CALIFORNIA HIGH-SPEED TRAIN

Technical Report

DRAFT

Fresno to Bakersfield Section

Archaeological Survey

July 2011

California High-Speed Rail Authority

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U.S. Department of Transportation
Federal Railroad Administration

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Archaeological Survey Technical Report

Prepared by:

URS/HMM/Arup Joint Venture

July 2011

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Acronyms and Abbreviations

AIEP	Fresno to Bakersfield Archaeological Inventory and Evaluation Plan
AMSL	above mean sea level
APE	area of potential effects
ASR	Archaeological Survey Report
AT&SF	Atchison Topeka and Santa Fe Railroad
Authority	California High-Speed Rail Authority
B.P.	before the present
BNSF	Burlington Northern Santa Fe Railroad
ca.	circa
Caltrans	California Department of Transportation
EIR	environmental impact report
EIS	environmental impact statement
FRA	Federal Railroad Administration
GIS	geographical information system
GPS	global positioning system
HMF	heavy maintenance facility
HST	high-speed train
NAHC	Native American Heritage Commission
NRHP	National Register of Historic Places
OCS	overhead catenary system
PTE	permission to enter
Section 106 PA	*Programmatic Agreement among the Federal Railroad Administration, the Advisory Council on Historical Preservation, the California State Historic Preservation Officer, and the California High-Speed Rail Authority Regarding Compliance with Section 106 of the National Historic Preservation Act*
SHPO	State Historic Preservation Office/Officer
SR	state route
SSJVIC	South San Joaquin Valley Information Center
Statewide Program EIR/EIS	*Final Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Proposed California High-Speed Train System*
TCP	traditional cultural property
TPS	traction power substation
USGS	U.S. Geological Survey
XPI	Extended Phase I

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Chapter 1.0
Introduction

1.0 Introduction

This report describes efforts to identify and evaluate cultural resources that may be affected by the California High-Speed Train (HST) Project, Fresno to Bakersfield Section. The overall project consists of new rail alignment construction, connecting northern and southern California (Figure 1-1). This particular document focuses on the three alternatives developed for the approximately 60-mile-long corridor between Fresno to Bakersfield. Under the National Environmental Policy Act (NEPA), the Federal Railroad Administration (FRA) is the federal lead agency. As a federal undertaking (defined at 36 CFR Part 800.16[y]), this project must comply with the requirements of the National Historic Preservation Act of 1966 (NHPA) Section 106, as well as the California Environmental Quality Act (CEQA).

The California High-Speed Rail Authority (Authority) was established in 1996 and has been authorized to undertake planning for the development of a proposed statewide high-speed train network that is fully coordinated with other public transportation services. In 2005, the Authority and FRA completed the *Final Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Proposed California High-Speed Train System* (referred to in this document as the "Statewide Program EIR/EIS") as the first phase of a tiered environmental review process (Authority and FRA 2005). The Authority certified the final program EIR under CEQA and approved the proposed HST System, and FRA issued a Record of Decision under NEPA on the federal program EIS.

The Statewide Program EIR/EIS established the purpose and need for the HST System, analyzed an HST System (referred to as the "HST Alternative"), and compared it with the No Project Alternative and the Multimodal Alternative. In approving the Statewide Program EIR/EIS, the Authority and FRA selected the HST Alternative; recommended certain corridors, general alignments, and general station locations; incorporated mitigation strategies and design practices; and specified further measures to guide the development of the HST System at the site-specific project level of the environmental review to avoid and minimize potential adverse environmental impacts.

Because the HST project is geographically extensive and is being developed in a series of sections, an ongoing effort is being made to develop a programmatic agreement (Authority and FRA 2011d), to coordinate all aspects of the cultural resources process and to provide a common format for resource identification, documentation, evaluation, mitigation, and consultation for the project as a whole (Appendix B). The identification and testing phases discussed in this ASR were conducted before the Section 106 PA was signed. Consequently, this survey report describes the implementation of the *Fresno to Bakersfield Archaeological Identification and Evaluation Plan* submitted and accepted by the California HST Project Management Team and the Authority (Authority and FRA 2011a), as well as in accordance with the Section 106 Programmatic Agreement (PA) as it was developed during the process of identification and evaluation presented in this report (Authority and FRA 2011d).

The provisions of the Section 106 PA include supervision of archaeological efforts by a professional archaeologist meeting the Secretary of the Interior's Professional Qualifications Standards, conducting consultation with Native Americans and other parties such as local museums and historical societies, defining the Area of Potential Effects (APE), and identifying methods for the identification and evaluation of historic properties. These steps have been followed in the conduct of this investigation to date. However, despite two field sessions (February 2010 and August 2010), the lack of access to properties requiring field survey has prevented completion of some of the provisions in the Section 106 PA as of the date of this report. This document follows the outline and content for the Archaeological Survey Report (ASR) stipulated in Attachment C, Part B, of the Section 106 PA.

Figure 1-1
Fresno to Bakersfield HST alignments

Chapter 2.0
Summary of Findings

2.0 Summary of Findings

Both background research and an archaeological survey were conducted to identify archaeological resources that may be affected by the proposed Fresno to Bakersfield Section of the California High-Speed Train (HST) Project. This specific section of the project is in the counties of Fresno, Kings, Tulare, and Kern. This survey report describes the implementation of the *Fresno to Bakersfield Archaeological Identification and Evaluation Plan* submitted and accepted by the California HST Project Management Team and the California High-Speed Rail Authority (Authority) (Authority and FRA 2011a), as well as in accordance with the Section 106 Programmatic Agreement as it was developed during the process of identification and evaluation presented in this report (Authority and FRA 2011d).

The background research included the identification of cultural resources formally recorded with the California Historical Resources Information System (CHRIS) housed at the South San Joaquin Valley Information Center (SSJVIC), California State University, Bakersfield, as well as with the Native American Heritage Commission's (NAHC's) Sacred Lands File. In addition, historical maps were reviewed for evidence of previously unrecorded historic-era resources. A bibliographic review of pertinent research was conducted to establish the overall archaeological and historical context. This bibliographic review included relevant geologic, geomorphic, and geoarchaeological literature pertinent to defining the potential for buried archaeological resources within the archaeological area of potential effects (APE).

The records search revealed 21 previously recorded archaeological resources within the 0.25-mile buffer of the APE for the project, 3 of which are in the archaeological APE. No sites listed in the NAHC's Sacred Lands File are in the immediate project area. Portions of the archaeological APE, for which permission to enter (PTE) had been obtained, were subject to a pedestrian survey by a team of URS archaeologists between February 15 and April 8, 2010. A subsequent survey was conducted from August 16 to August 18, 2010, which incorporated several changes to the proposed route.

The APE was defined as the proposed project's limits of direct impact, which includes the existing BNSF right-of-way as well as proposed construction easements. For the current project design, this APE constitutes 7,891 acres. Permission to enter (PTE) was obtained for approximately 49%, or 3,855 acres, of this area. Besides restrictions on entry, portions of the APE could not be surveyed because of crop cover, vegetation, or urbanization. As a result, 65%, or 2,521 acres, of the PTE area was surveyed. This acreage represents 32% of the total area. In addition, 386 acres of the BNSF right-of-way (which were not included in the PTE acreage described above) were surveyed within the footprint APE. Therefore, a total of 2,907 acres (37% of the APE) was subject to pedestrian surveys.

The field surveys completed to date have identified a total of seven archaeological resources; five are prehistoric and two are historic era. Of these, five are no longer within the project footprint and associated APE as currently configured, but are included in Appendix E (Survey Results of Alternatives No Longer Considered), for reference. The historic built-environment resources in the project vicinity are discussed in further detail in the *Fresno to Bakersfield Historic Property Survey Report* (Authority and FRA 2011b). As a result of the archaeological investigations described in this report, five archaeological resources—which include those both previously recorded and newly recorded—have been documented within the current California HST APE between Fresno and Bakersfield. As discussed below and in Appendix F (Archaeological Resources Extended Phase I Report), the investigations conducted on the sites identified within the APE concluded that none of these five sites appear eligible for listing on the National Register of Historic Places (NRHP). Therefore, no historic properties (archaeological resources) are affected by the proposed undertaking.

2.1 NRHP-Eligible Resources

No cultural resources that have been identified by background research or field efforts are considered NRHP-eligible resources within the current APE. As stipulated in the Section 106 PA, Section 8 [A][1], a phased identification effort will be necessary as access is granted and where adverse effects are likely to occur, and further evaluation of identified resources may be necessary at that time. This phasing will be coordinated through the establishment of a Memorandum of Agreement and is not addressed further in the present document.

2.2 NRHP-Recommended Not-Eligible Resources

Five sites were identified in the APE either through background research or field efforts that do not appear to contain values or conditions that would make them eligible for listing in either the NRHP or CRHR. These sites are recommended not eligible for NRHP listing for the following reasons:

- Lack integrity, and/or because they lack associations with events or people significant in California or national history.
- Lack distinctive characteristics of a type, period, or method of construction.
- Do not represent the work of a master or possess high artistic values.
- Would not yield information important in prehistory or history.

Each of these sites is summarized in Table 2-1 and is discussed further in Section 6.0.

Table 2-1
Summary of Findings for Archaeological Sites within the APE (Direct Impact Footprint)

Trinomial	Primary Number	Resource Name (by recorder)	Description	Basis of Recommendation	NRHP Eligibility Recommendation
CA-KER-2507	P-15-2507	Pro-3	Prehistoric/ethno-graphic village site	Site reported historically but recorded as destroyed	Not Eligible
CA-KER-3072	P-15-3072	GDE-903	Very sparse lithic flake scatter/ multiple isolated artifacts	Flakes found out of context within an unused field on Texaco Refinery property that has been disked and plowed.	Exempted by Section 106 PA
CA-TUL-2950H	4737	Stoil Site	Early 20th century Standard Oil Company pumping and rail station	Previous recording and determination adopted by CEQA lead agency	Not Eligible

Table 2-1
Summary of Findings for Archaeological Sites within the APE (Direct Impact Footprint)

Trinomial	Primary Number	Resource Name (by recorder)	Description	Basis of Recommendation	NRHP Eligibility Recommendation
N/A	N/A	HST-TUL-1	Sparse lithic scatter	Subsurface investigations determined that no additional resource types or features were present and that site was heavily disturbed; no potential to yield data and no integrity.	Not Eligible
N/A	N/A	HST-TUL-3	Sparse prehistoric artifact scatter dominated by thinning flakes with one shell and one stone bead identified.	Subsurface investigations determined that no subsurface artifacts or features were present and that site was heavily disturbed; no potential to yield data and no integrity.	Not Eligible

2.3 Unevaluated Resources

No cultural resources that have been identified by background research or field efforts remain unevaluated within the current APE. As stipulated in the Section 106 PA, Section 8 [A][1], a phased identification effort will be necessary as access is granted and where adverse effects are likely to occur, and further evaluation of identified resources may be necessary at that time. This phasing will be coordinated through the establishment of a Memorandum of Agreement and is not addressed further in the present document.

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Chapter 3
Project Description

3.0 Project Description

3.1 Project Introduction

The Fresno to Bakersfield Section of the HST project would be approximately 114 miles long, varying in length by only a few miles based on the route alternatives selected. To comply with the Authority's guidance to use existing transportation corridors when feasible, the Fresno to Bakersfield HST Section would primarily be located adjacent to the existing BNSF Railway right-of-way. Alternative alignments are being considered where engineering constraints require deviation from the existing railroad corridor and where necessary to avoid environmental impacts.

The Fresno to Bakersfield HST Section would cross both urban and rural lands and include a station in both Fresno and Bakersfield, a potential Kings/Tulare Regional Station in the vicinity of Hanford, a potential heavy maintenance facility (HMF), and power substations along the alignment. The HST alignment would be entirely grade-separated, meaning that crossings with roads, railroads, and other transport facilities would be located at different heights (overpasses or underpasses) so that the HST would not interrupt or interface with other modes of transport. The HST right-of-way would also be fenced to prohibit public or automobile access. The project footprint would consist primarily of the train right-of-way, which would include both a northbound and southbound track in an area typically 100 feet wide. Additional right-of-way would be required to accommodate stations, multiple track at stations, maintenance facilities, and power substations.

The Fresno to Bakersfield Section would include at-grade, below-grade, and elevated track segments. The at-grade track would be laid on an earthen rail bed topped with rock ballast approximately 6 feet off the ground. Fill and ballast for the rail bed would be obtained from permitted borrow sites and quarries. Below-grade track would be laid in an open or covered trench at a depth that would allow roadway and other grade-level uses above the track. Elevated track segments would span long sections of urban development or aerial roadway structures and consist of steel truss aerial structures or guideway structures with cast-in-place reinforced-concrete columns supporting the guideway box girders and platforms. The height of elevated track sections would depend on the height of existing structures below, and would range from 40 to 80 feet. Columns would be spaced 60 feet to 120 feet apart.

3.2 Project Alternatives

3.2.1 Alignment Alternatives

This section describes the Fresno to Bakersfield HST Section project alternatives, including the No Project Alternative. The project EIR/EIS for the Fresno to Bakersfield HST Section examines alternative alignments, stations, and HMF sites within the general BNSF Railway corridor. Discussion of the HST project alternatives begins with a single continuous alignment (the BNSF Alternative) from Fresno to Bakersfield. This alternative most closely aligns with the preferred alignment identified in the Record of Decision (ROD) for the Statewide Program EIR/EIS. Descriptions of the additional five alternative alignments that deviate from the BNSF Alternative for portions of the route then follow. The alternative alignments that deviate from the BNSF Alternative were selected to avoid environmental, land use, or community issues identified for portions of the BNSF Alternative (Figure 1-1).

3.2.2 No Project Alternative

Under the No Project Alternative, the HST System would not be built. The No Project Alternative represents the condition of the Fresno to Bakersfield Section as it existed in 2009 (when the Notice of Preparation was issued), and as it would exist without the HST project at the planning horizon (2035). To assess future conditions, it was assumed that all currently known programmed and funded improvements to the intercity transportation system (highway, rail, and transit), and reasonably foreseeable local development projects (with funding sources identified), would be developed by 2035. The No Project Alternative is based on a review of Regional Transportation Plans (RTPs) for all modes of travel, the State of California Office of Planning and Research CEQAnet Database, the Federal Aviation Administration Air Carrier Activity Information System and Airport Improvement Plan grant data, the State Transportation Improvement Program, airport master plans and interviews with airport officials, intercity passenger rail plans, and city and county general plans and interviews with planning officials.

A. BNSF ALTERNATIVE ALIGNMENT

The BNSF Alternative Alignment would extend approximately 114 miles from Fresno to Bakersfield and would lie adjacent to the BNSF Railway route to the extent feasible (Figure 1-1). Minor deviations from the BNSF Railway corridor would be necessary to accommodate engineering constraints, namely wider curves necessary to accommodate the HST (as compared with the existing lower-speed freight line track alignment). The largest of these deviations occurs between approximately Elk Avenue in Fresno County and Nevada Avenue in Kings County. This segment of the BNSF Alternative would depart from BNSF Railway corridor and instead curve to the east on the northern side of the Kings River and away from Hanford, and would rejoin the BNSF Railway corridor north of Corcoran.

Although the majority of the alignment would be at-grade, the BNSF Alternative would include elevated structures in all of the four counties through which it travels. In Fresno County, an elevated structure would carry the alignment over Golden State Boulevard and SR 99 and a second would cross over the BNSF Railway tracks in the vicinity of East Conejo Avenue. The alignment would be at-grade with bridges where it crosses Cole Slough and the Kings River into Kings County.

In Kings County, the BNSF Alternative would be elevated east of Hanford where the alignment would pass over the San Joaquin Valley Railroad and SR 198. The alignment would also be elevated over Cross Creek, and again at the southern end of the city of Corcoran to avoid a BNSF Railway spur. In Tulare County, the BNSF Alternative would be elevated at the crossing of the Tule River and at the crossing of the Alpaugh railroad spur that runs west from the BNSF Railway mainline. The BNSF Alternative would be elevated in Kern County across both Poso Creek and the Kern River continuing through the city of Bakersfield.

The BNSF Alternative Alignment would provide wildlife crossing opportunities by means of a variety of engineered structures. Dedicated wildlife crossing structures would be provided from approximately Cross Creek (Kings County) south to Poso Creek (Kern County) in at-grade portions of the railroad embankment at approximately 0.3-mile intervals. In addition to those structures, wildlife crossing opportunities would be available at elevated portions of the alignment, bridges over riparian corridors, road overcrossings and undercrossings, and drainage facilities (i.e., large-diameter [60 to 120 inches] culverts and paired 30-inch culverts). Where bridges, aerial structures, and road crossings coincide with proposed dedicated wildlife crossing structures, such features would serve the function of, and supersede the need for, dedicated wildlife crossing structures.

The preliminary wildlife crossing structure design consists of a modified culvert in the embankment that would support the HST tracks. The typical culvert would be 72 feet long from end to end (crossing structure distance), would span a width of approximately 8 feet (crossing structure width), and would provide 4 feet of vertical clearance (crossing structure height). Additional wildlife crossing structure designs could include circular or elliptical pipe culverts, and larger (longer) culverts with crossing structure distances of up to 100 feet. The design of the wildlife crossing structures may change depending on site-specific conditions and engineering considerations.

B. CORCORAN ELEVATED ALTERNATIVE ALIGNMENT

The Corcoran Elevated Alternative Alignment would be the same as the corresponding section of the BNSF Alternative Alignment except that it would pass through the city of Corcoran on the eastern side of the BNSF Railway right-of-way on an elevated structure. The elevated structure would reach a maximum height of approximately 40 feet to the top of the rail. Dedicated wildlife crossing structures would be provided from approximately Cross Creek south to Avenue 136 in at-grade portions of the railroad embankment at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of both the Cross Creek and Tule River crossings.

This alternative alignment would cross SR 43 and several local roads. SR 43 near Jersey Avenue would pass under the HST. Idaho Avenue, Jackson Avenue, Kent Avenue, Kansas Avenue, and Nevada Avenue would be grade-separated from the HST with overcrossings. The HST would pass over several local roads on an aerial structure, while other roads would be closed at the HST right-of-way.

C. CORCORAN BYPASS ALTERNATIVE ALIGNMENT

The Corcoran Bypass Alternative Alignment would run parallel to the BNSF Alternative Alignment from approximately Idaho Avenue south of Hanford, to approximately Nevada Avenue north of Corcoran. The Corcoran Bypass Alternative would then diverge from the BNSF Alternative and swing east of Corcoran, rejoining the BNSF Railway route at Avenue 136. The total length of the Corcoran Bypass would be approximately 21 miles.

Similar to the corresponding section of the BNSF Alternative, most of the Corcoran Bypass Alternative would be at-grade. However, two elevated structures would carry the HST over Cross Creek and the Tule River. Dedicated wildlife crossing structures would be provided from approximately Cross Creek south to Avenue 136 in at-grade portions of the railroad embankment at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of each of the Cross Creek and Tule River crossings.

