 6520 were recovered from a pale red (10R6/2) claystone which was at the base of an approximately 22 foot thick light grey mudstone with sparse thin silty laminae. This 22 foot thick unit was overlain by fine-grained sandstone and underlain by a light yellowish orange sandstone. Beds exposed on the hill were dipping 25 degrees to the south. The overall stratigraphic section exposed in this area consisted of an interbedded series of thick, faintly laminated mudstones and cross-bedded, fine-grained sandstones. The fossil assemblage recovered from the mudstone strata consists of well-preserved bones of freshwater bony fish, as well as impressions of aquatic plants. These organisms likely lived in the freshwater delta plain (landward) region of the prograding, ancestral Colorado River delta.

A total of 4 flats and 8 individual claystone blocks were collected. Fossils were recovered by prospecting spoils from drilling, and walking hill slopes south of the mainline. Fossils from natural exposures were discovered by splitting blocks in areas with some fossil concentrations.

Elevation Range: 251, 255, 264

Field Numbers: GC6Jun11-1, GC17Jun11-2, GC1Dec11-2, GC30Nov11-1

Dates Collected: 6 June 2011, 17 June 2011, 30 Nov 2011, 1 Dec 2011

LOCALITY 6520

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6520
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134450	1	cleithrum	Xyrauchen sp.
134451	2	vertebrae, caudal, part and counterpart	Trachurus symmetricus (Ayres, 1855)
134452	2	opercules	Osteichthyes
134453	2	vertebra, part and counterpart	Osteichthyes
134454	2	fin rays, part and counterpart	Osteichthyes
134455	1	bone, fragment	Osteichthyes
134456	1	bone	Osteichthyes
134840	2	molds, part/counterpart	Pelecypoda
134841	2	molds, part/counterprt w/ plant material	Pelecypoda
134842	2	burrows, vertical and horizontal	Ichnofossil
134843	2	impressions of blade like leaves	Tracheophyta
134844	2	charcoal, part/counterpart	Tracheophyta
134845	1	impressions, plant debris	Tracheophyta
134846	1	impressions, plant debris	Tracheophyta
134847	2	impressions, leaf	Tracheophyta
134848	2	impressions, part/counterpart	Tracheophyta
134849	2	impressions, plant debris	Tracheophyta
134850	2	impressions, part/counterpart	Tracheophyta

DATE 03/25/13
TIME 19:41:47

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6521

LOCALITY # 6521 LOCALITY NAME Sunrise Powerlink

FIELD NUMBER GC18May11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 253 FT

LATITUDE 32°47'25"N VARIANCE
LONGITUDE 115°56'30"W

UTM 11 599119 3628345 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Palm Spring Group
FORMATION Arroyo Diablo Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT Delta Front
CITATION

DONATED BY
BLM 18 May 2011

FIELD NOTES
GC #2, pg 92
COLLECTOR
G. Calvano 18 May 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6521 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is 4 miles northeast of town of Ocotillo. This site was 275 feet north of EP318 on the right-of-way for the access road. The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large

mammal isolated skeletal elements.

The stratigraphic section was poorly exposed in this area. Locality 6521 was from an oyster-rich bed that was within interbedded pale red to pinkish white, compact mudstones and siltstones. These units were within the lower portion of the Arroyo Diablo Formation.

The fossil assemblage recovered from the mudstone strata consists of mineralized shells of large oysters and scallops. The oysters likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

A total of 1 flat of loose oysters and some scallops was collected from the roadway surface.

The site is still accessible.

LOCALITY 6521

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6521
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134851	66	valves, whole & partial, left & right	Crassostrea columbiensis (Hanley, 1846)
134852	1	valve; whole, left	Dendostrea vespertina (Conrad, 1854)
134853	2	valves, fragments	Argopecten sp.
134854	1	valve, partial, left	Anomia subcostata Conrad, 1855
134888	1	calcareous tubes on pecten valve	Serpulidae

DATE 03/25/13
TIME 19:50:32

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6522

LOCALITY # 6522 | LOCALITY NAME Sunrise Powerlink | FIELD NUMBER TAD30Nov11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 238 FT

LATITUDE 32°47'25"N VARIANCE
LONGITUDE 115°56'13"W

UTM 11 599553 3628332 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Palm Spring Group
FORMATION Arroyo Diablo Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT Delta Front
CITATION

DONATED BY
BLM 30 Nov 2011

FIELD NOTES
TAD #13, pg 105
COLLECTOR
T.A. Demere 30 Nov 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6522 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is 4 miles northeast of town of Ocotillo. This site was exposed 300 feet southeast of the tower pad at EP319 from the south slope of a ridge between the ridge top and half way down the slope.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements. The stratigraphic section was poorly exposed in this area.

The bed of locality 6522 was within a cemented, shelly coarse-grained sandstone which formed the cap of the low east-west striking sandstone ridge. The sandstone cap has been completely undermined so that dislodged slabs litter both the south and north slopes. The capping sandstone is underlain by a grayish- yellow friable sandstone. These units were within the lower portion of the Arroyo Diablo Formation.

The fossil assemblage recovered from the cemented sandstone strata consists of mineralized and articulated shells of acorn barnacles and pieces of petrified wood. These organisms likely lived on and in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta. A total of a half-gallon baggie of cherry-picked mollusk and barnacle shells was collected as float. Only whole shells of Dendostrea and Anomia were collected, while any shell frag of Argopecten was collected. Several whole barnacles were also collected. No fossils were observed in situ within dislodged cemented sandstone blocks. Shells were widely dispersed, single valves, concordant to bedding.

