Appendix H

Mission Creek Habitat Restoration Project: Paleontological Resources Technical Report

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NOVEMBER 2023

PREPARED FOR

Southern California Edison
Environmental Services Department

PREPARED BY

SWCA Environmental Consultants

MISSION CREEK HABITAT RESTORATION PROJECT: PALEONTOLOGICAL RESOURCES TECHNICAL REPORT

Prepared for

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EXECUTIVE SUMMARY

This technical report prepared by SWCA Environmental Consultants (SWCA) details the results of a paleontological resources assessment and impact analysis for the proposed Mission Creek Habitat Restoration Project (project), situated on private and City of Santa Barbara–owned lands in unincorporated Santa Barbara County, California. This report presents the results of a desktop review, consisting of a review of geologic mapping and the scientific literature, a records search from the Natural History Museum of Los Angeles County, and a search of the online collections of the University of California Museum of Paleontology, as well as the results of two pedestrian surveys of the transmission access road and Mission Creek.

The desktop analysis identified three geologic units present in the project area: Quaternary landslide deposits, the Oligocene to late Eocene Sespe Formation, and the early Eocene Coldwater Formation. A variety of fossils are known from both the Sespe and Coldwater Formations; therefore, they are assessed as having high paleontological potential.

The proposed project's objectives are the full removal of all sidecast material and restoration of impacted habitat within the project area, including Mission Creek stream habitat, such that it may support native fish use to levels that existed prior to the December 2019 work. The project is specifically designed for the full removal of sidecast rock and sediments deposited in regulatory and upland areas, to restore stream hydrology (e.g., pools and riffles) and habitat within the project area to support native fish use to levels that existed prior to the December 2019 work, and to stabilize stream banks and slopes. The project will also restore impacted native vegetation habitats and promote the regrowth of chaparral and woodland/forest habitats, rehabilitate sensitive species populations within the project site, and remediate impacted trees within Mission Creek.

SWCA conducted two paleontological field surveys. The first survey consisted of an overview pedestrian survey of the entire length of Road Areas 1 to 9 and portions of the road in the Jesusita Trail with visible outcrops, excluding the sidecast areas that were too steep to access safely. Outcrops of bedrock, areas with visible landslide deposits, and collected debris moved by road work were inspected to characterize the lithology and identify whether fossils were present in the source rocks and sediments for the sidecast material. The second survey consisted of a focused pedestrian survey of newly identified project areas along Mission Creek downslope of Road Areas 1 and 2 and along Mission Creek downslope of Road Area 4. The high slope of the sidecast areas and the stream presented safety concerns for conducting the pedestrian survey throughout most of the project area. Therefore, SWCA conducted a pedestrian survey of the sidecast areas and the stream only during the second survey, which were accessed from a trailhead situated near the intersection of Mission Creek with Tunnel Road south of the project area. Sidecast material and debris were identified and inspected to characterize the lithology and identify any fossil material that may be present in the sidecast material.

Fossils were identified both in outcrop and in debris piles from road work near the source rocks and sediments of the sidecast material. All of the fossils observed are common, and many were poorly preserved. Thus, the observed fossils were determined to be nonsignificant. The presence of significant fossils within sidecast sediments on the slopes or within the stream cannot be ruled out, however. Based on the results of this desktop analysis and field survey, proposed project activities have the potential for significant direct and indirect impacts to paleontological resources.

These paleontological surveys confirmed the high potential of the Coldwater Formation to preserve fossil resources. Furthermore, the surveys identified fossils preserved in large boulders of the Coldwater Formation in the Quaternary landslide deposits, indicating that the landslide deposits should be assessed as having high paleontological potential as well. While significant fossils were not observed during the surveys, the lithology and preservation potential observed in the rocks in the project area indicate that there is the potential for significant fossils to be present in the Coldwater Formation, the Sespe Formation, and boulders of the Coldwater Formation present on landslide deposits. Therefore, based on the results of the paleontological assessment and surveys presented in this report, the proposed project has the potential to disturb significant paleontological resources. Recommendations are made for appropriate APMs to reduce impacts to those resources to less than significant.

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1 INTRODUCTION

Southern California Edison (SCE) has retained SWCA Environmental Consultants (SWCA) to conduct a paleontological resources assessment and impact analysis for the Mission Creek Habitat Restoration Project (project), situated on private and City of Santa Barbara–owned lands in unincorporated Santa Barbara County, California (Figures 1 and 2). Desktop analysis and a focused field survey were conducted following road maintenance and vegetation management activities on and along trails (known as the Mission Creek trails, the Mission Canyon trails, and the Jesusita Trail) in the Mission Canyon area. The desktop analysis was conducted to determine the paleontological potential of the geologic units present in the project area. Because the desktop analysis indicated that the geologic units in the area have high paleontological potential, field surveys were conducted to assess whether any paleontological resources could be identified in the area of proposed disturbance (i.e., the project area).

SWCA paleontology team lead Mathew Carson, M.S., and SWCA staff paleontologist Kristina Akesson, B.S., conducted the paleontological resources assessment presented herein and authored this technical report. SWCA paleontologists Kristina Akesson, B.S., and Jake Farhar, B.S., also assisted with the field surveys. SWCA principal wildlife biologist Pauline Roberts, Ph.D., served as overall project manager. Report figures were produced by SWCA geographic information system (GIS) technician Marty Kooistra, M.A.

The project site is defined as the restoration treatment locations and a contingency buffer, which make up the project site as defined in the Creek HRMP and summarized below (Helix 2023). The total project site comprises 7.24 acres. Although exact depths of disturbance are not yet known, the estimated depth of sidecast material is between 0 and 2.15 feet and it is assumed that the depth of disturbance related to tree planting will not exceed 3 feet below natural grade (Helix 2023:2-17 and 2-18). Thus, the depth of ground disturbance is expected to be a maximum of 3 feet below natural grade throughout the project site.

2 PROJECT DESCRIPTION

The objectives of the project are the full removal of all sidecast rock and sediments deposited in regulatory and upland areas, and restoration of impacted habitat within the project area, including Mission Creek stream habitat, such that it may support native fish use to levels that existed prior to the December 2019 work. The project objectives will be fulfilled by implementation of the Mission Creek Habitat Restoration and Mitigation Plan (Creek HRMP) (Helix Environmental Planning, Inc. [Helix] 2023).

This section describes the project and identifies goals, strategies, and activities proposed by SCE to restore the resources impacted by the December 2019 work. The project is specifically designed for the full removal of sidecast rock and sediments deposited in regulatory and upland areas, to restore stream hydrology (e.g., pools and riffles) and habitat within the project area to support native fish use to levels that existed prior to the December 2019 work, and to stabilize creek banks and slopes. The project would also restore impacted native vegetation habitats and promote the regrowth of chaparral and woodland/forest habitats, rehabilitate sensitive species populations within the project site, and remediate impacted trees within Mission Creek. Pre-project activities would include a stream hydrology survey, seed collection, weed abatement, avoidance flagging of sensitive resources, and mobilizing equipment into approved staging and stockpiling locations. Restoration activities would begin with sidecast removal.

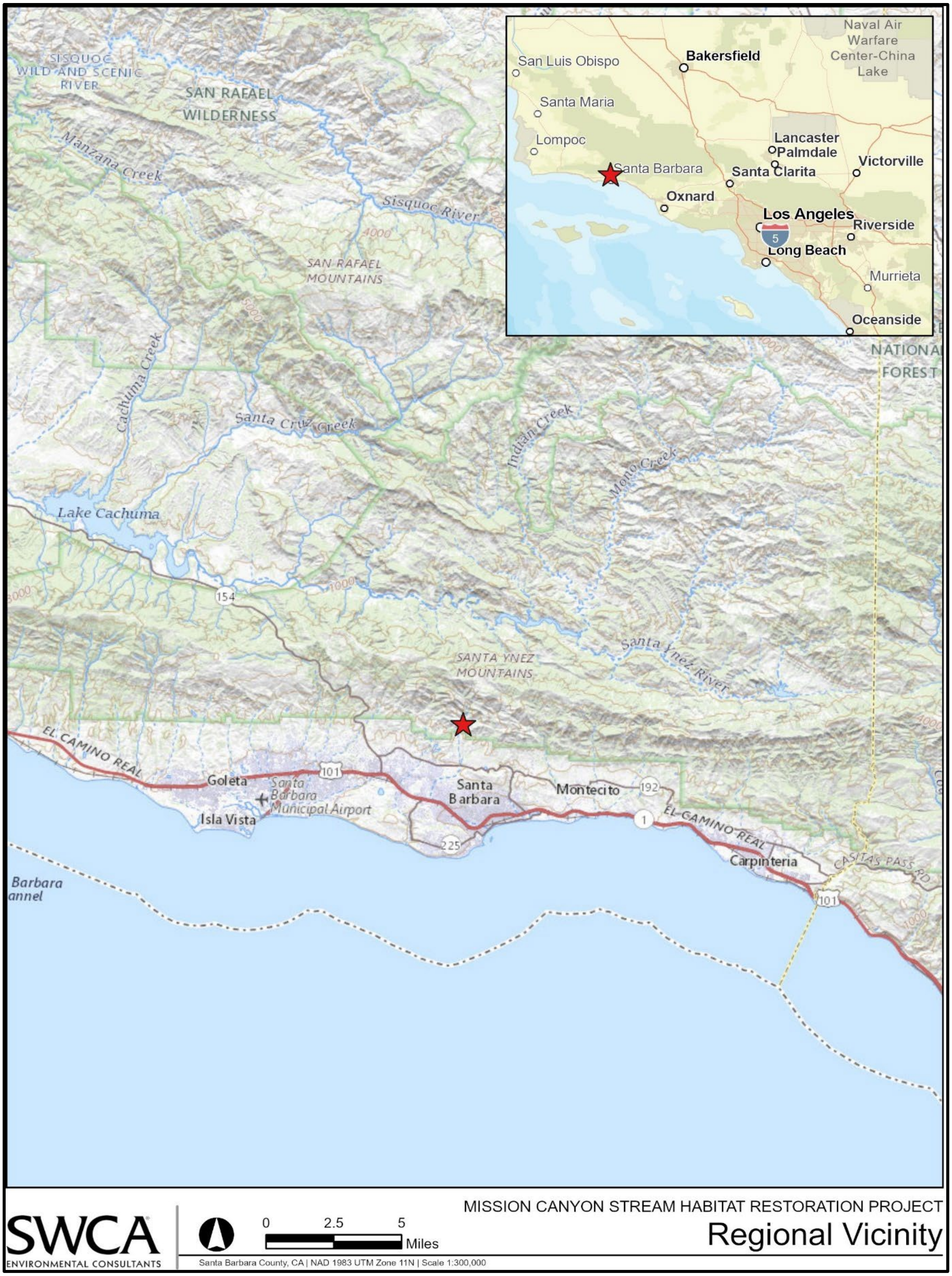

Figure 1. Regional vicinity of the project area.

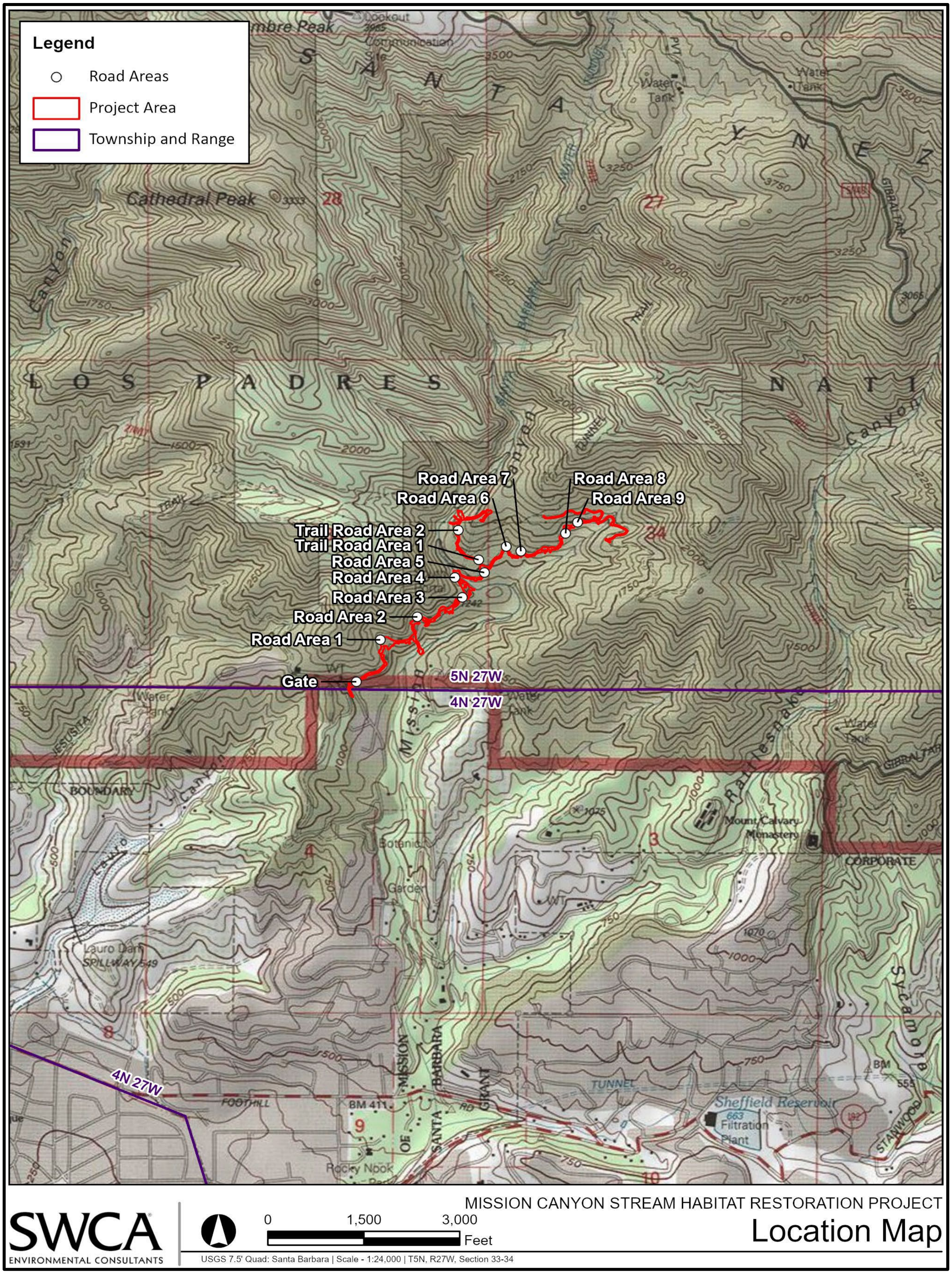

Figure 2. Local vicinity of the project area.