This alternative alignment would cross SR 43, Whitley Avenue/SR 137, and several local roads. SR 43, Waukena Avenue, and Whitley Avenue would be grade-separated from the HST with an overcrossing/undercrossing; other roads, including Niles Avenue, Orange Avenue, and Avenue 152, would be closed at the HST right-of-way.

D. ALLENSWORTH BYPASS ALTERNATIVE ALIGNMENT

The Allensworth Bypass Alternative Alignment would pass west of the BNSF Alternative, avoiding Allensworth Ecological Reserve and the Allensworth State Historic Park. This alignment was refined over the course of environmental studies to reduce impacts to wetlands and orchards. The total length of the Allensworth Bypass Alternative Alignment would be approximately 19 miles, beginning at Avenue 84 and rejoining the BNSF Alternative at Elmo Highway.

The Allensworth Bypass Alternative would be constructed on an elevated structure only where the alignment crosses the Alpaugh railroad spur. The alignment would pass through Tulare County mostly at-grade. Dedicated wildlife crossing structures would be provided from approximately Avenue 84 to Poso Creek at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of both the Deer Creek and Poso Creek crossings.

The Allensworth Bypass would cross County Road J22, Scofield Avenue, Garces Highway, Woollomes Avenue, Magnolia Avenue, Palm Avenue, Pond Road, Peterson Road, and Elmo Highway. Woollomes Avenue and Elmo Highway would be closed at the HST right-of-way, while the other roads would be realigned and/or grade-separated from the HST with overcrossings.

The Allensworth Bypass Alternative also includes an option to relocate the existing BNSF Railway tracks to be adjacent to the HST right-of-way for the length of this alignment. The possibility of relocating the BNSF Railway tracks along this alignment has not yet been discussed with BNSF Railway; however, if this option is selected, it is assumed that the existing BNSF Railway right-of-way would be abandoned between Avenue 84 and Elmo Highway, and the relocated BNSF Railway right-of-way would be 100 feet wide and adjacent to the eastern side of the Allensworth Bypass Alternative right-of-way.

E. WASCO-SHAFTER BYPASS ALTERNATIVE ALIGNMENT

The Wasco-Shafter Bypass Alternative Alignment would diverge from the BNSF Alternative between Sherwood Avenue and Fresno Avenue, crossing over to the eastern side of the BNSF Railway tracks and bypassing Wasco and Shafter to the east. The Wasco-Shafter Bypass Alternative would rejoin the BNSF Alternative at 7th Standard Road. The total length of the alternative alignment would be approximately 24 miles, and the alignment would be at-grade.

The Wasco-Shafter Bypass was refined to avoid the Occidental Petroleum tank farm as well as a historic property potentially eligible for listing on the National Register of Historic Places. The Wasco-Shafter Bypass would cross SR 43, SR 46, East Lerdo Highway, and several local roads. SR 46, Kimberlina Road, Shafter Avenue, Beech Avenue, Cherry Avenue, and Kratzmeyer Road would be grade-separated from the HST with overcrossings/undercrossings; other roads would be closed at the HST right-of-way.

F. BAKERSFIELD SOUTH ALTERNATIVE ALIGNMENT

From the Rosedale Highway (SR 58) in Bakersfield, the Bakersfield South Alternative Alignment would run parallel to the BNSF Alternative Alignment at varying distances to the north. At Chester Avenue, the Bakersfield South Alternative curves south, and runs parallel to California Avenue. As with the BNSF Alternative, the Bakersfield South Alternative would begin at-grade but then be elevated starting at Palm Avenue through Bakersfield to its terminus at the southern end of the Bakersfield station tracks. The elevated section would range in height from 50 to 70 feet. Dedicated wildlife crossing structures would be placed between 100 and 500 feet to the north and south of the Kern River.

The Bakersfield South Alternative would be approximately 9 miles long and would cross the same roads as the BNSF Alternative. This alternative includes the Bakersfield Station–South Alternative.

3.2.3 Station Alternatives

The Fresno to Bakersfield HST Section would include a new station in Fresno and a new station in Bakersfield. An optional third station, the Kings/Tulare Regional Station, is under consideration.

Stations would be designed to address the purpose of the HST, particularly to allow for intercity travel and connection to local transit, airports, and highways. Stations would include the station platforms, a station building and associated access structure, as well as lengths of bypass tracks to accommodate local and express service at the stations. All stations would contain the following elements:

- Passenger boarding and alighting platforms.
- Station head house with ticketing, waiting areas, passenger amenities, vertical circulation, administration and employee areas, and baggage and freight-handling service.
- Vehicle parking (short-term and long-term) and "kiss and ride".[1]
- Motorcycle/scooter parking.
- Bicycle parking.
- Waiting areas and queuing space for taxis and shuttle buses.
- Pedestrian walkway connections.

A. FRESNO STATION ALTERNATIVES

Two alternative sites are under consideration for the Fresno Station.

Fresno Station–Mariposa Alternative

The Fresno Station–Mariposa Alternative would be in downtown Fresno, less than 0.5 mile east of SR 99 on the BNSF Alternative. The station would be centered on Mariposa Street and bordered by Fresno Street on the north, Tulare Street on the south, H Street on the east, and G Street on the west. The station building would be approximately 75,000 square feet, with a maximum height of approximately 60 feet.

The two-level station would be at-grade; with passenger access provided both east and west of the HST guideway and the UPRR tracks, which would run parallel with one another adjacent to the station. The first level would contain the public concourse, passenger service areas, and station and operation offices. The second level would include the mezzanine, a pedestrian overcrossing above the HST guideway and the UPRR tracks, and an additional public concourse area. Entrances would be located at both G and H streets. A conceptual site plan of the Fresno Station–Mariposa Alternative is provided in Figure 3-1.

The majority of station facilities would be east of the UPRR tracks. The station and associated facilities would occupy approximately 18.5 acres, including 13 acres dedicated to the station, bus transit center, surface parking lots, and kiss-and-ride accommodations. A new intermodal facility would be included in the station footprint on the parcel bordered by Fresno Street to the north, Mariposa Street to the south, Broadway Street to the east, and H Street to the west (designated "Intermodal Transit Center" in Figure 3-1). Among other uses, the intermodal facility would accommodate the Greyhound facilities and services that would be relocated from the northwestern corner of Tulare and H streets.

The site proposal includes the potential for up to three parking structures occupying a total of approximately 5.5 acres. Two of the three potential parking structures would each sit on 2 acres, and each would have a capacity of approximately 1,500 cars. The third parking structure would be slightly smaller in footprint (1.5 acres), with five levels and a capacity of approximately 1,100 cars. Surface parking lots would provide approximately 800 additional parking spaces.

[1] "Kiss-and-ride" refers to the station area where riders may be dropped off or picked up before or after riding the HST.

Figure 3-1
Fresno Station–Mariposa Alternative

The Authority would work with the city of Fresno and other interested parties to phase parking supply to support HST ridership demand and the demand for emerging uses in the area surrounding the station. Under this alternative, the historic Southern Pacific Railroad depot would remain intact and could be used for station-related functions.

Fresno Station–Kern Alternative

The Fresno Station–Kern Alternative would be similarly situated in downtown Fresno and would be located on the BNSF Alternative, centered on Kern Street between Tulare Street and Inyo Street (Figure 3-2). This station would include the same components as the Fresno Station–Mariposa

Alternative, but under this alternative, the station would not encroach on the historic Southern Pacific Railroad depot just north of Tulare Street and would not require relocation of existing Greyhound facilities.

The station building would be approximately 75,000 square feet, with a maximum height of approximately 60 feet. The station building would have two levels housing the same facilities as the Fresno Station–Mariposa Alternative (UPRR tracks, HST tracks, mezzanine, and station office). The approximately 18.5-acre site would include 13 acres dedicated to the station, bus transit center, surface parking lots, and kiss-and-ride accommodations.

Two of the three potential parking structures would each sit on 2 acres, and each would have a capacity of approximately 1,500 cars. The third structure would be slightly smaller in footprint (1.5 acres) and have a capacity of approximately 1,100 cars. Surface parking lots would provide approximately 600 additional parking spaces. Like the Fresno Station–Mariposa Alternative, the majority of station facilities under the Kern Alternative would be sited east of the HST tracks.

B. KINGS/TULARE REGIONAL STATION

The potential Kings/Tulare Regional Station would be located east of SR 43 (Avenue 8) and north of the Cross Valley Rail Line (San Joaquin Valley Railroad) (Figure 3-3). The station building would be approximately 40,000 square feet with a maximum height of approximately 75 feet. The entire site would be approximately 28 acres, including 8 acres designated for the station, bus transit center, short-term parking, and kiss-and-ride. An additional approximately 20 acres would support a surface parking lot with approximately 1,600 spaces.

C. BAKERSFIELD STATION ALTERNATIVES

Two options are under consideration for the Bakersfield Station.

Bakersfield Station–North Alternative

The Bakersfield Station–North Alternative would be located at the corner of Truxtun and Union Avenue/SR 204 along the BNSF Alternative Alignment (Figure 3-4). The three-level station building would be 52,000 square feet, with a maximum height of approximately 95 feet. The first level would house station operation offices and would also accommodate trains running along the BNSF Railway line. The second level would include the mezzanine; the HST platforms and guideway would pass through the third level. Under this alternative, the station building would be located at the western end of the parcel footprint. Two new boulevards would be constructed to access the station and the supporting facilities.

Figure 3-2
Fresno Station–Kern Alternative

Figure 3-3
Kings/Tulare Regional Station

Figure 3-4
Bakersfield Station–North Alternative

The 19-acre site would designate 11.5 acres for the station, bus transit center, short-term parking, and kiss-and-ride. An additional 7.5 acres would house two parking structures that together would accommodate approximately 4,500 cars. The bus transit center and the smaller of the two parking structures (2.5 acres) would be located north of the HST tracks. The BNSF Railway line would run through the station at-grade, with the HST alignment running on an elevated guideway.

Bakersfield Station–South Alternative

The Bakersfield Station–South Alternative would be would be similarly located in downtown Bakersfield, but situated on the Bakersfield South Alternative Alignment along Union and California avenues, just south of the BNSF Railway right-of-way (Figure 3-5). The two-level station building would be 51,000 square feet, with a maximum height of approximately 95 feet. The first floor would house the concourse, and the platforms and the guideway would be on the second floor. Access to the site would be from two new boulevards, one branching off from California Avenue and the other from Union Avenue.

The entire site would be 20 acres, with 15 acres designated for the station, bus transit center, short-term parking, and kiss-and-ride. An additional 5 acres would support one six-level parking structure with a capacity of approximately 4,500 cars. Unlike the Bakersfield Station–North Alternative, this station site would be located entirely south of the BNSF Railway right-of-way.

3.2.4 Heavy Maintenance Facility (HMF)

One HST heavy vehicle maintenance and layover facility would be sited along either the Merced to Fresno or Fresno to Bakersfield HST section. Before the startup of initial operations, the HMF would support the assembly, testing, commissioning, and acceptance of high-speed rolling stock. During regular operations, the HMF would provide maintenance and repair functions, activation of new rolling stock, and train storage. The HMF concept plan indicates that the site would encompass approximately 154 acres to accommodate shops, tracks, parking, administration, roadways, power substation, and storage areas. The HMF would include tracks that allow trains to enter and leave under their own electric power or under tow. The HMF would also have management, administrative, and employee support facilities. Up to 1,500 employees could work at the HMF during any 24-hour period.

The Authority has determined that one HMF would be located between Merced and Bakersfield; however, the specific location has not yet been finalized. Five HMF sites are under consideration in the Fresno to Bakersfield Section (Figure 1-1):

- The Fresno Works–Fresno HMF site lies within the southern limits of the city of Fresno and county of Fresno next to the BNSF Railway right-of-way between SR 99 and Adams Avenue. Up to 590 acres are available for the facility at this site.
- The Kings County–Hanford HMF site lies southeast of the city of Hanford, adjacent to and east of SR 43, between Houston and Idaho avenues. Up to 510 acres are available at the site.
- The Kern Council of Governments–Wasco HMF site lies directly east of Wasco between SR 46 and Filburn Street. Up to 420 acres are available for the facility at this site.

Figure 3-5
Bakersfield Station–South Alternative

- The Kern Council of Governments–Shafter East HMF site lies in the city of Shafter between Burbank Street and 7th Standard Road to the east of the BNSF Railway right-of-way. This site also has up to 490 acres available for the facility.
- The Kern Council of Governments–Shafter West HMF site lies in the city of Shafter between Burbank Street and 7th Standard Road to the west of the BNSF Railway right-of-way. This site has up to 480 acres available for the facility.

3.3 Power

To provide power for the HST, high-voltage electricity at 115 kV and above would be drawn from the utility grid and transformed down to 25,000 volts. The voltage would then be distributed to the trains via an overhead catenary system. The project would not include the construction of a separate power source, although it would include the extension of power lines to a series of power substations positioned along the HST corridor. The transformation and distribution of electricity would occur in three types of stations:

- Traction power supply stations (TPSSs) transform high-voltage electricity supplied by public utilities to the train operating voltage. TPSSs would be sited adjacent to existing utility transmission lines and the HST right-of-way, and would be located approximately every 30 miles along the route. Each TPSS would be 200 feet by 160 feet.
- Switching stations connect and balance the electrical load between tracks, and switch power on or off to tracks in the event of a power outage or emergency. Switching stations would be located midway between, and approximately 15 miles from, the nearest TPSS. Each switching station would be 120 feet by 80 feet and located adjacent to the HST right-of-way.
- Paralleling stations, or autotransformer stations, provide voltage stabilization and equalize current flow. Paralleling stations would be located every 5 miles between the TPSSs and the switching stations. Each paralleling station would be 100 feet by 80 feet and located adjacent to the HST right-of-way.

3.4 Project Construction

The construction plan developed by the Authority and described below would maintain eligibility for eligibility for federal American Recovery and Reinvestment Act (ARRA) funding. For the Fresno to Bakersfield HST Section, specific construction elements would include at-grade, below-grade, and elevated track, l, track work, grade crossings, and installation of a positive train control system. At-grade track sections would be built using conventional railroad construction techniques. A typical sequence includes clearing, grubbing, grading, and compacting of the rail bed; application of crushed rock ballast; laying of track; and installation of electrical and communications systems.

The precast segmental construction method is proposed for elevated track sections. In this construction method, large concrete bridge segments would be mass-produced at an onsite temporary casting yard. Precast segments would then be transported atop the already completed portions of the elevated track and installed using a special gantry crane positioned on the aerial structure. Although the precast segmental method is the favored technique for aerial structure construction, other methods may be used, including cast-in-place, box girder, or precast span-by-span techniques.

Pre-construction activities would be conducted during final design and include geotechnical investigations, identification of staging areas, initiation of site preparation and demolition, relocation of utilities, and implementation of temporary, long-term, and permanent road closures.

Additional studies and investigations to develop construction requirements and worksite traffic control plans would be conducted as needed.

Major construction activities for the Fresno to Bakersfield HST Section would include earthwork and excavation support systems construction, bridge and aerial structure construction, railroad systems construction (including trackwork, traction electrification, signaling, and communications), and station construction. During peak construction periods, work is envisioned to be underway at several locations along the route, with overlapping construction of various project elements. Working hours and workers present at any time will vary depending on the activities being performed.

The Authority intends to build the project using sustainable methods that:

- Minimize the use of nonrenewable resources.
- Minimize the impacts on the natural environment.
- Protect environmental diversity.
- Emphasize the use of renewable resources in a sustainable manner. An example of this approach would be the use of material recycling for project construction (e.g., asphalt, concrete, or Portland Cement Concrete (PCC), excavated soil, etc.).

The overall schedule for construction is provided in Table 3-1.

Table 3-1
Construction Schedule

Activity	Tasks	Duration
Mobilization	Safety devices and special construction equipment mobilization	March–October 2013
Site Preparation	Utilities relocation; clearing/grubbing right-of-way; establishment of detours and haul routes; preparation of construction equipment yards, stockpile materials, and precast concrete segment casting yard	April–August 2013
Earth Moving	Excavation and earth support structures	August 2013–August 2015
Construction of Road Crossings	Surface street modifications, grade separations	June 2013–December 2017
Construction of Elevated Structures	Aerial structure and bridge foundations, substructure, and superstructure	June 2013–December 2017
Track Laying	Includes backfilling operations and drainage facilities	January 2014–August 2017
Systems	Train control systems, overhead contact system, communication system, signaling equipment	July 2016–November 2018
Demobilization	Includes site cleanup	August 2017–December 2019
HMF Phase 1[a]	Test Track Assembly and Storage	August–November 2017
Maintenance-of-Way Facility	Potentially colocated with HMF[a]	January–December 2018

Table 3-1
Construction Schedule

Activity	Tasks	Duration
HMF Phase 2[a]	Test Track Light Maintenance Facility	June–December 2018
HMF Phase 3[a]	Heavy Maintenance Facility	January–July 2021
HST Stations	Demolition, site preparation, foundations, structural frame, electrical and mechanical systems, finishes	Fresno: December 2014–October 2019 Kings/Tulare Regional: TBD[b] Bakersfield: January 2015–November 2019

Notes:
[a] The HMF would be sited along either the Merced to Fresno or Fresno to Bakersfield section.
[b] Right-of-way would be acquired for the Kings/Tulare Regional Station; however, the station itself would not be part of the initial construction.
Acronym: TBD = to be determined

3.5 Area of Potential Effects Defined

Section 106 of the National Historic Preservation Act requires that an APE be defined for the project. An APE is defined in 36 CFR Part 800.16(d) as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking; it may be different for different kinds of effects caused by the undertaking.

For the HST project, the APE for archaeological resources and built-environment resources was established in consultation with project engineers and the Authority (see Appendix A). On June 28, 2010, Susan Stratton, the State Historic Preservation Officer (SHPO), concurred with the approach defined below regarding the delineation of the APE, in accordance with the Section 106 Programmatic Agreement (Authority and FRA 2011d; Stratton 2010). The archaeological APE for this undertaking is defined as the project footprint, which is the area of horizontal and vertical ground disturbance expected during construction of the undertaking. Ground-disturbing activities include grading, cut and fill, easements, staging areas, utility relocations, borrow pits, and biological mitigation areas. All subsequent changes to the alignment have been related to its lateral position on the landscape or to the addition or removal of certain elements of the alignment. The overarching approach to defining the APE, however, did not change from the version approved by SHPO, as defined above.

The archaeological APE reported in this document reflects the most-current configuration of the project alignments. However, the APE was modified as project engineering issued changes to the project footprint between February and August 2010. The modifications to the APE were made in a manner consistent with the parameters for delineation discussed above. The investigations that addressed alignment alternatives and changes to the project footprint that have since been dropped from consideration in the current APE are described in Appendix E.