The site is still accessible.

LOCALITY 6522

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6522
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134855	1	bryolith, encrusted on a buccinid snail	cf. Biflustra sp.
134856	1	steinkern encrusted with bryozoans	Solenosteira sp.
134857	67	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134858	7	valves, fragments	Argopecten sp.
134859	63	valves, whole & partial, left & right	Anomia subcostata Conrad, 1855
134860	3	byssal plugs attached to valve fragments	Anomia sp.
134861	4	wall plates, articulated	Balanidae
134862	1	wood	Tracheophyta

DATE 03/25/13
TIME 19:55:25

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6523

LOCALITY # 6523 — LOCALITY NAME: Sunrise Powerlink

FIELD NUMBER: GC24May11-1

LOCATION
- COUNTRY USA
- STATE CA
- COUNTY Imperial
- CITY
- SECT TWNSP DIREC RANGE DIR
- LOCATION IN SECTION
- ELEVATION 222 FT

LATITUDE 32°47'26"N VARIANCE
LONGITUDE 115°56'16"W

UTM 11 599457 3628361 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
- GROUP Palm Spring Group
- FORMATION Arroyo Diablo Formation
- MEMBER
- INFORMAL NAME
- ERA Cenozoic
- SYSTEM Neogene
- SER/EPOCH early Pliocene
- AGE/STAGE
- NALMA
- ZONE NAME

LITHOLOGY: sdst
DEPOSITIONAL ENVIRONMENT: Delta Front
CITATION

DONATED BY
BLM 24 May 2011

FIELD NOTES
GC #2, pg 99, 134
COLLECTOR
G. Calvano 24 May 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6523 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is 4 miles northeast of town of Ocotillo. This site was exposed just north of the tower pad EP319.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal

isolated skeletal elements.

Locality 6523 was within a one-foot thick greenish-gray, fine-grained sandstone. The overall stratigraphic section exposed in this area consisted of yellowish gray, compact, fine-grained sandstones and reddish brown, well cemented, medium-grained sandstones. These beds were within the middle portion of the Arroyo Diablo Formation as exposed.

The fossil assemblage recovered from the cemented sandstone strata is characterized by well-mineralized pieces of wood. These organisms likely lived in riparian and upland portions of the delta plain region of the prograding, ancestral Colorado River delta.

A total of 1 flat of isolated fragments of petrified wood was recovered as float from the floor of the desert.

The site is still accessible.

LOCALITY 6522

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6523
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134863	11	wood material	Tracheophyta

DATE 03/25/13
TIME 19:50:35

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6524

LOCALITY # 6524 LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
see below

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 222 FT

LATITUDE 32°47'20"N VARIANCE
LONGITUDE 115°56' 5"W

UTM 11 599756 3628200 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Palm Spring Group
FORMATION Arroyo Diablo Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT Delta Front
CITATION

DONATED BY
BLM 26 May 2011

FIELD NOTES
GC #2, pg 99
COLLECTOR
G. Calvano 26 May 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6524 represents a series of two discovery sites that were exposed on the southern end of the Coyote Mountains which is approximately 4 miles northeast of Interstate 8 and town of Ocotillo. These sites were approximately 0.3 miles apart. GC26May11-1 was discovered in a road cut along the access road 477 feet south of the tower pad at EP319. GC26May11-2was discovered in a road cut along the access road 830 feet southeast of the tower pad at EP320.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were

reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Fossils from locality 6524 were collected in grayish orange (10YR7/4), greenish gray (5GY6/1), and paleo reddish brown (10R5/4) mudstones. The overall stratigraphic section exposed in this area consisted of mottled maroon and green massive siltstones. These beds were in the middle portion of the Arroyo Diablo Formation as exposed.

The fossil assemblage recovered from siltstone strata consists of disarticulated fish skeletons, charophyte gyrogonites, and stem impressions of aquatic plants. These organisms likely lived in the freshwater delta plain (landward) region of the prograding, ancestral Colorado River delta.

A total of 1 flat of mudstone blocks with plant fragments and a 150 pound bulk sample of mudstone blocks was collected from the two sites combined.

Elevations: 222, 186

Field Numbers: GC26May11-1, GC26May11-2

LOCALITY 6524

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6524
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134457	1	partial skeleton	cf. Xyrauchen sp.
134458	4	vertebrae and bones	Osteichthyes
134459	31	bone, fragments	Osteichthyes
134864	1	shell, partial	Mesogastropoda
134865	2	valves, fragments	Ostreidae
134866	1	valve, fragment	Argopecten sp.
134867	47	carapaces	Ostracoda
134868	16	carapaces in matrix	Ostracoda
134869	13	mud tubes	Ichnofossil
134870	1	gyrogonites, minute ovoid spiral-marked	Charales
134871	32	gyrogonites, minute ovoid spiral-marked	Charales
134872	2	impressions of plant debris	Tracheophyta
134873	3	impressions of plant debris	Tracheophyta

DATE 03/25/13
TIME 19:50:36

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6525

LOCALITY # 6525 — LOCALITY NAME: Sunrise Powerlink

FIELD NUMBER: BOR2Dec11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 209 FT

LATITUDE 32°47'27"N VARIANCE
LONGITUDE 115°55'53"W

UTM 11 599923 3628451 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Palm Spring Group
FORMATION Arroyo Diablo Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY: sdst
DEPOSITIONAL ENVIRONMENT: Delta Front
CITATION

