PALEONTOLOGICAL IDENTIFICATION REPORT FOR THE SANTA ANA RIVER TRAIL PHASE IV REACHES B AND C PROJECT, SAN BERNARDINO COUNTY REGIONAL PARKS DEPARTMENT AND DEPARTMENT OF PUBLIC WORKS, REDLANDS AND MENTONE, SAN BERNARDINO COUNTY, CALIFORNIA

SUBMITTED TO:
SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS
825 E. THIRD STREET, SAN BERNARDINO, CA 92415

SUBMITTED BY:
KIM SCOTT, QUALIFIED PRINCIPAL PALEONTOLOGIST

cogstone
PALEONTOLOGY - ARCHAEOLOGY - HISTORY

SEPTEMBER 2018

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SUMMARY OF FINDINGS

The purpose of this report is to identify the potential for paleontological resources within the proposed Santa Ana River Trail Phase IV Reaches B and C Project (project). The County of San Bernardino Regional Parks Department, with the assistance of the County of San Bernardino Department of Public Works, proposes to construct an approximately 3.2 mile long section of the Santa Ana River Trail on the southern bank of the Santa Ana River between Orange Street in the City of Redlands and Opal Avenue in the community of Mentone, California.

The surface of the project is mapped as middle to late Holocene (less than 7,500 years old) wash and axial channel deposits. Results of the record search indicate that no fossils have been recorded within 15 miles. Fossil outside of that radius have been from older sediments than those of this project.

Due to the young age and coarseness of the sediments present and the results of the records searches, no paleontological survey was conducted. All surficial project sediments have low potential for fossils (PFYC 2).

The planned maximum depth of excavation of the current project phase is five feet below the current surface. Recovery of fossils at this shallow depth is unlikely.

No further paleontological studies are recommended. In the unlikely event that unanticipated fossils are discovered during construction, work should be suspended within 50 feet of the find until it can be evaluated by a qualified paleontologist.

INTRODUCTION

PURPOSE OF STUDY

The purpose of this report is to identify the potential for paleontological resources within the proposed Santa Ana River Trail Phase IV Reaches B and C Project (project). This project is located within the City of Redlands, San Bernardino County, California (Figure 1).