3.5.1 Subsurface APE

The current project description indicates that the subsurface disturbance expected for the majority of the project alignment would be to a depth of less than 6 feet. In urban settings, road crossings would be undergrounded to avoid at-grade crossings; however, the exact depths of these undercrossings are unknown at this time. The aerial structures constructed in many areas along the alignment would require piles that would be driven into the subsurface, in some cases 40 to 100 feet below grade. In these instances the extent of disturbance would be limited to the diameter of the piles, which is currently unknown. Other elements of the project are also likely to result in subsurface disturbance, such as utility corridors, access roads, and laydown areas. The depths of disturbance associated with these elements are not presently known. As planning proceeds, these definitions will be added to the overall APE description.

Chapter 4.0
Summary of Identification Effort

4.0 Summary of Identification Effort

The following chapter describes the inventory and field methods employed, the methods used to characterize the geoarchaeological context, and efforts to involve the public, including Native American groups and individuals. The methods outlined here represent the implementation of the *Fresno to Bakersfield Archaeological Identification and Evaluation Plan* (AIEP) (Authority and FRA 2011a), which was submitted and approved by the Project Management Team and the Authority. Relevant aspects of the Section 106 PA were incorporated into the AIEP and were also implemented during the course of the inventory effort.

4.1 Archival Review and Research

4.1.1 Background Literature Review

A review of relevant literature and sources on San Joaquin Valley prehistory, ethnography, and history was undertaken to develop a broad context of the cultural evolution and archaeological record for this area of California. In addition, literature related to the natural and physiographic setting was reviewed. This research involved library database searches, reviews of texts that encompass the entire state, such as *California Archaeology* (Moratto 1984) and *California Prehistory: Colonization, Culture, and Complexity* (Rondeau et al. 2007), archaeological reports more directly relevant to the southern San Joaquin Valley, and readings on landscape ecology and paleoecology. The results of the literature review are summarized in Section 5.0 (Historic and Geomorphic Setting).

The geoarchaeological sensitivity assessment (Section 5.2.5) is based on the inventory, compilation, and analysis of existing data on the geomorphology, sedimentology, pedology, and hydrology in the project area and nearby. Several lines of evidence were used to assess the geomorphic setting and the potential for buried archaeological sites within the proposed California HST project vicinity. The first consists of existing quaternary geologic and geomorphic studies, generally produced as "open-file" reports by the U.S. Geological Survey (USGS), which provide a broad context on the timing and formation of various landforms found throughout the project area. The second is composed of existing soils data, including a compilation of radiocarbon (^{14}C) dates and their association to specific mapped soil series in the Soil Survey Geographic Database, which provides an estimate of the age of a given land surface. Finally, reports from archaeological excavations and geomorphological field studies within the specific project vicinity provide information on local depositional processes and known buried landforms.

A great deal of these existing data were recently compiled and synthesized in *A Geoarchaeological Overview and Assessment of Caltrans Districts 6 and 9* (Meyer et al. 2009), which encompasses the entire California HST Fresno to Bakersfield project area, and which deals with the problem of buried archaeological sites on a landscape scale directly relevant to the scale of the California HST project. Rather than attempt to duplicate the immense amount of time and effort—including original field studies—that went into creating the district-wide assessment, the California Department of Transportation (Caltrans) report is discussed and summarized in Section 5.2.4 with reference to the California HST archaeological APE, along with additional research and specificity where necessary. As such, a great deal of acknowledgment is due Meyer, Rosenthal, and Young (Meyer et al. 2009)—as well as the support and funding provided by Caltrans—for their seminal geoarchaeological study of the region.

4.1.2 Records Search

URS performed a digital scan of the South San Joaquin Valley Information Center (SSJVIC) Resource and Reports USGS 7.5' quadrangles that intersect with the current California HST alignment. Each quad was georeferenced to real-world coordinates and placed in a geographical information system (GIS) environment to allow for accurate digitization of the individual resources and reports recorded on the maps. All resources and surveys on each USGS quadrangle housed at the SSJVIC that intersect within a 1.25-mile buffer of the APE have been digitized. This buffer area is also considered the study area for the purposes of future discussion.

As the alignment engineering becomes better defined, additional records requests may be required to capture all previous studies within the alignment right-of-way and recorded resources within 0.25 mile of the "zone of expected disturbance." The following references were also reviewed:

- National Register of Historic Places – Listed Properties and Determined Eligible Properties.
- Directory of Properties in the Historic Property Data File for Kern, Kings, Tulare, and Madera Counties (OHP 2009).
- *California Inventory of Historic Resources* (OHP 1976).
- *California Points of Historical Interest* (OHP 1992).
- *California Historical Landmarks* (OHP 1995).
- *Handbook of North American Indians*, Volume 8, California (Spier 1978).
- Sanborn Maps in urban areas.
- Historic USGS quadrangles.
- Local General Plan Documents for Fresno, Kings, Tulare, and Kern counties.

The review of relevant literature is summarized in Section 4 and the results of the records search are discussed in Section 5.1.

4.2 Survey Methods

This section describes the field identification efforts conducted for the Fresno to Bakersfield Section of the California HST archaeological surveys, following the guidance set forth in the AIEP (Authority and FRA 2011a) and the Section 106 PA (Authority and FRA 2011d). This section also discusses the parameters for exempting certain properties according to the guidance set forth in the Section 106 PA (Authority and FRA 2011d).

Phase I of the identification plan entails the pedestrian survey of the project alignment APEs. Following the completion of Phase I, an Extended Phase I (XPI), which is analogous to the presence/absence of testing as defined in the Section 106 PA Attachment C (described in the AIEP), was undertaken on the sites identified within the APE to ascertain the site limits and determine the integrity of the deposits. The XPI also included efforts to characterize the geoarchaeological context at the location of the identified sites through a trenching program. The methods and results of the XPI are provided in Appendix F.

4.2.1 Survey Implementation

The principal constraint on the pedestrian survey was obtaining entry to private parcels of land that intersect with the APE. Prior to the survey, a third-party, right-of-way consultant, Bender Rosenthal, Inc., conducted a project-wide effort to secure permission to enter (PTE) privately held land. Lists of parcels for which PTE had been obtained, as well as any special conditions to access, were provided to URS by the Bender Rosenthal team. These lists were then integrated into both field mapping and global positioning system (GPS) units to provide field staff spatial information regarding where surveying was authorized. In many cases access was not granted. Those parcel owners who granted access for surveys represented approximately 48% of the project footprint acreage (i.e., the APE). The remaining parcel owners either did not respond or did not grant access to their land.[2] Section 6.3, below, discusses the area that was subjected to pedestrian survey relative to the total area within the APE.

Given differences in ground surface visibility across the APE, mainly due to factors such as vegetation cover or urban development (paving, etc.), variability in field-survey methods was employed. The paramount objective was to perform the field survey efficiently, while maximizing the opportunity for observation of archaeological manifestations. In every instance, however, the actual field circumstances dictated the most appropriate survey technique that balanced efficiency and the potential for detecting archaeological phenomena (Banning et al. 2006). All efforts to survey 100% of the accessible APE were taken; however, as discussed below, exceptions were taken in the field in areas that were deemed unsafe, or where the visibility of the surface was minimal or nonexistent and precluded the discovery of cultural resources. These include areas of dense underbrush, stands of poison oak, heavy agricultural cover, areas recently dusted with pesticides, concentrated feeding operations, and areas that were paved or under water.

The urbanized segments of the Fresno to Bakersfield Section were surveyed using a combination of techniques depending on the nature of the field condition. In some instances, areas of exposed ground within an otherwise heavily urbanized area were closely inspected. However, by and large, the urbanized areas provided little visibility with respect to surface manifestations of archaeological deposit, and pedestrian surveys were therefore not conducted.

To address the possibility of buried historic-era cultural deposits in urbanized settings, URS obtained a set of historic-era fire insurance maps called Sanborn maps for the historically urbanized areas that intersect with the California HST project alignment. The map set, which has been fully georeferenced, serves as a digital map tool (EDR 2010). The map set was reviewed to determine the sensitivity/potential for buried historic-era deposits within the project footprint.

In areas under active cultivation, survey transects followed the direction of the rows, if feasible. In areas where rows were planted obliquely to the direction of the APE, a zigzagging approach was employed. In general, planted and fallow agricultural fields were surveyed at 10- to 15-meter (33 to 49 feet) transect intervals. As discussed above, this was sometimes not feasible due to adverse conditions or variability in ground surface visibility. In these cases, the survey method that maximized ground surface inspection was employed.

In areas within the BNSF Railway right-of-way (which is considered 50 feet on either side of the centerline of the tracks) and other rail rights-of-way, the degree of disturbance within portions of the right-of-way precluded an examination of the native surface and hence these areas were not surveyed as intensely as areas of open land. These heavily disturbed portions of the existing rail rights-of-way include the rail prism and ballast, where the potential for archaeological deposits is assumed to be low enough not to warrant unnecessarily narrow transects. As discussed in the AIEP (Authority and FRA 2011a), substantial historic archaeological deposits were assumed not to exist within the rail right-of-way, given that habitations or activities producing either surface manifestations or buried features, other than evidence of original construction, would unlikely exist in these areas.

The entire BNSF Railway right-of-way, excluding those portions that were surveyed during the initial survey of adjacent and overlapping private parcels, was surveyed in late March to early April 2010 after receipt of a permit to enter from BNSF Railway. Approximately 386 acres of land

[2] In some instances, Bender Rosenthal, at the behest of the California HST Authority, did not notify or request access to certain parcels along the project footprint because the parcel contained negligible acreage within the footprint or represented a heavy industrial facility.

that had not been previously surveyed during the private parcel survey were surveyed within BNSF Railway right-of-way.

4.2.2 Framework for Identifying Archaeological Properties

The field procedures that guided the identification of archaeological sites relied on the *Fresno to Bakersfield Archaeological Identification and Evaluation Plan* (Authority and FRA 2011a) and the Section 106 PA (Authority and FRA 2011d), as well as the standards of professional practice of archaeology. The following served as the overarching approach to resources encountered in the field for the purposes of the California HST Fresno to Bakersfield Section and also served as the guidance for establishing historical property exemptions, the criteria for what constitutes an "isolate" and a "site," and the process for the initial evaluation of a given resource (Authority and FRA 2011a).

Archaeological Properties (Prehistoric and Historic) Exempt from Evaluation

The following properties are exempt from evaluation, as specified in Section 106 PA, Attachment D), based on the professional judgment of Qualified Investigators qualified in the area of archaeology (Authority and FRA 2011d: D-1):

- Isolated prehistoric finds consisting of fewer than three items per 100 square meters (1,076 square feet).
- Isolated historic finds consisting of fewer than three artifacts per 100 square meters (1,076 square feet) (e.g., several fragments from a single glass bottle are one artifact).
- Refuse scatters less than 50 years old (scatters containing no material that can be dated with certainty as older than 50 years old).
- Features less than 50 years old (those known to be less than 50 years old through map research, inscribed dates, etc.).
- Isolated refuse dumps and scatters over 50 years old that lack specific associations.
- Isolated mining prospect pits.
- Placer mining features with no associated structural remains or archaeological deposits.
- Foundations and mapped locations of buildings or structures more than 50 years old with few or no associated artifacts or eco-facts, and with no potential for subsurface archaeological deposits.
- Building and structural ruins and foundations less than 50 years old.

Qualified Investigators qualified in California archaeology applied professional judgment as to the level of identification effort, in consultation with consulting Native American tribe(s), where appropriate. This exemption process does not include archaeological sites, traditional cultural properties, or other cultural remains or features that may qualify as contributing elements of districts or landscapes. The lead archaeological surveyor was authorized to exempt these archaeological property types and features. Sites or deposits exempted were documented in the field and were retained as field notes.

In all other cases, the survey crews sought to identify historic properties that exist in the archaeological APE in accordance with 36 CFR Part 800.4(a)(2-4) and 36 CFR Part 800.4(b). This process followed the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 Federal Register 44716), and was consistent with the SHPO's guidance, and other guidance, methods, agreements, or protocols that FRA, Caltrans, the Authority, and SHPO agreed should be used to identify historic properties.

In addition to the above methods, all identified archaeological sites or concentrations were entered into an overall database of properties using a GPS-enabled handheld device. The entire database was designed to link photos, coordinates, and records to each property identified.

4.3 Native American Consultation

Adhering to the requirements of the Section 106 PA for the California HST, the FRA and the Authority have initiated consultation with the Native American Heritage Commission (NAHC) for purposes of conducting a search of its Sacred Lands File and obtaining lists of Native American contacts. The FRA and the Authority initiated consultation with these contacts by letter providing information about the proposed project alternatives and requesting information about any traditional cultural properties that could be affected by the project. FRA and Authority are expected to continue consultation through the completion of the Section 106 process.

4.3.1 Summary of Native American Communication

A. INITIAL CORRESPONDENCE

On April 21, 2009, Dean Martorana of URS prepared a letter, incorporating the required land descriptions that define the project APE and requesting that the NAHC conduct a search of the sacred land file maintained by the Commission (Martorana 2009). On May 5, 2009, Debbie Pilas-Treadway of the NAHC reported that a "… search of the sacred land file has failed to indicate the presence of Native American cultural resources in the immediate project area" (Pilas-Treadway 2009).

The NAHC did provide a list of Native American individuals and/or organizations that might have information pertinent to this project or concerns regarding the proposed project activities. The commission's letter suggested contact with each individual and/or group as a means to enable communication with each tribe or group regarding the project.

On October 18, 2009, Vance Benté of URS sent letters and maps to the contacts listed by the NAHC (Benté 2009). The letters were intended to inform the individuals and organizations about the project and to solicit comments, identifying any concerns or issues pertinent to the project. A project map (3-sheet map set, each 32 inches by 19 inches) was included with each letter. Each of the letters (including the accompanying map set) was posted by certified mail with a proof of delivery requested. Of the 53 mailings, 4 were returned as undeliverable.

During the period November 16, 2009, to December 1, 2009, an attempt was made to contact each individual and/or group by telephone to ensure receipt of the solicitation letter and the map set. A listing of the individuals who were sent letters and maps and the results of efforts to reach them by phone are summarized in Appendix D, Native American Communication. A summary of the correspondence received and results of the telephone conversations are provided below.

As a result of route changes and therefore changes to the APE, URS requested a second search of the sacred land file and for identification of interested individuals. On January 25, 2010, Dave Singleton of the NAHC, having reviewed the revised route commented that the search of the sacred land file had "… indicated the presence of Native American cultural resources within 0.5-mile radius of the project sites (APE) in the Corcoran and Rio Bravo USGS quadrangle areas" (Singleton 2010). The NAHC letter included a revised list of the "names of the nearest tribes and interested Native American individuals that the NAHC recommends as 'consulting parties'" (see Appendix D for this communication).

FRA and the Authority subsequently used the list of individuals and organizations accompanying the January 25, 2010, NAHC correspondence for a mailing that was designed to solicit issues or concerns from the Native American community.

B. RESULTS

Written communications in response to the mailings were received from Mary Matola (Matola 2009) of the Picayune Rancheria of the Chukchansi Indians, and from David Laughing Horse Robinson, chair of the Kawaiisu Tribe of the Tejon Reservation (Robinson 2009). Recognizing the inherent sensitivity of the project area, Ms. Matola commented that "… other tribal entities…would have a greater expertise concerning the cultural resources" but Ms. Matola wished to be informed regarding "… potential cultural disturbances, inadvertent discoveries … and the progress of the project." Mr. Robinson, representing the Kawaiisu Tribe, voiced his appreciation for being kept apprised of project progress and requested additional information.

Written comments were also received from Jim Redmoon, the cultural resources manager, of the Dumna Tribal Council (Redmoon 2010). Mr. Redmoon's comments, which described the Dumna Wo-Wah as wishing to participate in the Section 106 process as an interested party, were made in response to a letter sent by the HRA in May 2010, describing the Preliminary Alternatives Analysis.

Additional comments were offered by Lalo Franco, director of the Cultural Department Santa Rosa Rancheria (Franco 2009). Mr. Franco voiced concerns regarding the cultural resources in the project APE and a desire to meet with the Authority concerning future monitoring of project activities and the formulation of an agreement addressing burials.

Arrangements for meetings with individual Native Americans and/or groups are currently pending resolution of changes in the route alternatives.

4.3.2 Traditional Cultural Properties

Traditional cultural properties (TCPs) are places associated with the "cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community" (Parker and King 1990: 1). Examples include "a location associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world" and "a location where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice" (Parker and King 1990).

Based on the preliminary maps available at the time of the sacred lands record request, the NAHC did not identify any traditional cultural properties that could be affected by the project in this region. Currently, Native Americans contacted by letter have not notified the Authority of any traditional cultural properties or other cultural resources that could be affected by the project in this region. No historical societies or other interested parties that have been contacted thus far have responded with concerns regarding traditional cultural properties within the project vicinity (see Section 3, *California High-Speed Train Fresno to Bakersfield Historic Property Survey Report* [Authority and FRA 2011b]). Additional consultation with these groups may result in identification of TCPs, and, if so, the data will be considered in future planning.

Chapter 5.0
Historic and Geomorphic Setting

5.0 Historic and Geomorphic Setting

This chapter consists of a brief description of the ecological, geographic, and geomorphic setting. This information is used in a geoarchaeological framework to assess the potential for buried archaeological resources within the California high-speed train (HST) archaeological area of potential effects (APE). This discussion is followed by a review of the prehistoric and historic setting of the southern San Joaquin Valley.

5.1 Natural Setting

The study area for the Fresno to Bakersfield Section of the California HST is at the southern end of California's San Joaquin Valley. The San Joaquin Valley is bounded by the Sacramento–San Joaquin River Delta to the north, the Sierra Nevada to the east, the Tehachapi Mountains to the south, and the Coast Range to the west. The western slope of the Sierra Nevada is the source for rivers and streams that cross the San Joaquin Valley (Gronberg et al. 1998). The San Joaquin Valley is divided into two hydrologic sub-basins: (1) the San Joaquin sub-basin to the north; and (2) the Tulare sub-basin to the south. Rivers of the San Joaquin sub-basin join the San Joaquin River as it drains into the Sacramento River, flowing into San Francisco Bay. The rivers of the Tulare sub-basin, from the Kings River south, have no natural perennial surface outlet, and in the past, formed large, shallow, semi-permanent inland lakes. Only in years of exceptional rainfall did water cross the divide and enter the San Joaquin sub-basin.

During the Pleistocene era, alluvial fans of the Kings River and Los Gatos Creek formed a ridge that impounded waters to the south of the ridge and formed the Tulare Lake basin. As late as the 1840s, Tulare Lake measured 44 by 22 miles in diameter at high water and covered an area of 760 square miles (Gifford and Schenck 1926:7–8; Miller 1957:171–172). The other major lakes within the basin were Buena Vista and Kern.

At low water levels, Tulare and Buena Vista lakes were historically separated by a slough, but at higher water levels were connected into one lake. Buena Vista Slough connected the two basins where Buena Vista basin and Kern Lake reached Tulare Lake (Gifford and Schenck 1926:11). The slough extended from Tulare Lake for 40 miles to Buena Vista Lake. The northern 35 miles of the slough had an average width of 2 to 5 miles, while the lower 5 miles were 80 to 100 feet wide. Generally, the slough stuck to the eastern margins of the western foothills, and the swampy areas spread out to the east (Gifford and Schenck 1926:11).