Restoration installation would be carried out under the direction of the restoration ecologist and supported by a stream fluvial morphology team (consisting of a stream restoration ecologist, a fluvial morphologist, and a stream hydrologist), as well as botanists, arborists, and wildlife biologists (Helix 2023). Following site preparation, the installation would be completed in the following phases:

1. removal of sidecast from regulatory and upland areas
2. tree remediation through the removal of sidecast material
3. restoration of stream hydrology and function
4. slope stabilization
5. hydroseeding
6. planting
7. cutting collection
8. cutting installation
9. post-planting watering
10. species-specific rehabilitation

Following restoration installation, the restoration areas would be subject to a maintenance and monitoring program for a minimum of 5 years, contingent on meeting success criteria. The project site includes 2.48 acres of Sidecast Removal and Habitat Restoration areas, 1.8 acres of Existing Maintenance Roads, 0.37 acre of unvegetated Parking/Storage Areas, 0.43 acre for Staging Areas, 0.5 acres of Berm Stabilization or Reconstruction and Revegetation, 0.12 acre for Habitat Restoration of Non-Sidecast Areas, and 1.27 acres of Habitat Enhancement. Additionally, 0.27 acre has been identified as Contingency Areas to allow for foot trails for crews to access sidecast piles and conduct removal operations safely. Developed areas are not subject to habitat restoration. Details of the project activities are described in the Creek HRMP (Helix 2023).

2.1 Project Goals

This section provides an overview of SCE's strategy to restore resources impacted in Mission Creek and associated tributaries, and meet the following goals:

- Full removal of all sidecast material
- Restore stream hydrology (e.g., pools and riffles) and habitat
- Remediate impacted trees within Mission Creek
- Stabilize stream banks and slopes
- Restore impacted woodland/forest habitat and chaparral habitats
- Rehabilitation of sensitive plant species populations within the project area

Habitat restoration is intended to consist of three main phases: restoration planning and preparation, installation, and the maintenance and monitoring program. Figure 3 shows areas subject to project activities described in the Creek HRMP.

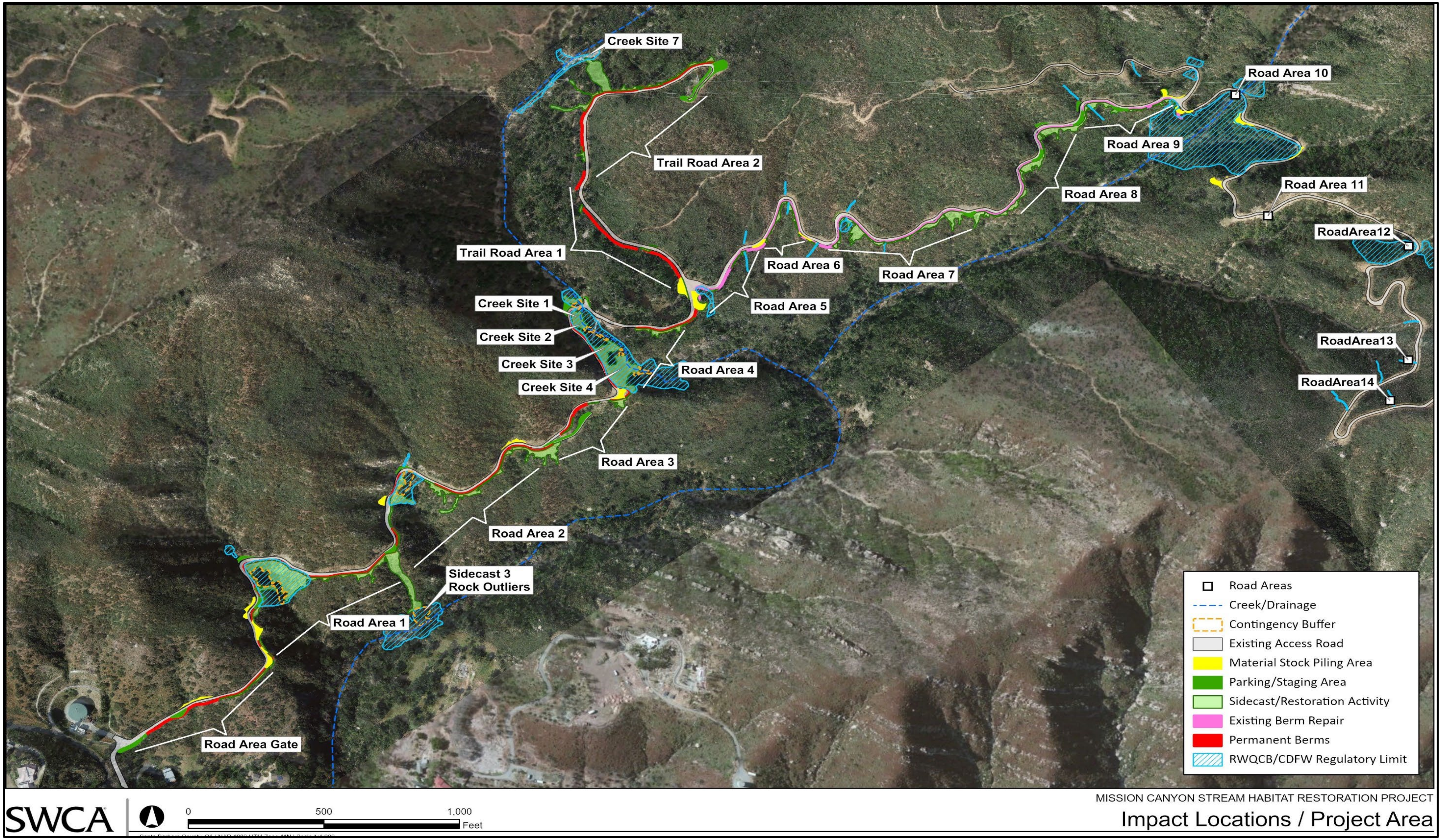

Figure 3. Project area with impact locations.

2.2 Technical Implementation Plan

Prior to sidecast removal in Creek Sites 1–4, the fluvial morphology team will develop a Technical Implementation Plan (TIP) (Helix 2023). The purpose of the TIP is to provide an execution document to guide the process of sidecast removal and the restoration and repair of habitat features within impacted areas of Creek Sites 1–4 (Helix 2023). The TIP will also present protocols to achieve the goals of the Creek HRMP while protecting and restoring the pre-impact natural stream topography, habitat, and function (Helix 2023). As sidecast removal begins, the construction operators will perform sidecast material removal under the direction and supervision of the fluvial morphology team to ensure that only sidecast material is removed (Helix 2023).

2.3 Sidecast Removal

Collectively, the total refined volume estimates from data collected in November 2020, September 2021, and September 2022 are summarized in Table 1 below. In accordance with the Creek HRMP, the data represent the best approximation, after multiple field visits, individual site inspections, and detailed data collection, of the volumes of sidecast material deposited by SCE's December 2019 work. The total estimated volume of sidecast material (rock, sediment, and debris) deposited within Regional Water Quality Control Board (RWQCB) and California Department of Fish and Wildlife (CDFW) regulatory areas was approximately 1,413 cubic yards, inclusive of the total estimated 135.4 cubic yards of sidecast material within U.S. Army Corps of Engineers (USACE) regulatory areas (Helix 2023). The total estimated volume of sidecast material (rock, sediment, and debris) deposited within upland areas was approximately 1,521.85 cubic yards. Separately, approximately 600 cubic yards were subsequently used to construct roadside berms from the Gate Area through Road Area 9 (Helix 2023). Due to major rainstorm events that impacted the project area in 2023, the total volumes of sidecast material remaining on-site at the time of construction will likely be less than the estimated volumes included in Table 1.

Table 1. Sidecast Rock, Boulders, and Sediments within Mission Canyon

Site	Surface Area (square feet)	Total Sidecast Volume (cubic yards)	Volume within USACE Jurisdiction (cubic yards)	Volume within RWQCB/CDFW Jurisdiction (cubic yards)
Sidecast	108,230.65	2,331.80	135.40	1,413.00
Berms	0.00	600.00	0.00	0.00
Total	**108,230.65**	**2,931.80**	**135.40**	**1,413.00**

2.3.1 *Contingency Buffers*

Contingency buffers are areas where impacts may extend outside of the limits of the main sidecast areas. Work within the contingency buffers will include the restoration activities defined in the Creek HRMP and summarized herein. Contingency buffers have been included around the following project sites:

- Road Area 1
- Sidecast 3 Rock Outliers
- Road Area 2
- Mission Creek Sites 1–4

Contingency buffers were included in the paleontological resources survey areas. Expected impacts to paleontological resources within these areas were assessed and will be fully avoided, minimized, or fully mitigated by implementation of the project Applicant Proposed Measures (APMs). Contingency buffer areas are shown in Table 2.

Table 2. Project Areas within RWQCB and CDFW Jurisdiction

Project Site	RWQCB/CDFW (acres)	USACE (acres)
Road Area 1 Project Area	0.39	0.00
Road Area 1 Contingency	0.14	0.01
Sidecast 3 Rock Outliers Contingency	0.08	0.00
Road Area 2 Project Area	0.09	0.00
Road Area 2 Contingency	0.06	0.00
Mission Creek Project Area (Creek Sites 1–4)	0.44	0.042
Mission Creek Contingency (Creek Sites 1–4)	0.06	0.03
Mission Creek Site 7	0.00	0.00
Road Areas 5–9	0.01	0.00
Total Project Area	**1.01**	**0.05**
Total Contingency	**0.27**	**0.04**
Total	**1.28**	**0.09**

Please note: Acres are shown as rounded to the nearest hundredth decimal place, yet totals reflect sums of the unrounded numbers.

2.3.2 *Sidecast Removal Methods*

Per the Creek HRMP, SCE’s sidecast removal methodologies were finalized through a comparative scoping analysis performed by SCE’s project team in August 2022 (Helix 2023). Through this iterative process, four methods to extract sidecast materials deposited during the December 2019 work were selected to achieve maximum extraction of sidecast material without causing harm to sensitive environmental resources, while maintaining a safe working environment and protecting public safety long term (Helix 2023).

According to the Creek HRMP, the primary method identified for sidecast removal is the combination of manual or hand removal, and removal using vacuum or guzzler trucks (hand and guzzler removal technique) (Helix 2023). The hand and guzzler removal technique will be used in conjunction with machinery staged on the road to facilitate the removal of the larger rock (Helix 2023). Two additional sidecast removal methods were also described in the Creek HRMP—hand rock removal, and helicopter removal. Table 3 summarizes sidecast removal methods by project site and Figure 4 depicts the areas where specific sidecast removal methods are proposed.