DONATED BY
BLM 2 Dec 2011

FIELD NOTES
BOR #37 pg 129, 131, 132
COLLECTOR
B.O. Riney 2 Dec 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6525 represents one discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 4 miles northeast of Interstate 8 and town of Ocotillo. This site was discovered 620 feet northeast of the tower pad at EP320.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

The stratigraphic section exposed in the area between EP319 and EP320 included 140 feet of grayish brown, massive to faintly laminated, fine-grained sandstones. At the base of this local section was a unit of yellowish orange to yellowish gray, claystones and mudstones with sandstone interbeds. Above this unit was a rip-up clast, cobble conglomerate overlain by a planar laminated sandstone unit that is cut by a claystone-filled channel sequence containing shells of estuarine mollusks. Approximately 30 feet of sandstone (locality 6525 at base) separated this mudstone from a 20 foot thick sequence of yellowish brown, well cemented, concretionary sandstones with sparse vertebrate remains and shell-rich sandstone stringers. Above this is a 60 foot thick sandstone sequence capped by a five foot thick bed of dark reddish brown, cemented, shelly sandstone.

The fossil assemblage recovered from the lower, light brown mudstone stratum consists of disarticulated, internal and external shell molds of infaunal and epifaunal bivalve mollusks. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

A 25 lb micro sample was collected from this site by hand quarrying.

The locality is still accessible.

LOCALITY 6525

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6525
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134874	1	encrusted on pelecypoda valve	Bryozoa
134875	7	valve, fragments	Ostreidae
134876	1	mold, internal	Argopecten sp.
134877	6	valves, whole & partial, left & right	Anomia subcostata Conrad, 1855
134878	2	molds, part/counterpart w/ shell	Pinna sp.
134879	38	molds, internal and external	Cyrtopleura sp.
134880	1	mold, internal	Pelecypoda
134881	2	wall plates in matrix	Balanidae
134882	1	shell type material	Inserta sedis

DATE 03/25/13
TIME 19:56:15

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6526

LOCALITY # 6526
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
GC30Apr11-2

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 220 FT

LATITUDE 32°47'26"N VARIANCE
LONGITUDE 115°56' 1"W

UTM 11 599852 3628372 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Palm Spring Group
FORMATION Arroyo Diablo Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT Delta Front
CITATION

DONATED BY
BLM 30 Apr 2011

FIELD NOTES
GC #2, pg 84
COLLECTOR
G. Calvano 30 Apr 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6526 represents one discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 5 miles northeast of the town of Ocotillo. This site was discovered 114 feet southeast of the tower pad at EP320. The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate

fossils were represented as large mammal isolated skeletal elements.

The stratigraphic section exposed in the area between EP319 and EP320 included 140 feet of grayish brown, fine-grained sandstones, and was within the middle portion of the Arroyo Diablo Formation. At the base of this local section was a unit of yellowish orange to yellowish gray, planar laminated claystones and mudstones with fine-grained sandstone interbeds. Above this unit was a siltstone rip-up clast, cobble conglomerate overlain by a planar laminated, fine-grained sandstone unit that is cut by a light brown, massive, claystone-filled channel sequence containing disperse shells of estuarine mollusks. Approximately 30 feet of sandstone separated this mudstone from a 20 foot thick sequence of yellowish brown, well cemented, concretionary and locally pebbly sandstones with sparse terrestrial vertebrate remains and shell-rich sandstone stringers. The base of this 20 foot thick concretionary sandstone contained the bed of locality 6526.

The fossil assemblage recovered from just below the cemented concretionary sandstone unit consists of mineralized shells of epifaunal bivalve mollusks and acorn barnacles. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

1 bag of oysters was collected by cherry picking shells from the bed.

The locality is still accessible.

LOCALITY 6526

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6526
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134883	29	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134884	20	valves, whole & partial, left & right	Anomia subcostata Conrad, 1855
134885	4	valve, fragments	Argopecten sp.
134886	1	valve, partial	Argopecten sp.
134887	2	wall plates	Balanidae

DATE 03/25/13
TIME 19:57:25

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6527

LOCALITY # 6527 — LOCALITY NAME: Sunrise Powerlink

FIELD NUMBER: see below

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 220 FT

LATITUDE 32°47'25"N VARIANCE
LONGITUDE 115°56' 2"W

UTM 11 599817 3628352 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Palm Spring Group
FORMATION Arroyo Diablo Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY: sdst
DEPOSITIONAL ENVIRONMENT: Delta Front
CITATION

DONATED BY
BLM 6 May 2011

FIELD NOTES
GC #2, pg 84-86, 88-89, GC #3 58-59
COLLECTOR
G. Calvano, C.S. Plouffe, B.O. Riney, P.J. Sena 6 May 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6527 represents series of seven discovery sites that were exposed on the southern end of the Coyote Mountains which is approximately 5 miles northeast of the town of Ocotillo. These sites were discovered between 366 and 170 feet southwest of the tower pad at EP320.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the Late Miocene Latrania Formation and Early Pliocene, Deguynos and Arroyo Diablo Formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The upper delta plain, non-marine portion of the delta, is within the Arroyo Diablo Formation. The contact between this unit and the underlying Deguynos Formation was not well defined owing to the transitional, and interfingingering nature of the strata as well as the added structural complexity due to the presence of faults. Rocks from this deposit were reddish to brown siltstones, claystones and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine shells, which are presumably reworked, and non-marine vertebrates including mammals which were represented by large mammal isolated skeletal elements.