About 12 miles south of Tulare Lake is Goose Lake, formed by a depression in the marshes that formed a lake even during low waters. To the south of Goose Lake is Jerry or Goose Lake Slough, which extends 25 to 30 miles to where it connects with the Kern River, approximately 6 miles west of Bakersfield.

Extensive marshes once surrounded the lakes, sloughs, and rivers. Before the historic period, their size varied seasonally. Plants such as tules (*Scirpus lacustris*), growing as tall as 10 to 12 feet, covered the entire range of the wetlands. On drier ground, vegetation consisted of sagebrush (*Artemesia* spp.), greasewood (*Purshia tridentate*), saltbush (*Atriplex* spp.) and various bunchgrasses. Few trees inhabited the area except for along river channels, and included cottonwood (*Populas fremontii*), sycamore (*Platanus racemosa*), and willow (*Salix* spp.). Figure 5-1 provides a generalized map of reconstructed native vegetation communities at the time of Euro-American entry into California (after Kuchler 1977). Wildlife abounded in the lake and marshlands where large numbers of migratory ducks and geese joined thousands of year-round aquatic birds. Freshwater mussel (*Margaritifera margaritifera*), fish, and turtles were abundant, along with pronghorn antelope (*Antilocapra americana*), tule elk (*Cervus elaphus*), and

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Figure 5-1
Historic natural vegetation and hydrology

Figure 5-1 11x17

and marshlands where large numbers of migratory ducks and geese joined thousands of year-round aquatic birds. Freshwater mussel (*Margaritifera margaritifera*), fish, and turtles were abundant, along with pronghorn antelope (*Antilocapra americana*), tule elk (*Cervus elaphus*), and winter herds of mule deer (*Odocoileus hemionus*). The area was also home to plentiful numbers of rabbit (*Sylvilagus* spp.), black-tailed hare (*Lepus californicus*), and valley quail (*Lophortyx californica*) (Wallace 1978a:449). The variety of wildlife in the southern San Joaquin Valley was typical for an area characterized by an arid to semi-arid climate, defined by hot summers and mild winters.

The southern San Joaquin Valley has undergone substantial and widespread ecological change since the arrival of Euro-Americans into the area in the early and middle nineteenth century. Channeling of the Kern River for agricultural purposes began in the 1850s, decreasing water flow into lakebeds and accelerating rates of evaporation for Tulare, Buena Vista, and Kern lakes. As the lakes shrank and eventually disappeared, the lakebeds were quickly reclaimed for agricultural purposes. Buena Vista Lake, which continued to receive minimal amounts of water for a longer period of time, was used as a reservoir until approximately 1950, when it too disappeared and was developed as farmland (Wedel 1941:7 in Hartzell 1992:62). Today, the area bears little resemblance to its prehistoric appearance. Plant and animal populations have significantly decreased in number and diversity and only 4% of the former wetlands remain within the southern San Joaquin Valley (Crampton 1974; Hartzell 1992; Munz 1968).

5.2 Geomorphic Setting and Geoarchaeological Assessment

The purpose of this geoarchaeological analysis is to determine the potential for the California HST project to cause adverse effects to archaeological resources that are not evident on the surface and, as such, would not be identified through conventional reconnaissance surveys. This effort helps to ensure that FRA has made a reasonable and good-faith effort to meet its Section 106 responsibilities to identify historic properties potentially affected by the project. Additionally, the geoarchaeological assessment effort seeks to avoid costly delays that may occur when resources are discovered after project construction has begun and late discovery protocols become necessary.

The relationship between archaeological sites and environmental context has long been recognized as important in understanding and interpreting the archaeological record. However, in California, the relationship between landscape evolution over time and the differential exposure and burial of archaeological sites has only begun to emerge as a significant research agenda (e.g., Meyer 1996). Before the last decade, archaeological studies of landscape formation have largely been ad hoc, after the discovery of buried archaeological material.

As a result of the dynamic nature of California's landscape, archaeological sites deposited over the last circa (ca.) 13,500 years (roughly the time that humans are known to have lived in California) have been subject to numerous geomorphic processes that have either buried, destroyed, or left these sites intact on the surface. Within the San Joaquin Valley, these geomorphic processes include the response of alluvial fan deposition to changing climate, fluctuating river courses and related floodplain deposition, the response of lakes (i.e., Tulare, Buena Vista) to climate, and the response of the San Joaquin River to sea-level rise and upstream effects of the formation of the San Joaquin Delta. All of these factors have likely affected the differential preservation of archaeological sites on the surface, and thus the ability to accurately assess the effects of the California HST project solely through archaeological reconnaissance surveys that are necessarily limited to investigation of the modern ground surface.

To assess the potential for buried archaeological sites within the proposed project components for the California HST, this study takes into account factors that either encouraged or discouraged human use or occupation of certain landforms (e.g., geomorphic setting and distance to water), combined with those that affected the subsequent preservation (i.e., erosion or burial) of those landforms. It is well known, for instance, that prehistoric archaeological sites in California are most often found on relatively level landforms near natural water sources (e.g., spring, stream, river, or estuary), which is often where two or more environmental zones (ecotones) are present (Beardsley 1954:64; Foster and Sandelin 2003:4; Jackson 1988; Pilgram 1987). Landforms with this combination of variables are frequently found at or near the contact between a floodplain and a higher and older geomorphic surface, such as an alluvial fan or stream terrace (Hansen et al. 2004:5).

As with surface sites, buried archaeological sites are not distributed randomly throughout the landscape, but occur in specific geo-environmental settings (Rosenthal and Meyer 2004a). For example, fans and floodplains regularly contain buried archaeological deposits, indicating some relationship between these landforms and past settlement activities. In the southern Santa Clara Valley, for example, it was found that most previously unidentified buried sites tend to be close to present stream channels (generally less than 656 feet), as well as abandoned stream channels (Rosenthal and Meyer 2004a:76). Thus, an increased potential exists for buried prehistoric archaeological sites in those areas where Holocene-age depositional landforms are near past or present water sources.

In general, most Pleistocene-age landforms have little potential for harboring buried archaeological resources, as they developed before the first evidence of human migration into North America (ca. 13,000 years before the present [B.P.]). However, Pleistocene surfaces buried below younger Holocene deposits do have a potential for containing archaeological deposits. Holocene alluvial deposits may contain buried soils (paleosols) that represent periods of landform stability before renewed deposition. The identification of paleosols within Holocene-age landforms is of particular interest because they represent formerly stable surfaces that have a potential for preserving archaeological deposits.

The problem of buried archaeological sites within the San Joaquin Valley and, more generally, the Central Valley as a whole, was recently summarized as such:

> The Central Valley's archaeological record, as it is known today, is biased by natural processes of landscape evolution. Surface sites are embedded in young sediments set within a massive and dynamic alluvial basin, while the majority of older archaeological deposits have been obliterated or buried by ongoing alluvial processes. Consequently, archaeologists have had to struggle to identify and explain culture change in portions of the Central Valley where available evidence spans only the past 2,500 years or, in rare cases, 5,500 years. (Rosenthal et al. 2007:150)

While the assumption that surface sites exist only in younger sediments is not necessarily accurate, the general problem of site visibility in a region that has been geomorphically dynamic over the past 13,500 years—roughly the period of human occupation in California—is highly relevant to the California HST project.

Geomorphic processes have played a major role in the differential preservation of archaeological sites in the San Joaquin Valley. Paleo-Indian sites (ca. 13,500–10,500 B.P.) and Lower Archaic sites (ca. 10,500–7500 B.P.) are extremely rare throughout the Central Valley. As discussed below in Section 5.3, Prehistoric Setting, these early sites are typified by sparse lithic remains, often around the edges of late Pleistocene to early Holocene lakes, including nearby Tulare, Buena Vista, and Goose lakes (Wallace and Riddell 1991, Dillon et al. 1991; Porcasi 2000; Fredrickson 1986). The end of each of these periods was marked by significant episodes of deposition—particularly at ca. 11,000 and 7500 B.P.—which covered and/or eroded the existing landforms (Rosenthal et al. 2007). Studies throughout northern California suggest that a period of relative landscape stability was followed by another episode of deposition ca. 2800 B.P. However, other indications are that late Holocene landscape changes tend to be more localized and dependent on local variability in climate and precipitation than are the more regional depositional trends documented for the earlier Holocene and Pleistocene (Meyer and Rosenthal 2007:7-8).

5.2.1 Geologic and Geomorphic Setting

The central area and eastern side of the San Joaquin Valley, through which the proposed California HST project rights-of-way run, are dominated by a complex intermingling of basin deposits that dominate the valley floor and by large alluvial fans that issue from the foothills of the Sierra Nevada and extend across the valley. This geomorphic contact is a geologically and seismically active area, and this activity has had a direct effect on surface geomorphology, deposition, and soils.

The San Joaquin Valley is a deep structural trough that was a large marine embayment (i.e., open to the ocean) during much of its geologic history. The trough became progressively closed off during Pliocene times (ca. 5 million years ago) as a result of the uplift and movement along the San Andreas fault zone, causing a transition from a marine to terrestrial depositional environment. This trend continued until the Pleistocene, when the valley was finally completely closed off from its outlet through Priest Valley (near Coalinga) and alluvial fan deposits like the Tulare Formation and Kern River Formation (see below) completed the infilling of the valley. Episodic alluvial sedimentation in the San Joaquin Valley throughout the Quaternary probably has been controlled more by climatic fluctuations than by tectonic activity, though both have played a role (Bartow 1991:7–9).

The Sierra Nevada range flanks the eastern side of the San Joaquin Valley, several miles east of the project APE. The climate of this large mountain range, with significant precipitation, primarily in the form of winter snow, is in stark contrast to that of the adjacent valley, which has a semi-arid climate that receives between 5 and 10 inches of rain each year across the APE. The large rivers and streams that drain the Sierra Nevada and cross the eastern San Joaquin Valley contrast with the surrounding semi-arid environment, and provide unique resources for human exploitation, as well as significant amounts of sediment that affect landscape formation. These drainages have apparently maintained a consistent but dramatically fluctuating discharge for much of the late Pleistocene and Holocene, building a series of large alluvial fans along the western flank of the Sierra Nevada.

5.2.2 Models of Landscape Development

Until recently, the primary model of alluvial landform development within the eastern San Joaquin Valley has been inherently linked to cycles of glaciation in the Sierra Nevada. The basic theory holds that the sediment necessary to create the large alluvial fans flanking the western slope of the Sierra was created and made available for transport during glacial maxima, and that such transport occurred soon thereafter. As drainages swelled with melting glacial waters, reduced vegetation cover resulting from a warmer, drier climate allowed the stripping of sediment from upslope, and the sediment was transported to the valley (Weissmann et al. 2005:182). This theory presumes that the majority of the sediments that make up the large fans along the eastern San Joaquin Valley date to the late Pleistocene—soon after the last glacial maximum at ca. 15,000 B.P., or earlier (i.e., related to previous glacial events). These late Pleistocene deposits are represented by the Modesto Formation, which is depicted and referenced in numerous seminal geology and geomorphology studies of the eastern San Joaquin Valley (Arkley 1962; Marchand and Allwardt 1981; Page 1986; Weissmann et al. 2005; Bennett et al. 2006).

However, as Meyer, Rosenthal, and Young (Meyer et al. 2009:16) point out, “few attempts have been made to actually demonstrate that glacial periods in the Sierra Nevada correlate with the age of alluvial deposits (in the San Joaquin Valley) presumed to derive from these cycles.” This correlation, or lack thereof, is key to the potential for buried archaeological sites within the California HST archaeological APE. If most of the landforms associated with the eastern San Joaquin Valley alluvial fans formed during the late Pleistocene, then they pre-date the entry of humans into California and, as such, are very unlikely to contain buried archaeological resources. On the other hand, if the glacial model is incorrect, the existing models of eastern San Joaquin Valley fan development may seriously underestimate the potential for buried archaeology.

5.2.3 Hydrology and Paleoclimate

Despite the lack of precipitation within the study area, several large lakes occupied the southern San Joaquin Valley throughout the late Pleistocene and Holocene (Figure 5-1). The largest of these lakes was Tulare Lake, just west of the APE. The Tulare Basin is dammed by the coalescent alluvial fans of the Kings River, draining the Sierra Nevada and feeding the basin and Los Gatos Creek, and draining the Coast Ranges and feeding north into the San Joaquin River aquifer. Tulare Lake declined rapidly after 1850, when the Kings River (and other tributary streams) began to be diverted for irrigation.

At its maximum historical extent, Tulare Lake covered an area of approximately 2,000 square kilometers (772 square miles) and had a maximum depth of 10 meters (33 feet) (Davis 1999). In an otherwise semi-arid environment, the Holocene lakes and their shorelines would have provided a rich and diversified ecosystem for prehistoric peoples. Indeed, the attractiveness of this unique resource to people throughout prehistory is evidenced by the presence of archaeological deposits, spanning from Paleo-Indian times (ca. 13,000 B.P.) to the historic era, along the shorelines of Tulare Lake. As discussed in Section 6.0, Findings, of this document, all of the prehistoric archaeological resources recorded during the field reconnaissance were near the maximum shoreline of the lake.

South of Tulare Lake, and farther from the APE, is Buena Vista Lake, which, along with the smaller Kern Lake, is fed by the Kern River. The Kern River drains the southern Sierra Nevada, from south of Mount Whitney to its outlet through Kern Canyon where it enters the San Joaquin Valley at Bakersfield (Figure 5-1). The large alluvial fan associated with the river extends from the foot of the Sierra entirely across the valley to the Elk Hills, forming a broad natural levee across which numerous forks of the river meander, draining partly southward into Buena Vista Lake and partly northward into Goose Lake and the Tulare Basin.

Lying south of the Kern River fan (Figure 5-1) is Buena Vista Basin, measuring about 30 miles from east to west by 20 miles. Its lowest point, which was occupied by Buena Vista Lake, is 268 feet above sea level, with the northern rim just under 300 feet. Within historic times considerable fluctuations have occurred in the height of water in the lake. In 1910, the shoreline followed the 291-foot contour and Buena Vista Lake was roughly 8 by 5 miles with no outlet. At 295 feet, or over, Buena Vista and Kern lakes form a single broad sheet, overflowing northwestward around the Elk Hills through Buena Vista Slough into Tulare Basin (Wedel 1941:6). Given the perennial nature of the Kern River, it is unlikely that either of the lakes ever dried up completely during the Holocene (Gifford and Schenck 1926:15). This is confirmed by pollen core analysis conducted at Tulare Lake, which shows that lake levels fluctuated significantly throughout the latest Pleistocene and Holocene, but never fully desiccated (Davis 1999).

Following on this pollen core analysis (Davis 1999), a more recent synthesis of available pollen and pedostratigraphic data from Tulare Lake resulted in a relatively well-defined history of lake highstands and associated environmental perturbations (Negrini et al. 2006). Throughout the late Pleistocene and Holocene, water levels within these lakes and wetlands fluctuated dramatically.

At least seven major fluctuations in lake levels during the past 11,500 years have been proposed (Negrini et al. 2006). Lake levels were generally higher during the early Holocene, with two highstands (ca. 220 feet above mean sea level [AMSL]) at 9500 to 8000 B.P. and 6900 to 6200 B.P. After that, it fluctuated at lower amplitude until reaching a major highstand during the most recent millennium (ca. 750 to 150 B.P.). At least three lowstands (less than 190 feet AMSL) occurred at the following times: approximately 9700, 6100, and 2750 B.P.

The timing of these lake-level events appears to be correlative with more widespread periods of landscape instability throughout the Central Valley. Several recent reviews of Central Valley geoarchaeology and geomorphology (Rosenthal and Meyer 2004a, 2004b; Rosenthal et al. 2007; Meyer et al. 2009) have identified numerous periods of local depositional events that have buried stable Holocene landforms and associated archaeological sites. While the timing of many events varies from locale to locale within the valley, several major periods of deposition seem to co-occur throughout the greater region. To assess the relationship between Tulare Lake Basin highstands and wider environmental processes, these major periods of alluvial deposition have been plotted against the lake-level records from Tulare Lake and other well-defined lake records in the southwest (Figure 5-2).

Basic geomorphic dynamics dictate that increased alluvial deposition will occur during wetter periods, when the carrying capacity and sediment load of watercourses are increased (Easterbrook 1999:118). As shown in Figure 5-2, this process is evinced by those periods of deposition that co-occur with the onset of lake highstands (i.e., most notably at ca. 650, 4000, 7000 to 7500, and 11,000 B.P.). However, at least two periods of broad-scale deposition appear to co-occur with the onset of Tulare Lake lowstands and associated environmental desertification (ca. 1300 and 2800 B.P.). These periods suggest that alluvial deposition may also be related to broader environmental perturbations, when reduced vegetation cover may lead to increased erosion of formerly stable landforms.

These multiple periods of alluvial deposition throughout the Holocene raise serious doubts about the efficacy of the glacial model described above. The timing of glacial events—even minor ones such as the “Little Ice Age,” which did not begin its retreat until ca. 400 B.P.—are out of step with the major Holocene depositional episodes documented throughout California and the Central Valley. Aside from the Little Ice Age, all of the most-recent periods of Sierra Nevada glaciation occurred during the Pleistocene. A different model is necessary to explain the periods of Holocene landscape stability and deposition. The co-occurrence of the onset of lake highstands, as well as the onset of lake desiccation, and depositional events, provides some clues.

The timing of major depositional episodes shown in Figure 5-2 indicates that landscape instability is associated with periods of climate change, both during transitions to wetter climate as well as transitions to drier climate. This suggests that there is an ideal threshold point at which precipitation outstrips the ability of vegetation to stabilize sediment. During periods of low rainfall, vegetation is sparser, but precipitation is not adequate to move the sediment on the surface. Alternatively, during periods of high rainfall vegetation is dense and stabilizes surface sediments from being transported downslope (Langbein and Schumm 1958; Miller et al. 2004). Therefore, in general, it is during periods of transition from one climatic regime to another that destabilization of sediment and landscape alteration occur.

The timing of these major climatological events is directly relevant to the potential for buried archaeological deposits within the California HST archaeological APE in two respects: (1) the timing of major broad-scale depositional events within the San Joaquin Valley and nearby Sierra Nevada and Coast Ranges gives an indication about the age of associated archaeological deposits that may potentially exist below successive depositional units within the study area; and (2) local changes in lake and slough water levels would have dramatically affected the extent and productivity of those resources, and thus the spatial relationship of archaeological sites to those resources. Fluctuations in water levels would have undoubtedly resulted in changes in settlement patterns and archaeological site deposition. In conjunction with alluvial depositional and/or erosional fluctuations, these two factors can be expected to largely dictate the placement and preservation of archaeological sites on (and within) the modern landscape.