Table 3. Sidecast Removal Method by Project Site

Project Site	Sidecast Removal Method
Roadside Sidecast Areas 1–2, 4–16	Excavator with Hand and Guzzler
Sidecast 3	Helicopter Removal
Creek Sites 1–4, Road Areas 1–2	Forklift with Hand and Guzzler
Creek Site 7, Roadside Sidecast Areas 17–19	Hand Rock Removal

2.3.2.1 HAND AND GUZZLER REMOVAL

Per the Creek HRMP, hand and guzzler removal is performed by manual removal by technicians in combination with vacuum or guzzler trucks and a small excavator and transported to an approved staging location. The construction contractor will use guzzler trucks (large vacuum trucks) staged from the existing access road/trail adjacent to work areas to remove fine materials and rock approximately 3 inches in diameter or smaller (Helix 2023). Manual manipulation of the hose will remove materials within the reach extent of the hose (Helix 2023).

Rocks greater than 3 inches in diameter would be carried out by hand or loaded into rock sacks and removed using the excavator (Helix 2023). Large rocks and boulders, greater than 24 inches in diameter, may be broken up into manageable pieces using sledgehammers, pickaxes, expansive rock breaking agent (e.g., expanding grout), or jackhammers and lifted by the excavator (Helix 2023). The excavator may also be used to lift rocks bolted to a chain with shackles and position them onto the road for staging (Helix 2023). All material will be transferred to an approved stockpile location where soils will be stockpiled and managed for load out into small-scale “bobtail” dump trucks, hauled off following a designated route, and disposed of at a local landfill (Helix 2023). Hand and guzzler removal areas are shown on Figure 4.

2.3.2.2 HAND ROCK REMOVAL

Per the Creek HRMP, hand rock removal is perfomed by technicians, using high-incline rigging for fall protection, who will manually remove the sidecast rock and transfer it up the slope by hand (Helix 2023). Large rocks will be broken into smaller manageable pieces using hand tools before removal (Helix 2023). Smaller rock or rock fragments may be transferred into rock sacks for easier removal and carried out using frame packs and manual means (Helix 2023). Rock will be staged on the side of the roadway, where it will be collected using a small loader or comparable equipment and transported to an approved staging area where the material can be hauled away for disposal (Helix 2023).

2.3.2.3 HELICOPTER REMOVAL

As described in the Creek HRMP, this method includes the use of a helicopter, such as a light-utility Bell 429, with a lift capacity of 1,500 to 2,000 pounds, fitted with enclosed steel baskets. The steel baskets can be covered with a safety net and lined to secure the rocks. Alternatively, the rocks can be placed into load bags and then loaded into the steel baskets (Helix 2023). Rock will be transferred into rock sacks by ground crews and staged for the aerial operation to minimize flight time (Helix 2023). The helicopter will hover approximately 100 to 150 feet in the air while ground crews fill the basket with rock sacks (Helix 2023). Once the basket is full, the pilot will relocate the material to an approved staging location within the project area (Helix 2023). A landing zone and refueling location, such as the Santa Barbara Airport, must be located within 10 to 15 minutes of flight time from the project area (Helix 2023).

SCE anticipates the full removal of all sidecast material remaining on the project area, potentially excepting only minor areas where constraints to full removal may exist (Helix 2023).

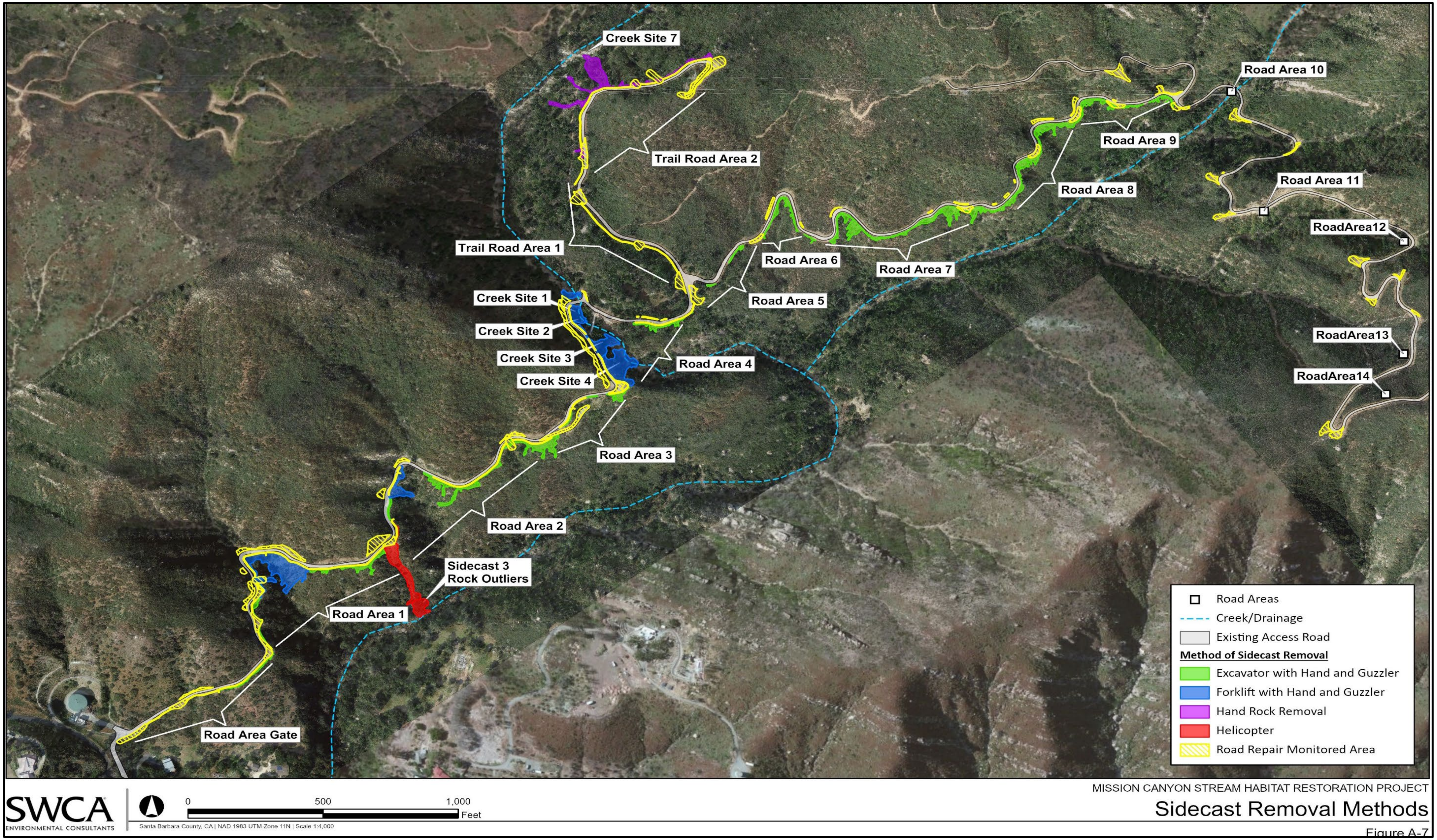

Figure 4. Project area with sidecast removal techniques.

2.3.3 *Sidecast Removal in Upland Areas*

2.3.3.1 ROADSIDE SIDECAST AREAS 1–2 AND 4–6: EXCAVATOR WITH HAND AND GUZZLER REMOVAL

As described in the Creek HRMP, sidecast deposits, occurring along Road Area Gate and up to Road Area 3 (except for Sidecast Area [SC]-03), consist of thin layers of finer soil material intermixed with rocks and scattered boulders accumulated along the base of vegetation. These materials will be removed manually by technicians in combination with vacuum or guzzler trucks and a small excavator (Helix 2023). This method will be performed on approximately 0.421 acre of sidecast deposits in SC 01, SC 02, and SC 04 through SC 06 and is expected to result in the full removal of the sidecast material at these locations (Helix 2023). All removed sidecast material will be taken to an approved staging location.

2.3.4 *Sidecast Removal from Stream*

As described in the Creek HRMP, the majority of sidecast deposits occurring within Mission Creek, and in tributaries located at Creek Sites 1–4 and Road Areas 1 and 2, and totaling approximately 0.935 acre, consist of a mixture of small and moderately sized rocks with finer soil material and scattered boulders. These materials will be removed using the hand and guzzler removal method and in combination with a long-reach forklift to extract material (Helix 2023). For large materials, technicians will manually break rocks and boulders into manageable pieces using sledgehammers, pickaxes, or, where necessary, drill and inject an expansive rock breaking agent (e.g., expandable grout) to allow them to break into smaller pieces overnight (Helix 2023). In accordance with the Creek HMRP, rocks will then be manually loaded into baskets and lifted by a 12k reach forklift with a 24-foot length and 38-foot reach. The forklift would be positioned at designated staging areas or along existing access roads to transport sidecast materials to an approved staging location prior to disposal. This method is expected to result in the full removal of the sidecast material at these locations; however, potential constraints to the slopes within Creek Sites 2, 3, and 4 were noted by SCE (Helix 2023).

2.3.4.1 SIDECAST 3 AND SIDECAST 3 OUTLIERS: HELICOPTER REMOVAL

Large boulders and smaller rock and soil material are positioned in Sidecast Area 3 and Sidecast Area 3 Outliers. These are located within Road Area 1 and cover approximately 0.257 acre, approximately 300 feet from the roadside with no footpath or road access (Helix 2023). Due to these limitations, SCE proposes to remove the material using the helicopter removal method to relocate the material to an approved staging area (Helix 2023).

2.3.4.2 CREEK SITES 1–4 AND ROAD AREAS 1–2: FORKLIFT WITH HAND AND GUZZLER

As described in the Creek HRMP, the majority of sidecast deposits occurring within Mission Creek, and in tributaries located at Creek Sites 1 to 4 and Road Areas 1 and 2, and totaling approximately 0.935 acre, consist of a mixture of small and moderately sized rocks with finer soil material and scattered boulders. These materials will be removed using the hand and guzzler removal method and in combination with a long-reach forklift to extract material (Helix 2023). For large materials, technicians will manually break rocks and boulders into manageable pieces using sledgehammers, pickaxes, or, where necessary, drill and inject an expansive rock breaking agent (e.g., expandable grout) to allow them to break into smaller pieces overnight (Helix 2023). In accordance with the Creek HMRP, rocks will then be manually loaded into baskets and lifted by a 12k reach forklift with a 24-foot length and 38-foot reach. The forklift would be positioned at designated staging areas or along existing access roads to transport sidecast materials to an approved staging location prior to disposal. This method is expected to result in the full removal of the sidecast material at these locations; however, potential constraints to the slopes within Creek Sites 2, 3, and 4 were noted by SCE (Helix 2023).

2.3.4.3 CREEK SITE 7, ROADSIDE SIDECAST 17–19: HAND ROCK REMOVAL

Per the Creek HRMP, sidecast deposits at Creek Site 7 and Roadside Sidecast Areas 17–19 are located on Trail Road Area 2 and consist of scattered rocks intermixed with existing vegetation. These sites are only accessible by foot; however, the low volume and manageable size of the rocks allow for manual removal using the Jesusita Trail to access the sidecast areas (Helix 2023). The hand removal method was selected as the least impactful to resources and is expected to be used to remove all sidecast material at these locations (Helix 2023).

2.3.4.4 ROADSIDE SIDECAST AREAS 7–16: EXCAVATOR WITH HAND AND GUZZLER REMOVAL

As described in the Creek HRMP, sidecast deposits, occurring along roadside slopes of Road Areas 5–9, consist of boulders and rocks intermixed with the roadside berms and deposits immediately downslope of the roadside. These materials will be removed manually by technicians in combination with vacuum or guzzler trucks and a small excavator (Helix 2023). This method is expected for the full removal of the sidecast material at these locations, except in areas where sidecast was not deposited down slopes and, therefore, no removal is necessary. In such areas, berms will be adjusted to align with the specifications approved by Santa Barbara County and tamped down and stabilized.

2.3.4.5 STABILIZE STREAM BANKS AND SLOPES

In accordance with the Creek HRMP, if it is determined that the stream banks have been collapsed and/or scoured by the sidecast deposits, in addition to recontouring, it may be necessary to provide additional bank stabilization by hand-placing cobbles and boulders to secure the soil in place and prevent future occurrences of erosion. Bank stabilization features would be designed and submitted to CDFW for approval, consistent with the adaptive management process, and incorporated into the Monitoring and Reporting Program described in Section 8 of the Creek HRMP (Helix 2023).

2.4 Habitat Restoration

2.4.1 *Native Tree Restoration/Mitigation*

The project proposes to address native tree restoration/mitigation by 1) completing remedial treatments to 30 impacted trees within Mission Creek, and 2) planting trees within Mission Creek and Road Areas 1 and 2, and planting acorns in upland habitat areas. Remedial treatments to impacted trees are necessary to prevent further damage and stimulate recovery. These remedial treatments include the removal of rocks/soil from the base of the tree, pruning, and cutting or trimming roots. These activities are described in detail in Sections 6.1 of the Creek HRMP. Native tree remediation within the upland areas was completed in 2020 as a component of the Road Repair Project.