The stratigraphic section exposed in the area between EP319 and EP320 included 140 feet of grayish brown, massive to faintly laminated, fine-grained sandstones, and was within the middle portion of the Arroyo Diablo Formation. At the base of this local section was a unit of yellowish orange to yellowish gray, planar laminated claystones and mudstones with fine-grained sandstone interbeds. Above this unit was a siltstone rip-up clast, cobble conglomerate overlain by a planar laminated, fine-grained sandstone unit that is cut by a light brown, massive, claystone-filled channel sequence containing disperse shells of estuarine mollusks. Approximately 30 feet of sandstone separated this mudstone from a 20 foot thick sequence of yellowish brown, well cemented, concretionary and locally pebbly sandstones with sparse terrestrial vertebrate remains and shell-rich sandstone stringers. Ten feet above the base of this

20 foot thick concretionary sandstone contained the bed of locality 6527. Above this is a 60 foot thick sandstone sequence capped by a five foot thick bed of dark reddish brown, cemented, coarse-grained and cross-bedded, shelly sandstone.

The fossil assemblage recovered from the cemented concretionary sandstone unit consists of premineralized bones of terrestrial and marine mammals, internal molds of epifaunal bivalve mollusks, gastropods, acorn barnacles, and decapod crustaceans. This ecologically diverse fossil assemblage suggests mixing of skeletal remains in distributary channels, likely in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

Invertebrate fossils were recovered by collecting 5 flats of sandstone blocks that had either isolated invertebrates or assemblages of shells. A partial palate of a camelid was collected in a 2 foot by 2 foot by 2 foot block. In addition a partial camel phalanx in a small standstone block was also collected.

The locality is still acessible

Elevations: 210, 215, 220

Field Numbers: GC1Dec11-1, GC30Apr11-1, GC6may11-2, GC7May11-2

Dates Collected: 30 Apr 2011, 2 May 2011, 5 May 2011, 6 May 2011, 7 May 2011, 1 Dec 2011,

LOCALITY 6527

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6527
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134460	1	tooth, pharyngeal?	Osteichthyes
134461	3	diaphysis of tibiotarsus?	Aves
134462	10	maxila, left, w/h P3-M2 frags, erup M3	Camelidae
134463	3	phalanx, proximal, distal and prox ends	Camelidae
134464	2	vertebra, transverse process only	Mysticeti
134465	1	vertebra, lumbar, fragment	Mysticeti
134466	1	bone fragment	Mammalia
134954	3	bryolith, encrusted on a buccinid shell	Biflustra commensale (Kirkpatrick & Metzelaar, 1922
134955	2	bryolith, encrusted on a buccinid shell	Biflustra commensale (Kirkpatrick & Metzelaar, 1922
134956	2	bryolith, encrusted on a buccinid shell	Biflustra commensale (Kirkpatrick & Metzelaar, 1922
134957	2	encrusted form on oyster valve, p/c	Cheilostomata
134958	1	encrusting form on oyster valve	Cheilostomata
134959	1	encrusting form	Bryozoa
134960	1	mold, internal	Acmaeidae
134961	1	mold, internal	Acmaeidae
134962	1	mold, internal	Acmaeidae
134963	1	steinkern w/ encrusting bryozoa colony	Solenosteira sp.
134964	1	steinkern	Solenosteira sp.
134965	3	steinkern w/ encrusted bryolith colony	cf. Solenosteira sp.
134966	2	mold, part/counterpart	Buccinidae
134967	2	mold, part/counterpart	Buccinidae
134968	2	stienkern w/ external mold	Buccinidae
134969	1	mold, external	Buccinidae
134970	1	mold, internal	Nassarius sp.
134971	1	mold, internal	Nassarius sp.
134972	4	molds, internal	Olivella sp.
134973	3	molds, internal	cf. Conus sp.
134974	2	steinkern & internal mold	cf. Pedipes sp.
134975	5	steinkerns & internal molds	Gastropoda
134976	4	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134977	130	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
134978	3	valve, fragments	Dendostrea vespertina (Conrad, 1854)
134979	1	valve, fragment	Dendostrea sp. cf. D. vespertina (Conrad, 1854)
134980	1	mold, internal	Argopecten sp.
134981	1	mold, internal	cf. Argopecten sp.

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6527
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134982	4	valves, whole & partial, left & right	Anomia sp. cf. A. subcostata Conrad, 1855
134983	1	mold, external	Cyrtopleura costata (Linne, 1758)
134984	4	molds, internal	Cyrtopleura sp. cf. C. costata (Linne, 1758)
134985	2	molds, internal	Cyrtopleura costata (Linne, 1758)
134986	1	wall plates, articulated	Balanidae
134987	6	wall plates, articulated	Balanidae
134988	2	wall plates	Balanidae
134989	1	wall plates, articulated	Balanidae
134990	2	cheliped, part/counterpart	cf. Callinectes sp.
134991	2	carapace, part/counterpart	cf. Callinectes sp.
134992	1	carapace	cf. Callinectes sp.
134993	2	mold, part/counterpart	cf. Callinectes sp.
134994	1	carapace	Callinectes sp.
134995	1	carapace	cf. Callinectes sp.
134996	1	carapace	Callinectes sp.
134997	1	carapace	Callinectes sp.
134998	3	molds, parts/counterpart	Callinectes sp.
134999	2	cheliped, part/counterpart	Callinectes sp.
135000	1	dactylus	Portunidae
135001	1	dactylus	Portunidae
135002	1	dactylus	Decapoda
135003	2	mold, part/counterpart	Decapoda
135004	1	dactulus	Decapoda
135005	3	body parts	Malacostraca
135006	5	body parts	Malacostraca
135007	1	merus	Malacostraca
135008	1	burrows	Ichnofossil
135009	1	mold, internal	Inserta sedis
135010	1	fragment, waxy texture	Inserta sedis
135011	1	fragment	Inserta sedis
135012	1	thin bone material	Chordata