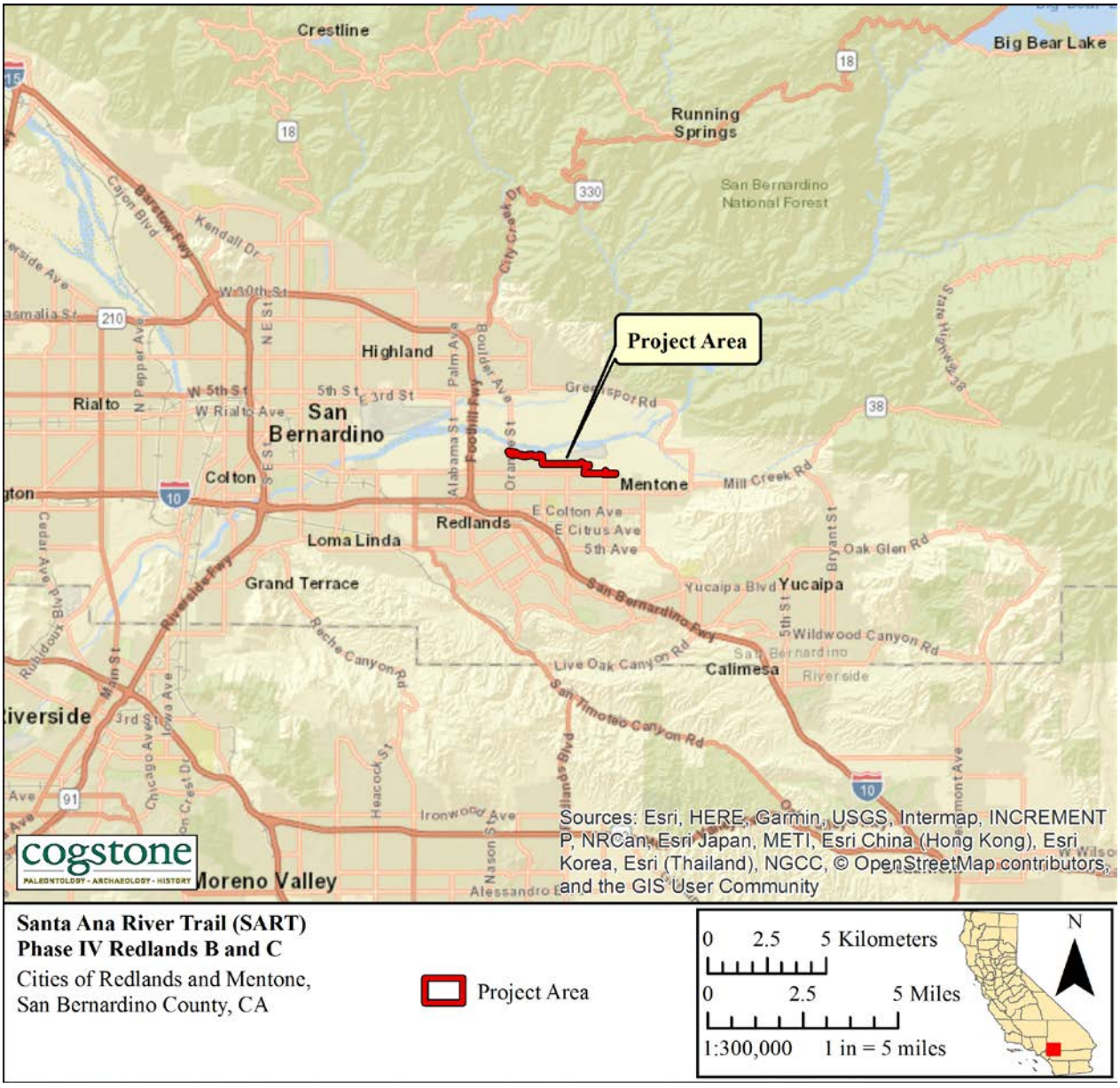

Figure 1. Project vicinity map

PROJECT DESCRIPTION

The County of San Bernardino Regional Parks Department (Regional Parks), with the assistance of the County of San Bernardino Department of Public Works (Department of Public Works), proposes to construct an approximately 3.3-mile-long section of the Santa Ana River Trail (SART) near the southern bank of the Santa Ana River and local streets within the City of Redlands. The SART is a regional recreational trail; segments of the trail within San Bernardino County have been constructed in various sections (phases) with projects named sequentially. The proposed section of the SART currently being investigated is SART Phase IV, Reaches B & C; the trail would begin on the west side of Orange Street in the City of Redlands and terminate at Opal Avenue near the Redlands city limits (Figures 2, 3).

East of Orange Street the conceptual trail alignment overlaps a local trail known as the "Bluffs Trail." At River Bend Drive the alignment takes off from the river bluff and transitions on to the local city streets; the trail travels south on River Bend Drive, east on Pioneer Avenue, south on Dearborn Street, and east on San Bernardino Avenue until it reaches Opal Avenue.

The trail segments on the river bluffs would consist of a 10-foot-wide asphalt/concrete trail and 4-foot decomposed granite/or 2-foot graded shoulder on each side of the asphalt/concrete trail. On the public right-of-way the existing road surface would be widened where possible to accommodate a Class-2 dedicated bicycle lane and/or standard bicycle lane; striping would be used to mark the alignment on the existing road surfaces (Class 3). Under existing conditions portions of Pioneer Avenue and San Bernardino Avenue do not have curb and gutter. Where possible, ultimate curb and gutter or asphalt dike would be constructed as part of the Project. In general, construction activities associated with development of the trail would include: earthwork, including excavation and grading; construction of embankments and/or retaining walls; construction of drainage structures and slope protection; construction of asphalt concrete dike, curb and gutter; installation of fencing, railing, access gates, trail delineators, and signage; painting of pavement striping and pavement markings; and, construction of appurtenant features. The subject segment of the SART includes one bridge over Orange Street in the City of Redlands.

Equipment staging during project construction may potentially occur:

1. at various locations within the disturbed vacant lands on the north side of Riverview Drive;
2. on disturbed road shoulders and/or street right-of-way on the south side of Pioneer Avenue;
3. at the Redlands Sports Park paved parking lot;
4. on disturbed road shoulders and/or street right-of-way on the south side of San Bernardino Avenue; and,
5. on paved road shoulders and/or street right-of-way on the east side of Wabash Avenue.

This 3.3 mile long project is located in sections 13, 14 and 15 of Township 1 South and Range 3 West and section 18 of Township 1 South and Range 2 West of the Redlands 7.5' United States Geological Survey quadrangle. The planned maximum depth of excavation of the current project phase is less than two feet for the majority of the project and five feet below the current surface for the footings for the bridge across Orange Street (Figure 3).