In addition to completing remedial treatments, the project will mitigate for impacted trees by planting a total of 90 trees or acorns. This planting quantity will achieve a mitigation ratio of 5:1 for trees for which impacts are considered “major”, and a ratio of 1:1 for trees for which impacts are considered “moderate”, as defined in Section 2.4 of the Creek HRMP. Within CDFW regulatory areas, the project will plant 49 of the 90 trees or acorns to offset previous impacts to trees within CDFW regulatory areas (Table 4). As a continuation of native tree restoration/mitigation in upland areas outside CDFW regulation, the project will plant the remaining 41 acorns or trees within transitional woodland areas. Planting will be completed as a component of the native vegetation restoration described below. The number of trees planted as saplings or acorns may be adjusted based on the availability of materials; however, mitigation quantities will be retained.

Overplanting may be implemented to ensure mitigation quantities are achieved. Planted trees and acorns will be subject to 5-year success criteria, as described in Section 8 of the Creek HRMP (Helix 2023). No trees will be removed as part of the project.

Table 4. Summary of Recommended Remediation for Trees within CDFW Regulatory Areas of Mission Creek

Tree Species	Trees with Recommended Remedial Actions	Leave as Snag	Remove Rocks/Soil	Prune	Trim/Cover Roots
Coast live oak (*Quercus agrifolia*)	18	0	14	8	0
Bay laurel (*Laurus nobilis*)	14	2	13	3	1
Western sycamore (*Platanus racemosa*)	7	0	7	2	0
Total	**39**	**2**	**34**	**13**	**1**

2.4.2 *Native Vegetation Restoration*

Temporary impacts to native vegetation will be restored in both woodland/forest and upland chaparral habitats along Mission Creek. Coast live oak woodland and California bay forest habitats are the dominant habitats within Mission Creek and Road Areas 1 and 2, while upland habitats are dominated by *Ceanothus* chaparral and associated native plant communities. These areas will be restored through the application of a native seed mix, and planting of shrubs, trees, and cuttings as described in Section 6 of the Creek HRMP. Restoration of woodland and forest habitats will focus on controlling erosion and restoration of forest canopy structure. Overall, nonnative species cover within the woodland and forest habitats is low; however, efforts to control nonnative species will be a component of the maintenance program in these habitats. Creek Site 7 also supports woodland habitat; however, due to the steep and unstable slopes, efforts will focus on the application of seed mix and erosion control. Approximately 1.06 acres of woodland and forest habitats will be restored as part of the project (Table 5).

Upland chaparral habitats within the project area are largely dominated by various species of Ceanothus, with the presence of occasional oak trees as the canyon transitions to woodland habitats. Upland habitats occur along Spyglass Road and will be restored through the application of a native seed mix, select use of container plantings, and planting of acorns in transitional woodland areas. Native vegetation restoration of the upland chaparral habitats will focus on erosion control and nonnative species control during the maintenance period, specifically targeting mustards (*Brassica* spp.) and other nonnative perennial species. Species diversity and shrub canopy are expected to naturally recover with effective control of nonnative species and erosion to minimize soil disturbance; however, this will be evaluated and addressed as part of Adaptive Management (see Section 8 of the Creek HRMP) if recovery is not observed. Approximately 1.45 acres of upland habitats will be restored as part of the project (see Table 5).

Table 5. Proposed Project Restoration by Vegetation Community

Vegetation Community	Acres*1
Bigpod Ceanothus (*Ceanothus megacarpus*) Chaparral Alliance	0.83
Bigpod Ceanothus Chaparral Alliance, *Ceanothus megacarpus–Salvia mellifera* Association†	0.08
California Bay Forest and Woodland Alliance†	0.08
Coast Live Oak Woodland Alliance, *Quercus agrifolia–Umbellularia californica* Association†	0.63
Coast Live Oak Woodland and Forest Alliance	0.35
Hairy Leaf–Woolly Leaf Ceanothus Chaparral Alliance, *Ceanothus oliganthus* Association†	0.02
Holly Leaf Cherry–Toyon–Greenbark Ceanothus Chaparral Alliance, *Ceanothus spinosus* Association	0.02
Holly Leaf Cherry–Toyon–Greenbark Ceanothus Chaparral Alliance, *Ceanothus spinosus–Ceanothus megacarpus* Association	0.47
Developed/disturbed	0.0
Subtotal for woodland and forest habitats	*1.06*
Subtotal for upland habitats (excludes developed/disturbed)	*1.42*
Total	**2.48**

* Contingency buffers totaling 0.35 acre are included in these totals and may be reseeded if disturbance to vegetation occurs during sidecast removal.

† Denotes a state sensitive natural community.

Woodland and upland revegetation activities are designed to meet the project goal of restoring impacts to native vegetation. Sensitive plants and native trees will be monitored for recovery as a component of the monitoring program for the respective habitats, as described in Section 8.1.5 and 8.1.6 of the Creek HRMP (Helix 2023). Restored areas will be evaluated annually and compared to unimpacted native habitats in adjacent areas. Implementation, materials, maintenance, monitoring, and reporting are described in the Creek HRMP (Helix 2023).

2.4.3 *Sensitive Species Rehabilitation*

The project would restore sensitive plants presumed to be directly impacted as a result of the December 2019 work. These sensitive species include Santa Barbara honeysuckle (*Lonicera subspicata*), Plummer’s baccharis (*Baccharis plummerae*), and Hubby’s phacelia (*Phacelia hubbyi*). Seeds and cuttings from unimpacted sensitive plants will be collected as described in Section 4.8 of the Creek HRMP (Helix 2023) and seeded/planted in plots within suitable habitat integrated into the project area (see Section 6.8 of the Creek HRMP). Plots will be monitored and maintained and subject to a 5-year success criterion, as described in Section 8 of the Creek HRMP (Helix 2023).

One oscillated Humboldt lily (*Lilium humboldtii* ssp. *ocellatum*) was identified outside of the project area. There is no evidence of direct impacts to Humboldt lily, nor has habitat for the species within the project area been confirmed. Annual presence/absence surveys will be conducted as described in Section 8.1.5, however (Helix 2023).

2.5 Staging and Storage Areas

Approximately 0.99 acre of developed/disturbed areas have been identified for use as staging, parking, and material storage throughout the project area. These areas are largely limited to compacted roadside and shoulders. If native vegetation was removed to support the Road Repair Project, completed

November 2020, or to support the project, however, these areas will be restored in accordance with the Creek HRMP (Helix 2023) and subject to ongoing monitoring and maintenance (see Figure 2). Five of these staging areas, also previously used for the Road Repair Project, will be restored to native habitats following project construction as well as an additional area located at the south end of the intersection of Tunnel Trail Road and Mission Canyon Catway within Road Area 5 between SC 7 and SC 8 previously disturbed by an unknown party (non-SCE related), will also be restored to native habitats following project construction.

2.6 Schedule

In accordance with the Creek HRMP, it is anticipated that work may begin as early as summer 2023 (Helix 2023). As project work occurs within the creek and associated banks, it is essential that all removal, and associated revegetation and stabilization activities, occur under dry conditions to ensure work can be completed safely. Cutting installation and hydroseeding will be implemented prior to the rainfall season. If project activities are completed in a season not suitable for planting and seeding (i.e., summer), installation of these components would be postponed until an appropriate season as determined by the restoration ecologist. It is not anticipated that a hydromulch or tackifier will be needed prior to hydroseeding for stabilization, except possibly in the upland sidecast areas. Work may be paused and resumed in the following year if needed to avoid working during surface flows in Mission Creek.

3 REGULATORY SETTING

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value and are afforded protection under federal and state laws and regulations. This study satisfies project requirements in accordance with state and local regulations and was conducted as a means of characterizing the existing conditions consistent with the application of the screening criteria defined in Appendix G of the California Environmental Quality Act (CEQA) Guidelines (as amended December 28, 2018). This analysis also complies with guidelines and criteria specified by the Society of Vertebrate Paleontology (SVP) (2010) and follows best practices in mitigation paleontology (Murphey et al. 2019).

3.1 State Regulations

3.1.1 *California Environmental Quality Act*

CEQA is the principal statute governing environmental review of projects occurring in the state and is codified at Public Resources Code (PRC) Section 21000 et seq. CEQA requires lead agencies to determine whether a proposed project would have a significant effect on the environment, including significant effects on paleontological resources. Guidelines for the Implementation of CEQA, as amended December 1, 2016 (Title 14, Chapter 3, California Code of Regulations 15000 et seq.), define procedures, types of activities, persons, and public agencies required to comply with CEQA. Section VII(f) of the Environmental Checklist (State CEQA Guidelines Appendix G) asks whether a project would directly or indirectly destroy a unique paleontological resource and result in impacts to the environment.

3.1.2 *Public Resources Code Section 5097.5*

Requirements for paleontological resource management are included in PRC Division 5, Chapter 1.7, Section 5097.5, which states:

> No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate

> paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor.

These statutes prohibit the removal, without permission, of any paleontological site or feature from land under the jurisdiction of the state or any city, county, district, authority, or public corporation, or any agency thereof. Consequently, local agencies are required to comply with PRC 5097.5 for their own activities, including construction and maintenance, as well as for permit actions (e.g., encroachment permits) undertaken by others. PRC Section 5097.5 also establishes the removal of paleontological resources as a misdemeanor and requires reasonable mitigation of adverse impacts to paleontological resources from developments on public (state, county, city, and district) land.

4 METHODS

4.1 Desktop Methods

Prior to field efforts, a desktop analysis was conducted to determine the paleontological potential of the geologic units present in the project area. This analysis consisted of a review of the most recent geologic mapping available for the area (Johnson and Cochrane 2014), a review of the scientific literature, a records search of the Natural History Museum of Los Angeles County (LACM), and a search of the online collections database of the University of California Museum of Paleontology (UCMP).

4.1.1 *Professional Standards*

The SVP has established standard guidelines that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation (SVP 2010). Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements as specifically provided in its standard guidelines. Most state regulatory agencies with paleontological laws, ordinances, regulations, and standards accept and use the professional standards set forth by the SVP.

As defined by the SVP (2010:11), significant paleontological resources are defined as:

> fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years).

Numerous paleontological studies have developed criteria for the assessment of significance for fossil discoveries (e.g., Eisentraut and Cooper 2002; Murphey et al. 2019; Scott and Springer 2003). In general, these studies assess fossils as significant if one or more of the following criteria apply:

1. the fossils provide information on the evolutionary relationships and developmental trends among organisms, living or extinct;
2. the fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;

3. the fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;
4. the fossils demonstrate unusual or spectacular circumstances in the history of life; or
5. the fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

A geologic unit known to contain significant fossils is considered sensitive to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit will either disturb or destroy fossil remains directly or indirectly. This definition of sensitivity differs fundamentally from the definition for archaeological resources as follows:

> It is extremely important to distinguish between archaeological and paleontological (fossil) resource sites when defining the sensitivity of rock units. The boundaries of archaeological sites define the areal extent of the resource. Paleontological sites, however, indicate that the containing sedimentary rock unit or formation is fossiliferous. The limits of the entire rock formation, both areal and stratigraphic, therefore define the scope of the paleontological potential in each case. (SVP 1995)

Many archaeological sites contain features visually detectable on the surface. In contrast, fossils are often contained within surficial sediments or bedrock, and are therefore not observable or detectable unless exposed by erosion or human activity.

In summary, paleontologists cannot know either the quality or quantity of fossils prior to natural erosion or human-caused exposure. As a result, even in the absence of fossils on the surface, it is necessary to assess the sensitivity of rock units based on their known potential to produce significant fossils elsewhere within the same geologic unit (both within and outside the study area), a similar geologic unit, or based on whether the unit in question was deposited in a type of environment known to be favorable for fossil preservation. Monitoring by experienced paleontologists greatly increases the probability that fossils will be discovered during ground-disturbing activities and that, if these remains are significant, successful mitigation and salvage efforts may be undertaken to prevent adverse impacts to these resources.

4.1.2 *Paleontological Potential*

Paleontological potential is defined as the potential for a geologic unit to produce scientifically significant fossils. This is determined by rock type, history of the geologic unit in producing significant fossils, and fossil localities recorded from that unit. Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from a specific survey. In its *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources*, the SVP (2010:1–2) defines four categories of paleontological potential for rock units: high, low, undetermined, and no potential:

> **High Potential**. "Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e.g., ash or tephra), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e.g., middle Holocene and older, fine-grained fluvial sandstone, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstone, fine-grained marine sandstone, etc.). Paleontological potential consists of both a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or

> trace fossils and b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units which contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential."
>
> **Low Potential**. "Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e.g. basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils."
>
> **Undetermined Potential**. "Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy."
>
> **No Potential**. "Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection or impact mitigation measures relative to paleontological resources." (SVP 2010:1–2)

4.2 Paleontological Field Survey

Because the paleontological desktop analysis indicated the geologic units in the project area have high paleontological sensitivity (see Section 5: Results, below), pedestrian field surveys were conducted to determine whether either direct or indirect impacts to paleontological resources would occur as a result of the proposed project.