DATE 03/25/13
TIME 20:04:09

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6528

LOCALITY # 6528 LOCALITY NAME Sunrise Powerlink

FIELD NUMBER PJS1Dec11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR

LOCATION IN SECTION

ELEVATION 253 FT

LATITUDE 32°47'28"N VARIANCE
LONGITUDE 115°56' 5"W

UTM 11 599752 3628436 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Palm Spring Group
FORMATION Arroyo Diablo Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT Delta Front
CITATION

DONATED BY
BLM 2 Dec 2011

FIELD NOTES
PJS #9, pg 113; BOR #37, pg 128
COLLECTOR
P.J. Sena. B.O. Riney 2 Dec 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6528 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 5 miles northeast of the town of Ocotillo. This site was discovered on a natural outcropping termed - Barnacle Hill, which was approximately 450 feet northwest of tower pad at EP320.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the Late Miocene Latrania Formation and Early Pliocene, Deguynos and Arroyo Diablo Formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The upper delta plain, non-marine portion of the delta, is within the Arroyo Diablo Formation. The contact between this unit and the underlying Deguynos Formation was not well defined owing to the transitional, and interfingingering nature of the strata as well as the added structural complexity due to the presence of faults. Rocks from this deposit were reddish to brown siltstones, claystones and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine shells, which are presumably reworked, and non-marine vertebrates including mammals which were represented by large mammal isolated skeletal elements.

The stratigraphic section exposed in the area between EP319 and EP320 included 140 feet of grayish brown, massive to faintly laminated, fine-grained sandstones, and was within the middle portion of the Arroyo Diablo Formation. At the base of this local section was a unit of yellowish orange to yellowish gray, planar laminated claystones and mudstones with fine-grained sandstone interbeds. Above this unit was a siltstone rip-up clast, cobble conglomerate overlain by a planar laminated, fine-grained sandstone unit that is cut by a light brown, massive, claystone-filled channel sequence containing disperse shells of estuarine mollusks. Approximately 30 feet of sandstone separated this mudstone from a 20 foot thick sequence of yellowish brown, well cemented, concretionary and locally pebbly sandstones with sparse terrestrial vertebrate remains and shell-rich sandstone stringers. Above this is a 60 foot thick

sandstone sequence capped by a five foot thick bed of dark reddish brown, cemented, coarse-grained and cross-bedded, shelly sandstone from. Locality 6528 was discovered in this cemented shelly sandstone.

The fossil assemblage recovered from the upper, cross-bedded, shelly sandstone stratum consists of disarticulated, mineralized shells of epifaunal bivalve mollusks and acorn barnacles. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

Fossils from this site were collected by bulk sampling 25 lbs of sandstone matrix, which on the surface showed barnacles, oysters, and scallops.

The locality is still accessible

LOCALITY 6528

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6528
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
135017	8	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
135018	3	valves, whole, right	Argopecten sp. cf. A. deserti (Conrad, 1855)
135019	11	valves, whole & partial, left & right	Anomia subcostata Conrad, 1855
135020	1	mold, internal	Cyrtopleura costata (Linne, 1758)
135021	1	complete	Balanidae
135022	53	wall plates, articulated	Balanidae

DATE 03/25/13
TIME 20:04:48

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6529

LOCALITY # 6529 | LOCALITY NAME: Sunrise Powerlink | FIELD NUMBER: see below

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT 10 | TWNSP 16 | DIREC S | RANGE 11 | DIR E

LOCATION IN SECTION NW1/4, NW1/4, NW1/4,SE1/4

ELEVATION 180 FT

LATITUDE 32°47'27"N VARIANCE
LONGITUDE 115°55'24"W

UTM 11 600818 3628410 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Palm Spring Group
FORMATION Arroyo Diablo Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Paleogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT marine deltaic
CITATION

DONATED BY
BLM 6 May 2011

FIELD NOTES
TAD #13, pg 71-72; GC#2, pg 88; TAW#1 pg 47
COLLECTOR
TAD, GC, TAW, CSP 6 May 2011
COMPILED BY
K.A. Randall 18 Aug 2011

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 18 Aug 2011

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6529 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 5 miles northeast of the town of Ocotillo. This site was collected over 2 different days and discovered on a natural low rise hill outcropping that would be graded for an access road. The site was approximately 420 feet southwest of tower pad at EP322.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were

reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Fossils from locality 6529 were discovered in a light brownish gray (10YR6/2), medium- to fine-grained, cemented, subrounded to subangular sandstone. The overall stratigraphic section exposed in this area consisted of light brownish gray, fine-grained compact, shelly sandstones and massive siltstones. These units were within the middle portion of the Arroyo Diablo Formation.

The fossil assemblage recovered from the sandstone strata consists of mineralized shells of epifaunal bivalve mollusks and acorn barnacles. These organisms likely lived in the littoral, delta plain (landward) region of the prograding, ancestral Colorado River delta.

Preserved shells included partial pectins, fragmentary and whole oysters, and barnacles. Oysters were the dominant shell at the site and over 50 percent of shells were free of matrix. Two flats and one bag of mostly isolated shells were collected.

The locality has been graded away; though the fossil-bearing bed does continue pass the access road.

Field Numbers: TAW2711-1, GC6May11-1

Collecting Dates: 27 April 2011, 4 May 2011, 6 May 2011

LOCALITY 6529

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6529
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
135023	2	molds, internal	Acmaeidae
135024	1	mold, internal	Gastropoda
135025	9	valves, fragments & partial, left & rght	Dendostrea vespertina (Conrad, 1854)
135026	7	valves, whole & partial, left & right	Dendostrea vespertina (Conrad, 1854)
135027	5	valves, whole & partial, left & right	Anomia subcostata Conrad, 1855
135028	22	valves, whole & partial, left & right	Anomia subcostata Conrad, 1855
135029	19	valves, whole & partial, left & right	Argopecten deserti (Conrad, 1855)
135030	2	valve, fragments	Argopecten sp.
135031	1	mold, exterier	Cyrtopleura costata (Linne, 1758)
135032	15	wall plates, articulated	Balanidae
135033	1	wall plate	Balanidae
135034	2	wall plates	Balanidae
135035	1	pincer, partial	Decapoda
135036	1	fragment	Inserta sedis
135037	1	fragment	Inserta sedis

DATE 03/25/13
TIME 20:05:22

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6530

LOCALITY # 6530
LOCALITY NAME Sunrise Powerlink

FIELD NUMBER
GC10Apr11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR
1

LOCATION IN SECTION

ELEVATION 197 FT

LATITUDE 32°47'30"N VARIANCE
LONGITUDE 115°54' 9"W

UTM 11 602765 3628497 VARIANCE

MAP NAME Painted Gorge, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP Palm Spring Group
FORMATION Arroyo Diablo Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Neogene
SER/EPOCH early Pliocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY sdst
DEPOSITIONAL ENVIRONMENT Delta Front
CITATION

DONATED BY
BLM 10 Aug 2011

FIELD NOTES
GC #3, pg 8
COLLECTOR
G. Calvano 10 Aug 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 123 mile long alignment included: construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch within the City of San Diego. The project also involved reconductoring of several 69kV transmission lines in the Communities of Scripps Ranch, Tierrasanta, and Mission Gorge. Locality 6530 represents a single discovery site that was exposed on the southern end of the Coyote Mountains which is approximately 6 miles northeast of the town of Ocotillo. This site was temporarily exposed in the borehole drilled for tower leg A at EP326.

The eastern end of the SRPL alignment extended across the southern foothills of the Coyote Mountains, and grading and drilling for tower construction impacted the late Miocene Latrania Formation and early Pliocene, Deguynos and Arroyo Diablo formations. Beds throughout the majority of the section were dipping to the southeast between 10 and 25 degrees and were generally striking between N5E and N80E, thus the units encountered were older to the west and younger to the east. The Latrania Formation was observed overlying metamorphic basement rock, consisted of locally derived, sublittoral marine, coarse- to medium-grained sandstones and were deposited before the formation of the ancestral Colorado River Delta. The Latrania Formation, Deguynos Foramation and Arroyo Diablo Formation represent different facies of the prograding ancestral Colorado River Delta. The lowest unit of the Deguynos Formation that was impacted was the Mud Hills Member. This unit is the distal-most portion of the ancestral Colorado River Delta (pro-delta), and consisted of a series of massive, olive green siltstones and pale orange to yellowish brown silty fine-grained sandstones. Overlying this was the Yuha Member, which represents the delta front portion of the delta and consisted of a series of death assemblage, cemented oyster coquina beds of transported shells deposited in channels. These cross-bedded coquina beds were separated by yellowish brown claystones and siltstones. This delta front sequence was overlain by sediments representing the tidal-influenced and marine portion of the delta plain named the Camels Head Member. These beds consisted of yellow and gray, cross-bedded, coarse-grained channel sandstones with claystone units throughout. The upper delta plain, non-marine portion of the delta, is represented by the Arroyo Diablo Formation. The contact between this unit and the underlying Camels Head Member of the Deguynos Formation was not well defined owing to the transitional and interfingingering nature of the strata, as well as the added structural complexity due to faulting. Rocks from this deposit were reddish to brown siltstones, claystones, and fine-grained sandstones of subaerial channel and flood plain deposits. This sequence preserved marine

shells, which are presumably reworked, and non-marine vertebrates including mammals. Terrestrial vertebrate fossils were represented as large mammal isolated skeletal elements.

Drilling at the borehole exposed 30 feet of deposits of the middle portion of the Arroyo Diablo Formation. This includes a 6 foot thick, basal gray, medium-grained, sandstone with reddish-brown mudstone rip up clasts, and interbeds of mudstone, overlain by a 20 foot thick, friable, iron-stained, grading up to a yellowish-brown, fine-grained, planar laminated sandstone. The section was capped by a 4 foot thick coarse-grained, conglomeratic sandstone. Locality 6530 was discovered in a grayish orange pink (5YR7/2), medium grained, cemented sandstone, which was within the 2 foot thick, rip-up clast bed.

The fossil assemblage recovered from the sandstone strata consists of oxidized impressions of vascular plant stems. These organisms likely lived along distributary channels in the delta plain (landward) region of the prograding, ancestral Colorado River delta.

A total of one flat of sandstone matrix blocks containing plant debris was collected from the site.

The borehole from which the fossils were found was buried in concrete.

LOCALITY 6530

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6530
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
135038	3	plant debris	Tracheophyta

DATE 03/25/13
TIME 20:05:53

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6531

LOCALITY # 6531 | LOCALITY NAME Sunrise Powerlink | FIELD NUMBER GC23Jun11-1

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR
1

LOCATION IN SECTION

ELEVATION -13 FT

LATITUDE 32°44' 4"N VARIANCE
LONGITUDE 115°45'28"W

UTM 11 616384 3622350 VARIANCE

MAP NAME Yuha Basin, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP
FORMATION Brawley Formation
MEMBER
INFORMAL NAME

ERA Cenozoic
SYSTEM Quaternary
SER/EPOCH early Pleistocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY slst
DEPOSITIONAL ENVIRONMENT Lacustrine
CITATION

DONATED BY
BLM 23 Jun 2011

FIELD NOTES
GC #2, pg 122
COLLECTOR
G. Calvano 23 Jun 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 118 mile long alignment included construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch, within the City of San Diego. The project also involved reconductoring of several 69kV tielines in the Scripps Ranch, Tierrasanta, and Mission Gorge communities. Locality 6531 represents a single discovery site that was collected during borehole drilling for leg A at the tower pad EP355, on the eastern end of the alignment, 2.5 miles northwest of the Imperial Valley Substation. This site was approximately 5.5 miles southwest of the town of Seeley and 2.5 miles south of Interstate 8.

The 118 mile long alignment terminated at the Imperial Valley Substation, with fossils being found between tower EP355 and the Imperial Valley Substation. Sedimentary units impacted within this area of the alignment includes undifferentiated units of the Palm Spring Group, Brawley Formation, Quaternary fluvial deposits, and Cahuilla Lake beds with the fossil producing beds being limited to the Lake Cahuilla Deposits and Brawley Formation. Lake Cahuilla deposits extended to a maximum depth of about 12 feet, but in most areas were generally less than 5 feet thick. They consisted of very pale brown, massive to laminated, loosely consolidated, fine-grained sandstones interbedded with light brownish gray, friable, medium- to coarse-grained sandstones. Brawley Formation sediments were temporarily exposed at the Imperial Valley Substation and generally consisted of light brown, thin beds of interbedded mudstone, siltstone, and fine-grained sandstone. A geotechnical borehole drilled at EP363 penetrated about 40 feet of Brawley Formation, includes, from top to bottom, light brown, thickly bedded siltstones; light brown, finely interbedded intervals of fine-, medium-, and coarse-grained sandstones; light brown, fine-grained, massive, micaceous sandstones; and light brown, fine-grained, laminated sandstones with dark laminations. At EP353 approximately 30 feet of Brawley Formation strata was exposed and consisted of, from bottom to top, a basal unit of yellowish brown, thinly laminated siltstone that grade upwards into a reddish brown massive claystone paleosol with root casts. This paleosol was overlain by a light brown, fine-grained, ripple drift sandstone that grades upwards into a gray to brown claystone with thin, light gray, siltstone interbeds.

Within leg A of EP355, six feet of reddish-brown, laminated siltstone was overlain by 9 feet of light reddish-brown, massive, very fine-grained sandstone capped with a developed paleosol. Above this was a 13 foot thick unit of ripple drift sandstone on the bottom and friable siltstone and mudstone on top. This totaled 28 feet of Brawley Formation sediments, with the section being capped by 2 feet of sands from Cahuilla Lake Deposits. Locality 6531

was at the bottom the six foot thick, reddish-brown, laminated siltstone.

The fossil assemblage recovered from the mudstone strata consists of well-preserved bones and teeth of freshwater bony fish, as well as internal and external molds of freshwater mollusks. These organisms likely lived in the water column and on the floor of the large, Pleistocene freshwater lake that formerly occupied this area of the Salton Trough.

Fossils were collected by prospecting borehole spoils and collecting a 500 lb bulk sample of siltstone. The sample was wet screened and picked.

The locality has been buried in concrete.

LOCALITY 6531

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6531
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
134467	12	pharyngeal teeth	Xyrauchen texanus (Abbott, 1860)
134468	10	isolated pharyngeal teeth	Xyrauchen sp.
134469	1	fin spine	Xyrauchen sp.
134470	1	pharyngeal area	Gila sp.
134471	1	pharyngeal tooth	Gila sp.
134472	20	isolated pharyngeal teeth	Gila sp.
134473	37	fin spine, pelvic	Gasterosteus aculeatus Linnaeus, 1758
134474	1	skull bone	Osteichthyes
134475	1	precaudal vertebra	Osteichthyes
134476	1	precaudal vertebra	Osteichthyes
134477	1	precaudal vertebra	Osteichthyes
134478	1	caudal vertebra	Osteichthyes
134479	1	caudal vertebra	Osteichthyes
134480	1	precaudal vertebra	Osteichthyes
134481	1	vertebra	Osteichthyes
134482	2	vertebrae (small fish)	Osteichthyes
134483	1	vertebra, fragment	Osteichthyes
134484	1	vertebra, fragment	Osteichthyes
134485	1	vertebra, fragment	Osteichthyes
134486	130	miscellaneous bone fragments	Osteichthyes
134487	34	miscellaneous bone fragments	Osteichthyes
134488	2	bone fragments	Osteichthyes
135039	26	shells, whole & partial	Tryonia sp.
135040	2	mold, external	Gastropoda
135041	2	mold, part/counterpart	Anodonta sp.
135042	2	molds, part/ counterpart	Anodonta sp.
135043	2	molds, internal & external	Anodonta sp.
135044	2	molds. part/counterpart	Pelecypoda
135045	2	molds, part/counterpart	Pelecypoda
135046	1	carapaces, disarticulated	Ostracoda
135047	5	carapaces within matrix	Ostracoda
135048	2	carapaces, disarticulated, textured	Ostracoda
135049	2	mold, part/counterpart	Inserta sedis
135050	1	fragment	Inserta sedis
135051	2	a	Charales