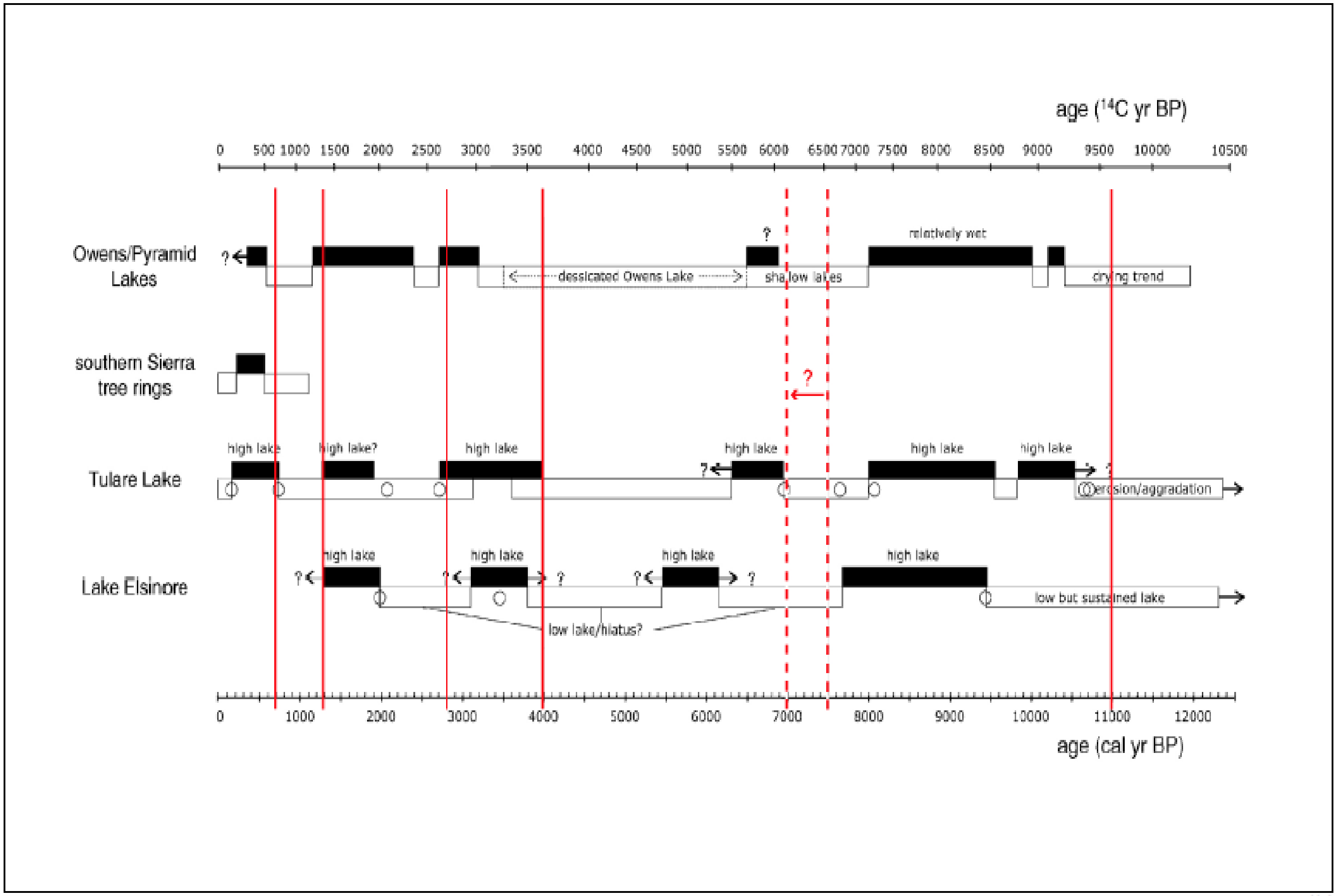

Figure 5-2

Holocene climate record. Representative Holocene climate records for Tulare Lake and other regions of the southwestern US (from Negrini et al. 2006).

Red lines represent approximate periods of major widespread depositional events in central and northern California (Rosenthal and Meyer 2004; Rosenthal, White, and Sutton 2007). Note the very close relationship between the beginning and end of Tulare Lake highstands and the onset of deposition.

5.2.4 Project Area Soils and Geoarchaeology

Through correlation of mapped surface soil units, field observations, soil profile descriptions, and radiocarbon dates—compiled from existing studies as well as original fieldwork conducted for Caltrans—Meyer et al. (2009) established a relational database of mapped soil series and landform age for the southern San Joaquin Valley. Their study is largely based on soils data obtained through the Soil Survey Geographic Database, which is a digital duplication of various original Soil Conservation Service soil survey maps. A re-creation of this landform age map, based on the published soil-age database (Meyer et al. 2009), is included here in Figure 5-3.

The database is predicated on the theory that specific soils types are typically associated with specific depositional environments and landforms of a particular age. The degrees of soil profile development provided by official soil series descriptions were used to make initial relative-age estimates. In addition to relative soil development, age estimates were also based on the geomorphic position of associated landforms, crosscutting relationships, degree and extent of erosional dissection, radiocarbon dates, and correlations with other dated deposits (Rosenthal and Meyer 2004a:76).

In cases where there was disagreement on landform age assignments between soil surveys and/or other geomorphic studies, a combination of soil profile development, horizontal crosscutting relationships, and radiocarbon dating was used to place similar soil series and landforms into particular temporal groups. This cross-comparison effort eventually resulted in Soil Survey Geographic Database soil map units that were consistently associated with landforms that occupy similar geomorphic positions on the landscape. These units could then be grouped into major temporal periods that could be assigned a relative sensitivity for buried archaeological resources. (For a complete description of methodology used to create the soil-age database, see Meyer et al. 2009:3, 123-128.)

5.2.5 APE Geoarchaeological Sensitivity

At the most basic level, buried site potential is dependent on the likelihood that a given landform contains buried soils (paleosols). These paleosols are representative of stable landforms that would have been conducive to human occupation. In general, the younger the surface soils are on a depositional landform, the more likely that landform is to contain buried stable surfaces, and thus potentially harbor buried archaeological sites. As such, the more recent (late Holocene and latest Holocene) portions of the alluvial fan and basin deposits shown on Figure 5-3, are the most sensitive for buried archaeological deposits.

However, as discussed above, archaeological sites are not distributed randomly on the landscape but are chosen as a result of human need and cognition. These considerations include access to resources, proximity to trade routes, and desire to mitigate conflict with surrounding populations. Unfortunately, many of these considerations are difficult to quantify and are dependent on cultural norms that are elusive (at best) given the nature of the archaeological record.

Figure 5-3
Landform age based on soil series

Figure 5-3 11x17

Quantifiable environmental factors, such as proximity to water, precipitation, surface slope and aspect, and biotic zone, were tested against known archaeological sites to determine positive or negative correlations (Meyer et al. 2009:130). Meyer et al. used this regressive analysis to determine that proximity to water was a significant factor in determining site location, with sites generally being farther from lakes and major rivers than from smaller springs and streams (Meyer et al. 2009:130–131). Additionally, it was determined that site slope played a less important, but correlative, role in determining site location (Meyer et al. 2009:130). These multiple environmental considerations were combined in a weighted relational database and used to create a geoarchaeological sensitivity map of Districts 6 and 9 (Meyer et al. 2009:136). This sensitivity map is reproduced here with relation to the California HST archaeological APE (Figure 5-4).

As seen in the preceding discussion and from the landform ages and the sensitivity model developed by Meyer et al. (2009), the sensitivity for buried archaeological deposits is variable across the California HST archaeological APE. Sensitivity ranges from very low to very high. The largest area of high sensitivity is between the Kings River (north) and Deer Creek/Alpaugh (south). The very high sensitivity of this area is primarily caused by the co-occurrence of the latest Holocene alluvial surface deposits (Figure 5-3) and proximity to the eastern shore of Tulare Lake (Figure 5-1), which, as discussed above, is known to have been a highly attractive resource to prehistoric populations. As discussed in Section 6.0, Findings, all of the prehistoric archaeological resources recorded during the field reconnaissance for this project are near the Tulare Lake paleo-shoreline.

Because of the sensitivity of large portions of the proposed California HST APE and the concomitant potential for affecting buried archaeological resources not identified during the field reconnaissance, a field geoarchaeological research program is being implemented at the time of this writing (Authority and FRA 2011c). This program consists of targeted subsurface explorations (backhoe trenching, coring, etc.) that focus on those portions of the vertical APE with high geoarchaeological sensitivity and significant project-related subsurface impacts (e.g., footings, borrow areas).

The background literature review presented here, the studies conducted by Meyer et al. (2009), and the resulting landform age and geoarchaeological sensitivity maps are intended to serve as a preliminary assessment of buried archaeological sensitivity for the region surrounding the California HST project. The field investigations have been designed to identify buried archaeological sites within those most-sensitive portions of the California HST archaeological APE, and will be used to refine or modify any relevant conclusions presented here. In addition, the field investigations may improve our understanding of the timing and relationship of Tulare Lake shorelines to alluvial depositional events, as well as the depth and location of specific paleosols within the California HST archaeological APE.

Figure 5-4
Weighted sensitivity for buried archaeology

5.3 Prehistoric Setting

As discussed above, geomorphic processes—which have buried or destroyed archaeological sites throughout the region—have created obvious limitations to understanding the prehistory of the southern San Joaquin Valley. Despite these limitations, there is a long history of archaeological research in the southern San Joaquin Valley that informs the present understanding of the prehistory of the region. Much of the early research was focused on the material remains of the late prehistoric and ethnographic periods. In the last decade of the nineteenth century, professional and amateur archaeologists began investigating the numerous "Indian mounds" of the region. C.H. Merriam collected a large coiled basket that contained the mummified body of a child, [redacted] (Merriam 1905 in Heizer 1951:30). Other materials collected by Merriam included another basket, a net manufactured from the fibers of the milkweed, hemp cordage, portions of a rush mat, and fragments of a rabbit-skin blanket. In February 1909, N.C. Nelson of the University of California Archaeological Survey recovered a cache of baskets and other artifacts [redacted] (Moratto 1984:174).

In 1899, 1909, 1923, 1924, and 1925 [redacted] all focusing on the recovery of burials and grave goods from large village sites (Gifford and Schenck 1926; Hartzell 1992:122). In 1926, Gifford and Schenck of the University of California published their volume on the archaeology of the southern San Joaquin Valley. The report included the documentation of approximately 40 sites, the results of their excavation of 9 sites, and the examination of private collections. They concluded that the only discernible change in, or addition to, the culture of the southern San Joaquin Valley is represented by steatite in the "slough and lake regions" (Gifford and Schenck 1926:118). This apparent lack of change in material culture resulted in their claim that the cultural remains recovered seemed to be as readily assignable to the "last century as to the last millennium" (Gifford and Schenck 1926:118). In part, these early assumptions regarding the lack of change over time in the archaeological record were the result of poor dating techniques, as well as sampling bias resulting from over-dependence on large, highly visible recent archaeological sites that dominate surface contexts in the region. (See geoarchaeological discussion, Sections 5.2.4 and 5.2.5, above.)

This work was followed in the 1930s through 1960s by limited excavations [redacted] by various researchers, including the Smithsonian Institute, Wedel, von Werlhof, Warren, and Fredrickson, which also focused on larger village and burial sites (Schiffman and Garfinkel 1981:3-4). During the Depression years of 1933 and 1934, the Civil Works Administration excavated [redacted] The midden sites, CA-KER-39 and CA-KER-60, exhibited stratified deposits that represented both prehistoric and protohistoric/ethnographic occupations. Materials recovered from the two cemeteries, CA-KER-40 and CA-KER-41, appeared contemporaneous with materials from the upper deposits of CA-KER-39 and -60, suggesting that they may have been the burial grounds for the inhabitants of the midden sites. Reported upon by Wedel (1941), this investigation stands as the "most intensive scientific excavation work so [redacted]" (Moratto 1984:188).

CA-KER-39 and -40 were subsequently found to be components of a much larger site, CA-KER-116. Excavated in the mid-1960s by Fredrickson and Grossman (1977), CA-KER-116 was found to contain a deeply buried component that was not identified by Wedel. Situated at depths of greater than 2.8 meters (9.2 feet), this component was dated to circa 6250 before Christ (B.C.) (Moratto 1984:99, 188).

From an archaeological perspective, research conducted [redacted] has resulted in the identification and definition of a number of temporal components, periods, or phases that reflect prehistoric human lifeways and land use patterns. This research has predominately focused on sites [redacted] (Fredrickson and Grossman 1977; Gifford and Schenck 1926; Hartzell 1992; Riddell 1951; Walker 1947; Wedel 1941) [redacted] (Angel 1966; Hewes 1941; Siefkin 1999). As shown in Figure 5-5, the early comprehensive surveys of the San Joaquin Valley revealed [redacted]

Wedel's (1941) investigations resulted in the definition of a general chronological framework based on stratigraphic analyses and comparison of artifact assemblages. A two-phase sequence, composed of a pre-European late occupation and an earlier cultural complex, was proposed (Wedel 1941). The early complex was correlated to the Oak Grove Culture of the Santa Barbara Coast, dated alternately at 2,000 to 4,000 years ago (Meighan 1955) and 4,000 to 7,000 years ago (Heizer 1964). The late complex was clearly separated from the earlier one by both stratigraphy and artifact types. Wedel (1941) subdivided the late complex into two phases: the early late phase, and the later protohistoric period. Wedel suggested that the early late phase began about A.D. 1400, and reflected a simple complex with similarities to the Tulare Basin to the north. The later protohistoric period, dating to after A.D. 1500, revealed strong influence from Santa Barbara coastal cultures.

In the mid-1960s, additional investigations were conducted [redacted] (Fredrickson 1986). Incorporating data from both Wedel's (1941) study and his own 1960s work, Fredrickson (1986) has since proposed a four-phase cultural sequence for [redacted].

The earliest occupation is represented by a meager inventory of distinctive artifacts, which include a ground-stone atlatl spur, three crescents, and fragments of several crude, leaf-shaped projectile points (Fredrickson 1986). Radiocarbon age determinations provided three dates of suggested cultural association: two dates were 6250 B.C. and the third was 5650 B.C. (Fredrickson 1986; Fredrickson and Grossman 1977). Fredrickson (1986) notes that while similar style artifacts were recovered from Paleo-Indian period contexts [redacted] (Riddell and Olsen 1969), similar conclusions regarding such antiquity at CA-KER-116 should not be made in the absence of corroborative stratigraphic data.

The ensuing phase is represented by sparse remains that reflect an early milling stone assemblage with possible cultural relationship to the Oak Grove and other milling stone complexes of southern California (Fredrickson 1986). Hallmark attributes include handstones, milling stones, flake scrapers, and extended burial posture. This phase remains undated, but inferences may be drawn from the milling stone horizon elsewhere in southern California, which began as early as 5000 B.C. and persisted for 3,000 years or more (Fredrickson 1986, citing Wallace 1971).

REDACTED FROM THIS VERSION

Figure 5-5
San Joaquin Valley archaeological site distribution (after Hewes 1941)

The next cultural phase, the late period (ca. A.D. 900 – A.D. 1500), is separated from the milling stone complex by millennia, as no assemblage has been found along the southwestern lakeshore to fill in the presumed occupational gap (Fredrickson 1986). Based on stylistic and technological differences in artifact forms, Fredrickson (1986) has tentatively divided the late phase into two subphases: the earlier subphase and the later subphase. The earlier subphase is distinguished by split-punched and whole spire-lopped Olivella beads and crudely made leaf-shaped points. The later subphase is defined by more finished and rough disk Olivella beads and by a local bead-making industry, which may have used rare whole-shell Olivella (Fredrickson 1986). Small quantities of asphaltum[3] are noted, as are hopper mortars, and clay-lined roasting ovens filled with freshwater clamshell; steatite is rare.

The final period [redacted] is considered to represent the ancestral Yokuts' continuous use of the lakeshore environment. This protohistoric period, dating perhaps from A.D. 1500 to the ethnographic period, is represented by abundant use of asphaltum and steatite, the presence of baked-clay objects, triangular projectile points, an elaborate bone technology, bowl hopper mortar, disk Olivella beads, Haliotis beads and ornaments, marine clam-shell disk beads, and small pendants and carvings of steatite (Fredrickson 1986).

Recent archaeological research conducted by Hartzell (1992) [redacted]) has resulted in the refinement of the lakeshore's chronological sequence as it relates to the Holocene epoch. A similar approach was taken by Siefkin and colleagues (Siefkin et al. 1996) for the [redacted]. Cumulatively, these studies provide definition of three broad temporal periods for the larger southern San Joaquin Valley area: (1) Early Holocene, (2) Middle Holocene, and (3) Late Holocene.

5.3.1 Early Holocene (12,000 to 7000 B.P.; 10,000 to 5000 B.C.)

The earliest period of human use of the southern San Joaquin Valley dates to approximately 12,000 years ago (10,000 B.C.). During this time, the archaeological record suggests that native peoples lived in camps around lake margins and relied extensively on lacustrine resources (i.e., fish, turtle, freshwater mollusks, and waterfowls) and terrestrial resources (mainly rabbits and artiodactyls).

Populations are considered to have been small, a conclusion based on the absence of imported items and the use of local resources from within a relatively restricted area centered on the lake marshes and the surrounding plains and foothills. Late Pleistocene/early Holocene cultural deposits found in the Tulare Lake and Buena Vista Lake basins indicate that stemmed and lanceolate points and crescents were used (Hartzell 1992:317-331; Siefkin 1999:50). Also noted with these artifacts were species of extinct megafauna, although direct cultural association has not been proven (Siefkin 1999:49).

Fluted points have yet to be identified at [redacted], a factor that Sutton (Sutton 1996) correlates with the absence of a lacustrine habitat during the early human occupation of the southern San Joaquin Valley. Artifact distribution [redacted], however, indicates that water levels were lower during the late Pleistocene, a trend that was likely reflected by [redacted] (Wallace and Riddell 1988:89). Siefkin (1999:51) considers the modern archaeological emphasis on the upper shorelines a more reasonable answer to the current lack of fluted points and other Paleo-Indian remains [redacted].

5.3.2 Middle Holocene (7000 to 4000 B.P.; 5000 to 2000 B.C.)

Few well-stratified archaeological deposits from the southern San Joaquin Valley date to this period. The paucity of such sites has been attributed to fluctuating lakeshores and the movement

[3] A naturally occurring tar used as a binding agent.

of campsites to locations above or below areas that have previously been studied by archaeologists (Hartzell 1992:318; Siefkin 1999:52).

This period is characterized by assemblages that are similar to Windmiller Pattern sites in the northern part of the San Joaquin Valley, including extended burials without funerary objects, Pinto projectile points, and charmstones but with some local deposits more closely resembling the Oak Grove and other millingstone complexes of southern California, with millingstones, handstones, and flake scrapers (e.g., Gerow 1974; Gifford and Schenck 1926; Hartzell 1992; Siefkin 1999; Wallace 1954:120–121). While conclusions are tenuous based on the very limited assemblages for this time, this may suggest cultural affiliation with the northern parts of the Central Valley (Windmiller) as well as southern California and the coast (Oak Grove).

Also found during this period are imported items such as obsidian artifacts and beads and ornaments made of marine shell. Worked bone and steatite implements occur in the archaeological record in limited amounts (Hartzell 1992:322).

From archaeological evidence, it appears that year-round acquisition of fauna occurred at lakeshore sites, and many logistical bases were set up along lakeshores. Rises above the lakes were likely used by hunting parties to retool weaponry and/or process game (Hartzell 1992:320).

5.3.3 Late Holocene (4000 B.P. to 150 B.P.; 2000 B.C. to A.D. 1850)

In contrast to earlier periods, the archaeological record of the late Holocene period is significantly more complex. During the late Holocene period, with the lowering of water levels and greater amounts of alkalinity in the area lakes (resulting in less abundant and reliable resources), a residential mobility pattern of land use began. This strategy involved more-frequent moves, where an entire population or group traveled to resource areas.

Notable technological changes include the introduction of the hopper mortar, changes in Olivella shell bead forms, and the use of asphaltum in small quantities (Fredrickson 1986; Hartzell 1992:326). Also introduced into the tool kit were cottonwood series projectile points, bi-pointed bone objects used as fish hooks, steatite H-shaped “reels,” and tule-covered clay ball net weights. Late-Holocene–period sites often contain freshwater mussels, turtle remains, ground stone, and marine shell beads (Peak and Associates 1991), and are generally found on knolls between ephemeral drainages (Hartzell 1992:328; Moratto 1984:189). Mortuary patterns included flexed or semi-flexed burials, somewhat similar to the late Horizon of the Central Valley sequence.

The protohistoric period of the late Holocene, dating from roughly 500 B.P. (A.D. 1500) to the ethnographic period, is represented by a diversified artifact assemblage. Common implements included baked-clay objects, triangular projectile points, elaborate bone work, bowl hopper mortars, Olivella disk beads, Haliotis beads and ornaments, clamshell disk beads, and small steatite pendants and carvings (Fredrickson 1986).

5.3.4 Northern San Joaquin Valley

The relatively low number of archaeological investigations conducted within the northern San Joaquin Valley region has resulted in a paucity of information on prehistoric events in the area. However, the results of these studies provided information toward an understanding of the prehistoric peoples who inhabited this region. Details of these efforts are summarized in Moratto (1984:189, 191–193, 215, 573) and are briefly presented below.

Intensive archaeological investigations within the northern San Joaquin Valley were initiated during the 1960s (Olsen and Payen 1968, 1969; Riddell and Olsen 1969; Treganza 1960). Artifacts recovered from [redacted]

[redacted] are similar to materials associated with Phase 2 of the Late Horizon described by Bennyhoff and Heizer (1958), which has been dated to ca. A.D. 1500 (Wallace 1978c:463).

Studies conducted [redacted] resulted in the identification of a cultural sequence similar to, but distinct from, that identified for the delta region. Excavations conducted for the construction of several reservoirs, including Little Panoche Reservoir, revealed a series of four cultural complexes focused on the exploitation of the foothill-valley biotic zone. This sequence indicates that prehistoric people occupied the valley for a period extending from ca. 3000 B.C. to A.D. 1850, with a 500-year hiatus between ca. A.D. 1000 and 1500. The earliest complex identified is the Positas Complex (ca. 3300–2600 B.C.), followed by the Pacheco Complex (ca. 2600 B.C.–A.D. 300), the Gonzaga Complex (ca. A.D. 300–1000), and the Panoche Complex (ca. A.D. 1500–1850).

It has proven difficult to determine the ancestry of these early peoples. However, artifact assemblages associated with occupation ca. 1000 B.C. to A.D. 500 suggest that the inhabitants were possibly the ancestors of the ethnographic Yokuts (Moratto 1984:188). The latest occupation, the Panoche Creek Complex (A.D. 1500–1850), is associated with the period when the ethnographic Yokuts inhabited the region.

5.4 Ethnographic Setting

The present-day southern San Joaquin Valley is in the homeland of the Southern Valley Yokuts (Wallace 1978b:448, 449), a geographic division of the much larger Yokuts linguistic group, who occupied the entire San Joaquin Valley and adjoining Sierra Nevada foothills (Kroeber 1907, 1925, 1963; Latta 1949; Newman 1944). Yokutsan is one of four Penutian linguistic stocks which included Costanoan (Ohlonean); Miwok (Utian); Wintu, Nomlaki, and Patwin (Wintuan); and the Maidu, Nisenan, and Koncow (Maiduan) (Shipley 1978).

In contrast to the typical California cultural grouping known as the tribelet, the Yokuts were organized into “true tribes,” in that each had “a name, a dialect, and a territory” (Heizer 1971: 370). Kroeber (1925:474) estimated that as many as 50 Yokuts tribes may have originally existed, but that only 40 were “sufficiently known to be locatable” at the time of his survey. Each tribe inhabited an area averaging “perhaps 300 square miles,” or about the distance one could walk in any direction in half a day from the center of the territory. Some Yokuts tribes only inhabited a single village, while others occupied several (Kroeber 1925: 474–475).

The Southern Valley Yokuts territory was centered near the basins of Tulare, Buena Vista, and Kern lakes, their connecting sloughs, and the lower portions of Kings, Kaweah, Tule, and Kern rivers. Sixteen subgroups, each speaking a different dialect of the Yokut language, made up the Southern Valley Yokuts, and included the Apyachi, Choynok, Chuxoxi, Chunut, Hewchi, Hometwoli, Hoyima, Koyeti, Nutunutu, Pitkachi, Tachi, Telamni, Tulamni, Yawelmani, Wowol, and Wechihit. Three of the groups, the Tachi, Chunut, and Wowol, claimed the shores of Tulare Lake, while the Nutunutu inhabited the swampy area north of Tulare Lake, south of Kings River. The Wimilichi, Wechihit, and Apyachi occupied the area to the north of Kings River, with the Apyachi living near the river’s outlet on the western side of the valley, and the Wimilichi and Wechithit to the east. The Choynok occupied an area east of Tulare Lake in the Kaweah River Delta, southwest of the Telamni and Choynok groups. The Koyeti’s territory was in the swampy sloughs of the Tule River. The Tulamni occupied Buena Vista Lake, with the Chuxoxi living in the channels and sloughs of the Kern River Delta. The Hometwoli occupied the area surrounding Kern Lake, while the Kawelmani lived to the northeast near Kern River and Poso Creek (Wallace 1978b:449).

Subsistence strategies focused on fishing, hunting waterfowl, and collecting shellfish, seeds, and roots. Fish species commonly hunted included lake trout, chubs, perch, steelhead, salmon, and sturgeon. Waterfowl were mainly caught in snares and nets. Plant foods played a key part in the

Yokuts diet; the most important resource was tule, whose roots and seeds were eaten. Other plant foods included various species of grasses, clover, fiddleneck, and alfilaria. Acorns were not readily available, and groups often journeyed into foothill zones to trade for the nut (Wallace 1978b:450).

Southern Valley Yokuts generally placed their settlements on top of low mounds near major watercourses, and constructed two types of permanent residences. The first was an oval, single-family dwelling with wooden framing covered by tule mats. The second type was a long, steep-roofed communal residence that housed at least 10 families. Other structures included granaries and a communally owned sweathouse (Wallace 1978b:450, 451).

Southern Valley Yokuts relied heavily on tule reeds for making woven baskets and mats. Basketry tools, such as awls, were manufactured from bone (Wallace 1978b:451, 452). Flaked stone implements included projectile points, bifacial and unifacial tools, and edge-modified pieces. Ground-stone tools consisted of mortars, pestles, handstones, and millingstones.

Of particular relevance to the Bakersfield area was the *Yowlumne* tribe, a subset of the Yokuts, which occupied a number of village locations throughout the southern San Joaquin Valley. The *Yowlumne* tribe reportedly occupied the village of "*Woilu* at the site of the town of Bakersfield" (Kroeber 1925: 482). According to Latta (1949), the location of *Woilu* was reported to be on a knoll between the present-day 16th and F streets and the Mercy Hospital at 16th and C streets. This former village site is discussed further in Section 6.0.

5.5 Historic Setting[4]

The Spanish first explored Kern County, at the southern end of the San Joaquin Valley, in 1772, but its distance from the missions and presidios along the coast delayed permanent settlement until the period of Mexican control over California. Explorers, such as the American trapper Jedediah Smith passed through the area, and their routes became important transportation corridors used by later travelers and stage companies and settlers. The Mexican government granted the first ranchos in the southern part of the valley in the early 1840s, but these did not result in permanent settlement. Instead, Mexican rancho owners along the California coast allowed their cattle to wander and graze as far afield as the San Joaquin Valley during this period (Robinson 1961: 1–12, 17–20, 28–29).

One of the earliest transportation routes through the San Joaquin Valley and Kern County was El Camino Viejo, a Mexican route along the western side of the valley, roughly along present-day SR 33. In the 1850s, the Army established another road along the eastern side of the valley, and the Butterfield Stage route ran through the valley, connecting Los Angeles and San Francisco (Robinson 1961: 24-35; Hoover et al. 1966: 128–130).

The discovery of gold in the northern part of the state encouraged prospectors to scour the rest of the new state of California in search of new strikes. Gold was first discovered in the mountains east of the valley in 1851, and immediately lured a rush of fortune seekers. As their number grew, some new immigrants began farming in the valley to supply the miners and mining towns. Ranchers grazed cattle and sheep, and farmers dry-farmed or used limited irrigation to grow grain crops. One small agricultural settlement, founded by Colonel Thomas Baker in 1861, took advantage of reclaimed swampland along the Kern River. This settlement became the town of Bakersfield, and soon served as the center of activity in the southern San Joaquin Valley and in the newly formed Kern County because of its location on the main stage road through the valley.

[4] For a more in-depth and complete treatment of the historic context of the California HST project area, see the background sections of the *California High-Speed Train Fresno to Bakersfield Section: Historic Property Survey Report* (Authority and FRA 2011b).

The town's role as the primary market and transportation hub for stock and farm products was solidified with the arrival of the Southern Pacific Railroad in the Bakersfield area in 1873, which connected it with other important markets in the state (Zonlight 1979: 2-9; Hoover et al. 1966: 132–133; Robinson 1961: 24-35).

Following the passage of statewide no-fence laws in 1874, farming expanded in the valley in both large land holdings and smaller, subdivided properties. As the farming population grew, so did the demand for irrigation. Reclamation of swampland began in 1866, with small dams built across the Kern River to divert water into the fields; by 1880, more than 80 diversions were taking water from the river. Ten years later, 15 major canals provided water to thousands of acres in the county (Zonlight 1979: 310-331; Berg 1971: 10–12, 28–33). Smaller canals built in the 1870s supplied water to individual farms growing feed crops, and larger facilities like the James Canal were established in the 1880s. A portion of the James Canal alignment is east of the APE in Sections 28 and 33. Kern County Land Company acquired several extant canals when it incorporated in 1890, including the James Canal. Several of these canals were enlarged and remain in service in Kern County, including the Gates, Stine, and Calloway canals. Large twentieth-century canals are also found in Kern County, including the Friant-Kern Canal, constructed between 1945 and 1951. The Friant-Kern is part of the Central Valley Project and carries San Joaquin River water from Friant Dam to the southern San Joaquin Valley (JRP Historical Consulting 1993).

Aside from the petroleum industry, which first developed in the 1890s, agriculture remained the dominant activity in the southern San Joaquin Valley through the twentieth century. Post-World War II irrigation projects, including the Friant-Kern Canal, brought water to the valley on an even larger scale, and continued to encourage the development of agriculture and related industries, such as expansive cotton production and sugar beet growing and refining (JRP Historical Consulting 1993).

Chapter 6.0

Findings

6.0 Findings

6.1 Records Search Results

To identify the locations of previously recorded cultural resources and prior inventory surveys, a digital scan was performed of the South San Joaquin Valley Information Center (SSJVIC) USGS 7.5-minute quadrangles that intersect with the HST alignment. The quadrangles housed at the SSJVIC contain the plotted locations of sites and surveys for a particular region of California. Each quadrangle was georeferenced to real-world coordinates and placed in a geographical information system (GIS) environment to allow for accurate digitization of the individual resources and survey reports hand-plotted on the original maps. The resource and survey content, as of September 2009, on each quadrangle was then digitized to create a geodatabase of known resources and surveys. As a result of this effort, it was determined that 80 previous surveys have been conducted in areas that intersect the archaeological APE. Appendix B, Records Search Results, provides the list of survey reports that intersect the APE. An update of the original records search was conducted in March 2011 to obtain any sites or surveys submitted to the SSJVIC since the quadrangles were scanned in September 2009. These sites were incorporated into the geodatabase and were applied to the following analysis.

In total, 21 previously recorded archaeological resources are [redacted] (see Figure 6-1). Table 6-1 lists these previously recorded resources. Of these, three sites, [redacted] see Table 6-2).

CA-KER-2507 was formally recorded on DPR 523 forms in 1989 (Ptomey and Wear 1989). This recordation indicates that the site is completely destroyed. The site was identified through written accounts that exist from the 1890s and ethnographic interviews conducted in the early twentieth century. Ethnographic informants described the site as the *Yowlumne* village site of *Woilu* (Latta 1949:46-47). The village was situated on a hill adjacent to the Kern River and was surrounded by a marshy environment dominated by tule and cattails. The hill upon which the village was situated was reported to have existed [redacted] (Latta 1949:47). The village site was known historically as "Reeder Hill" after a man who built a house there. Based on Latta's (1949) description it appears that the hill may have actually been a mound site. He reports that the mound was removed during construction of the Santa Fe Railway and that the excavated sandy soils were used as fill along the railroad grade in both directions from Bakersfield. Latta reports that hundreds of mortars, pestles, and burials were removed from the site along with the fill. The former location of the site is now completely developed, covered by portions of the BNSF switching yard and associated facilities, paved streets, parking lots, and buildings. No topography is evident in the area that would suggest the former location of the CA-KER-2507 mound site.

CA-KER-3072 was identified as a "very sparse lithic scatter" within t[redacted]y (Everson 1991). The elements of the deposit consisted of a "few" lithic flakes (assumed to be three) over a 2,500-square-meter area. CA-TUL-2950H/P-54-004737 is the [redacted] (Orfila 2010). Levees have been constructed around the perimeter of the site, and it is periodically utilized as a water retention basin by the Alpaugh Irrigation District.

A few examples of the sites identified within 0.25 mile of the project and farther afield are discussed here (and shown on Figure 6-1) to provide a background of the types of archaeological sites that occur in the project vicinity and their relation [redacted]. Although not in the APE,

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Figure 6-1
Previously recorded (0.25-mile) archaeological sites

P-473, recorded by Davis and Cursi (1977), is described as a “sparse scatter of lithic debitage and artifacts spread over a plowed field.” Given the proximity of this site [redacted] it was probably a large site that has been disturbed and re-deposited over a large area. Another site, CA-TUL-212 (P-212), [redacted] TUL-212 was originally recorded in 2000 and was tested in 2003 (Fogerty 2003). This site was described as a surface concentration of lithics and shellfish fragments. The distribution of lithics and shell covered a 12,600-square-meter (135,625-square-foot) area. The extent and concentrations of shell with a surface scatter of lithic debitage suggest that this site functioned as a seasonal resource procurement activity site. The flake stone debitage included obsidian, which suggests the manufacture or resharpening of non-local materials (Fogerty 2003).

P-473 and P-212 [redacted]t) are indicative of the broader archaeological sensitivity of the [redacted] vicinity. The majority of the most well-known and well-stratified archaeological sites in the region have been recorded along the 200-foot-elevation contour of the ancient lakeshore bed, which indicates the primacy of the Tulare Lake to San Joaquin Valley area peoples for their subsistence and settlement.

[redacted] CA-TUL-1613, or the Creighton Ranch site, merits discussion here. The dataset gathered from this site emphasizes the significance of the marshy margins of [redacted] It was excavated in 1989 by Brian Dillon (Dillon et al. 1991; Porcasi 2000).

Table 6-1

Archaeological Resources Identified within 0.25 Mile of APE (Project Footprint)

Number	Site Identifier (P#)	Resource Name (by recorder)	Site Constituents	Description	Comment/Evaluation from Recording
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 6-1
Archaeological Resources Identified within 0.25 Mile of APE (Project Footprint)

Number	Site Identifier (P#)	Resource Name (by recorder)	Site Constituents	Description	Comment/Evaluation from Recording
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 6-1
Archaeological Resources Identified within 0.25 Mile of APE (Project Footprint)

Number	Site Identifier (P#)	Resource Name (by recorder)	Site Constituents	Description	Comment/Evaluation from Recording
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 6-2
Previously Recorded Archaeological Sites within the APE (Direct Impact Footprint)

Number	Site Identifier (P#)	Resource Name (by recorder)	Site Constituents	Description	Comment / Evaluation from Recording
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The contents of the site revealed large quantities of lake fish, freshwater clams, and turtles, in addition to large and small mammals. The data obtained at this site suggest that during the course of the site's occupation, the occupants shifted their subsistence patterns relative to ecological changes. [redacted] (Riddell 1951). The [redacted], dating to 1700 B.P., was contemporaneous with these two sites; however, the site may be even older because the deepest levels were not reliably dated (Dillon et al. 1991). The large quantities of once-living refuse and organic refuse at TUL-1613 indicate that the focus of the activities was food procurement and preparation rather than the habitation-related material identified at the two sites to the west. The APE is between these two site types (food procurement/processing and habitation/burial), suggesting the potential sensitivity for multiple archaeological site types within that portion of [redacted].

As suggested above, the shoreline zone of Tulare Lake appears to have been heavily used, which is in large part attributable to the ease of access to abundant and unique lacustrine resources in an otherwise semi-arid ecological setting. Although only two previously recorded archaeological sites, [redacted], it appears, based on the larger patterns of settlement seen thus far in the archaeological record, that the segment of the California HST that runs closest to [redacted] zone would have the greatest potential to affect prehistoric archaeological resources. This sensitivity is substantiated by the geoarchaeological research and discussion provided above (Section 5.2.5), and was manifested in the findings of the field surveys (Section 6.3.1). As discussed below, all archaeological sites and isolates encountered during the field surveys were in a confined area [redacted].

6.2 Historic Research and Map Analysis

Research was undertaken to obtain information pertaining to the Stoil town site (CA-TUL-2950H/P-54-004737), along with a review of historic Sanborn Company fire insurance maps. This research sought to identify areas where previously unrecorded historic-era archaeological resources might be found in order to identify areas in the APE where historic-era resources may be encountered during construction.

6.2.1 Stoil Town Site

The settlement history of Stoil, in southwestern Tulare County has its beginnings in the transportation history of this previously remote part of the San Joaquin Valley. The Stoil site is located in Section 19, T23S, R24E, MDBM, and was undeveloped open land owned by Caroline Shuster through the mid-1890s, when a group of San Francisco merchants founded the San Francisco and San Joaquin Valley Railway (SF&SJV) to compete with Southern Pacific Railroad’s monopoly on rail shipping. The SF&SJV was nicknamed “the People’s Railroad” and was enthusiastically supported by many valley farmers. The SF&SJV line eventually ran from Stockton to Bakersfield, generally west of and roughly parallel to the Southern Pacific line, and is now known as the BNSF railroad (Rice et al. 1988: 217–236; Bergman 2009: 51–53; Preston 1981: 164–166).

Construction of the SF&SJV reached Fresno in 1896 and finished a branch line from Fresno to Visalia the following year before pushing south from Hanford to reach Bakersfield in 1898. The new railroad stretched 278 miles through the valley, but had no outlet to the south. Although it offered an important shipping option for the San Francisco Bay Area and northern California markets, SF&SJV officials knew that success depended on linking with the Atchison Topeka and Santa Fe Railroad (AT&SF) to connect to southern California. In the fall of 1898, AT&SF agreed to purchase the common stock of SF&SJV and operated the line that passed through the Stoil site for the next century (Vandor 1919: 271; Storey 1940: 31-39; Bergman 2009: 51–53; Bryant 1974: 175–178; Waters 1950: 139–140; Duke and Kistler 1963).

More transportation infrastructure arrived in the vicinity of the Stoil site within a few years of completion of the rail line. The Pacific Coast Oil Company, a subsidiary of Standard Oil, completed an oil delivery pipeline in 1903. The pipeline paralleled the AT&SF railroad right-of-way through the valley to transport crude oil from the Kern oil fields to its refinery in Richmond. Heavy California crude oil needed to be heated to make it thin enough to pump through the 280-mile, 8-inch line, and heating took place at pumping stations located at 14- to 25-mile intervals along the route. Standard Oil built a pumping station at the Stoil site between 1903 and 1912, probably in 1911. It appears that the pumping station was not in place at the time of an early account of the oil industry (published in 1905) that listed stations at other small locales, such as Pond and Corcoran.

The first documented development at Stoil is a town site map filed with Tulare County on November 13, 1911, for “Iowa City.” This name does not appear to have been used by the locals, and the site took on the name Stoil, a shortened version of the company name “Standard Oil” (Whiteshot 1905: 164-165, 829; California State Council of Defense 1917: 85-88; Tulare County Assessor n.d. 313: 7). It is likely, therefore, that various buildings and structures were installed at the Stoil site within a few years of completion of the pipeline in 1903, and probably by late 1911 when the town plat was filed. The earliest known record of buildings is shown on a railroad station plat dated June 1912, which clearly shows a boiler house and pump house at the “Station Grounds at Stoil, Cal” (ATSF 1912). A few years later, when the state government surveyed the industry in 1917 prior to the United States entry into World War I, typical pumping stations consisted “… of storage tanks, oil heaters, boilers, pumps, and the necessary buildings for equipment and crew.” The steel storage tanks at these pumping stations usually had a capacity of 37,000 to 55,000 barrels (California State Council of Defense 1917: 87). USGS recorded the presence of storage tanks (3), dwellings, and other buildings at Stoil when it surveyed the area in 1926 (USGS 1926-1929).

During the 1910s, yet another industry was rapidly increasing its presence in the valley: the electric company known as San Joaquin Light & Power Company. SJL&P constructed a substation near Stoil before 1914, when it reported installing "an additional bank of 100 kva transformers" and switching equipment in the existing outdoor type Stoil substation. The company expanded rapidly between 1913 and 1918 as it established district sales offices throughout its valley service area to reach local farmers, who were generally eager to accept the new technology to power irrigation pumps. Low maintenance and low-cost power were especially important for water-hungry crops like alfalfa and for other agricultural uses like dairies (*Rice et al. 1988; San Joaquin Power & Light Magazine* March 1913: 104; *San Joaquin Power & Light Magazine* November 1914: 560–562).

Perhaps the strongest evidence for a 1911 construction date for the pumping station at Stoil is the U.S. census data. Review of the 1910, 1920, and 1930 census population schedules shows that very few people reported oil industry occupations in 1910, and these were a few "oil drillers." By 1920, the occupations reported not only included oiler, engineer, foreman, and laborer, but specifically identified Standard Oil Company as the employer. In fact, 55 construction crew laborers were listed in the 1920 census for the Alpaugh Township that included the Stoil area. By the time of the next census in April 1930, Stoil only reported a total of 10 households and all heads of household were employed by the oil pumping station (U.S. Census Bureau, Angiola and Alpaugh Districts, 1910, 1920, and 1930).

The need for onsite pumping station employees faded as pipeline and oil transportation technology changed, and by the early 1950s, the USGS survey of the area noted few remaining buildings; the pumping station buildings were likely vacant and the tanks were gone. The land surrounding Stoil remained largely undeveloped, and the area east of the railroad became the Pixley National Wildlife Refuge by the late 1960s (USGS 1953, photo revised 1969). BNSF track records show that the rails on the main line and siding at Stoil date to 1970, and the ties were replaced in 1996 (BNSF 2003). The current property information for the former Stoil site maintained by the Tulare County Assessor lists the entire area covered by the "Iowa City" plat as a single 47.5-acre parcel. The streets are labeled "road not on ground," and a portion of Avenue 68 near the railroad is shown as "abandoned" (Tulare County Assessor n.d., 313: 7).

In summary, the existing historic archival record is extensive for the Stoil site. The information reviewed to provide this summary history is cited above, and demonstrates that additional documentation is also available in the form of oil company and utility publications, county property data and recorded documents, state regulatory records (the oil company and railroad are common carriers that were subject to government oversight), and U.S. census data, not to mention other local records such a county directories and newspapers. As historian William Preston noted, the AT&SF did not invest in town development the way that the Southern Pacific had, and instead private interests started small town sites adjacent to the AT&SF line near depots and sidings. Stoil, as well as Angiola, Guernsey, Spa, Blanco, and Turnbull, all failed to survive in the long run (Preston 1981: 165–166).

6.2.2 Sanborn Map Analysis

Sanborn maps, which had been scanned, were georeferenced and placed within a GIS to allow visualization and comparison with respect to the California HST APE (EDR 2010). The historic Sanborn maps were generally available for all urban areas in the project vicinity, including Fresno, Hanford, Wasco, Shafter, Bakersfield, East Bakersfield, and Sumner (incorporated into East Bakersfield in 1910). The dates of the maps vary by location, with larger urban areas generally having earlier mapping near their historic downtowns, and smaller towns and more peripheral urban areas having later mapping. The purpose of this review was to evaluate the potential for subsurface remains related to the historic period of occupation, as opposed to an effort to identify whether properties depicted in the Sanborn maps are extant within the APE.

Table 6-3 provides a summary of the results of the Sanborn map review; the summary shows that Fresno, Wasco, Shafter, and Bakersfield at least partially intersect the APE and include buildings or structures that were once within the APE. The other towns, while in proximity to the APE, do not include mapped structures within the APE. This review did not immediately identify elements of infrastructure that would predict the existence of a subsurface historic-period deposit, such as a privy. However, as stipulated in the Section 106 PA, Section 8 [A][1], a phased identification effort may be necessary in areas that may be inaccessible or infeasible to excavate at this time if adverse effects are likely to occur. Therefore, additional efforts to identify areas of heightened sensitivity for substantial subsurface historic-period deposits may be conducted if deemed necessary as the Section 106 PA is executed and as project planning proceeds. At this time, it appears that no specific areas of sensitivity for subsurface historic archaeological deposits can be isolated, especially in the urbanized areas.

Table 6-3 also lists the general archaeological property types that may be encountered within the APE for a given location and time period, based on the structures depicted. These property types are based on those defined in the *Fresno to Bakersfield Archaeological Identification and Evaluation Plan* (AIEP) (Authority and FRA 2011a) and discussed in the *Draft Townsites: Historic Context and Archaeological Research Design* (HARD Team 2007). However, based on the review discussed above, no features of the Sanborn-mapped streetscapes indicate the presence of potential sources of historic-period deposits.

Table 6-3
Results of Sanborn Insurance Map Review

Town	Map Year	Sheet Numbers	General Location of APE Intersect	Type of Development Depicted	Potential Associated Property Types
Fresno	1885	4, 5	Fresno St to Kern St, between G and H streets (SPRR right-of-way)	Primarily railroad-related infrastructure	Transportation, Industrial
Fresno	1888	14, 16, 17	Fresno St to Ventura St, between G and H streets (SPRR right-of-way)	Railroad infrastructure, with some related light industry and commercial	Transportation, Industrial, Commercial
Fresno	1898	10, 12 through 19	Amador St to San Bernardino St, between G and H streets	Railroad infrastructure (including "Chinese" structures), commercial ("Cosmopolitan Laundry"), light industrial, and dwellings (at least 2)	Transportation, Industrial, Commercial, Domestic
Fresno	1906	18, 23 through 29, 111, 113	Roosevelt/Divisidero to S. Van Ness at S. Railroad Ave	Multiple dwellings, commercial, industrial, and rail	Transportation, Industrial, Commercial, Domestic

Table 6-3
Results of Sanborn Insurance Map Review

Town	Map Year	Sheet Numbers	General Location of APE Intersect	Type of Development Depicted	Potential Associated Property Types
Fresno	1918	57 through 65, 93, 94, 95, 100	Corner of Roosevelt and Divisidero streets to East and Church streets	Multiple dwellings, commercial, industrial, and rail	Transportation, Industrial, Commercial, Domestic
Fresno	1948	58 through 65, 93, 94, 95, 100	Corner of Roosevelt and Divisidero streets to East and Church streets	Multiple dwellings, commercial, industrial, and rail	Transportation, Industrial, Commercial, Domestic
Hanford	1885 to 1950		None		
Corcoran	1912	1, 2	NW and SW of Whitley	Lumber yard; rail	Industrial, Transportation
Corcoran	1928	1, 3	NW and SW of Whitley	Lumber yard, grain and feed, rail	Industrial, Transportation
Corcoran	1942	1, 3	NW Hanna to SW Jepson	Grain and rail	Industrial, Transportation
Wasco	1913	1	G St between 6th and 9th Ave	Rail and commercial	Transportation, Commercial
Wasco	1926	1, 7	12th on South to Paso Robles on north	Commercial and industrial	Transportation, Commercial, Industrial
Wasco	1941	1, 7	13th on South to Paso Robles on north	Commercial and industrial	Commercial, Industrial
Shafter	1926	1	California Ave to State Ave, between Walker St and the AT&SF tracks	Light industrial	Industrial
Shafter	1940	2, 3	Shafter Ave to Lerdo Hwy between Walker St and the AT&SF tracks	Light industrial	Industrial
Bakersfield	1888	3	15th St and Chester	1 Dwelling	Domestic
Bakersfield	1889	3	15th S and Chester	1 Dwelling	Domestic
Bakersfield	1890	3, 4	G St to N St, between 16th and 12th streets	Multiple dwellings	Domestic
Bakersfield	1892	3, 7, 6, 9	A St to L St, between 16th and 12th streets	Multiple dwellings, commercial, and industrial sites	Domestic, Commercial, Industrial
Bakersfield	1899	2, 8, 9, 10, 11	A Street to O Street, between 16th and 12th streets	Multiple dwellings, rail, commercial, and industrial sites	Domestic, Commercial, Industrial, Transportation

Table 6-3
Results of Sanborn Insurance Map Review

Town	Map Year	Sheet Numbers	General Location of APE Intersect	Type of Development Depicted	Potential Associated Property Types
Bakersfield	1905	17 through 23, 28	A St to O St, between 16th and 12th streets	Multiple dwellings, rail, commercial, and industrial sites	Domestic, Commercial, Industrial, Transportation
Bakersfield	1912	29 through 39, 66 through 69	A St to O St, between 16th and 12th streets	Multiple dwellings, rail, commercial, and industrial sites	Domestic, Commercial, Industrial, Transportation
Bakersfield	1949	29 through 39, 66 through 69	A St to O St, between 16th and 12th streets	Multiple dwellings, rail, commercial, and industrial sites	Domestic, Commercial, Industrial, Transportation
East Bakersfield	1890	—	None	—	—
Sumner	1888	—	None	—	—
Sumner	1889	—	None	—	—

Acronyms and Abbreviations:
APE = Area of Potential Effect
Ave = Avenue
NW = northwest
SPRR = Southern Pacific Railroad
St = Street
SW = southwest

6.3 Field Inventory

An intensive pedestrian survey to inventory archaeological resources within the APE was conducted between February 15 and April 8, 2010. A subsequent survey was conducted in August 2010 to address changes to the APE. Appendix E provides inventory data for surveyed project alternatives that are no longer included in the current project footprint (the APE).

For the current project design, this APE constitutes a total of 7,891 acres. Permission to enter (PTE) was obtained for approximately 49%, or 3,855 acres, of this area. In addition to restrictions on entry, portions of the APE could not be surveyed because of crop cover, vegetation, or urbanization. As a result, 65%, or 2,521 acres, of the PTE area were surveyed. In terms of the total footprint APE, as currently configured, this acreage represents 32% of the total area. The remaining acreage was not surveyed for several reasons: (1) PTE received from landowners was conditional and could not be obtained at the time of survey; (2) There was no way to ingress specific parcels (e.g., the only access to a parcel was across property for which PTE had not been obtained); or (3) Ground visibility was completely obscured and parcels were completely paved, otherwise developed, or currently under cultivation with a dense non-row crop.

Table 6-4 indicates the amount of the area surveyed where access was granted (i.e., PTE) against the total area that represents the APE. The table also shows the total amount of area accessible as a percentage of the total APE. Figure 6-2 also conveys the surveyed area by alignment alternative and in terms of parcel accessibility.

Table 6-4
Summary of Survey Effort by Alignment Alternative

Alignment Alternative	Acreage in APE (Footprint)	Acreage with PTE		Acreage Surveyed		
		Total	Percentage of APE	Total	Percentage of Land with PTE*	Percentage of Total APE
BNSF Alternative	6,024	2,424	40%	1,574	65%	26%
Corcoran Elevated	63	12	18%	9	78%	14%
Corcoran Bypass	960	254	26%	66	26%	7%
Allensworth Bypass	513	137	27%	162	118%	32%
Wasco-Shafter Bypass	1,590	1,005	63%	709	71%	45%
Bakersfield South	390	24	6%	1	4%	0%
Totals	7,891	3,855	49%	2,521*	65%	32%*

Acronyms and Abbreviations:
APE = area of potential effects
PTE = permission to enter

*Including 386 acres exclusively within the BNSF right-of-way, requiring separate PTE, total equals 2,907 acres surveyed, or 37% of the total APE.

*Includes land that was surveyed when initial denial of access was granted.

Note: Where the alternative alignments diverge and converge with the BNSF Alternative, the survey acreage contained within the construction footprint is reported for both alternatives. The calculations presented above are not affected by this overlap area since these areas are counted toward both the alternative and the BNSF alignments.

Acronyms and Abbreviations:
APE = area of potential effects
PTE = permission to enter

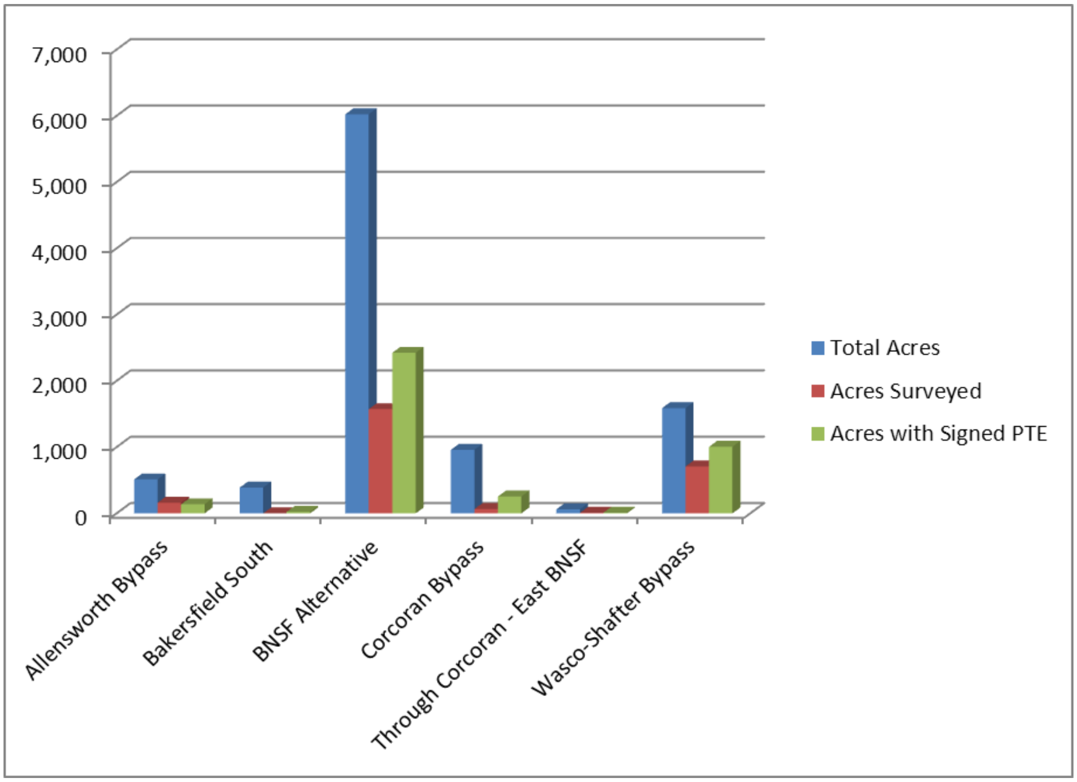

Figure 6-2
Area surveyed by alternative alignment

6.3.1 Field Survey Results

In addition to the three sites previously identified in the APE, a total of seven archaeological sites were identified during the pedestrian survey of the APE: five are prehistoric and two are historic era. Of these, [redacted]. The additional BNSF Railway right-of-way survey did not identify any archaeological resources. As a result of the research and survey, five sites have been identified [redacted].

The two newly identified resources within the current APE are identified in Table 6-5. Descriptions of these resources are provided below the table (the associated project alignment component is identified in parentheses). The three sites previously identified as a result of the archaeological survey are also described here and have been found through field investigation to lack eligibility for the NRHP.

A large number of isolated artifacts were identified during the surveys. Although isolates are exempt from evaluation (see California HST Section 106 PA, Attachment D, Archaeological Properties Exempt from Evaluation [Authority and FRA 2011d]), the location and nature of the isolates encountered during the pedestrian survey may indeed be noteworthy with regard to the known prehistorical occupation sequence in the Central Valley. While the isolates' original context has likely changed, the overall distribution of them at a landscape level may inform settlement patterns of the Central Valley and the South San Joaquin Valley in particular. As such, their presence and relevance are discussed below (see Figure 6-3). Figure C-1 in Appendix C, Figures and DPR Forms of Identified Archaeological Resources, depicts the location of the identified resources [redacted]).