A direct impact to paleontological resources would result from the damage or destruction of fossils. Indirect impacts would result from increased erosional rates or expanded areas of erosion, where fossils could become exposed at the surface over time and would therefore be more likely to be destroyed by erosion or collected illegally by people using the road.

On August 21, 2020, SWCA paleontological Principal Investigator Alyssa Bell, Ph.D., and SWCA paleontological field technician Jake Farhar, B.S., conducted a pedestrian survey of the entire length of Road Areas 1 to 9 and the portions of the road in the Jesusita Trail with visible outcrops. Outcrops of bedrock, areas with visible landslide deposits, and collected debris moved by road work were inspected to characterize the lithology and identify whether fossils were present. The high slope of the sidecast areas and the stream presented safety concerns for conducting the paleontological resources survey in these areas. Therefore, SWCA did not conduct a pedestrian survey of the sidecast areas or the stream at this time.

On October 22, 2021, SWCA staff paleontologist Kristina Akesson, B.S., under the direction of SWCA paleontology team lead Mathew Carson, M.S., conducted a pedestrian survey of two additional areas, the first area situated along Mission Creek downslope of Road Area 1 and Road Area 2 near a sidecast deposit, and the second area situated along Mission Creek downslope of Road Area 4. Outcrops of bedrock and areas with visible landslide deposits were documented for their potential to contain paleontological resources. Due to previous safety concerns pertaining to the high slope of the sidecast areas, the paleontological field technician walked to the first survey area by entering Mission Creek near its intersection with Tunnel Road and hiked along the stream to the first area. The second survey area was accessed from the Tunnel Trail in Road Area 4.

5 RESULTS

5.1 Paleontological Setting

The project area is in the western Transverse Ranges geomorphic providence, a complex series of young, east-west-trending mountain ranges and valleys that contrast with general north-south orientation of California's other mountain ranges, such as the Peninsular Ranges and Coastal Ranges (Matti et al. 1992). The Transverse Ranges begin at Point Conception in Santa Barbara County and extend in an easterly direction, terminating at the San Bernardino Mountains in San Bernardino County. Most of the ranges are bounded to the north and east by the San Andreas Fault System, which separates the ranges from the Coastal Ranges and Peninsular Ranges. Components of the ranges that lie north of the San Andreas Fault are the Tehachapi Mountains and San Bernardino Mountains. Most of the tallest peaks are in the eastern portion of the range and include Mount San Gorgonio (3,505 meters above sea level) and San Bernardino Peak (3,246 meters above sea level). The Transverse Ranges are noted for being extremely steep and difficult to traverse.

The Transverse Ranges include a wide variety of geologic units, ranging in age from the Proterozoic to the recent (Norris and Webb 1990). The Transverse Ranges are composed of a thick sequence of late Mesozoic- and Cenozoic-age strata that rest unconformably on a variety of basement rocks (Namson and Davis 1988). In the western Transverse Ranges, around the project area, these strata are primarily marine and record a complex cycle of marine transgressions and regressions as the basin that is today California filled over time (Sylvester and Brown 1988). These ranges are undergoing active north-south shortening due to faulting (Norris and Webb 1990) that causes a rise in elevation on an annual scale. These fault-bounded ranges are mainly composed of two distinct types of crystalline basement rocks that are separated by thrust faults.

The project area has been mapped by Johnson and Cochran (2014) at a scale of 1:24,000 (Figure 5). This mapping indicates three geologic units are present in the project area: Quaternary landslide deposits, the Eocene-Oligocene Sespe Formation, and the Eocene Coldwater Formation. These units and their paleontological potential are discussed below.

Landslide Deposits (Qls). Landslide deposits vary from poorly sorted and disrupted mixtures of rock fragments and soil to relatively intact bedrock slump blocks deposited as a result of debris flows and mass wasting. Within the project area, landslide deposits occur at Road Areas 5 to 7 and the southern part of the Jesusita Trail area (Johnson and Cochran 2014). These deposits date from the Quaternary, from recent times to the middle Pleistocene (approximately 1 million years ago [Ma]). Due to the high energy of deposition of these sediments, they are unlikely to preserve fossil resources. The thickness of this deposit is not known in the project area, however, and the Coldwater Formation underlies this landslide at an undetermined depth.

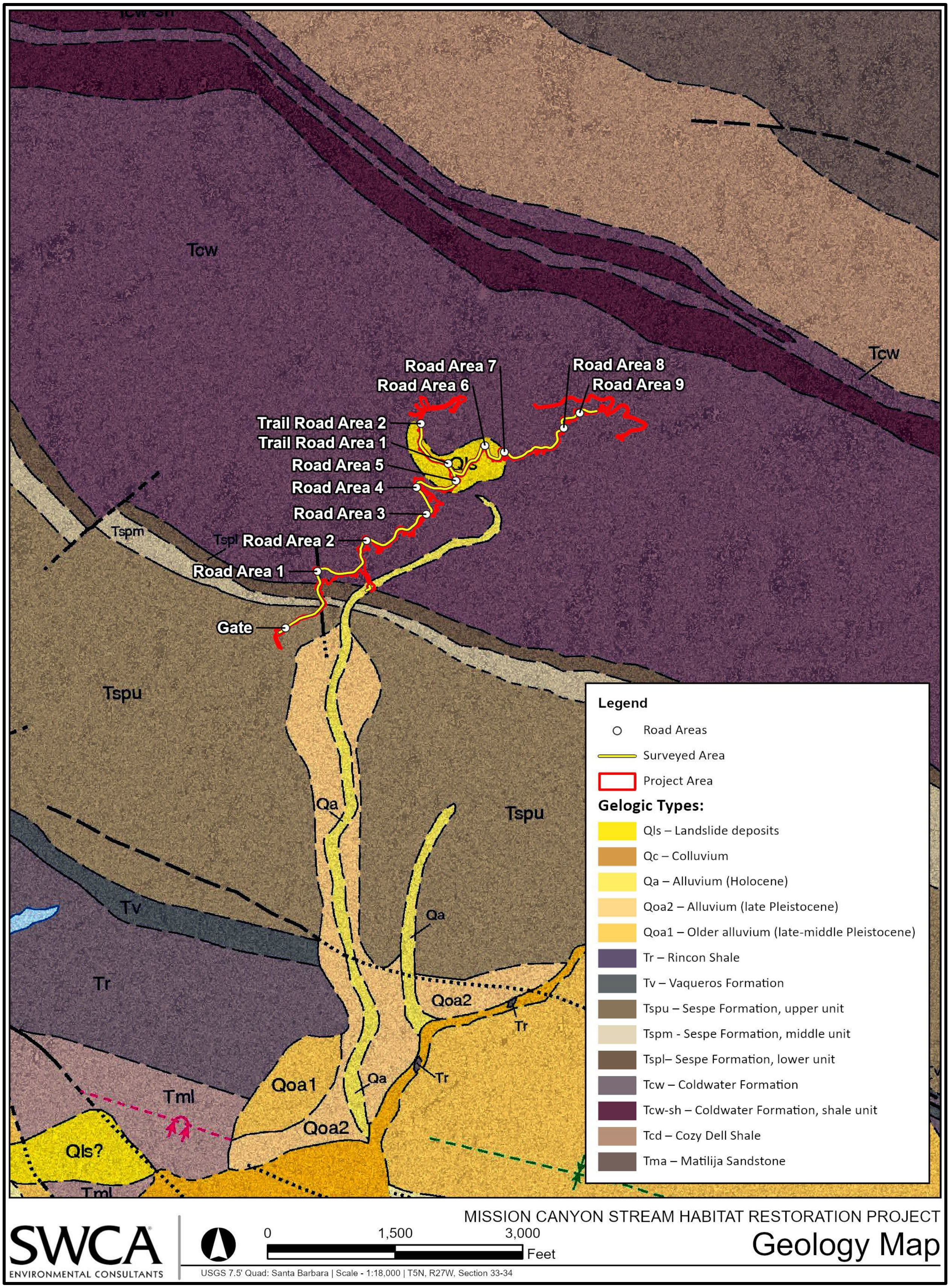

Figure 5. Geologic map of the project area, from Johnson and Cochran (2014).

Sespe Formation (Tspu, Tspm, Tspl). The Sespe Formation records transitional marine environments (Liddicoat 1990) with sediments that consist of interbedded gray siltstone and red claystone with sandstone layers and fluvial conglomerate (Johnson and Cochran 2014). The Sespe Formation ranges in age from the Oligocene to the late Eocene (23 to approximately 40 Ma; Johnson and Cochran 2014). Within the project area, three lithofacies of the Sespe Formation are present: sandstone and mudstone (upper unit, Tspu); conglomerate and sandstone (middle unit, Tspm); and conglomerate and sandstone (lower unit, Tspl) (Johnson and Cochran 2014). The upper unit dates to the late Oligocene and consists of interbedded sandstone, siltstone, and mudstone, with sandstones broadly lenticular and laminated in thin to thick beds (Johnson and Cochran 2014). The upper unit lies conformably on the middle unit, which dates from the Oligocene and consists of interbedded conglomerate, sandstone, and mudstone; conglomerate clasts are from the Franciscan Complex and composed of primarily chert and sandstone (Johnson and Cochran 2014). The contact between the middle and lower units is an unconformity representing a depositional hiatus during the early Oligocene (Johnson and Cochran 2014). The lower unit dates from possibly the early Oligocene to the late Eocene and consists of interbedded conglomerate, conglomeratic sandstone, sandstone, mudstone, and minor shale, with sandstones indurated and conglomerate clasts derived from Mojave Desert source terranes.

Fossils from the Sespe Formation include highly weathered marine mollusks (Liddicoat 1990) and a wide variety of terrestrial vertebrates such as turtle, opossum, rabbit, pocket mouse, badger, and primate (Lander 1983; Mason 1990; Whistler and Lander 2003). The closest fossil locality in the Sespe Formation known to the LACM is approximately 5 kilometers (km) south of the project area, where a member of the Artiodactyla, a large family of cloven-hooved mammals including camels, giraffes, and antelope, was recovered from an unrecorded depth (LACM 2020; Table 6). Note that the LACM does not provide specific geographic coordinates or maps of fossil localities with their records search results to maintain confidentiality (see Confidential Appendix A). The online collections of the UCMP indicate they have records of 13 fossil localities in Santa Barbara County from the Sespe Formation; however, specific locality locations are not available (UCMP 2020). These localities preserved primarily invertebrate fossils, as well as a rare animal called an oreodont (specifically *Sespia californica*), an extinct mammal somewhat like a modern sheep (Lander 2002; UCMP 2020).

Coldwater Formation (Tcw). The Coldwater Formation preserves a marine regression, or time of falling sea level, of near-shore marine depositional environments from the upper Eocene (around 33–40 Ma) (Squires 1994). The Coldwater Formation is exposed as a narrow band in the Transverse Ranges across Santa Barbara and Ventura Counties (Johnson and Cochran 2014). The Coldwater Formation consists of thin- to thick-bedded sandstone that weathers to pale shades of buff, yellow, and brown with lesser amounts of siltstone, shale, and mudstone interbeds (Johnson and Cochran 2014). Two distinct sequences are preserved within the Coldwater Formation, a tide-dominated shoreline in the southwestern extent of the unit and a wave-dominated shoreline to the northeast (Jiao and Fritsche 1994). The tidal sequences are overall finer grained than the wave-dominated sequence, which consists primarily of massively bedded or cross-bedded sandstone. The tidal-dominated sequence fines upward, with the lower part preserving medium-grained sandstone, with the proportion of siltstone and claystone increasing in the upper parts. The opposite is true in the eastern, wave-dominated facies, where siltstone is more common in the lower part of the formation and massive medium-grained sandstone beds up to 20 m (meters) thick are found in the upper part (Jiao and Fritsche 1994).

The Coldwater Formation is well known to preserve invertebrate fossils such as oysters and other bivalves as well as gastropods, and which can occur as dense shell beds in some sections (Jiao and Fritsche 1994; Johnson and Cochran 2014; Squires 1994). Plant fossils such as leaf impressions and petrified wood are also known in parts of the Coldwater Formation (Jiao and Fritsche 1994). Vertebrates are poorly described from the formation; however, the online collections of the UCMP indicate they have two fossil localities around Ojai, approximately 40 km east of the project area, where mammal fossils have been collected (UCMP 2020). The nearest fossil localities known to the LACM are shown in

Table 6. These are all invertebrate fossil localities, the closest of which is 22 km southeast of the project area.