PROJECT PERSONNEL

Cogstone conducted the paleontological resources studies. A short resume is provided for the report author (Appendix A) and additional qualifications of key Cogstone staff are available at www.cogstone.com/Staff

- Kim Scott served as the Principal Paleontologist for the project and wrote this report. Scott has a M. S. in Biology with an emphasis in paleontology from California State University, San Bernardino, a B.S. in Geology with an emphasis in paleontology from the University of California, Los Angeles, and over 20 years of experience in California paleontology and geology.

- Sherri Gust reviewed this report for quality control. Gust has a M.S. in Anatomy (Evolutionary Morphology) from the University of Southern California, a B.S. in Anthropology from the University of California at Davis and over 35 years of experience in California.

- Megan Wilson prepared the Geographic Information System (GIS) maps throughout this report. Wilson has a M.A. in Anthropology from California State University Fullerton, a GIS certification, and over nine years of experience in California archaeology and paleontology.

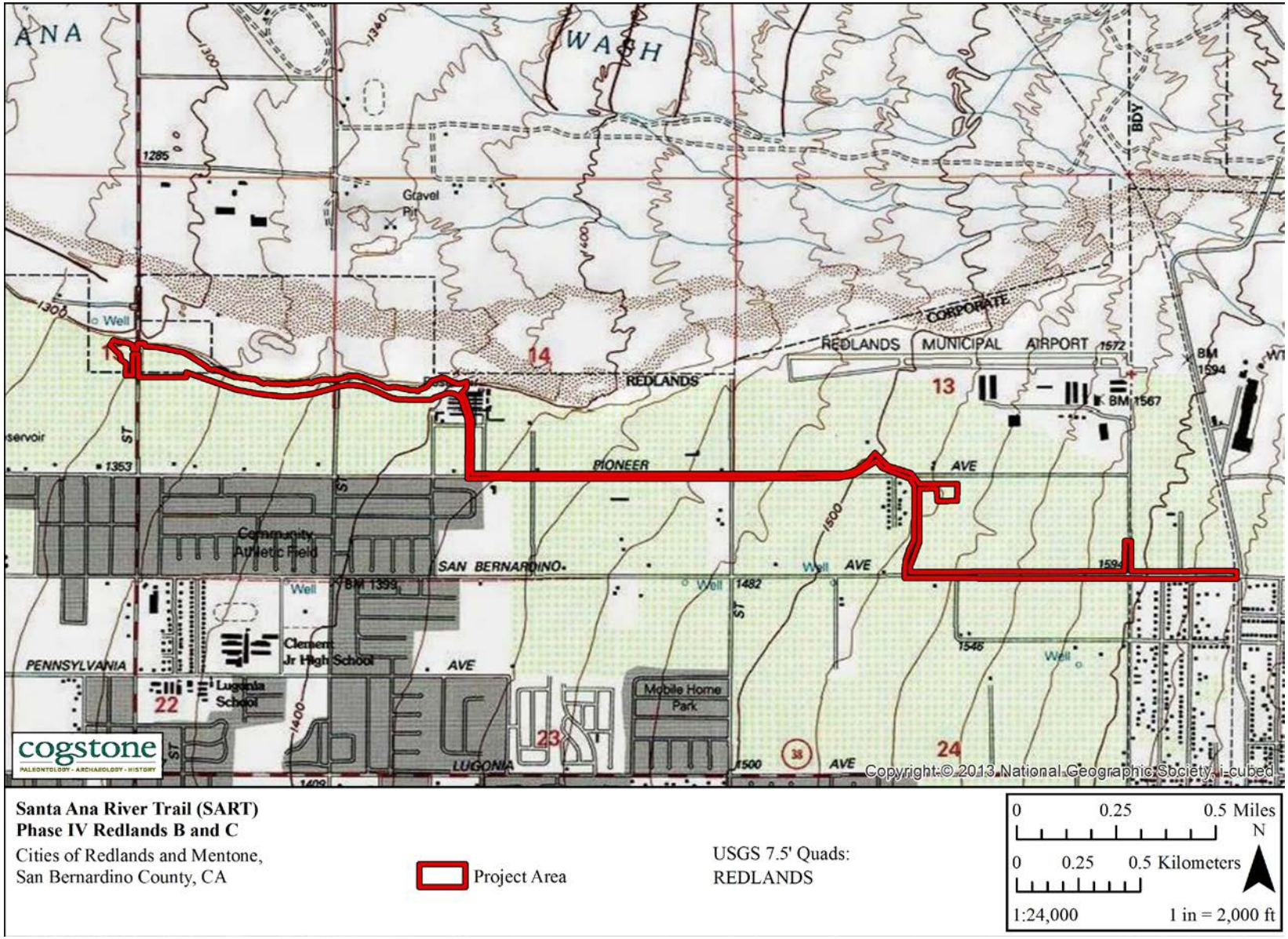

Figure 2. Project location

Figure 3. Project Aerial

BACKGROUND

GEOLOGICAL SETTING

This project is in one of the most tectonically active regions of North America. To the north of the project the San Andreas Fault Zone travels up Cajon Pass where it forms the boundary between the Pacific Plate and the North American Plate. The Transverse Ranges are a result of these two plates grinding past each other and "catching" along the bend in the San Andreas. The Pacific Plate is composed of numerous blocks that can move independently.

The Transverse Range Province is an east-west trending series of steep mountain ranges and valleys aligned obliquely to the normal northwest trend of coastal California, hence the name "Transverse." The province extends offshore to include San Miguel, Santa Rosa, and Santa Cruz islands. Its eastern extension, the San Bernardino Mountains, has been displaced to the south along the San Andreas Fault. Intense north-south compression is squeezing the Transverse Ranges, and as a result this is one of the most rapidly rising regions of the earth (Wagner 2002).

STRATIGRAPHY

The surface of the project is mapped as middle to late Holocene (less than 7,500 years old) wash and axial channel deposits (Figure 4; Morton and Miller 2006). Most of the sediments of the project area were supplied from the east by Santa Ana River and Mill Creek.