REDACTED FROM THIS VERSION

Figure 6-3
Newly recorded isolated artifacts, HST Fresno to Bakersfield

Table 6-5
Newly Recorded Archaeological Resources within the APE

Newly Recorded Resource Field Recording Number	Component	Associated Project Alignment
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
Acronym: HST = high-speed train		

6.3.2 Site Descriptions and Evaluations

The following section describes both the previously identified and newly identified archaeological resources that are currently within the APE. Each description provides the NRHP eligibility recommendations for each site.

<u>Previously Identified Archaeological Resources</u>

CA-TUL-2950H/P-54-004737 ([redacted])

As discussed in Section 6.2.1, CA-TUL-2950H/P-54-004737 is the former location [redacted] (Orfila 2010).

This site consists of a sparse, widely dispersed scatter of historic-era (late nineteenth- and early twentieth-century) domestic debris [redacted]

During the field survey, URS re-identified CA-TUL-2950H/P-54-004737 and observed surface artifacts and features that appear to represent the remnants of a domestic occupation; the debris is characterized by concrete and brick structural elements and ceramic sewer pipe. Domestic artifacts include the following:

- Whiteware (5).
- Soda and condiment bottle glass (7).
- Broken, unmarked red bricks (13).
- Glazed redware sewer pipe fragments (15).
- Concrete fragments (11).
- Solarized glass (3).
- Milk glass fragment (1).
- Metal chair frame (1).
- Butchered bone (3).
- Clamshell (1).

Smaller artifacts are concentrated [redacted]. Portions of a remnant concrete road or driveway are visible on the surface of the site. The road is lined with mature palm trees. Aside from the concrete-paved road or driveway, no intact features were identified, and none of the observed artifacts appear to be associated with distinct features.

The area has been modified to create a retention basin and conveyance channels. Ground surface visibility was poor because of dense vegetation, siltation, and erosion throughout the detention pond. Documentary evidence suggests that Stoil was sporadically used and occupied, and failed to survive in the face of economic and industrial developments in the first half of the twentieth century. A review of satellite aerial imagery depicts grading disturbance throughout the site, which is further evidenced by the observation of artifacts dating to Stoil's occupation period in the sidewalls of the retention basin levees.

As discussed in Section 6.2.1, the abundance of written information that exists for this type of settlement and its overall lack of uniqueness suggests that Stoil, as a repository of information on early oil distribution in California, would not warrant further interpretation through archaeological investigation. As mentioned above, the site was identified by Orfila (2010), who concluded that the area that represented [redacted] did not possess sufficient data potential to qualify as a historic resource under CEQA. The County of Tulare prepared a Mitigated Negative Declaration that used this conclusion to support a less-than-significant impact finding associated with a proposed solar-power project. All in all, the extensive modification by the Alpaugh Irrigation District and the location's current usage as a water retention basin has compromised any integrity of the ephemerally occupied CA-TUL-2950H/P-54-004737, and therefore it does not appear eligible for listing on the NRHP.

CA-KER-3072

As discussed above, CA-KER-3072 was identified as a "very sparse lithic scatter" within the [redacted] (Everson 1991). The elements of the deposit consisted of a "few" lithic flakes—assumed to be three—over an approximately 2,500-square-meter area. This parcel was not surveyed for the purposes of the present project because access was not granted. However, because only three flakes were recorded within a 2,500-square-meter area, this recorded site is exempted under the conditions outlined in the California HST Draft PA Attachment D, Properties Exempt from Evaluation. In addition, the original recording of the site observed that the site had been extensively plowed and disked and that the artifacts were likely not in their original depositional context (Everson 1991). Therefore, this site is not considered a historic property under NHPA and requires no further treatment.

CA-KER-2507

This site was known anecdotally to have existed [redacted] and, as stated in the site record (Ptomey and Wear 1989) and in Latta's (1949) definitive ethnography of the Yokuts, the site was destroyed by the construction of the railroad. As discussed in Chapter 3.17, Cultural and Paleontological Resources, Section 3.17.3, Methods for Evaluating Effects/Impacts, of the EIR/EIS, the site was originally identified in historical accounts as a "small group of shelters" located on a "sandy hill." This hill was leveled for the construction of the Santa Fe Railroad in the 1890s, thus destroying all evidence of the site and its association with the village of *Woilu* (Latta 1949:46-47). Access was restricted to the area where the site was identified in the site record and reported by the SSJVIC. The site is currently [redacted] and consequently was not surveyed for this project. [redacted] The entire testing program did not identify any archaeological deposits to depths of 5 feet.

Consequently, given the both the previously reported destruction of the site and the results of the subsequent subsurface testing, this site is considered to no longer exist and therefore is not considered a historic property. While documentary evidence suggests that the site existed on a hill that was completely leveled and destroyed, the area is located on the actively accreting fan of the Kern River and is considered to have high geoarchaeological sensitivity (see Section 5.2 and Figure 5-4). As such, construction in this area has the potential to disturb previously unrecorded subsurface archaeological deposits. Pre-construction subsurface testing and a monitoring mitigation measure are provided in the EIR/EIS at this location.

Newly Recorded Archaeological Sites

HST-A-TUL-1 [redacted])

This site consists of a sparse lithic scatter composed primarily of chert with a small percentage of obsidian. The site was initially recorded during reconnaissance surveys as two separate lithic scatters—HST-A-TUL-1 and HST-A-TUL-2— separated by an agricultural field. Subsequent testing within the field revealed that the deposits are connected and form part of a larger lithic scatter. In total, eight pieces of debitage were located at the original locus of HST-A-TUL-1, with six of these being of chert and two of obsidian. Flakes were dominantly tertiary or thinning flakes, with one larger secondary chert flake and one piece of chert shatter. In addition to the flakes, one tool (Artifact-1) was located. Artifact-1 is a stem-point type with an elongated basal tang composed of a banded chert (Monterey) with a hinge fracture at the midsection of the artifact. The site was observed along a dirt agricultural access road that parallels the BNSF railroad tracks, over a length of approximately 75 meters (246 feet) by the width of the road (approximately 10 meters (33 feet). The field adjacent to the west was planted in wheat and the visibility was poor, leaving the possibility that the site may extend into the agricultural field.

The original recorded site location of HST-A-TUL-1 was near another lithic deposit, recorded during reconnaissance surveys as HST-A-TUL-2, in another dirt road on the western side of the same field (approximately 150 meters [492 feet] west). This resource consisted of a sparse lithic scatter composed entirely of chert debitage. In total, 12 tertiary and bifacial thinning flakes were found in an area of approximately 500 square meters (5,382 square feet). Visual attributes indicate that multiple-source materials are represented. The site is distributed linearly along a dirt agricultural access road that parallels a canal over a length of approximately 75 meters (246 feet) by the width of the road (approximately 7 meters [23 feet]). Because of the poor surface visibility within the field, it was believed that the two "sites" may be components of a single site. This was confirmed through subsurface investigations.

As outlined in the Section 106 PA and the IAEP (see Section 4.2 of this document), execution of an Extended Phase I (XPI) testing program was conducted to gain more information on the extent and subsurface nature of the site. The program consisted of 12 shovel test units (STUs) excavated near the originally recorded HST-TUL-1, to depths of 60 to 80 cm and to at least two sterile levels. Cultural materials were recovered from 7 of 12 units, with no increase in artifact density or type as compared with the surface constituents (see Appendix F). Substantial ground disturbance from agricultural activities was noted in all units to depths of 40 to 60 cm.

In addition, 21 STUs were excavated at the site originally recorded as HST-TUL-2 using the same methodology as the STUs at HST-TUL-1. Cultural materials were recovered from 11 of the 21 units with similar results to HST-TUL-1. In addition to the STUs, two backhoe trenches were excavated on the site to a depth of approximately 4 meters below surface. No artifacts, cultural features, or potentially culturally sensitive paleosols were identified within the trenches. Because of the presence of flakes within the field separating the HST-TUL-2 deposits from HST-TUL-1, the two sites that were initially recorded separately during reconnaissance surveys have been combined into a single site: HST-TUL-1. An in-depth discussion of the methodology and results of the XPI program are provided in Appendix F.

HST-TUL-1 consists of a sparse lithic scatter that has been redeposited and heavily disturbed within an agricultural field and adjacent dirt roads. No diagnostic artifacts, other artifact classes, or features were identified. HST-TUL-1 does not appear eligible for listing on the NRHP because of a lack of integrity and lack of potential to yield information important in prehistory (Criterion D). Extensive long-term agricultural activity, including disking and plowing, has caused substantial ground disturbance that precludes the ability to interpret information about the site to answer questions related to the site's earlier occupation.

HST-A-TUL-3 [redacted]

This resource consists of a sparse lithic scatter composed primarily of chert and obsidian debitage. In total, 63 chert flakes (primarily thinning, tertiary, and pressure flakes), 29 obsidian flakes (also primarily small late-stage), 3 vitrified basalt flakes, 1 chert projectile point tip, 3 chert biface fragments, 3 obsidian biface fragments, 1 Olivella "wall" bead, and 1 stone (heat-treated chalcedony) bead, were identified over an area of approximately 10,000 square meters (107,639 square feet). Given the predominance of small late-stage chert and obsidian flakes, the site appears to have been the focus of lithic tool production, particularly biface manufacture/reduction. The absence of primary flakes and the minimal presence of cores and secondary flakes indicate that raw-material procurement and initial reduction occurred elsewhere prior to transport to this site.

The cultural constituents of HST-A-TUL-3 were found almost exclusively within numerous dirt agricultural access roads along the eastern and southern edges of a planted wheat field, and between two smaller fallow parcels south of the wheat field. Although ground surface visibility was generally poor within the wheat field, large portions of the field adjacent to the roads had good ground visibility (80% or better) with no evidence of cultural deposits. Siltation within the field from multiple periods of irrigation and evaporation may partially explain the lack of visible artifacts in bare portions of the field. Also, artifacts may have been displaced within the road from a more central location, as a result of transport by vehicle tires and grading.

The only diagnostic artifacts identified are the Olivella and stone bead, although temporal associations of these artifacts within the [redacted] are not well established. In addition to the cultural constituents, three non-human fossilized bone fragments (flange, cranial, and long bone) were identified on the surface of the site.

As outlined in the Section 106 PA and the IAEP (see Section 4.2 of this document), execution of an XPI testing program consisted of three STUs excavated within the APE at HST-A-TUL-3 to depths of 50 to 80 cm and to two sterile levels (see Appendix F). A single flake was recovered from one unit; substantial ground disturbance was noted in all units to depths of 50 cm. In addition to the STUs, three backhoe trenches were excavated across the site to depths of approximately 4 meters. No artifacts, cultural features, or potentially culturally sensitive paleosols were identified within the trenches. An in-depth discussion of the methodology and results of the XPI program are provided in Appendix F.

HST-TUL-1 consists of a sparse artifact scatter that has been redeposited and heavily disturbed within dirt roads adjacent to agricultural fields. HST-A-TUL-3 does not appear eligible for listing on the NRHP because of a lack of integrity. Extensive long-term agricultural activity, including disking and plowing, has caused substantial ground disturbance that precludes the ability to interpret information about the site to answer questions related to the site's earlier occupation.

6.3.3 Summary

Francis Riddell, one of the premier contributor's to southern San Joaquin Valley archaeology with over 60 years of published works, concludes in a recent review of the *Status of San Joaquin Valley Archaeology* (Riddell 2002:56):

> Agriculture in the San Joaquin Valley has been the leading factor in the destruction of archaeological sites. One large landowner, several decades ago, had a crew engaged in land leveling operations around the clock for at least five years. An uncounted number of major sites were destroyed, with their loss noted only by a private collector who kept a schedule of the approach of the heavy equipment toward a doomed site. This is not an isolated report but constitutes a portion of a dominant pattern for the loss to farming of archaeological sites in the San Joaquin Valley.

Riddell's synopsis is supported by the subsurface examination of the archaeological deposits identified within the APE for the Fresno to Bakersfield Section of the High-Speed Train Project, though a slight modification is necessary. In general, it appears that archaeological sites have not been "lost" to farming—indeed, it is very hard to make artifacts disappear, unless they are picked up by collectors—but their integrity and context have been so compromised as to make them virtually useless to advancing the understanding of prehistoric lifeways and the cultural chronology in the San Joaquin Valley. The few sites recorded and investigated during this project consistently revealed that prehistoric cultural materials (dominated by lithic flakes) exist primarily in surface contexts—often in dirt roads and at the edges of agricultural fields—with sparse concentrations mixed into agricultural fields to the depth of disking and other mechanical activities. Subsurface testing indicates that no subsurface features or intact cultural strata are present at these "sites." Indeed, it appears questionable whether the cultural materials observed are even remotely associated with their original geographic context. One hundred and fifty years of intensive grading, plowing, and earthmoving in the San Joaquin Valley have dramatically altered the landscape and displaced natural sediments and the cultural materials that are carried in that matrix, from their original depositional context. This effect has only been heightened in the last 50 years, with the introduction of increasingly more-precise grading technologies, and responses to the dramatic subsidence of the valley, which requires continual maintenance and response to changing grades (Galloway and Riley 1999).

With regards to historic-era archaeology, only one such site was identified within the APE, and suffered a similar fate described by Riddell (2002) and observed at the prehistoric sites. This site, [redacted] was dramatically altered when it was graded and incorporated into [redacted] The site was previously recorded and recommended ineligible to the California Register of Historical Resources (Orfila 2010) and impacts to the site were approved by the CEQA lead agency without additional mitigation. A summary of NRHP-eligibility findings for all of the sites within the APE is provided in Table 2-1.

Riddell does identify one potential for the preservation of valuable prehistoric archaeological data in the San Joaquin Valley (Riddell 2002:56):

> In recent discussions with colleagues some optimism has crept in regarding the status and future of archaeological research in the San Joaquin Valley. It has been pointed out that the valley [historically, prior to the impounding of waterways] receives an accretion of from one to 1.5 m of alluvium each millennium. Under these circumstances it is reasonable to expect numerous archaeological sites to be buried sufficiently to avoid being leveled through agricultural activities. Preparing a model for the discovery of these sites through new and improved technological means seems feasible and productive ... We must, therefore, be alert to the probability that important archaeological sites lie buried at depth only to be revealed in

the process of deep excavation for construction, or by careful planned and executed test excavations by professional archaeologists.

This potential is currently being addressed by a forthcoming geoarchaeological investigation and report (Authority and FRA 2011c). Given the increased significance of undisturbed buried archaeological resources, future Memoranda of Agreement will likely have to address this potential through construction monitoring in areas and at depths determined to have a likelihood for buried prehistoric archaeological resources.

Chapter 7.0
References

7.0 References

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Section 8.0
Preparer Qualifications

8.0 Preparer Qualifications

The survey efforts were supervised by archaeologists who meet the professional qualification standards in Archaeology and Historic Preservation, Secretary of Interior's Standards and Guideline (Federal Register, Volume 48, No. 190, September 29, 1983).

The Federal Railroad Administration (FRA) managed the implementation of the survey plan, while specific functions may be carried out by qualified consultants. It is anticipated that consultants will perform the field studies described in the survey plan, as well as laboratory activities and reporting as specified in this plan. All decisions on level of effort or discretionary actions described in the survey plan will be approved by FRA prior to their implementation.

The following staff performed fieldwork or contributed to the ASR for the Fresno to Bakersfield Section.

- Brian Hatoff holds a master's degree in anthropology and is a Registered Professional Archaeologist (RPA). He has over 30 years of experience in the management of cultural resources with specialized expertise in the prehistoric archaeology and ecology of California and the Great Basin. During his tenure with the U.S. Bureau of Land Management he held primary responsibility for the management of cultural resources on 5.5 million acres of public lands in western Nevada and eastern California. Mr. Hatoff will serve as the principal archaeologist for this project.

- Dean Martorana, RPA, holds a master's degree in anthropology from California State University, Long Beach. He served as the lead archaeologist on the project. Mr. Martorana has 10 years of experience in both historic and prehistoric archaeology, including 6 years of experience in cultural resources management in northern California. Mr. Martorana specializes in GIS and geophysical techniques applied to archaeology.

- Vance G. Benté, RPA, provided peer review of the ASR. Mr. Benté holds a master's degree in anthropology from California State University, Northridge, and has over 30 years of professional experience in archaeology and cultural resources management in California.

- Benjamin J. Elliott, RPA, holds a master's degree in cultural resource management from Sonoma State University. He has 8 years of experience in historic and prehistoric archaeology and cultural resource management, participating in and directing projects in California and Utah for private consulting firms, the United States Forest Service, and research-based institutions.

- Jay Rehor, RPA, holds a B.A. in Anthropology from the University of California, Santa Cruz, and a master's degree in Cultural Resources Management from Sonoma State University. He has 10 years of experience in California archaeology, with 8 years of experience in cultural resources management. Mr. Rehor specializes in geoarchaeological studies and landscape evolution as it relates to archaeology.

- Maureen Kick, RPA, holds a B.A. in anthropology from Bryn Mawr College, Pennsylvania, and a master's degree in anthropology from the City University of New York, Hunter College. She has 10 years of experience in North American archaeology, both historic and prehistoric, including 7 years in cultural resources management and 3 years of experience in California. Ms. Kick specializes in historical archaeology.

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Appendix A
Area of Potential Effects Mapping

[Appendix A, Archaeological Area of Potential Effects Mapping, is uploaded as a separate document]

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Appendix B
Records Search Results
REDACTED

Appendix C

Figures and DPR Forms of Identified Archaeological Resources

REDACTED

Appendix D
Native American Communication

Appendix E

Survey Results of Alternatives No Longer Considered

E1 Survey Results of Alternatives No Longer Considered

As a result of modifications in project design, and the removal of previously considered project alternatives, some lands were surveyed that are no longer part of the project footprint and APE as currently configured. As such, three archaeological resources were identified and recorded that are no longer within the project APE. The descriptions of these resources and associated Department of Parks and Recreation 523 forms are provided in Appendix C for reference.

HST-A-KIN-1 [redacted]

[redacted]

[redacted]

[redacted] A series of shovel test units and geoarchaeological trenches excavated within the currently proposed alignment in the vicinity of the recorded site boundary, indicated that no site constituents are present (either surface or subsurface) within the currently proposed alignment. As such, the site will not be affected by the proposed project as currently designed.

HST-A-KIN-2 [redacted]

[redacted]

[redacted] Additional testing within the field will be necessary to better constrain the site boundary. No diagnostic artifacts were identified.

HST-A-TUL-4 [redacted]

[redacted]

HST-A-TUL-5H [redacted]

[redacted] As such, the site lacks specific associations with an identifiable individual or group and is no longer in its original setting. These conditions would preclude the site from further consideration based on the California High-Speed Rail Section 106 PA (Authority and FRA 2011d).

Appendix F

Archaeological Resources Extended Phase I Report

REDACTED