Table 6. Results of the Museum Records Search from the LACM for Southern California Edison's Mission Canyon Creek Restoration Project Area

Locality Number	Location	Approximate Distance and Direction from Project Area	Formation	Taxa	Depth
LACM VP 3253	Exact locality unrecorded; 2 miles northeast of Santa Barbara in roadcut.	5 km south	Sespe Formation	Artiodactyla	Unknown
LACM IP 24227	6,000 feet north from large stream intersection of Las Flores Canyon and Corral Canyon	30 km west	Sespe Formation	Invertebrates	Unknown
VP CIT 420, 421	0.125 miles east of Sespe Gorge	40 km northeast	Sespe Formation	Mammals	Unknown
LACM IP 26634	Small canyon between Brea Canyon and Ventura County Dump canyon	48 km southeast	Sespe Formation	Vertebrates	Surface
VP CIT 160, 220	West side of Willard Canyon near top of deep draw	61 km southeast	Sespe Formation	Mammals	Surface
LACM IP 26982	Carpinteria Creek, 3.2 miles north of Rincon Point	22 km southeast	Coldwater Formation	Densely packed mollusk bed	Surface
LACM IP 27015	North side of Santa Ynez River; southeast corner of Section 1, Township 5 North, Range 29 West; San Marcos Pass U.S. Geological Survey quadrangle	23 km northwest	Coldwater Formation	Invertebrates, including *Venericardia* (bivalve mollusk)	Surface
LACM IP 41115	Along State Route 33 north of Cherry Canyon Road	35 km northeast	Coldwater Formation	Invertebrates	Unknown
LACM IP 16672	Along State Route 33, above Adobe Creek	37 km northeast	Coldwater Formation	Invertebrates	Unknown

5.2 Desktop Paleontological Potential

The review of the scientific literature and museum records searches discussed above were used to determine the paleontological potential of the project area as follows:

Quaternary Landslide Deposits (Qls). Landslide deposits form in a high-energy depositional setting unlikely to preserve significant fossil resources. Furthermore, these deposits are too young to preserve fossil (i.e., under 5,000 years, in accordance with the SVP [2010]) in the upper layers. Therefore, the landslide deposits in the project area are assessed as having low paleontological potential.

Sespe Formation (Tspu, Tspm, Tspl). The Sespe Formation is known to preserve an array of invertebrate and some vertebrate fossils; therefore, the Sespe Formation is assessed as having high paleontological potential.

Coldwater Formation (Tsw). The Coldwater Formation is known to preserve an array of invertebrates, including thick shell beds, as well as plants and some vertebrate fossils; therefore, the Coldwater Formation is assessed as having high paleontological potential.

5.3 Paleontological Survey Results

A field survey of the project area was conducted on August 21, 2020. The pedestrian survey began at the gate at the entrance to the affected road areas and continued along Road Areas 1 to 9 and the Jesusita Trail segment (Trail Road Areas 1 and 2 in Figure 3). The high slope of the sidecast areas and the stream presented safety concerns for conducting the pedestrian survey in these areas. Therefore, SWCA did not conduct a pedestrian survey of the sidecast areas or the stream at that time.

A second field survey of two additional areas was conducted on October 22, 2021. The first area was situated along Mission Creek downslope of Road Area 1 and Road Area 2 near a sidecast deposit, and the second area situated along Mission Creek downslope of Road Area 4. Due to previous safety concerns pertaining to the high slope of the sidecast areas, the paleontologist walked to the first survey area by entering Mission Creek near its intersection with Tunnel Road and hiked along the stream to the first area. The second survey area was accessed from the Tunnel Trail in Road Area 4.

Although a pedestrian survey could not have been conducted safely throughout the sidecast areas during the first survey, any paleontological resources that may have been present would have been likely similar in type, taxonomy, and preservation (i.e., level of significance) to those observed along the road and trail areas that were subject to the majority of the pedestrian survey (see below). Field observations during the second field survey confirmed the presence of fossils in the sidecast material similar to those observed along the road. These fossils were all nonsignificant and common; however, the presence of significant paleontological resources in sidecast areas and the stream cannot be ruled out because only a small fraction of the sidecast areas were safely accessible.

5.3.1 *Geology and Paleontology*

The paleontological surveys confirmed the presence of the Sespe Formation from the gate to just before Road Area 1 (mapped as Tspu, Tspm, and Tspi in Figure 5), Coldwater Formation along the majority of the affected areas (Road Areas 1 to 9; mapped as Tcw in Figure 5), as well as a large landslide deposit present from Road Areas 5 to 7 and along the Jesusita Trail up to Trail Road Area 2 (mapped as Qls in Figure 5).

Quaternary Landslide Deposits (Qls). Landslide deposits were identified in the location indicated on the geology map of the project area (see Figure 5). This unit consisted of boulder-sized, rounded to subrounded clasts of Coldwater Formation massive sandstones in a silty-sand matrix (Figure 6).
The boulders were large enough that they could individually preserve fossils from the Coldwater Formation, and some invertebrate fossils were noted on individual clasts along the Jesusita Trail segment (Figure 7).

Figure 6. Landslide deposit (Qls) along Road Area 5.

Figure 7. Oyster fossils and dissolution molds in a block of Coldwater Formation (Tsw) in sandstone present in landslide deposits along the Jesusita Trail segment.

Sespe Formation (Tspu, Tspm, Tspi). The Sespe Formation was identified as mapped from the gate to just before the marker for Road Area 1, as shown on the geology map for the project area (see Figure 5). The Sespe is tilted dramatically, with near-vertical bedding. No fossils were observed in the Sespe Formation.

- Upper Unit (Tspu). The upper unit is present at the gate and the beginning of the trail, and consists of massive reddish-tan sandstone that weathers to darker tan to brown. The sandstone is moderately to well sorted, with fine- and medium-grained sand and a slightly blocky texture (Figure 8). Thin shale layers (submeter scale) were observed.
- Middle Unit (Tspm). The middle unit is present as a thin band approximately 30 m thick downsection from the upper unit. The middle unit consists of thick sandstone beds (2–3 m), thin conglomerate beds (<1 m), and thin shale beds (<1 m) (Figure 9). Conglomerate clasts are primarily chert and sandstone, with some quartzite, and range in size from pebble to cobble, with gravels dominating.
- Lower Unit (Tspl). The lower unit consists of a thick, massive sandstone similar to that seen in the upper unit underlain by repeated meter-scale beds of sandstone and thin beds of conglomerate and shale, similar to that observed in the middle unit but with a higher proportion of shale and less sandstone. Conglomerate clasts are primarily sedimentary and metasedimentary rocks, and primarily pebble to gravel in size.

Figure 8. Massive sandstone of the upper unit of the Sespe Formation (Tspu, Tspm, Tspi).

Figure 9. Conglomerate bed (left) and alternating sandstone and shale interbeds (right) in the middle unit of the Sespe Formation (Tspu, Tspm, Tspi). Scale is extended to 20 centimeters.

Coldwater Formation (Tsw). The Coldwater Formation was identified in locations as mapped in the geology map of the project area (see Figure 5). The contact between the Coldwater Formation and overlying Sespe Formation is obscured by younger alluvium or colluvium, which may conceal a fault at the contact (Figure 10). The Coldwater Formation consists primarily of alternating 5- to 10-m sections of massive sandstone alternating with narrower (<5 m) layers of alternating meter-scale interbedded massive sandstone and shale. Sandstones are primarily massive yellowish tan, fine- to medium-grained sandstone; however, some crossbedding was observed. Induration varies, with some layers consisting of crumbly, soft sandstone and others consisting of highly indurated, resistant sandstone. Shale beds increased in frequency down-section, indicating that the Coldwater Formation coarsens upward as the water depth of the depositional environment lowered over time.

A variety of fossils were observed in the sandstone of the Coldwater Formation. These consist of isolated occurrences of small collections of fossil wood (Figure 11), trace fossils (Figure 12), isolated invertebrate fossils (see Figure 6), and 20- to 70-centimeter (cm)-thick shell beds preserving dissolution molds of invertebrate fossils as well as preserved shells (Figure 13). Invertebrates consist of bivalve mollusks, with oysters identified in several places (Figures 14–17); however, the preservation was too poor to allow more precise identification of most invertebrates. The trace fossils consist of burrows present as isolated linear and sinusoidal burrows as well as geometric networks of linear to slightly curved burrows (see Figure 12). Burrows range from 1 to 4 cm in diameter and up to 30 cm long. The trace fossils are assigned to the ichnogenus *Thalassinoides*, indicative of shallow marine environments.

Figure 10. Contact between the Sespe Formation (Tspu, Tspm, Tspi) and Coldwater Formation (Tsw).

Figure 11. Fossilized wood in a block of Coldwater Formation (Tsw) sandstone in a rubble pile generated by project road work.

Figure 12. Interconnected (left) and isolated branching (right) *Thalassinoides* burrows in the Coldwater Formation (Tsw). Scale is extended to 10 cm.

Figure 13. Approximately 50-cm-thick bed with abundant shell dissolution molds in the Coldwater Formation (Tsw). Scale is extended to 1 m.

Figure 14. Oyster shells in a piece of Coldwater Formation (Tsw) found in a roadside berm from project road work.

Figure 15. Oyster shells in a boulder of Coldwater Formation (Tsw) from sidecast material along Mission Creek.

Figure 16. Oyster shell in a boulder of Coldwater Formation (Tsw) from sidecast material situated south of the bridge in Road Area 4.

Figure 17. Sidecast material of Coldwater Formation (Tsw) situated along the Mission Canyon slope south of Road Area 4.

5.3.2 *Revised Paleontological Potential*

The results of the field survey provided additional information for the paleontological assessment conducted above from a review of the literature and museum records (Table 7).

Table 7. Paleontological Potential of the Geologic Units Present in the Project Area

Geologic Unit	Location within the Project Area*	Description	Paleontological Potential
Landslide Deposits	Road Areas 4–7, Trail Road Areas 1 and 2	Boulders of Coldwater Formation in silt-sand matrix	High (boulders of Coldwater Formation)
Sespe Formation	Gate to just south of Road Area 1	Interbedded massive sandstone with conglomerate and shale	High
Coldwater Formation	Road Area 1 to south of Road Area 5, Road Areas 7–9	Massive sandstone with interbeds of shale	High

* Road area numbers as shown on Figure 5.

Quaternary Landslide Deposits (Qls). While landslides are high-energy events unlikely to preserve fossils from the time of the landslide, the landslide present in the project area contains abundant large boulders of the Coldwater Formation, which were observed to preserve fossils. Therefore, the clasts within the landslide have the potential to preserve significant fossils and the unit should be considered to have high paleontological potential.

Sespe Formation (Tspu, Tspm, Tspl). While the field survey did not identify fossils in the Oligocene to late Eocene Sespe Formation exposed along the road, the Sespe Formation is well documented to preserve an array of invertebrate and some vertebrate fossils in the region. Additionally, the observed lithology (particularly sandstone and shale beds) is appropriate for the preservation of fossil resources. Therefore, the Oligocene to late Eocene Sespe Formation should be considered to have high paleontological potential.

Coldwater Formation (Tsw). The field survey documented several types of fossils in the early Eocene Coldwater Formation outcrops and debris in the project area. Although these fossils were nonsignificant, they indicate the potential for preservation of other fossils in the project area. Additionally, this geologic unit is known to host significant vertebrate fossils around Ojai, approximately 40 km east of the project area (UCMP 2020). Therefore, the early Eocene Coldwater Formation is considered to have high paleontological potential.

6 IMPACTS ANALYSIS

Approximately 1.6 miles of SCE access roads were repaired on Spyglass Ridge Road, Mission Canyon Catway, and the spur road to Jesusita Trail in mid-December 2019. These roads were repaired and widened for accessibility of large utility and emergency vehicles. The proposed project remedies certain impacts to Mission Creek and its tributaries caused by the December 2019 work, as well as areas impacted by sidecast along Road Areas Gate through Road Area 3; Road Areas 1 and 2; Roadside Sidecast Areas 1and 2, 4 to 16, and 17 to 19; Sidecast Area 3, Sidecast Area 3 Outliers; and Creek Sites 1–4 and 7. The proposed restoration activities have the potential for both direct and indirect effects on paleontological resources, under CEQA.

The loss of any identifiable fossil that could yield information important to prehistory, or that embodies the distinctive characteristics of a type of organism, environment, period of time, or geographic region, would be a significant environmental impact. Direct impacts to paleontological resources primarily concern the potential destruction of nonrenewable paleontological resources and the loss of information associated with these resources. Indirect impacts include the future potential loss or damage to fossil resources, such as through increased erosion that could result in exposure of fossil localities or increased access to the area that could result in increased illegal collection.

6.1 Significance Thresholds

The following are the significance thresholds for paleontological resources provided in the State CEQA Guidelines Appendix G Environmental Checklist, which states that project activities could potentially have a significant effect if they:

1. Impact-GEO-1: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature (Threshold Geo-1).

6.2 Impact-GEO-1: Paleontological Resources

6.2.1 *Direct Effects*

This updated paleontological resources assessment was conducted to analyze any potential impacts this project may have on paleontological resources located within the project area. Based on the results of this study, the project may result in impacts to geologic units with high paleontological sensitivities. Under CEQA, an impact to fossil resources would occur if a unique paleontological resource or site were destroyed during the restoration activities proposed along the road and trail areas, the sidecast areas along the slope, or the stream and its tributaries for this project. Direct effects occur if resources are altered, disturbed, destroyed, or removed during the implementation of a project. Because paleontological resources in the form of invertebrate, trace, and plant fossils were identified in the Coldwater Formation in outcrops, as well as in road debris within and immediately adjacent to the project area, paleontological resources may be present in the sidecast and stream areas, and direct impacts would occur if these fossils were damaged or destroyed.