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6531
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
135052	1	impression, stem	Tracheophyta
135053	2	impression, stem	Tracheophyta

DATE 03/25/13
TIME 20:10:10

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
LOCALITY CARD

LOCALITY #- 6532

LOCALITY # 6532 LOCALITY NAME Sunrise Powerlink

FIELD NUMBER see below

LOCATION
COUNTRY USA
STATE CA
COUNTY Imperial
CITY

SECT TWNSP DIREC RANGE DIR
1

LOCATION IN SECTION

ELEVATION 14 FT

LATITUDE 32°43' 6"N VARIANCE
LONGITUDE 115°43'22"W

UTM 11 619702 3620606 VARIANCE

MAP NAME Mount Signal, CA
MAP SCALE 1:24000 DATUM NAD1927
MAP SOURCE USGS 1957

STRATIGRAPHIC POSITION
GROUP
FORMATION
MEMBER Cahuilla Lake Beds
INFORMAL NAME

ERA Cenozoic
SYSTEM Quaternary
SER/EPOCH Holocene
AGE/STAGE
NALMA
ZONE NAME

LITHOLOGY slst
DEPOSITIONAL ENVIRONMENT Lacustrine
CITATION

DONATED BY
BLM 24 Jun 2011

FIELD NOTES
GC #2, pg 123, BOR 36 pg 130
COLLECTOR
B.O. Riney, G. Calvano 24 Jun 2011
COMPILED BY
K.A. Randall 3 Dec 2012

PHOTOS ACCESS NO.

ENTERED BY
K.A. Randall 10 Dec 2012

LOCALITY DESCRIPTION

Fossils discovered at this locality were exposed during construction activities for the Sunrise Powerlink (SRPL) construction project. Work along this 118 mile long alignment included construction of new 500kV transmission towers, installation of underground utility lines, construction of new and improvements to existing substations, and reconductoring of existing overhead transmission lines. The project alignment extends from the central portion of the Imperial Valley to the neighborhood of Scripps Ranch, within the City of San Diego. The project also involved reconductoring of several 69kV tielines in the Scripps Ranch, Tierrasanta, and Mission Gorge communities. Locality 6532 represents a single discovery site that was collected during borehole drilling for leg C at the tower pad EP362, on the eastern end of the alignment, 0.4 miles northwest of the Imperial Valley Substation. This site was approximately 5.5 miles southwest of the town of Seeley and 3.5 miles south of Interstate 8.

The 118 mile long alignment terminated at the Imperial Valley Substation, with fossils being found between tower EP355 and the Imperial Valley Substation. Sedimentary units impacted within this area of the alignment included undifferentiated units of the Palm Spring Group, Brawley Formation, Quaternary fluvial deposits, and Cahuilla Lake beds with the fossil producing beds being limited to the Lake Cahuilla Deposits and Brawley Formation. Lake Cahuilla deposits extended to a maximum depth of about 12 feet, but in most areas were generally less than 5 feet thick. They consisted of very pale brown, massive to laminated, loosely consolidated, fine-grained sandstones interbedded with light brownish gray, friable, medium- to coarse-grained sandstones. Brawley Formation sediments were temporarily exposed at the Imperial Valley Substation and generally consisted of light brown, thin beds of interbedded mudstone, siltstone, and fine-grained sandstone. A geotechnical borehole drilled at EP363 penetrated about 55 feet of Brawley Formation, which exposed, from top to bottom, light brown, thickly bedded siltstones; light brown, finely interbedded intervals of fine-, medium-, and coarse-grained sandstones; light brown, fine-grained, massive, micaceous sandstones; and light brown, fine-grained, laminated sandstones with dark laminations. At EP353 approximately 30 feet of Brawley Formation strata was exposed and consisted of, from bottom to top, a basal unit of yellowish brown, thinly laminated siltstone that grades upwards into a reddish brown massive claystone paleosol with root casts. This paleosol was overlain by a light brown, fine-grained, ripple drift sandstone that graded upwards into a gray to brown claystone with thin, light gray, siltstone interbeds.

The stratigraphic section exposed in the borehole consisted of 32 feet of sedimentary deposits. The lower 28 feet of Brawley Formation, was primarily a light gray to light brown, fine- to medium-grained, locally laminated, friable sandstone with occasional stringers of coarse-grained friable sandstone and claystone rip-up clast cobble conglomerates. This section was capped by Cahuilla Lake Deposits: a two foot thick horizon of light brown, fine-grained,

micaceous, silty, friable sandstone with articulated shells of freshwater bivalve mollusks in life position. The locality 6532 was recovered from light brown (5YR6/4), fine-grained sandstone layer, within the 2 foot thick shelly, micaceous, friable, fine-grained sandstone stratum.

The fossil horizon consists of well-preserved shells of freshwater mollusks. These organisms likely lived on the floor of ancient Lake Cahuilla.

A total of 20 lbs of dry screened matrix was collected, as well as 1 flat of individual gastropods and clams from surface collecting.

The locality has been buried in concrete.

LOCALITY 6532

SAN DIEGO NATURAL HISTORY MUSEUM
DEPARTMENT OF PALEONTOLOGY
FAUNAL LIST FOR LOCALITY 6532
Sunrise Powerlink

SPECIMEN NUMBER	NUMBER OF ITEMS	DESCRIPTION	SPECIES
135054	6	shells, whole & partial	Fontelicella longinqua (Gould, 1855)
135055	2	shells, partial	Gyraulus parvus (Say, 1817)
135056	2	valves, partial	Anodonta californiensis Lea, 1852
135057	2	valves, juvinile	cf. Pisidium sp.