VERY YOUNG WASH DEPOSITS, LATE HOLOCENE

The undifferentiated very young wash sediments (Qw) were deposited less than 4,000 years old during the late Holocene. These deposits form the active portions of modern rivers and consist of sand to boulder clasts from local sources. The unconsolidated sediments coarsen upstream with boulders being deposited during flash floods. While the clasts range from angular to rounded, the larger clasts are typically more rounded than smaller clasts. There is essentially no soil development present (Morton and Miller 2006).

YOUNG AXIAL CHANNEL DEPOSITS; UNITS 5, 4, AND 3, MIDDLE TO LATE HOLOCENE

The youngest unit present, Unit 5 (Qya_5) consist of late Holocene sediments less than 3,000 years old. These terraced deposits form small and large benches along the Santa Ana River and the terrace tops may be capped by weak to moderate A/C soil. Sediments are unconsolidated, white and light gray to very pale brown, thin- to thick-bedded, very fine to medium sands which coarsen upstream. The sand is interlayered with subordinate pebbly fine sand and dark-colored organic-rich layers (Morton and Miller 2006).

The slightly older, Unit 4 of the young axial channel deposits (Qya_4) consist of late Holocene sediments less than 4,000 years old. These terraced deposits form benches along the Santa Ana River and may incise the slightly older, Unit 3 young axial channel deposits. The terrace tops may be capped by weak to moderate A/AC/Cox soils. Sediments are unconsolidated, pale brown and very pale brown, fine- to coarse-grained sand and pebbly sand that coarsens upstream to poorly sorted fine to coarse-grained sand and sandy-pebble to small-cobble gravel (Morton and Miller 2006).

The oldest unit present, Unit 3 (Qya_3) consists of terraced middle Holocene sediments between 7,500 and 4,000 years old which are extensively developed adjacent to Santa Ana River channel. These terraces are typically between 3 and 6 feet above active washes and are between 6 and 15 feet thick. The terrace tops may be capped by weak to moderate A/AC/Cox soils. Sediments are unconsolidated to slightly consolidated, pale brown and very pale brown, fine- to coarse-grained sand and pebbly sand that coarsens up-stream to poorly sorted fine- to coarse-grained sand and sandy pebble to small-cobble gravel (Morton and Miller 2006).

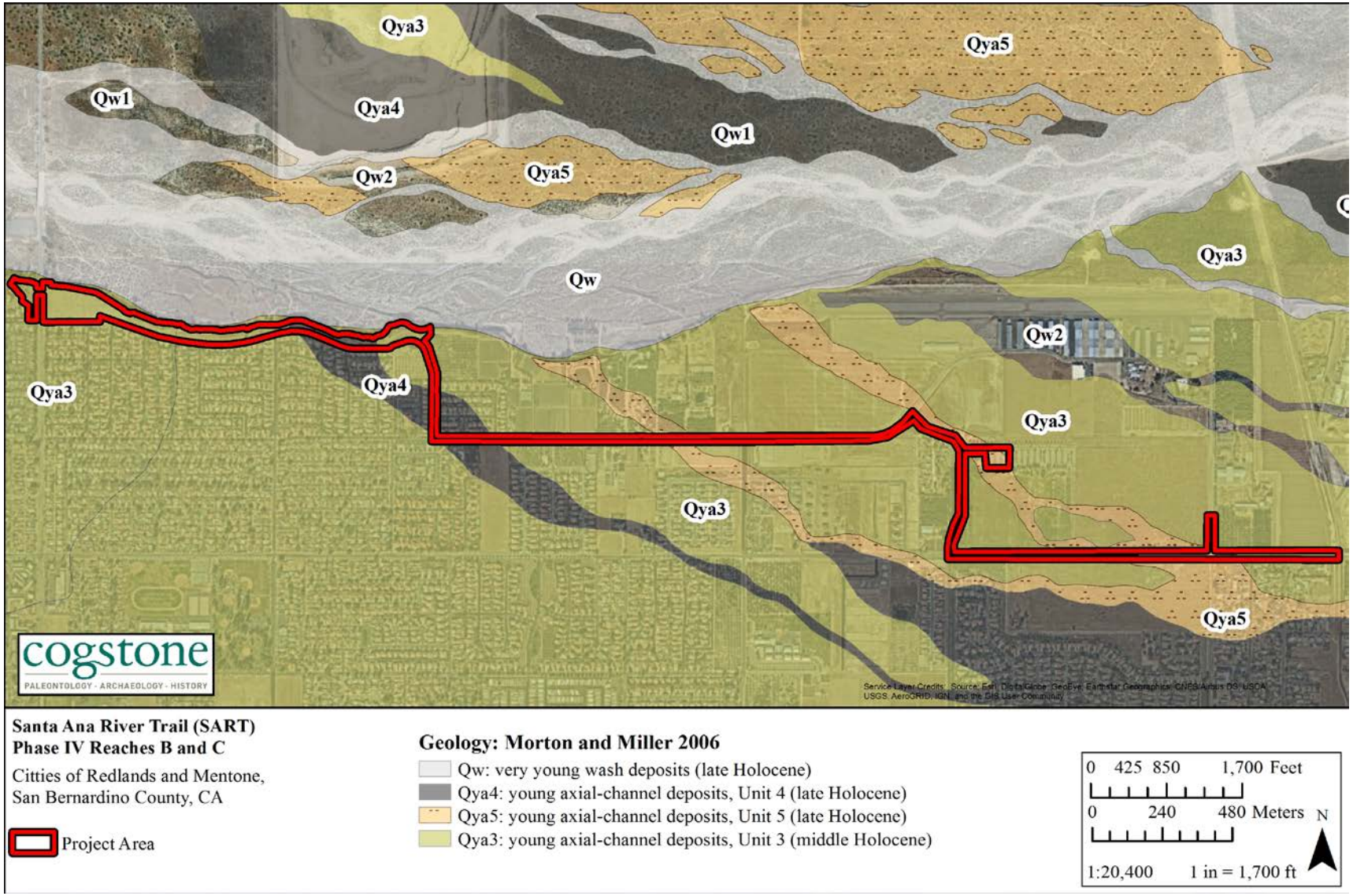

Figure 4. Project Geology

PALEONTOLOGICAL RECORDS SEARCH

Cogstone requested a records search from the Western Science Center that covered the project area as well as a 1 mile radius (Radford 2018; Appendix B). Online resources including the Natural History Museum of Los Angeles County, Department of Invertebrate Paleontology (LACMIP 2018), the Paleobiology Database (PBDB 2018), the University of California Museum of Paleontology Database (UCMP 2018), literature (Jefferson 1991a, 1991b), and prior records searches were also checked for nearby localities.

Results of the record search indicate that no previous fossil localities have been recorded within the project boundaries. Of the fossil localities in the vicinity, none were Holocene in age. Instead the fossils were primarily from extinct Pleistocene animals, much older than the sediments found at the surface within the project area. The Western Science Center had no localities near the project area (Radford 2018; Appendix B).

A San Bernardino County Museum record search for Interstate 10 from the City of Redlands to the City of Ontario (Scott 2008) indicated that nearest locality came from Fontana, 16 miles west-southwest of the project. A saber-toothed cat (SBCM 5.1.11) was recovered from a proximal alluvial fan, however, the sediments were not as coarse as those of the project area. Several other localities from Fontana, 19 miles west-southwest of the project (SBCM 5.1.14-SBCM 5.1.21) produced mastodon, Bison, and camel (Scott 2008). However, these sediments were not from a similar paleoenvironmental setting as is present within the project (Table 1).

A Natural History Museum of Los Angeles County records search for Elder Creek in the City of Highland indicated only two localities near to the project in similar sediments. The first was just over 16 miles to the southeast in southeastern Moreno Valley which produced a fossil horse. The second was just over 24 miles to the west-southwest in southeastern Ontario and produces the fossil of a whipsnake (McLeod 2017; Table 1).

Table 1. Pleistocene fossils in the vicinity of the project

Extinct animals are noted by †

Common Name	Taxon	Depth	Formation	Locality	Location	Reference
sabre-toothed cat	†*Smilodon* sp.	unknown	Quaternary older alluvial fan	SBCM 5.1.11	near the intersection of Citrus Ave and Jurupa Ave., southern Fontana	Scott 2008
mastodon	†*Mammut* sp.	more than 5 feet	Quaternary older alluvium	SBCM 5.1.14-5.1.21	near the intersection of Valley Blvd. and Commerce Dr., Fontana	Scott 2008
bison	†*Bison* sp.					
camel	†*Camelops* sp.					
mammoth	†*Mammuthus* sp.	~20 feet	Quaternary older alluvium	SBCM 5.1.8	near Haven Ave., ~1.5 miles south of Interstate 10, Ontario	Scott 2008
whipsnake	*Masticophus* sp.	~9-11 feet	Quaternary older alluvium	LACM 7811	along Sumner Road/Haven Ave., north of Cloverdale, Ontario	McLeod 2017
horse	†*Equus* sp.	unknown	Quaternary young alluvial fan?	LACM 4540	northwestern corner of San Jacinto Valley, just west of Jackrabbit Trail, Moreno Valley	McLeod 2017

SURVEY

Due to the young age and coarseness of the sediments present and the results of the records searches, no paleontological survey was conducted.

PALEONTOLOGICAL SENSITIVITY

A multilevel ranking system was developed by professional resource managers within the Bureau of Land Management (BLM) as a practical tool to assess the sensitivity of sediments for fossils. The Potential Fossil Yield Classification (PFYC) system (BLM 2008; Appendix C) has a multi-level scale based on demonstrated yield of fossils. The PFYC system provides additional guidance regarding assessment and management for different fossil yield rankings.

Fossil resources occur in geologic units (e.g., formations or members). The probability for finding significant fossils in a project area can be broadly predicted from previous records of fossils recovered from the geologic units present in and/or adjacent to the study area. The geological setting and the number of known fossil localities help determine the paleontological sensitivity according to PFYC criteria.

Sediments that are close to their basement rock source are typically coarse; those farther from the basement rock source are finer. The chance of fossils being preserved greatly increases once the average size of the sediment particles is reduced to 5 mm in diameter or less. Moreover, fossil preservation also greatly increases after natural burial in rivers, lakes, or oceans. Remains left on the ground surface become weathered by the sun or consumed by scavengers and bacterial activity, usually within 20 years or less. So the sands, silts, and clays of rivers, lakes, and oceans are the most likely sediments to contain fossils.

Using the PFYC system, geologic units are classified according to the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts within the known extent of the geological unit. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher PFYC value; instead, the relative abundance of localities is intended to be the major determinant for the value assignment.

No fossils are known near to the project. The project surface is mapped as middle to late Holocene (less than 7,500 years old) wash and axial channel deposits. The age of the deposits means that these sediments are too young to contain the remains of extinct animals.

All Holocene project sediments are assigned to a low (PFYC 2) fossil potential based on the age of the sediments. The Pleistocene alluvial fan sediments in the area are also assigned to a low (PFYC 2) fossil potential. This is due to the high percentage of pebbles, cobbles, and boulders sized clasts present in the proximal to middle alluvial fan setting.

CONCLUSIONS AND RECOMMENDATIONS

No fossils have been recorded from alluvial fan deposits closer than 16 miles from the project. The project surface is mapped as middle to late Holocene (less than 7,500 years old) wash and axial channel deposits. Holocene deposits (<11,700 years old) are too young to contain the remains of extinct animals. All surficial project sediments have low potential for fossils (PFYC 2). The Pleistocene deposits (11,700 years to 2.6 million years old) closest to the project consist of alluvial fans. These sediments may contain fossils but the alluvial fans are likely too coarse and/or too oxidized (weathered) to contain fossils. Both the large sediment size and the amount of time that the surface was exposed to the elements indicate a low or sporadic sensitivity.

Grading and excavation for this project would be limited to a maximum of five feet below ground surface. Recovery of fossils at this shallow depth is unlikely.

No further paleontological studies are recommended. In the unlikely event that unanticipated fossils are discovered during construction, work should be suspended within 50 feet of the find until it can be evaluated by a qualified paleontologist.

REFERENCES CITED

BLM (Bureau of Land Management)
2008 Potential Fossil Yield Classification (PFYC*)* System. Online at: http://www.blm.gov/style/medialib/blm/ut/natural_resources/cultural/paleo/Paleontology_Documents.Par.97864.File.dat/IM2008-009_att1%20-%20PFYC%20System.pdf

Jefferson, G. T.
1991a A catalogue of Late Quaternary vertebrates from California-- part one, non-marine lower vertebrate and avian taxa: Natural History Museum of Los Angeles County Technical Reports No. 5.
1991b A catalogue of Late Quaternary vertebrates from California-- part two, mammals: Natural History Museum of Los Angeles County Technical Reports No. 7.

LACMIP
2018 Online records search of the Natural History Museum Los Angeles County Department of Invertebrate Paleontology database, visited 2018/06/22.

McLeod, S. A. (Natural History Museum Los Angeles County)
2017 Vertebrate Paleontology Records Check for paleontological resources for the proposed Elder Creek Project, Cogstone Project # 3126-004, Packet 13, in the City of Highland, San Bernardino County, project area. On file with Cogstone, Orange, CA.

Morton, D. M. and F. K. Miller
2006 Geology map of the San Bernardino and Santa Ana 30' x 60' quadrangles, California; Geology and description of map units, version 1.0. Digital preparation by Cossette, P. M. and K. R. Bovard. USGS Open File Report 2006-1217, scale 1:100,000.

PBDB
2018 Online records search of the Paleobiology Database, visited 2018/06/22.

Radford, D. (Western Science Center)
2018 Paleontological records search for the SART Phase IV project. See Appendix B.

Scott, E. (San Bernardino County Museum)
2008 Paleontological literature and records review, I-10 high occupancy vehicle lane project, Haven Ave. to Ford St., San Bernardino Co., CA. On file with Cogstone, Orange, CA.

Wagner, D.L.
2002 California Geomorphic Provinces. *California Geologic Survey Note* 36. Website: http://www.consrv.ca.gov/cgs/information/

UCMP
2018 Online records search of the University of California, Berkeley paleontology database, visited 2018/06/22.

APPENDIX A: QUALIFICATIONS

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PALEONTOLOGY - ARCHAEOLOGY - HISTORY

KIM SCOTT
Qualified Principal Paleontologist

EDUCATION

2000 B.S., Geology with paleontology emphasis, University of California, Los Angeles
2013 M.S., Biology with a paleontology emphasis, California State University, San Bernardino

SUMMARY QUALIFICATIONS

Scott has more than 20 years of experience in California paleontology and geology. She is a qualified geologist and field paleontologist with extensive survey, monitoring and fossil salvage experience. In addition, she has special skills in fossil preparation (cleaning and stabilization) and preparation of stratigraphic sections and other documentation for fossil localities. Scott serves as company safety officer and is the author of the company safety and paleontology manuals.

SELECTED PROJECTS

Cactus Basin 4 Project, Rialto, San Bernardino County. Paleontological monitoring and mitigation for the Cactus Detention Basin 4 excavations. Prepared a Paleontological Monitoring Report. Sub to ECORP. Principal Paleontologist. 2017-2018

Cajon Creek Wildlife and Habitat Preservation Land Bank, San Bernardino, San Bernardino County. Proposed a management plan for future excavations that may impact paleontological resources within the Cajon Creek. Prepared a Paleontological Resources Management Plan Report. Sub to ECORP. Principal Paleontologist. 2017

Bridge replacement for Dola and Lanzit ditches, east of Amboy, San Bernardino County. Proposed a management plan for the replacement of the Dola and Lanzit Bridges. Supervised paleontological monitoring during construction. Prepared Paleontological Resources Management and Monitoring Plans as well as a Paleontological Monitoring Reports. Sub to ECORP. Principal Paleontologist. Sub to ECORP. 2016-2017

Luna Road Reconstruction Overlay and V-Ditch Project, Victorville, San Bernardino County. Conducted an assessment of archaeological and paleontological resources which may be present along Luna Road from Amethyst Road to Amargosa Road recommended mitigation measures. Co-authored Cultural and Paleontological Evaluation and Mitigation Plan Report. Sub to ECORP. Principal Paleontologist. 2016

Morongo Wash Channel Improvements Project, North Cathedral City, Riverside County. Conducted an assessment of paleontological resources which may be present for a flood protection improvement project along Morongo Wash. Co-authored a Paleontological Assessment Report. Sub to Michael Baker International. Principal Paleontologist. 2016

Rialto Metrolink Affordable Housing Project, Rialto, San Bernardino County. Conducted an assessment of paleontological resources which may be present for a multi-generation residential project consisting of 64 units in a mix of one, two, and three bedroom units. Prepared a Paleontological Assessment Report. Sub to Michael Baker International. Principal Paleontologist. 2015

Valley Corridor Specific Plan, Bloomington, San Bernardino County, CA. Assessed the archaeological, historical, and paleontological resources which may be present. Data was used to create five Specific Plan land use districts. Co-authored Cultural and Paleontological Technical Report. Sub to The Planning Center. Principal Paleontologist. 2015

City of Yucaipa Assessment, San Bernardino County, CA. Prepared an assessment of paleontological resources for the City of Yucaipa and the city's sphere of influence on adjoining lands. This data will be incorporated in to the General Plan for the city. Co-authored a Paleontological Literature Search Report. Sub to The Planning Center. Principal Paleontologist. 2014

APPENDIX B. PALEONTOLOGICAL RECORDS SEARCH

WESTERN SCIENCE CENTER

June 26, 2018

Cogstone
Megan Wilson, M.A., RPA
1518 W. Taft Avenue
Orange, CA 92865

Dear Ms. Wilson,

This letter presents the results of a record search conducted for the SART Phase IV Project in San Bernardino County, California. The project site is located south of the Santa Ana Wash in Section 14 and 15, Township 1 South, Range 3 West, and Section 18, Township 1 South, Range 2 West on the Redlands USGS 7.5 minute quadrangle.

The geologic units underlying this project are mapped entirely as young or very young axial-valley alluvium deposits dating from the latest Holocene period (Matti, Morton, Cox, and Kendrick, 2003). Alluvial units are considered to be of high paleontological sensitivity, but the date range of the sediment indicates any material found would be modern in age. The Western Science Center does not have localities within the project area or within a 1 mile radius.

Latest Holocene units are unlikely to produce fossil material unless a significant depth is reached during excavation. If excavation activity associated with development of the project area is planning to reach a significant depth, and could potentially impact deeper paleontologically sensitive units, than it would be the recommendation of the Western Science Center that a paleontological resource mitigation program be put in place. If excavation activity is not planning to reach a significant depth, than it is unlikely that a monitoring program will yield fossil material.

If you have any questions, or would like further information please feel free to contact me at dradford@westerncentermuseum.org

Sincerely,

Darla Radford
Collections Manager

APPENDIX C: SENSITIVITY RANKING CRITERIA

PFYC Description (BLM 2008)	PFYC Rank
Very Low. The occurrence of significant fossils is non-existent or extremely rare. Includes igneous or metamorphic and Precambrian or older rocks. Assessment or mitigation of paleontological resources is usually unnecessary.	1
Low. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils. Includes rock units too young to produce fossils, sediments with significant physical and chemical changes (e.g., diagenetic alteration) and having few to no fossils known. Assessment or mitigation of paleontological resources is not likely to be necessary.	2
Potentially Moderate but Undemonstrated Potential. Units exhibit geologic features and preservational conditions that suggest fossils could be present, but no vertebrate fossils or only common types of plant and invertebrate fossils are known. Surface-disturbing activities may require field assessment to determine appropriate course of action.	3b
Moderate Potential. Units are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered and of low abundance. Common invertebrate or plant fossils may be found. Surface-disturbing activities may require field assessment to determine appropriate course of action.	3a
High. Geologic units containing a high occurrence of significant fossils. Fossils must be abundant per locality. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. If impacts to significant fossils can be anticipated, on-the-ground surveys prior to authorizing the surface disturbing action will usually be necessary. On-site monitoring or spot-checking may be necessary during construction activities.	4
Very High. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils. Vertebrate fossils or scientifically significant invertebrate fossils are known or can reasonably be expected to occur in the impacted area. On-the-ground surveys prior to authorizing any surface disturbing activities will usually be necessary. On-site monitoring may be necessary during construction activities.	5