As the fossils recorded during field surveys are common invertebrates, traces, or plants, they do not meet the SVP (2010) definition of significant fossils. However, the presence of significant fossils within sidecast sediments on the slopes or within the stream cannot be ruled out. Therefore, future project activities have the potential for significant direct impacts to paleontological resources; thus, APMs should be implemented to reduce potential direct impacts to a less than significant level.

6.2.2 *Indirect Effects*

Indirect effects under CEQA would occur if a unique paleontological resource or site were destroyed following completion of the proposed project as a result of the restoration's having occurred. Examples of indirect effects on paleontological resources include modifications that increase erosion or expose fossils to illegal collecting.

The types of fossils observed in the project area are common and often exposed through natural erosional processes; however, the proposed project seeks to stabilize the slopes or remove sidecast material from the slopes or stream to minimize the effects of erosion. As the project area is situated on private and city-owned lands in unincorporated Santa Barbara County, California, and any significant fossil identified during monitoring would belong to the landowner. The field survey did not identify any indicators that significant fossil resources were exposed to illegal collection by project activities. Illegal collecting cannot be ruled out, however. Therefore, future project activities have the potential for significant indirect impacts to paleontological resources; therefore, APMs should be implemented to reduce potential indirect impacts to a less than significant level.

7 RECOMMENDATIONS

The geologic units underlying the project area (i.e., Quaternary landslide deposits with boulders of Coldwater Formation, Oligocene to late Eocene Sespe Formation and/or early Eocene Coldwater Formation) have high paleontological potential; therefore, future ground-disturbing activities in the project area risk impacting paleontological resources. Should fossils be encountered during ground-disturbing activities from the project, they would be at risk for damage or destruction, constituting a direct impact under CEQA. The implementation of appropriate APMs will ensure that should fossils be encountered, they are assessed for significance and, if significant, salvaged and curated with an accredited repository. This will reduce the impacts to fossil resources from the project to less than significant.

The proposed project remedies certain impacts caused by the December 2019 work, including habitat restoration within Mission Creek and its tributaries, restoration of areas impacted by sidecast between Road Areas Gate through Road Area 3; Road Areas 1 and 2; Roadside Sidecast Areas 1 and 2, 4 to 16, and 17 to 19; Sidecast Area 3, Sidecast Area 3 Outliers; and Creek Sites 1 to 4 and 7. Geologic exposures along the road and trail areas were inspected for paleontological resources where they were accessible at the time of the surveys, such as in bedrock outcrops, at berms along the road, at the surface of rubble piles, and in the sidecast areas along Road Areas 1 and 2 and Road Area 4 that were safe to access; however, most sidecast areas could not be surveyed on foot due to site accessibility issues, and rubble buried within piles or under netting could not be inspected during the survey. Although most fossils observed in geologic exposures and in sidecast material were nonsignificant, sidecast material or rubble may preserve more fossils that should be documented and assessed for significance, and, if significant, salvaged during implementation of the project.

Activities planned for the removal phase of work include the following methods: Hand and Guzzler Removal, Hand Rock Removal, and Helicopter Removal. Using the hand and guzzler removal method, a guzzler truck will remove fine sediment and rocks 3 inches in diameter or smaller while rocks larger than 3 inches in diameter would be carried out by hand or loaded into rock sacks and removed using the excavator. Large rocks and boulders would be broken up using sledgehammers, pickaxes, expansive rock breaking agent, or jackhammers and then removed with the excavator. The Hand Rock Removal method will be used where scattered rocks are intermixed with existing vegetation and access is only available by foot. Technicians will use high incline rigging for fall protection and will manually remove the sidecast rock and transfer it upslope by hand. Lastly, a helicopter will be used to remove large boulders and smaller rock and soil material where there is no footpath or road access. The helicopter removal method will relocate the material to an approved staging area.

Accordingly, to ensure that potential impacts to paleontological resources that may be present in the project area are clearly less than significant, SWCA recommends the APMs outlined below. The APMs have been developed in accordance with the performance standards of the SVP (2010) and industry best practices (Murphey et al. 2019). Implementing these measures will reduce impacts to paleontological resources to a less than significant level.

> **GEO-1**: A qualified project paleontologist will be retained to prepare and implement a paleontological resources monitoring and mitigation plan. This plan will address specifics of monitoring and mitigation, including but not limited to preconstruction meeting attendance requirements, monitoring methods and procedures, monitoring staff qualifications, worker training, unanticipated discovery protocols, notification procedures, fossil salvage or sampling requirements, final reporting, and accessioning of

any discovered paleontological resources into a recognized repository such as a museum, should fossils be found. The plan will comply with the recommendations of the SVP (2010). The project paleontologist will also prepare a report of the findings of the monitoring plan after construction is completed.

GEO-2: The project paleontologist will develop a Worker's Environmental Awareness Program to be incorporated into the general Worker's Environmental Awareness Program training for the construction crew on the legal requirements for preserving fossil resources as well as procedures to follow in the event of a fossil discovery. This training program will be given to the crew before ground-disturbing work commences and will be given to new workers upon onboarding.

GEO-3: Certain ground-disturbing activities used for sidecast removal will require initial full-time paleontological monitoring. Monitoring should be conducted by a paleontological monitor who meets the standards of the SVP (2010) under the supervision of the project paleontologist. The project paleontologist may periodically inspect construction activities to adjust the level of monitoring in response to subsurface conditions. Monitoring can be reduced to part-time or ceased entirely if determined adequate by the project paleontologist. The monitor will have authority to temporarily divert activity away from exposed fossils to evaluate the significance of the find and, should the fossils be determined significant, professionally and efficiently recover the fossil specimens and collect associated data. Paleontological monitors will record pertinent geologic data and collect appropriate sediment samples from any fossil localities.

For both the hand and guzzler removal method and the hand rock removal method, initial full-time paleontological monitoring should occur during manual (hand) removal of sidecast clasts greater than 3 inches in diameter, as well as during manual breakage of large rocks and boulders greater than 24 inches in diameter by sledgehammers, pick axes, expansive rock breaking agents, or jackhammers prior to removal by excavators. In instances where high incline fall protection for technicians removing the sidecast is required for the safe removal of the sidecast material (such as in the hand rock removal method), the paleontological monitor should inspect the sidecast clasts for significant fossils from along the road or from an accessible safe location. In locations where helicopter removal is necessary to remove sidecast material, paleontological monitoring is not required; however, at the discretion of the project paleontologist, the paleontological monitor may inspect stockpiles of soil removed by the hand and guzzler removal method, the hand rock removal method, or the helicopter removal method prior to being hauled away for disposal. Sidecast clasts less than or equal to 3 inches in diameter and/or sidecast material subject to guzzler vacuum truck removal do not require paleontological monitoring.

GEO-4: In the event of a fossil discovery, whether by the paleontological monitor or a member of the construction crew, all work will cease in a 15-meter (50-foot) radius of the find while the project paleontologist assesses the significance of the fossil and documents its discovery. Should the fossil be determined significant, it will be salvaged following the procedures and guidelines of the SVP (2010) and in consultation with an accredited repository. Recovered fossils should be prepared to the point of curation, identified by qualified experts, listed in a database to facilitate analysis, and deposited in a designated paleontological curation facility. The most likely repository is the LACM.

GEO-5: Upon conclusion of ground-disturbing activities, the Qualified Paleontologist overseeing paleontological monitoring should prepare a final Paleontological Resources Monitoring Report (PRMR) that documents the paleontological monitoring efforts for the project and describes any paleontological resource discoveries observed and/or recorded during the life of the project. If paleontological resources are curated, the PRMR and any associated data pertinent to the curated specimen(s) should be submitted to the designated repository. A copy of the final PRMR should be filed with the CDFW.

8 LITERATURE CITED

Eisentraut, P., and J. Cooper. 2002. *Development of a Model Curation Program for Orange County's Archaeological and Paleontological Collections.* Submitted to the County of Orange Public Facilities and Resources Department/Harbors, Parks and Beaches. Fullerton: California State University.

Helix Environmental Planning, Inc. (Helix). 2023. *Mission Creek Habitat Restoration and Mitigation Plan*. Helix Environmental Planning, Inc.

Jiao, Z., and A. Fritsche. 1994. Depositional environments and paleogeography of the Coldwater Formation, upper Sespe Creek, Ventura County, California. In *Sedimentology and Paleontology of Eocene Rocks in the Sespe Creek Area, Ventura County, California*, edited by A. Fritsche, pp. 57–79. Book 74. Society for Sedimentary Geology, Pacific Section.

Johnson, S., and S. Cochran (eds.). 2014. California State Waters Map Series: Offshore of Santa Barbara, California. Scientific Investigations Map 3281. U.S. Geological Survey.

Lander, E.B. 1983. Continental vertebrate faunas from the upper member of the Sespe formation, Simi Valley, California, and the terminal Eocene event. In *Cenozoic Geology of the Simi Valley Area, Southern California*, edited by R.R. Squires and M.V. Falewiez, pp. 142–144. Fall Field Trip Volume and Guidebook. Society of Economic Paleontologists and Mineralogists, Pacific Section.

———. 2002. Life near the edge: Sespia (Mammalia, Artiodactyla, Oreodontidae) from the continental Sespe and marine Alegria formations, southern Santa Ynez Mountains, coastal Santa Barbara County, California. 2002 California Paleontology Conference Abstracts. *PaleoBios* 22(1)(Suppl.):6–7.

Liddicoat, J.C. 1990. Tectonic rotation of the Santa Ynez Range, California, recorded in the Sespe Formation. *Geophysical Journal International* 102:739–745.

Mason, M.A. 1990. New fossil primates from the Uintan (Eocene) of southern California. *PaleoBios* 13:1–7.

Matti, J.C., D.M. Morton, and B.F. Cox. 1992. *The San Andreas Fault System in the Vicinity of the Central Transverse Ranges Province, Southern California*. Open File Report 92-354. U.S. Geological Survey.

Murphey, P.C., G.E. Knauss, L.H. Fisk, T.A. Deméré, and R.E. Reynolds. 2019. *Best Practices in Mitigation Paleontology*. Proceedings of the San Diego Society of Natural History No. 47. San Diego Society of Natural History.

Namson, J., and T.L. Davis. 1988. Structural transect of the western Transverse Ranges California: implications for lithospheric kinetics and seismic risk evaluation. *Geology* 16:675–679.

Natural History Museum of Los Angeles County (LACM). 2020. Records search results for the Mission Canyon Project. Letter response to an email from A. Bell, SWCA Environmental Consultants, on August 18, 2020.

Norris, R.M., and R.W. Webb. 1990. *Geology of California*. 2nd ed. New York: John Wiley and Sons.

Scott, E., and K. Springer. 2003. CEQA and fossil preservation in southern California. *The Environmental Monitor* 2003:4–10.

Society of Vertebrate Paleontology (SVP). 1995. Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources: Standard Guidelines. *Society of Vertebrate Paleontology News Bulletin* 163:22–27.

———. 2010. Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources. Available at: https://vertpaleo.org/wp-content/uploads/2021/01/SVP_Impact_Mitigation_Guidelines-1.pdf. Accessed August 25, 2020.

Squires, R. 1994. Macropaleontology of Eocene marine rocks, upper Sespe Creek area, Ventura County, southern California. In *Sedimentology and Paleontology of Eocene Rocks in the Sespe Creek Area, Ventura County, California*, edited by A. Fritsche, pp. 39–56. Book 74. Society for Sedimentary Geology, Pacific Section.

Sylvester, A.G., and G.C. Brown. 1988. Roadlog. In *Santa Barbara and Ventura Basins; Tectonics, Structure, Sedimentation, Oilfields Along an East-West Transect*, edited by A. G. Sylvester, pp. 1–52. Field Guide Vol. 64. Ventura, California: Coast Geological Society.

University of California Museum of Paleontology (UCMP). 2020. Online collections database. Available at: https://ucmpdb.berkeley.edu/loc.html. Accessed August 19, 2020.

Whistler, D.P., and E.B. Lander. 2003. New late Uintan to early Hemingfordian land mammal assemblages from the undifferentiated Sespe and Vaqueros Formations, Orange County, and from the Sespe and equivalent marine formations in Los Angeles, Santa Barbara, and Ventura Counties, Southern California. *Bulletin of the American Museum of Natural History* 279:231–268.

APPENDIX A

Natural History Museum of Los Angeles County Records Search

Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

Research & Collections

e-mail: paleorecords@nhm.org

August 18, 2020

SWCA Environmental Consultants
51 West Dayton Street
Pasadena, CA 91105

Attn: Alyssa Bell, Ph.D., Paleontological Principle Investigator

re: Paleontological resources for the proposed Mission/Goleta Project, Santa Barbara, CA

Dear Alyssa:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for proposed development at Mission/Goleta Project area as outlined on the portion of the Santa Barbara USGS topographic quadrangle map that you sent to me via e-mail on August 18, 2020. This records search covers only the records of the Natural History Museum of Los Angeles County ("NHMLA"). It is not intended as a paleontological assessment of the project area for the purposes of CEQA or NEPA. Potentially fossil-bearing units are present in the project area, either at the surface or in the subsurface. As such, NHMLA recommends that a full paleontological assessment of the project area be conducted by a paleontologist meeting Bureau of Land Management or Society of Vertebrate Paleontology standards.

We do not have any fossil localities that lie directly within the proposed project area, but we do have fossil localities from the same sedimentary deposits that occur in the proposed project area, either at the surface or at depth. The following table shows the closest known localities in the collection of the Natural History Museum of Los Angeles County.

Locality Number	Location	Formation	Taxa	Depth
LACM IP 26982	Carpinteria Creek; 0.5 mile up creek from Carpinteria Plain; approximately 3.2 miles north of Rincon Point	Coldwater Sandstone	densely packed mollusk bed	surface
LACM IP 27015	north side of Santa Ynez River; within 1000	Coldwater Sandstone	Invertebrates including	surface

	feet of 3500 feet north; 300 feet west of SE corner section 1; T5N; R29W; San Marcos Pass quad		*Venericardia*	
LACM IP 41115	Along Hwy 33 north of Cherry Canyon Rd and Sandstone camp	Coldwater Sandstone	Invertebrates	Unknown
LACM IP 16672	Along Highway 33; above Adobe Creek	Coldwater Sandstone	Invertebrates	Unknown
LACM VP 3253	Exact locality unrecorded. Two miles northeast of Santa Barbara in roadcut.	Sespe Formation	Artiodactyla	Unknown
LACM IP 24227	6000 feet north from large stream intersection of Las Flores Canyon and Corral Canyon	Sespe Formation	Invertebrates	Unknown
VP CIT 420	1 1/8 mi. E of Sespe Gorge	Sespe Formation	Mammals	Unknown
LACM IP 26634	small canyon between Brea Canyon and Ventura County Dump canyon	Sespe Formation	Vertebrates	Surface
VP CIT 160, 220	West side of Willard Canyon near top of deep draw	Sespe Formation	Mammals	Surface

VP, Vertebrate Paleontology; IP, Invertebrate Paleontology; bgs, below ground surface

Sincerely,

Alyssa Bell

Alyssa Bell, Ph.D.
Natural History Museum of Los Angeles County

enclosure: invoice

APPENDIX B

Field Survey Log

Paleontological Survey: Mission Canyon Stream Restoration Project

Survey Point	UTM Zone	Easting	Northing	Geologic Description	Paleontological Resources Observed
1	11 South	250940	3817100	Sespe Formation (Tspu, Tspm, Tspi): reddish-tan to brown medium-grained sandstone, well-sorted, well-cemented, blocky with massive bedding.	None
2	11 South	250979	3817142	Sespe Formation (Tspu, Tspm, Tspl): reddish-brown conglomerate with fine- to medium-grained sandstone matrix and pebble- to cobble-sized clasts. Clasts are poorly sorted, well cemented, and composed of chert, sandstone, quartzite, and igneous plutonic rocks. Toward the northeast near the bend in the trail, conglomerate becomes interbedded with sandstone and shale, with beds less than 1 meter thick.	None
3	11 South	250950	3817268	Coldwater Formation (Tcw): yellowish tan to white fine- to medium-grained sandstone, well sorted, well cemented, blocky, and massive. A local fault causes the sandstone to be overlain by organic-rich, dark shale, alluvium.	None
4	11 South	251134	3817380	Coldwater Formation (Tcw): white, grey, and tan fine- to medium-grained sandstone, well cemented, and massive.	Fossil wood from yellow massive sandstone; poorly preserved fossil invertebrate shells, such as oyster and other marine mollusks.
5	11 South	251382	3817471	Coldwater Formation (Tcw): yellowish tan fine- to medium-grained sandstone, well cemented, and massive.	Fossil wood from yellow massive sandstone; poorly preserved fossil invertebrate shells, such as oyster and other marine mollusks.
6	11 South	251387	3817560	Quaternary Landslide Deposits (Qls): Small to medium boulders of Coldwater Formation, with clasts subrounded to rounded. Boulder clasts contain crossbedding.	Fossil invertebrate shells exhibiting poor preservation from dissolution.
7	11 South	252158	3817715	Coldwater Formation (Tcw): yellowish tan fine- to medium-grained sandstone, well cemented, and massive.	None

Paleontological Survey – Daily Report

SCE Mission Canyon Post-Impact Assessment
Santa Barbara Co., CA
Project Paleontologist: Alyssa Bell

SWCA
ENVIRONMENTAL CONSULTANTS

Date: 8/21 **Start Time:** 8:30 AM **End Time:** 12:08 **Total Hours:** 3 1/2 **Crew Chief:** A. Bell

Other Team Members: J Farhar

Health, Safety, & Environment – *Pre-field Checklist*

☑ **JHA signed**	☑ **Fuel in Vehicle**	☑ **Vehicle Inspection**	☑ **Water**	☑ **1st Aid Kits**

Tailgate safety topics:
heat, snakes, people

Work Done

Survey Coverage: 4.8 ~3mi km *(approximate length of pedestrian survey out of the total area traversed during the day; reflects the area of PFYC U or ≥3 encountered)*

Number of Localities Identified: 0 **Number of Fossils Collected:** 0

Notes: numerous Non-Sig fossils throughout Tcw

Post Field Report

Safety Incident: Yes [✓ No] Vehicle Incident: Yes [✓ No]

Near-Hit: Yes [✓ No] Hazards Identified: Yes [✓ No]

Notes:
rubble in in v steep drainages, largely inaccessible from trail

Equipment Problems: /

Paleontological Survey – Daily Log

SCE Mission Canyon Post-Impact Asessment
Santa Barbara Co., CA
Project Paleontologist: Alyssa Bell

SWCA ENVIRONMENTAL CONSULTANTS

Date: 5/21 **Tablet:** phone **Survey Points Taken:** 7

Recorder: ABell **Other Team Members:** J Farhar

Start Time: 8:30 AM **Lunch:** - **End:** 12:00pm **Total Hours:** 3 1/2

Starting Point: zone 15, [illegible] E, [illegible] N **End Point:** zone 15, 252312 E, 3874970 N

Survey Coverage: 4.8 km km *(approximate length of pedestrian survey out of the total area traversed during the day; reflects the area of PFYC U or ≥3 encountered)*

Fossils Identified: [✓ YES] ○ NO **(if no, skip this section)**

Complete the table below for all fossils/localities

Locality Number	Significant Fossils? (Y/N)	Brief Description of specimens
0	N	dissolution shell beds
		oysters + unid-able mol.
		burrows
		wood scraps

See expansion table if checked - ☐

Each locality identified should have a locality form completed. Each specimen* ***collected* *should have a specimen number & tag with it. Specimens not collected (i.e. nonsignificant) should be photographed and noted.*

Overview of Sediment Types Observed:

dominant → massive SS

1-2m scale shale interbeds common

<1m scale conglomerate rare

Survey points should be taken as sediments vary throughout the day, either from what has been observed from earlier areas OR where sediments differ widely from what is mapped (where possible to make comparisons)

Survey Point 1 of 7 **Location:** zone 15, 250940 E, 3817100 N 75m from gate

Unit coldwater Tcw	Rock Type SS	Color (fresh) reddish tan	Color (weathered) brown / [illegible]	Texture blocky
Grain Size Cl Slt VF [✓ F M] C Gv CB	Sorting Poor Mod [✓ Well]	Rounding Ang sbAng sbRnd Rnd wRnd	Lithification Poor Mod [✓ Well]	Sed Structures massive bedding

Notes:

small outcrop @ left side of trail, does not appear disturbed

No Fossils

typical massive SS

Survey Point 2 of 7 **Location:** zone 15, 250979 E, 3817142 N 20m up from 1, near 1st major curve in trail

C2nd X

Unit Tcw / cgs	Rock Type conglomerate	Color (fresh) /	Color (weathered) reddish brown	Texture /
Grain Size Cl Slt VF [✓ F M C Gv CB]	Sorting [✓ Poor] Mod Well	Rounding Ang [✓ sbAng sbRnd] Rnd wRnd	Lithification Poor Mod [✓ Well]	Sed Structures /

Notes: dmnd pebble

1st coarse conglom. bed - SS matrix, pebble-cobble clasts, gravel dominated, clast vis'
chert, SS, Quartzite, & igneous clasts

From here to bend in trail alternating beds of SS from pt 1 + this conglomerate
- thin (<1m) conglom beds and thicker (1-[illegible]) SS beds
- thin (<1m) shale beds intermixed

Pic ↓ up to 2m | + closeups

✓ samples [illegible] x @ bend

Survey Point 3 of 7 **Location:** zone 11S, 250950 E, 3817406 N @ bend after 2nd X

Unit Tcw	Rock Type SS	Color (fresh) yellow-tan	Color (weathered) white/yellow	Texture blocky
Grain Size Cl Slt VF [✓ F] M C Gv CB	Sorting Poor Mod [✓ Well]	Rounding Ang sbAng sbRnd Rnd wRnd	Lithification Poor Mod [✓ Well]	Sed Structures massive

? see description

Notes:

Fault b/n pt 1 SS overlain by organic/dark shale, alluvium in fault contact w/ white-yellow massive SS on other side

Fine-Med/Fine SS, crumbly/soft massive bedding

around bend - see some cm-scale shale beds; goes back to massive @ curve.

Survey Point 4 of 7 **Location:** zone 11S, 251134 E, 3817380 At bend from uptrail 3rd X

Unit Tcw	Rock Type SS	Color (fresh) white/tan	Color (weathered) gray/tan	Texture
Grain Size Cl Slt VF [✓ F M C] Gv CB	Sorting [✓ Poor] Mod Well	Rounding Ang sbAng sbRnd Rnd wRnd	Lithification Poor Mod [✓ Well]	Sed Structures massive

Notes:

~~Fossil~~ wood in massive yellow SS from pt 3

Just to uptrail of wood section in contact w/ massive round weathering SS (see pic w/ Jake) more indurated than yellow SS below

on up ~100 m increase in ~1m scale shale beds w/ v. poorly preserved shells (see pics)

around S curve shells present in 20cm band, loosely packed, lots of dissolution cavities

-Shale content increases up @ band

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Survey Point 5 **of** 7 **Location:** zone 15, 251382 E, 3817471 N @ 4th x where road narrows sign is

Unit	Rock Type	Color (fresh)	Color (weathered)	Texture
Grain Size Cl Slt VF F M C Gv CB	Sorting Poor Mod Well	Rounding Ang sbAng sbRnd Rnd wRnd	Lithification Poor Mod Well	Sed Structures

Notes:

→ Same yellow-tan (darker) ss

→ dissolution shell molds

oysters (scattered) ~~not bed~~
↳ + dissolution beds

wood too

Survey Point 6 **of** 7 **Location:** zone 15, 251384 E, 3817560 N ~~78~~50 m up from bridge

Unit Landslide	Rock Type	Color (fresh)	Color (weathered)	Texture
Grain Size Cl Slt VF F M C Gv CB	Sorting Poor Mod Well	Rounding Ang sbAng sbRnd Rnd wRnd	Lithification Poor Mod Well	Sed Structures

Notes:

Sml-med boulder of Tcw in silty colluvium
↳ subrounded - rounded

→ Going up Jesuit's Trail - more hills w/ trees & overgrown / plant growth - can't see much

did see / photo good dissolution bed & block w/ cross bedding unclear if rubble or in place

landslide ends c 1st bend after 5th x

back to yellow hard ss

(see 1st screenshot
↳ ~251830/3817718)

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ENVIRONMENTAL CONSULTANTS

Survey Point 7 **of** 7 **Location:** zone 13, [illegible] E, [illegible] N

Unit	Rock Type	Color (fresh)	Color (weathered)	Texture
Grain Size Cl Slt VF F M C Gv CB	Sorting Poor Mod Well	Rounding Ang sbAng sbRnd Rnd wRnd	Lithification Poor Mod Well	Sed Structures

Notes:

yellow indurated

Burrows picture

(after 2nd, mud [illegible])

In between 2-3 x's from face [illegible]

(2nd screenshot)

Survey Point _____ **of** _____ **Location:** zone , E, N

Unit	Rock Type	Color (fresh)	Color (weathered)	Texture
Grain Size Cl Slt VF F M C Gv CB	Sorting Poor Mod Well	Rounding Ang sbAng sbRnd Rnd wRnd	Lithification Poor Mod Well	Sed Structures

Notes: