3.8 Hydrology and Water Resources

This section identifies the physical setting of the Bakersfield to Palmdale Project Section and the existing water quality; specifies the regulatory framework with respect to water quality; assesses potential impacts on surface water hydrology, water quality, floodplains, and groundwater associated with implementation of the California High-Speed Rail (HSR) Project; and identifies mitigation measures for potential hydrology and water resource impacts.

This section includes analysis for the following components associated with the B- P Section:

- Bakersfield to Palmdale Build Alternatives 1, 2, 3, and 5 (B-P Build Alternatives)
- The César E. Chávez National Monument Design Option (CCNM Design Option)
- The Refined César E. Chávez National Monument Design Option (Refined CCNM Design Option)
- The portion of the Fresno to Bakersfield Locally Generated Alternative (F-B LGA) from the intersection of 34th Street and L Street to Oswell Street[1]
- The Light Maintenance Facility/Maintenance-of-Way Facility/Maintenance-of-Infrastructure Siding Facility (LMF/MOWF/MOIS Facilities) in the B-P Section

Surface Water Features

Surface water features are important indicators of the environmental health of the study area and provide important habitats for wildlife. Water resources are also important relative to both domestic water supplies and recreational activities. Groundwater aquifers must be protected because of the relationship of aquifers to domestic and agricultural water supplies.

Floodplains

Floodplains are important environmental resources that, if unmanaged, can cause major damage. Therefore, it is important to evaluate whether the project would limit the current natural conveyance of floodwaters or modify the water surface elevation. The purpose of this section is to evaluate whether the proposed project would be built in or modify the existing 100-year floodplain in accordance with applicable regulations. Any addition to impervious surfaces would require the use of detention systems so that excess storm runoff associated with an increased basin imperviousness would not exceed current runoff amounts.

Summary of Results

The hydrology and water resources analysis considers the potential for construction and operation of the Bakersfield to Palmdale Project Section to result in impacts on floodplains, hydraulics, surface waters, and groundwater in the project vicinity. However, all four B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would be required to comply with applicable permits and the state and Regional Water Quality Control Board (RWQCB) requirements to reduce potential construction and operations impacts resulting from changes to drainage, impervious surfaces, stormwater runoff, and water quality, as specified in the impact avoidance and minimization features (IAMF) outlined in Section 3.8.6, and mitigation measures outlined in Section 3.8.7. Therefore, with implementation of the IAMFs and mitigation measures, impacts on hydrology and water resources associated with the B-P Build Alternatives would be less than significant pursuant to the California Environmental Quality Act (CEQA) under any of the four B-P Build Alternatives (including both the CCNM Design Option and the Refined CCNM Design Option), including the Preferred Alternative (Alternative 2 with the Refined CCNM Design Option). While the B-P Build Alternatives would result in impacts on hydrology and water resources (e.g., increased runoff from increased impervious surfaces and pollutants of concern reaching receiving waters during construction and operation), the effects of

[1] The portion of the Fresno to Bakersfield Locally Generated Alternative (F-B LGA) alignment from the intersection of 34th Street and L Street to Oswell Street is analyzed and considered as part of the HSR Bakersfield to Palmdale Project Section under all of the Build Alternatives. The *Fresno to Bakersfield Section Final Supplemental Environmental Impact Report* (Authority 2018b) approved the F-B LGA alignment from the City of Shafter through the Bakersfield F Street Station; however, the portion of the F-B LGA alignment from the intersection of 34th Street and L Street to Oswell Street has not been approved. As such, the approval of this portion of the alignment may occur through approval of the Bakersfield to Palmdale Project Section.

the current built environment on hydrology and water resources would continue, including effects from continued operation of existing roadways and increased population on groundwater withdrawals.

3.8.1 Introduction

The information in this section is based on the *Hydrology and Water Resources Technical Report* (California High-Speed Rail Authority [Authority] 2018a). For information on how to access and review technical reports, please refer to the Authority's website at www.hsr.ca.gov.

Additional sections of this EIR/EIS that address topics related to hydrology and water resources include:

- Section 3.6, Public Utilities and Energy, which discusses water resources and supply related to the B-P Build Alternatives
- Section 3.7, Biological and Aquatic Resources, which discusses wetlands and surface waters in the project vicinity
- Section 3.9, Geology, Soils, Seismicity, and Paleontological Resources, which addresses erosion and soils in the project vicinity, risk to landslides or rock falls, and inundation due to failure of a levee or dam or mudflow
- Section 3.10, Hazardous Materials and Wastes, which discusses ground disturbance (including disturbance of groundwater and surface waters) near sites where contamination is known to exist or could exist in the resource study area (RSA)

3.8.2 Laws, Regulations, and Orders

The following sections summarize key laws and regulations for hydrology and water resources relevant to the B-P Build Alternatives.

3.8.2.1 Federal

FRA Procedures for Considering Environmental Impacts (64 Fed. Reg. 28545)

These FRA procedures state that an EIS should consider possible impacts on water quality and flood hazards and floodplains.

Clean Water Act (33 U.S. Code § 1251 et seq.)

The Clean Water Act (CWA) is the primary federal law protecting the quality of the waters of the U.S., which include lakes, rivers, and wetlands. The CWA prohibits any discharge of pollutants into the nation's waters unless specifically authorized by a permit. The potentially applicable sections of the CWA are further discussed below.

- Section 102 requires the planning agency of each state to prepare a basin plan to set forth regulatory requirements for protection of surface water quality, which include designated beneficial uses for surface waterbodies as well as specified water quality objectives to protect those uses. Analysis of the degree to which discharges of runoff from the project may or may not adversely affect project receiving water beneficial uses and attainment by the receiving water of assigned water quality objectives indicates the degree to which the project may affect water quality of existing surface waters.
- Section 303(d) requires each state to provide a list of impaired surface waters that do not meet or are expected not to meet state water quality standards as defined by that section. It also requires each state to develop total maximum daily loads (TMDL) of pollutants for impaired waterbodies. The TMDL must account for the pollution sources causing the water to be listed.
- Under Section 401, applicants for a federal license or permit to conduct activities that may result in the discharge of a dredged or fill material into waters of the U.S. must obtain certification that the discharge of fill will not violate water quality standards, including water quality objectives and beneficial uses. The certification is issued by the state in which the

discharge would originate or from the interstate water pollution control agency with jurisdiction over affected waters. In California, the RWQCB and the State Water Resources Control Board (SWRCB) issue Section 401 certifications.

- Under Section 402, all point-source discharges, including, but not limited to, construction-related runoff discharges to surface waters and some post-development discharges, are regulated through the National Pollutant Discharge Elimination System (NPDES) program. Project sponsors must obtain an NPDES permit from the SWRCB.
- Under Section 404, the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency regulate the discharge of dredged and fill materials into the waters of the U.S. Project sponsors must obtain a permit from USACE for discharges of dredged or fill materials into proposed jurisdictional waters over which USACE exerts jurisdiction.

Rivers and Harbors Act of 1899 (33 U.S. Code § 401 et seq.)/General Bridge Act of 1946 (33 U.S. Code § 525 et seq.)

The Rivers and Harbors Act is a primary federal law regulating activities that may affect navigation on the nation's waterways, including:

- Section 9 of the Rivers and Harbors Act and Section 9 of the General Bridge Act require a U.S. Coast Guard permit for the construction of bridges and causeways over certain navigable waters of the U.S. to ensure marine traffic is not adversely affected. Section 9 bridge permits are only required for waters that are currently or potentially navigable for commerce; general recreational boating is typically not sufficient to establish jurisdiction. Navigable waters are defined as those waterbodies subject to the ebb and flow of the tide or that are utilized currently, potentially, or historically in their natural condition or by reasonable improvements, as means to transport interstate or foreign commerce.
- Section 10 of the Rivers and Harbors Act requires authorization from USACE for the construction of any structure in or over any navigable waters of the U.S.
- Section 14 of the Rivers and Harbors Act requires USACE permission for the use, including modifications or alterations, of any flood control facility work built by the U.S. to ensure that the usefulness of the federal facility is not impaired. The permission for occupation or use is to be granted by an appropriate real estate instrument in accordance with existing real estate regulations. USACE permission is granted through the issuance of a Section 408 permit.

Floodplain Management (U.S. Presidential Executive Order 11988) and U.S. Department of Transportation Order 5650.2 (Floodplain Management and Protection)

U.S. Presidential Executive Order (USEO) 11988 requires that federal agency construction, permitting, or funding of a project must avoid incompatible floodplain development, be consistent with the standards and criteria of the National Flood Insurance Program, and restore and preserve natural and beneficial floodplain values. U.S. DOT Order 5650.2 contains policies and procedures for the transportation agencies to implement USEO 11988 on transportation projects.

Protection of Wetlands (U.S. Presidential Executive Order 11990)

USEO 11990 aims to avoid direct or indirect impacts on wetlands from federal or federally approved projects when a practicable alternative is available. If wetland impacts cannot be avoided, all practicable measures to minimize harm must be included.

National Flood Insurance Act (42 U.S. Code § 4001 et seq.) and Flood Disaster Protection Act (42 U.S. Code §§ 4001 to 4128)

The purpose of the National Flood Insurance Act is to identify flood-prone areas and provide insurance. The act requires purchase of insurance for buildings in special flood hazard areas. The act is applicable to any federally assisted acquisition or construction projects in an area identified as having special flood hazards. Projects should avoid construction in, or develop a design to be consistent with Federal Emergency Management Agency (FEMA) identified flood hazard areas.

The Flood Disaster Protection Act requires the purchase of insurance for buildings in special flood hazard areas identified and mapped by FEMA.

Safe Drinking Water Act of 1974 (42 U.S. Code § 300 et seq.)

The Safe Drinking Water Act was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The Act authorizes the U.S. Environmental Protection Agency to set national health-based standards for drinking water to protect against both naturally occurring and human-produced contaminants that may be found in drinking water. The Act applies to every public water system in the U.S.

The Sole Source Aquifer Protection Program is authorized by Section 1424(e) of the Act. The Sole Source Aquifer designation is a tool to protect drinking water supplies in areas where there are few or no alternative sources to the groundwater resource and where, if contamination occurred, using an alternative source would be extremely expensive. All proposed projects receiving federal funds are subject to U.S. Environmental Protection Agency review to ensure that they do not endanger the water source.

3.8.2.2 State

Porter-Cologne Water Quality Control Act (California Water Code § 13000 et seq.)

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) requires the regulation of all pollutant discharges, including wastes in project runoff that could affect the quality of the state's water. Any entity proposing to discharge a waste must file a Report of Waste Discharge with the appropriate RWQCB or SWRCB. The RWQCBs are responsible for implementing CWA Sections 401, 402, and 303(d). Because the HSR project is a project of statewide importance, any Reports of Waste Discharge would be filed with the SWRCB. The act also provides for the development and periodic reviews of basin plans that designate beneficial uses of California's major rivers and groundwater basins and establish water quality objectives for those waters.

Construction Activities, National Pollutant Discharge Elimination System General Construction Permit

Under the federal CWA, discharges of stormwater from construction sites must comply with the conditions of a National Pollutant Discharge Elimination System (NPDES) permit. The SWRCB is the permitting authority in California and has adopted the statewide General Permit for Stormwater Discharges Associated with Construction Activity that applies to projects resulting in one or more acres of soil disturbance. For projects disturbing more than 1 acre of soil, a construction Stormwater Pollution Prevention Plan (SWPPP) is required that specifies site management activities to be implemented during site development. These management activities include construction stormwater best management practices (BMP), erosion and sedimentation controls, dewatering (nuisance water removal), runoff controls, and construction equipment maintenance.

The SWRCB requires a Notice of Intent to be filed before any stormwater discharge from construction activities and requires that the SWPPP be implemented and maintained on-site. On July 1, 2010, the General Permit for Stormwater Discharges Associated with Construction Activities (SWRCB Water Quality Order No. 2009-0009-DWQ, NPDES No. CAS000002) superseded the previous statewide Construction General Permit. This permit was later revised by Order No. 2010-0014-DWQ and Order No. 2012-006-DWQ. The new statewide permit implements a risk-based permitting approach, specifies minimum BMP requirements, and requires stormwater monitoring and reporting.

According to the Construction General Permit, discharges that are not tributary or hydrologically connected to waters of the U.S. are not subject to regulation under the Construction General Permit. As discussed in Section 3.7, Biological and Aquatic Resources, the receiving waterbodies in the aquatic resource study area are all hydrologically isolated from waters of the U.S. per the USACE letter dated December 11, 2017, and approved jurisdictional determination from USACE. Therefore, it is anticipated that the Bakersfield to Palmdale Project Section of the California HSR System would not be subject to the requirements of the Construction General Permit. Although it is not anticipated that the Bakersfield to Palmdale Project Section would be required to obtain coverage under the Construction General Permit, the Authority has committed to implementing a SWPPP and Construction BMPs on all HSR project sections during construction. Ongoing coordination between the Authority and the SWRCB related to this topic will continue to occur throughout the environmental review process.

National Pollutant Discharge Elimination System General Industrial Permit

Another required permit is the statewide General Permit for Discharges of Stormwater Associated with Industrial Activities (SWRCB Water Quality Order No. 2014-0057-DWQ, NPDES No. CAS000001). Qualifying industrial sites are required to prepare SWPPPs describing BMPs that will be employed to protect water quality. Industrial facilities are required to use best conventional pollutant control technology for control of conventional pollutants and best available technology economically achievable for toxic and nonconventional pollutants. Monitoring runoff leaving the site is also required. For transportation facilities, this permit applies only to vehicle maintenance shops and equipment-cleaning operations. The permit established number action levels that reflect California Environmental Protection Agency benchmarks. For the Bakersfield to Palmdale Project Section, the LMF and the MOWF would be subject to the requirements of the Industrial NPDES permit as transportation facilities that conduct vehicle maintenance.

California Department of Transportation National Pollutant Discharge Elimination System Statewide Stormwater Permit

The California Department of Transportation (Caltrans) operates under a permit (Order No. 2012-0011-DWQ, NPDES No. CAS000003) that regulates stormwater discharge from Caltrans properties, facilities, and activities and requires that the Caltrans construction program comply with the adopted General Permit for Stormwater Discharges Associated with Construction Activities (described above). The permit requires Caltrans to implement a year-round program in all parts of the state to effectively control stormwater and nonstormwater discharges (SWRCB 2012). The Caltrans permit is applicable to portions of the HSR project that involve modifications to state highways.

Cobey-Alquist Flood Plain Management Act (California Water Code, § 8400 et seq.)

The Cobey-Alquist Flood Plain Management Act encourages local governments to adopt and enforce land use regulations to accomplish floodplain management. It also provides state assistance and guidance for flood control.

Central Valley Flood Protection Act of 2008 (California Water Code, § 9600)

The Central Valley Flood Protection Act of 2008 establishes the 200-year flood event as the minimum level of flood protection for urban and urbanizing areas. As part of the state's FloodSafe program, those urban and urbanizing areas protected by flood control project levees must receive protection from the 200-year flood event level by 2025. The California Department of Water Resources (DWR) and the Central Valley Flood Protection Board (CVFPB) collaborated with local governments and planning agencies to prepare the Central Valley Flood Protection Plan, which was adopted on June 29, 2012. The objective of the Central Valley Flood Protection Plan is to create a system-wide approach to flood management and protection improvements for the Central Valley and San Joaquin Valley.

Central Valley Flood Protection Board Regulations (California Code of Regulations, Title 23, Division 1, Tier 1b Updates, and Division 1.5)/California Water Code, § 8710 et seq.)

The CVFPB exercises regulatory authority within its jurisdiction to maintain the integrity of the existing flood control system and designated floodways by issuing permits for encroachments. The CVFPB has mapped designated floodways along more than 60 streams and rivers in the Central Valley. In addition, Table 8.1 of the California Code of Regulations, Title 23, Section 112, contains several hundred stream reaches and waterways that are regulated streams. Projects that encroach within a designated floodway or regulated steam, or within 10 feet of the tow of a state-federal flood control structure (levee), require an encroachment permit and the submission of an associated application, including an environmental assessment questionnaire. A project must demonstrate that it will not reduce the channel flow capacity at that it will comply with channel and levee safety requirements.

In cooperation with USACE, CVFPB enforces standards for the construction, maintenance, and protection of adopted flood control plans that will protect public lands from floods. The jurisdiction of CVFPB includes the Central Valley, including all tributaries and distributaries of the Sacramento River, the San Joaquin River, and designated floodways (23 California Code of Regulations § 2). CVFPB has all the responsibilities and authorities necessary to oversee future modifications as approved by USACE pursuant to assurance agreements with USACE and the USACE Operation and Maintenance Manuals under 33 Code of Federal Regulations Part 208.10 and 33 U.S. Code § 408.

Streambed Alteration Agreement (California Fish and Game Code §§ 1600 et seq.)

The California Fish and Game Code requires the Authority to notify the California Department of Fish and Wildlife prior to implementing any HSR project that would divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream (including intermittent streams), or lake.

Sustainable Groundwater Management Act

The Sustainable Groundwater Management Act of 2014 (SGMA) is a comprehensive three-bill package that Governor Jerry Brown signed in September 2014. SGMA provides a framework for sustainable management of groundwater supplies by local authorities, with a limited role for state intervention only if necessary to protect the resource. SGMA is intended to ensure a reliable groundwater water supply for California for years to come. SGMA requires the formation of local Groundwater Sustainability Agencies (GSA), which are required to adopt Groundwater Sustainability Plans (GSP) to manage the sustainability of groundwater basins of groundwater basins designated by the Department of Water Resources (DWR) and medium- or high-priority basins.

As discussed later in this section, the RSA crosses through several groundwater basins, including the Kern County Subbasin in the San Joaquin Valley Groundwater Basin, the Tehachapi Valley West Groundwater Basin, the Tehachapi Valley East Groundwater Basin, the Fremont Valley Groundwater Basin, and the Antelope Valley Groundwater Basin. SGMA requires the formation of local GSAs, which are required to adopt GSPs to manage the sustainability of groundwater basins. The Tehachapi Valley West Groundwater Basin, the Tehachapi Valley East Groundwater Basin, the Fremont Valley Groundwater Basin, and the Antelope Valley Groundwater Basin are identified by the Department of Water Resources as very low- or low-priority basins; therefore, development of a GSP is not required. However, the Kern County Subbasin is identified as a high-priority basin, therefore, implementation of a GSP is required. The portion of the RSA that overlaps with the Kern County Subbasin is managed by the Kern Groundwater Authority GSA and the Kern River GSA. Both the Kern Groundwater Authority GSA and the Kern River GSA are composed of various cities, water districts, and regulatory agencies. The Kern County Subbasin GSPs are not currently available and are due to the Department of Water Resources by January 31, 2020.

3.8.2.3 Regional and Local

This section discusses local and regional regulations and permitting requirements. Cities and counties in the project vicinity, as well as regional agencies, have developed ordinances, policies, and other regulatory mechanisms to minimize negative effects during a project's construction and operation. The following local plans and policies were identified.

Basin Plans

The *Water Quality Control Plan for the Tulare Lake Basin* and the *Water Quality Control Plan for the Lahontan Region* are the applicable Basin Plans for the RSA. The Basin Plans designate beneficial uses for specific surface water and groundwater resources, establish water quality objectives to protect those uses, and set forth policies to guide the implementation of programs to attain the objectives.

Dewatering Activities

Central Valley Regional Water Quality Control Board Dewatering Permits

Discharges to land from dewatering activities are covered under the Central Valley RWQCB's Resolution No. R5-2013-0145, Approving Waiver of Reports of Waste Discharge and Waste Discharge Requirements for Specific Types of Discharge within the Central Valley Region, which was adopted on December 5, 2013. The Central Valley RWQCB allows the discharge to waters of the U.S. of certain categories of clean or relatively pollutant-free wastewater posing little or no threat to water quality. The general permit is Order No. R5-2013-0074, NPDES No. CAG995001, *Waste Discharge Requirements General Order for Dewatering and Other Low Threat Discharges to Surface Waters,* and was adopted on May 31, 2013. The permit allows discharges provided they do not contain significant quantities of pollutants and either: (1) the discharge is 4 months or less in duration, or (2) the average dry-weather discharge does not exceed 250,000 gallons per day. All pollutants must be properly treated before discharge to ensure continuous compliance with applicable water quality requirements. Compliance with RWQCB Order No. R5-2013-0074 serves as compliance with the NPDES permit requirements under Section 402 of the CWA and the amendments thereto.

Lahontan Regional Water Quality Control Board Dewatering Permits

The Lahontan RWQCB has a similar general permit for low-threat water discharges to surface waters. The general permit is Order No. R6T-2014-0049, NPDES No. CAG996001, *Renewal of Waste Discharge Requirements and NPDES General Permit for Limited Threat Discharges to Surface Waters.* The Lahontan RWQCB encourages the disposal of wastewater on land, where practicable, and requires applicants for this general permit to evaluate land disposal as the first alternative. This general permit covers the following discharges provided that the discharge does not contain significant quantities of pollutants that could adversely affect designated beneficial uses including:

- Diverted stream flows
- Construction dewatering
- Dredge spoils dewatering
- Subterranean seepage dewatering
- Well construction and pump testing of potable aquifer supplies

The Lahontan RWQCB also has a general permit for the discharge of water from a groundwater treatment unit to surface waters. This permit is Order No. R6T-2010-0024, NPDES No. CAG916001, *Waste Discharge Requirements for Surface Water Disposal of Treated Groundwater.* Its provisions cover the discharge of treated groundwater from cleanups of pollution, other than through a community wastewater collection and treatment facility, to surface waters.

National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permits

The Municipal Stormwater Permitting Program regulates stormwater discharges from municipal separate storm sewer systems (MS4). The MS4 NPDES permits are issued in two phases by the SWRCB and RWQCBs. Phase I MS4 permits are issued to medium-sized (serving between 100,000 and 250,000 people) and large (serving 250,000 people) municipalities. Most of these permits are issued to a group of co-permittees encompassing an entire metropolitan area. The Phase I MS4 permits require the discharger to develop and implement a Stormwater Management Plan/Program, which is discussed in more detail in the next section, Stormwater Management Programs (33 U.S. Code § 13421[p]).

The Phase II MS4 Permits are issued to smaller municipalities (population of fewer than 100,000 people), including nontraditional small MS4s, such as military bases, public campuses, and prison and hospital complexes. The Phase II Small MS4 Permit (Order No. 2013-0001-DWQ, NPDES No. CAS000004) covers Phase II permittees statewide and became effective on July 1, 2013. The Phase II Small MS4 Permit requires the preparation of a Stormwater Management Plan/Program.

The Authority requested designation as a nontraditional permittee of the Phase II Small MS4 permit (Order No. 2013-0001-DWQ); the permit became effective on August 22, 2014. This order is the only MS4 permit for which the Authority has obtained coverage as a nontraditional permittee. The Phase II Small MS4 permit replaces county-/city-specific MS4 permits that would otherwise be applicable to the project. These county-/city-specific MS4 permits are described further below. Low-impact development design standards and a post-construction stormwater management program are required under this MS4 permit.

General Plan Policies and Ordinances

The State of California requires all cities and counties to adopt general plans and municipal codes that provide objectives, policies, goals, and ordinances addressing public health and safety, including protection of water resources and against flood events. Table 3.8-1 provides a list of the plans, policies, and ordinances adopted by the cities and counties in the Bakersfield to Palmdale Project Section. These local general plan objectives, policies, and goals and municipal code ordinances were identified and considered in the preparation of this analysis. Table 2-H-6 in Appendix 2-H lists the local jurisdictions and planning documents applicable to the Bakersfield to Palmdale Project Section and discusses the project section's consistency with each.

Table 3.8-1 Local Plans, Policies, and Ordinances

Plan	Segments	Alternatives	Consistency
Kern County General Plan: Land Use, Open Space, and Conservation Element	Unincorporated Kern County	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)	Not Consistent with Physical and Environmental Constraints Implementation Measure I Consistent with all other policies.
Kern County Municipal Code	Unincorporated Kern County	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)	Consistent
Metropolitan Bakersfield General Plan: Conservation and Safety Elements	City of Bakersfield	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) and the Bakersfield Station	Consistent
Bakersfield Municipal Code	City of Bakersfield	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) and the Bakersfield Station	Consistent
Los Angeles County General Plan: General Goals and Policies, Conservation and Open-Space Element, Water and Waste Management Element	Unincorporated Los Angeles County	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)	Consistent
Los Angeles County Municipal Code	Unincorporated Los Angeles County	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)	Consistent
City of Tehachapi General Plan: Sustainable Infrastructure Element	City of Tehachapi	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)	Consistent

Plan	Segments	Alternatives	Consistency
City of Tehachapi General Plan: Sustainable Infrastructure Element	City of Tehachapi	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)	Not Consistent with Sustainable Infrastructure Element Watershed and Water Supply Policies SI1 or SI7. Consistent with all other policies.
City of Tehachapi Municipal Code	City of Tehachapi	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)	Consistent
City of Lancaster General Plan	City of Lancaster	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) and Lancaster North B MOWF	Consistent
City of Lancaster Municipal Code	City of Lancaster	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) and Lancaster North B MOWF	Consistent
City of Palmdale General Plan: Environmental Resources and Public Services Elements	City of Palmdale	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option), Palmdale Station, Avenue M LMF Zone	Consistent
City of Palmdale Municipal Code	City of Palmdale	All B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option), Palmdale Station, Avenue M LMF Zone	Consistent

Source: California High-Speed Rail Authority, 2018
B-P = Bakersfield to Palmdale Project Section
CCNM = César E. Chávez National Monument
HSR = high-speed rail
LMF= Light Maintenance Facility
MOWF= Maintenance-of-Way Facility

3.8.3 Regional and Local Policy Analysis

State and regional policies supporting the California HSR System are described in Section 3.1.3 of this document. Because the Bakersfield to Palmdale Project Section is an undertaking of the Authority, in their respective capacities as state and federal agencies, the project section is not required to be consistent with local plans. The Council on Environmental Quality and FRA regulations, however, require the discussion of any inconsistency or conflict of a proposed action with regional or local plans and laws. Where inconsistencies or conflicts exist, the Council on Environmental Quality and the Authority require a description of the extent of reconciliation and the reason for proceeding if full reconciliation is not feasible (Code of Federal Regulations Title 40, Part 1506.2(d), and 64 Code of Federal Regulations 28545, 14(n)(15)). The CEQA Guidelines also require that an EIR discuss the inconsistencies between the proposed project and applicable general plans, specific plans, and regional plans (CEQA Guidelines, Section 15125(d)).

As noted above, the Bakersfield to Palmdale Project Section is a state and federal government project and is not subject to local government jurisdictional issues of land use because a city or county is not "an agency with jurisdiction over the project" as described in Appendix G of the CEQA Guidelines. Therefore, although the EIR/EIS describes the project section's consistency with local plans in order to provide a context for the project, any inconsistency with a local plan is not considered an environmental impact. The discussion regarding the project section's consistency with local policies, goals, and objectives for conserving hydrology and water resources is included to provide the local planning context. Table 2-H-6 in Appendix 2-H lists the local jurisdictions and planning documents applicable to the Bakersfield to Palmdale Project Section and discusses the project section's consistency with each one.

As described in Table 2-H-6 (Appendix 2-H), the Bakersfield to Palmdale Project Section is consistent with a majority of the goals, policies, objectives, implementation measures, and ordinances of the local plans and municipal codes related to hydrology and water resources because the project would comply with the requirements set forth by the Phase II Small MS4 Permit, USEO 1198, FEMA regulations, the Industrial Stormwater Pollution Prevention Plan, Regional Dewatering Permits, and applicable drainage requirements. The Bakersfield to Palmdale Project Section is not consistent with Physical and Environmental Constraints Policy I of the Land Use, Open Space, and Conservation Element of the Kern County General Plan, because the project does not include provisions to preserve flood control channels or watercourses. The Bakersfield to Palmdale Project Section is not consistent with Watershed and Water Supply Policy SI 7 of the Sustainable Infrastructure Element of the City of Tehachapi General Plan, because the project includes the construction of stream crossings over surface waters. However, the stream crossings would be designed to provide flow conveyance and connectivity. The Bakersfield to Palmdale Project Section is not consistent with Watershed and Water Supply Policy SI 7 of the Sustainable Infrastructure Element of the City of Tehachapi General Plan, because the project would increase impervious surface area within the RSA. However, the Bakersfield to Palmdale Project Section would promote infiltration into the soil through the installation of infiltration/detention basins.

3.8.4 Methods for Evaluating Impacts

The method for evaluating project impacts begins with identifying the resource study area (RSA). Information is then gathered on the existing hydrology and water resources features in the RSA such as surface waters (e.g., rivers, creeks, and canals); FEMA-designated floodplains; and groundwater basins through associated geographic information system (GIS) tools; review of laws, regulations, and permitting requirements; and coordination with resource agencies.

3.8.4.1 Study Area for Analysis

The RSA is the area in which all environmental investigations specific to each EIR/EIS resource are conducted to determine the resource characteristics and the potential impacts of the project. The RSA includes the regional study area (i.e., entire watersheds and groundwater basins) and the localized study area, which includes surface waters, floodplains, and groundwater present within the area of construction. The RSA for hydrology and water resources includes both sides of the right-of-way for each alternative alignment and the project's proposed physical ground-disturbance footprint (e.g., stations, track, maintenance facilities, and temporary construction areas). In addition, the RSA includes the following elements:

- **Surface Waters**—Receiving waters of project runoff
- **Floodplains**—FEMA-designated flood hazard areas within the project's physical ground disturbance footprint and DWR awareness flood zone areas, as well as any adjacent areas where flood frequency, extent, and duration could be affected by the project
- **Groundwater**—Aquifer(s) underlying the project footprint

3.8.4.2 Impact Avoidance and Minimization Features

The Authority has pledged to integrate programmatic IAMFs consistent with (1) the 2005 Statewide Program EIR/EIS, (2) the 2008 Bay Area to Central Valley Program EIR/EIS, and (3) the 2012 Partially Revised Final Program EIR into the HSR project. The Authority would implement these features during project design and construction, as relevant to the HSR project section, to avoid or reduce impacts. These IAMFs are incorporated into the project design and construction and would avoid or minimize the environmental or community impacts. Each IAMF is described below and discussed further under each impact statement.

HYD-IAMF#1: Storm Water Management

Prior to construction, the contractor shall prepare a stormwater management and treatment plan for review and approval by the Authority. During the detailed design phase, each receiving stormwater system's capacity to accommodate project runoff would be evaluated. As necessary, on-site stormwater management measures, such as detention or selected upgrades to the receiving system, would be designed to provide adequate capacity and to comply with the design standards in the latest version of Authority Technical Memorandum *2.6.5 Hydraulics and Hydrology Guidelines*. On-site stormwater management facilities would be designed and constructed to capture runoff and provide treatment prior to discharge of pollutant-generating surfaces, including station parking areas, access roads, new road over- and underpasses, reconstructed interchanges, and new or relocated roads and highways. Low-impact development techniques would be used to detain runoff on site and to reduce off site runoff such as constructed wetland systems, biofiltration and bioretention systems, wet ponds, organic mulch layers, planting soil beds, and vegetated systems (biofilters), such as vegetated swales and grass filter strips, would be used where appropriate.

HYD-IAMF#2: Flood Protection

Prior to construction, the contractor shall prepare a flood protection plan for Authority review and approval. The project would be designed both to remain operational during flood events and to minimize increases in 100-year or 200-year flood elevations, as applicable to locale. Design standards will include the following:

- Establish track elevation to prevent saturation and infiltration of stormwater into the sub-ballast.
- Minimize development within the floodplain, to such an extent that water surface elevation in the floodplain would not increase by more than 1 foot, or as required by state or local agencies, during the 100-year or 200-year flood flow [as applicable to locale]. Avoid placement of facilities in the floodplain or raise the ground with fill above the base-flood elevation.
- Design the floodplain crossings to maintain a 100-year floodwater surface elevation of no greater than 1 foot above current levels, or as required by state or local agencies, and project features within the floodway itself would not increase existing 100-year floodwater surface elevations in Federal Emergency Management Agency-designated floodways, or as otherwise agreed upon with the county floodplains manager.

The following design standards would minimize the effects of pier placement on floodplains and floodways:

- Design site crossings to be as nearly perpendicular to the channel as feasible to minimize bridge length.
- Orient piers to be parallel to the expected high-water flow direction to minimize flow disturbance.
- Elevate bridge crossings at least 3 feet above the high-water surface elevation to provide adequate clearance for floating debris, or as required by local agencies.
- Conduct engineering analyses of channel scour depths at each crossing to evaluate the depth for burying the bridge piers and abutments. Implement scour-control measures to reduce erosion potential.
- Use quarry stone, cobblestone, or their equivalent for erosion control along rivers and streams, complimented with native riparian plantings or other natural stabilization alternatives that would restore and maintain a natural riparian corridor.
- Place bedding materials under the stone protection at locations where the underlying soils require stabilization as a result of stream flow velocity.

HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan

Although the project is not required to obtain coverage under the SWRCB Construction General Permit, prior to construction (any ground-disturbing activities), the contractor shall comply with the SWRCB Construction General Permit requiring preparation and implementation of a SWPPP. The Construction SWPPP would propose BMPs to minimize potential short-term increases in sediment transport caused by construction, including erosion control requirements, stormwater management, and channel dewatering for affected stream crossings. These BMPs would include measures to incorporate permeable surfaces into facility design plans where feasible, and how treated stormwater would be retained or detained on site. Other BMPs shall include strategies to manage the amount and quality of overall stormwater runoff. The Construction SWPPP would include measures to address, but are not limited to, the following:

- Hydromodification management to verify maintenance of pre-project hydrology by emphasizing on-site retention of stormwater runoff using measures such as flow dispersion, infiltration, and evaporation (supplemented by detention where required). Additional flow control measures would be implemented where local regulations or drainage requirements dictate.
- Implementing practices to minimize the contact of construction materials, equipment, and maintenance supplies with stormwater.
- Limiting fueling and other activities using hazardous materials to areas distant from surface water, providing drip pans under equipment, and daily checks for vehicle condition.
- Implementing practices to reduce erosion of exposed soil, including soil stabilization, regular watering for dust control, perimeter siltation fences, and sediment catchment basins.
- Implementing practices to maintain current water quality, including siltation fencing, wattle barriers, stabilized construction entrances, grass buffer strips, ponding areas, organic mulch layers, inlet protection, storage tanks, and sediment traps to arrest and settle sediment.
- Where feasible, avoiding areas that may have substantial erosion risk, including areas with erosive soils and steep slopes.
- Using diversion ditches to intercept surface runoff from off-site.
- Where feasible, limiting construction to dry periods when flows in waterbodies are low or absent.
- Implementing practices to capture and provide proper off-site disposal of concrete wash water, including isolation of runoff from fresh concrete during curing to prevent it from reaching the local drainage system, and possible treatments (e.g., dry ice).
- Developing and implementing a spill prevention and emergency response plan to handle potential fuel and/or hazardous material spills.

Implementation of a SWPPP would be performed by the construction contractor as directed by the contractor's Qualified SWPPP Practitioner or designee. As part of that responsibility, the effectiveness of construction BMPs must be monitored before, during and after storm events. Records of these inspections and monitoring results will be maintained by the construction contractor.

HYD-IAMF#4: Prepare and Implement an Industrial Stormwater Pollution Prevention Plan

Prior to construction of any facility classified as an industrial facility, the contractor shall comply with existing water quality regulations. The stormwater general permit requires preparation of a SWPPP and a monitoring plan for industrial facilities that discharge stormwater from the site, including vehicle maintenance facilities associated with transportation operations. The permit includes performance standards for pollution control.

BIO-IAMF#8: Delineate Equipment Staging Areas and Traffic Routes

Prior to any ground disturbing activity, the Authority will establish staging areas for construction equipment in areas that minimize effects to sensitive biological resources, including habitat for special-status species, seasonal wetlands, and wildlife movement corridors. Staging areas (including any temporary material storage areas) will be located in areas that would be occupied by permanent facilities, where practicable. Equipment staging areas will be identified on final project construction plans. The Authority will flag and mark access routes to ensure that vehicle traffic within the project footprint is restricted to established roads, construction areas and other designated areas.

BIO-IAMF#9: Dispose of Construction Spoils and Waste

During ground-disturbing activities, the Authority may temporarily store excavated materials produced by construction activities in areas at or near construction sites within the project footprint. Where practicable, the Authority will return excavated soil to its original location to be used as backfill. Any excavated waste materials unsuitable for treatment and reuse will be disposed at an off-site location, in conformance with applicable state and federal laws.

BIO-IAMF#11: Maintain Construction Sites

Prior to any ground-disturbing activity, the Authority will prepare a construction site BMP field manual. The manual will contain standard construction site housekeeping practices required to be implemented by construction personnel. The manual will identify BMPs for the following topics; temporary soil stabilization, temporary sediment control, wind erosion control, nonstormwater management, waste management and materials control, rodenticide use, and other general construction site cleanliness measures.

All construction personnel will receive training on BMP field manual implementation prior to working within the project footprint. All personnel will acknowledge, in writing, their understanding of the BMP field manual implementation requirements. The BMP field manual will be updated by January 31 of each year. The Authority will provide, on an annual basis, training updates to all construction personnel.

GEO-IAMF#1: Geologic Hazards

Prior to construction, the contractor shall prepare a Construction Management Plan (CMP) addressing how the Contractor would address geologic constraints and minimize or avoid impacts on geologic hazards during construction. The plan would be submitted to the Authority for review and approval. At a minimum, the plan would address the following geological and geotechnical constraints/resources:

a. **Groundwater Withdrawal.** Controlling the amount of groundwater withdrawal from the project, by re-inject groundwater at specific locations if necessary, or use alternate foundation designs to offset the potential for settlement. This control is important for locations with retained cuts in areas where high groundwater exists, and where existing buildings are located near the depressed track section.

b. **Unstable Soils.** Employing various methods to mitigate for the risk of ground failure from unstable soils. If soft or loose soils are encountered at shallow depths, they can be excavated and replaced with competent soils. To limit the excavation depth, replacement materials can also be strengthened using geosynthetics. Where unsuitable soils are deeper, ground improvement methods, such as stone columns, cement deep-soil-mixing (CDSM), or jet-grouting, can be used. Alternatively, if sufficient construction time is available, preloading—in combination with prefabricated vertical drains (wicks) and staged construction—can be used to gradually improve the strength of the soil without causing bearing-capacity failures.

c. **Subsidence.** The Authority addresses subsidence in its design and construction processes. For the initial design, survey monuments were installed to establish a datum and set an initial track profile. In the construction phase, the design-build contractors for track bed preparation would conduct topographic surveys for preparation of final design. Because subsidence could have occurred since the original benchmarks (survey monuments) were established, the design-build contractor's topographic surveys would be used to help determine whether subsidence has occurred. The updated topographic surveys would also be used to establish the top of rail elevations for final design where the HSR system is outside established floodplain areas and above water surface elevations. Where the HSR system is in floodplain areas susceptible to flooding, consideration is being given to overbuild the height of the rail bed in anticipation of future subsidence.

d. **Water and Wind Erosion.** The contractor would implement erosion control methods as appropriate from the various erosion control methods documented in the Construction SWPPP (See HYD-IAMF#3), the Caltrans Construction Manuals, and the construction technical memorandum (see GEO-IAMF#6), and in coordination with other erosion, sediment, stormwater management and fugitive dust control efforts. Water and wind erosion control methods may include, but are not limited to, use of revegetation, stabilizers, mulches, and biodegradable geotextiles.

e. **Soils with Shrink-Swell Potential.** In locations where shrink-swell potential is marginally unacceptable, soil additives would be mixed with existing soil to reduce the shrink-swell potential. Construction specifications would be based upon the decision whether to remove or treat the soil. This decision is based on the soils, specific shrink-swell characteristics, the additional costs for treatment versus excavation and replacement, as well as the long-term performance characteristics of the treated soil.

f. **Soils with Corrosive Potential.** In locations where soils have a potential to be corrosive to steel and concrete, the soils would be removed and buried structures would be designed for corrosive conditions, and corrosion-protected materials would be used in infrastructure.

HMW-IAMF#6: Spill Prevention

Prior to construction (any ground-disturbing activities), the contractor shall prepare a Construction Management Plan addressing spill prevention. A Spill Prevention, Control, and Countermeasure (SPCC) plan (or Soil Prevention and Response Plan if the total above-ground oil storage capacity is less than 1,320 gallons in storage containers greater than or equal to 55-gallons) shall prescribe BMPs to follow to prevent hazardous material releases and clean-up of any hazardous material releases that may occur. The plans would be prepared and submitted to the PCM on behalf of the Authority and shall be implemented during Construction.

HMW-IAMF#7: Transport of Materials

During construction, the contractor would comply with applicable state and federal regulations, such as the Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Hazardous Materials Release Response Plans and Inventory Law, and the Hazardous Waste Control Act. Prior to construction the contractor would provide the Authority with a hazardous materials and waste plan describing responsible parties and procedures for hazardous waste and hazardous materials transport.

HMW-IAMF#8: Permit Conditions

During construction the contractor would comply with the State Water Resources Control Board Construction Clean Water Act Section 402 General Permit conditions and requirements for transport, labeling, containment, cover, and other BMPs for storage of hazardous materials during construction. Prior to Construction, the Contractor shall provide the Authority with a hazardous materials and waste plan describing responsible parties and procedures for hazardous waste and hazardous materials transport, containment, and storage BMPs that would be implemented during Construction.

HMW-IAMF#9: Environmental Management Systems

To the extent feasible, the Authority is committed to identifying, avoiding, and minimizing hazardous substances in the material selection process for construction, operation, and maintenance of the HSR System. The Authority would use an Environmental Management System to describe the process that would be used to evaluate the full inventory of hazardous materials as defined by federal and state law employed on an annual basis and would replace hazardous substances with nonhazardous materials. The Contractor shall implement the material substitution recommendation contained in the annual inventory.

HMW-IAMF#10: Hazardous Materials Plans

Prior to operations and maintenance activities, the Authority shall prepare hazardous materials monitoring plans. These would use as a basis source, such as a hazardous materials business plan as defined in Title 19 California Code of Regulations and a SPCC plan.

3.8.4.3 Methods for NEPA and CEQA Impact Analysis

This section describes the sources and methods the Authority used to analyze potential impacts on surface water hydrology, surface water quality, groundwater, and floodplains from implementation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option). These methods apply to both the National Environmental Policy Act (NEPA) and CEQA unless otherwise indicated. Refer to Section 3.1.3.4, Methods for Evaluating Impacts, for a description of the general framework for evaluating impacts under NEPA and CEQA.

The following information sources (and associated GIS data) were used to describe the project's affected environment:

- **Climate, Precipitation, and Topography**—Sources of information for these elements included the Statewide Program EIR/EIS (Authority and FRA 2005), the Western Regional Climate Center, U.S. Geological Survey (USGS) topographic maps, and the RSA.
- **Regional and Local Hydrology and Water Resources**—The existing hydrology and water resources features in the regional and local project vicinity are surface water features that include rivers, creeks, canals, floodplains, and groundwater aquifers. Information regarding these features and their conditions originates in the following sources: the Statewide Program EIR/EIS, USGS topographic maps, aerial imagery, Basin Plans (*Water Quality Control Plan for the Tulare Lake Basin* and *Water Quality Control Plan for the Lahontan Region*), the CWA Section 303(d) list of water quality-impaired reaches, USGS surface water and groundwater data, and data from the DWR water data library.
- **Existing Floodplain Conditions**—The existing conditions with respect to floodplains are based on available data, reports, studies, and topographic and floodplain mapping. The FEMA-designated 100-year floodplain areas were identified and mapped using GIS and are based on FEMA's Flood Insurance Rate Maps (FIRM) for Kern and Los Angeles Counties (September 26, 2008). The special flood hazard area designations and base flood elevation information were obtained from the FIRMs. In addition, the DWR awareness flood zone areas were identified and mapped using GIS. As shown in Table 3.8-2, both quantitative and qualitative analyses were performed to evaluate potential impacts on hydrology and water resources. The supporting project documents prepared for the Bakersfield to Palmdale Project Section (as well as other HSR project sections) that were reviewed are listed in Table 3.8-3. Topic-specific evaluation methods are included in Table 3.8-4.

Table 3.8-2 Quantitative and Qualitative Analyses for Hydrology and Water Resources

Item/Document Reviewed	Analysis Conducted
Quantitative Analysis	
Conceptual-level plans and profiles (15 percent design) for each of the high-speed rail B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)	Reviewed and compared with information on floodplains, surface water features, and groundwater basins.
Maintenance facility and station locations and footprints	Reviewed and compared with information on floodplains, surface water features, and groundwater basins.
Qualitative Analysis	
Federal and state statutes regulating water resources	The applicable statutes establish water quality standards; regulate discharges and pollution sources; and protect drinking water systems, aquifers, and floodplain values. The statutes were considered during analysis of potential flooding, hydrology, and water quality impacts.

Item/Document Reviewed	Analysis Conducted
County and city general plans and ordinances	Reviewed for applicable policies and regulations to determine whether implementation of the project would result in potential impacts.
Available documents from various agencies, including the U.S. Geological Survey, the Federal Emergency Management Agency, the State Water Resources Control Board, and the Regional Water Quality Control Board	Reviewed to determine whether water quality and/or water resources would be affected by the alternative alignments. Local agencies were consulted.

Table 3.8-3 High-Speed Rail Documents Reviewed

High-Speed Rail Project Section	Document Reviewed
Statewide Program	▪ Section 3.8, Hydrology and Water Resources, in the *Technical Guidance California High-Speed Rail Project EIR/EIS Environmental Methodology Guidelines, Version 5*
Bakersfield to Palmdale Project Section	▪ *Technical Memorandum 2.6.5, Hydraulics and Hydrology Guidelines* ▪ *Preliminary Engineering for Project Definition Floodplain Impact Report* ▪ *Storm Water Management Report* ▪ *Hydrology, Hydraulics, and Drainage Report* ▪ *Biological and Aquatic Resources Technical Report* ▪ *Geology, Soils, and Seismicity Technical Report*
Fresno to Bakersfield Project Section	▪ *Hydrology and Water Resources Technical Report* ▪ Section 3.8, Hydrology and Water Resources, in the *Draft Supplemental EIR/EIS*

Source: California High Speed Rail Authority, 2016
B-P = Bakersfield to Palmdale Project Section
CCNM = César E. Chávez National Monument
EIR/EIS = Environmental Impact Report/ Environmental Impact Statement

Table 3.8-4 Evaluation Method by Topic Area

Topic Area	Evaluation Method
Surface Water Hydrology	▪ Analysts overlaid GIS layers for the proposed B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) onto the GIS layers for surface waters and flood-prone areas, USGS topographic maps, and aerial photography from web mapping services to identify the potential impacts on surface waters. Analysts then used these GIS layers to identify project crossings of streams and canals. ▪ The lengths of rivers and creeks crossed by the project footprint were estimated using GIS. ▪ The amount of impervious area that would be created by the B-P Build Alternatives was estimated by calculating the width of the track, including ballast[1] and concrete at-grade track sections; the width of aerial structures; the area of proposed roadway crossings and access roads; and the size of the MOWF and the LMF, the tunnel portal building, and traction power facilities. Increases in impervious surface area lead to increases in volume and velocity of water runoff. ▪ Analysts evaluated changes to drainage patterns in the RSA during construction and operation.

Topic Area	Evaluation Method
Surface Water Quality	▪ Consideration of the location of stream segments with impaired water quality in relation to the proposed alternatives. ▪ Evaluation of the potential for construction activities to affect surface water quality as a result of uncontrolled runoff and discharges. These activities include accidental releases of construction-related hazardous materials, ground disturbance and associated erosion and sedimentation, stormwater discharges, and dewatering discharges, particularly in locations within or close to a surface waterbody. ▪ Consideration of in-water construction work to directly contaminate surface water quality and redirect flows. ▪ Review of the potential for project operation and maintenance activities to introduce pollutants into the environment, with a particular focus on stormwater runoff from major facilities (e.g., the LMF or MOWF). ▪ Evaluation of the project to create significant new sources of pollutants (e.g., construction equipment, parking lots, and maintenance facilities) leading to new sources of contaminated runoff in the RSA.
Floodplains	▪ Review of conceptual-level plans (15 percent design) for each of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) and comparison with information on the existing floodplain. ▪ Estimation of the lengths of the floodplains (defined as special flood hazard areas) crossed by the project alignments using GIS layers for the proposed alternatives overlaid onto the GIS layers for floodplains. ▪ Review of project facilities located within a designated floodplain that could expose the project to risks related to flooding as well as subject other areas to impacts resulting from changes in the location and/or direction of flood flows. ▪ Evaluation of the potential for each alternative to increase flood height and/or divert flood flows using flood information from the FEMA flood insurance studies and available topographic data. ▪ Evaluation of the potential for the project to result in incompatible floodplain development and impact floodplain values using flood information from the FEMA flood insurance studies. ▪ Consideration of construction activities within a designated floodplain, which could redirect flows and pose a risk to construction workers and equipment.

Topic Area	Evaluation Method
Groundwater	▪ Review of documents available from the DWR, Central Valley and Lahontan RWQCBs, counties, and other agencies. ▪ Analysts overlaid GIS layers for the proposed alternatives onto the GIS layers for groundwater basins to identify potential impacts on groundwater basins. The length and acreage of groundwater basins beneath the project footprint were estimated using GIS. ▪ The depth to groundwater within the RSA was estimated on the basis of available documentation from the DWR. ▪ For construction-related impacts, the following were evaluated: – Excavation activities (e.g., recontoured ground, open-cut, or tunnel construction) that could result in intrusions below the groundwater table, which could be a direct mechanism for contaminants to enter groundwater. – Dewatering activities that could potentially deplete localized groundwater supplies. – Potential for contaminated site runoff to percolate to the groundwater aquifer. ▪ For operations impacts, the following were evaluated: – Increases in impervious surface area as a result of the project that could reduce groundwater recharge. – Whether displacement of existing agricultural and domestic wells within the B-P Build Alternatives right-of-way could result in additional groundwater pumping or change in the water level in neighboring wells.

Source: California High Speed Rail Authority, 2016

[1] The ballast track bed sections are impervious, because the subballast is compacted material that does not allow for infiltration into the soil.

B-P = Bakersfield to Palmdale Project Section
DWR = California Department of Water Resources
FEMA = Federal Emergency Management Agency
GIS = geographic information system
LMF = Light Maintenance Facility
MOWF = Maintenance-of-Way Facility
RSA = resource study area
RWQCB = Regional Water Quality Control Board
USGS = U.S. Geological Survey

3.8.4.4 Method for Determining Significance under CEQA

CEQA requires that an EIR identify the significant environmental impacts (CEQA Guidelines Section 15126) of a proposed project and its alternatives. One of the primary differences between NEPA and CEQA is that CEQA requires a threshold-based analysis of the impacts (see Section 3.1 for further information). Accordingly, Section 3.8.9, CEQA Significance Conclusions, summarizes the significance of the environmental impacts on hydrology and water resources for the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option). The Authority is using the following thresholds to determine if a significant impact on hydrology and water resources would occur as a result of the Bakersfield to Palmdale Project Section:

- Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality
- Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management or the basin
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the alteration of impervious surfaces, in a manner that would:
  - Result in substantial erosion or siltation on- or off-site;
  - Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
  - Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
  - Impede or redirect flood flows

- In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation
- Conflict with or obstruct implementation of a water quality control or sustainable groundwater management plan

As discussed above, state and federal agencies, including the US Environmental Protection Agency, the SWRCB and the RWQCBs, have established water quality standards and waste discharge requirements that are relevant to the project. These standards and requirements have been developed to prevent the degradation of water quality, and thus serve as appropriate thresholds for determining the significance of water quality impacts.

For impacts related to flood-related hazards, the analysis relies on standards established by FEMA and local agencies. FEMA oversees federal floodplain management policies and runs the National Flood Insurance Program adopted under the National Flood Insurance Act of 1968. FEMA prepares FIRMs that delineate the regulatory floodplain to assist local governments with land use and floodplain management decisions to avoid flood-related hazards. To avoid impacts related to flooding, FEMA and the local agencies require that an encroachment into a floodplain not increase the water surface elevation of the base flood (i.e., 100-year flood) by more than 1 foot.

There are no oceans, bays, or other bodies of water sufficient to result in a release of pollutants from seiche or tsunami near the project alignment; therefore, risk of release of pollutants from tsunami or seiche is not discussed further.

3.8.5 Affected Environment

Information in this section is summarized from the *Hydrology and Water Resources Technical Report* (Authority 2018a). The RSA for water resources stretches from the southern portion of Kern County in the City of Bakersfield across the Tehachapi Mountains and through the northern portion of Los Angeles County to the City of Palmdale. The limits of the RSA are the Bakersfield Station in the north and the Palmdale Station in the south.

3.8.5.1 Study Area Watersheds

The northern portion of the RSA is within the Tulare Lake Basin, and the southern portion of the RSA is within the South Lahontan Basin.

The Tulare Lake Basin covers an area of approximately 17,400 square miles. Approximately one-third of the Tulare Lake Basin is used for agriculture, most of which is on the valley floor. The basin is primarily drained by the Kern River, Walker Creek, and Caliente Creek, which flow toward the dry lakebeds of Tulare, Buena Vista, and Kern Lakes. The basin is partially endorheic; its only outlet is to the north into the San Joaquin River, which only flows during periods of extreme runoff. The RSA traverses 2 of these 10 watersheds within the Tulare Lake Basin: the South Valley Floor and Grapevine watersheds (Figure 3.8-1).

Endorheic Basin

Endorheic basins are closed drainage basins that retain water but allow no outflow to other external bodies of water, such as seas or oceans. These basins are usually in the interior of a landmass, in areas of relatively low rainfall where the topography prevents their drainage to the oceans, and they converge into lakes that form a balance of surface inflows, evaporation, and seepage.

The South Lahontan Basin covers an area of approximately 26,600 square miles. The RSA traverses 2 of the 29 watersheds within the South Lahontan Basin: the Fremont Valley and Antelope Valley Watersheds (Figure 3.8-1). Although the Fremont Valley and Antelope Valley Watersheds are separated by a topographic and hydrologic divide in the Antelope Valley, they are often referred to collectively as the Antelope-Fremont Valleys Watershed. In this section, the watersheds are discussed together when appropriate.

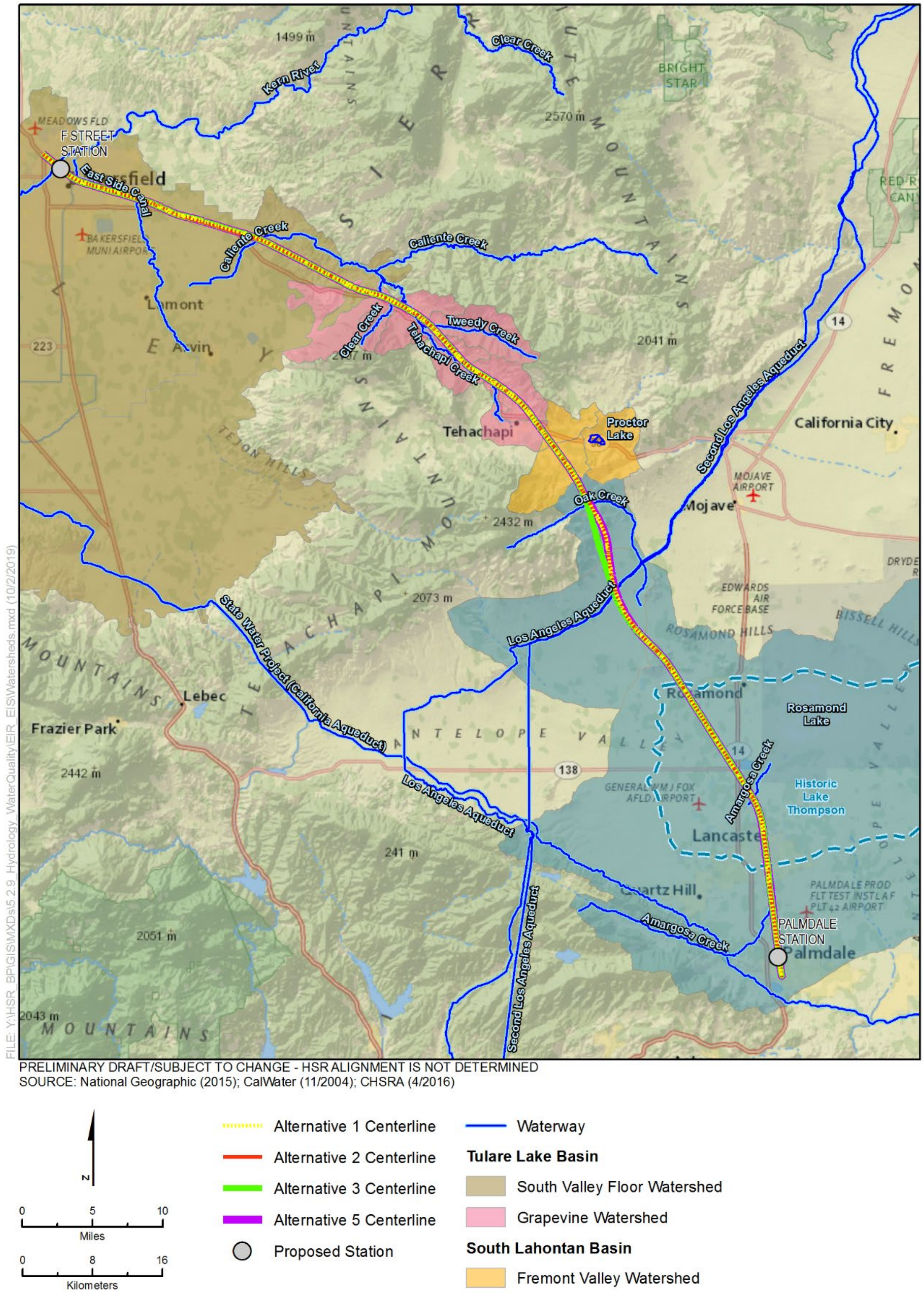


Figure 3.8-1 Watersheds and Surface Waters

(Sheet 1 of 2)

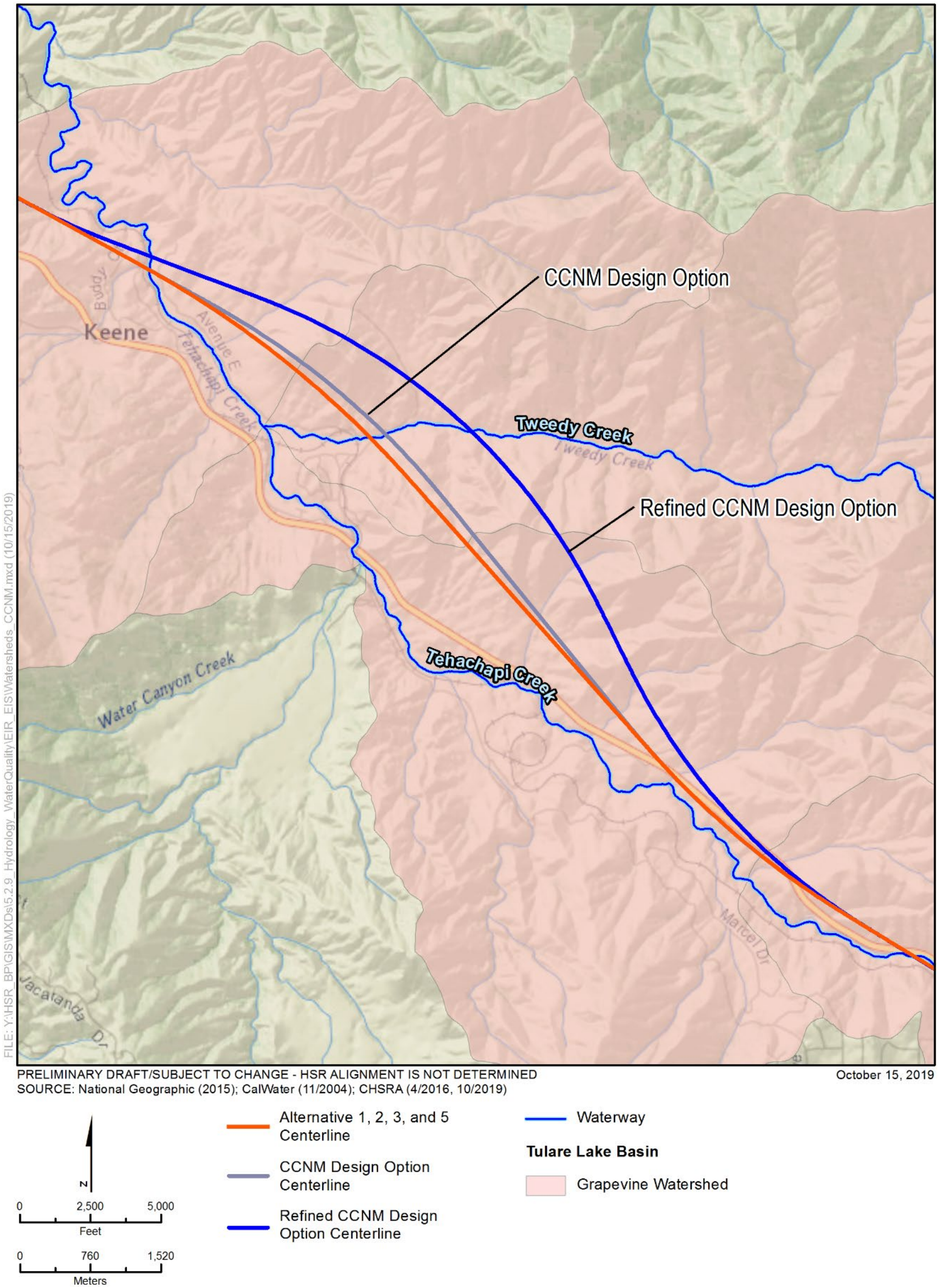


Figure 3.8-1 Watersheds and Surface Waters

(Sheet 2 of 2)

Regional Water Quality Control Board Watershed Designations

For regulatory purposes, the Central Valley RWQCB and Lahontan RWQCB designate watershed areas in Hydrologic Units (HU), which are further divided into Hydrological Areas (HA). As designated by the Central Valley RWQCB, the RSA is within the South Valley Floor HU, Arvin-Wheeler Ridge HA, and the Grapevine HU, Tehachapi Creek HA. As designated by the Lahontan RWQCB, the RSA is within the Fremont HU, East Tehachapi HA, and the Antelope HU, Willow Springs HA and Lancaster HA (Figure 3.8-2).

3.8.5.2 Climate and Precipitation

The northwestern portion of the RSA is characterized as having a semi-arid, desert-like climate. Summers are long, hot, and dry, and winters are temperate, brief, and moist.

The central portion of the RSA is in the Tehachapi Mountains and Tehachapi Valley, with elevations of up to 4,500 feet. The climate is both typical California Mediterranean and subalpine, depending on elevation. Mediterranean climates are characterized by warm, dry summers and cool, wet winters. Subalpine climates are characterized by long winters with short growing seasons.

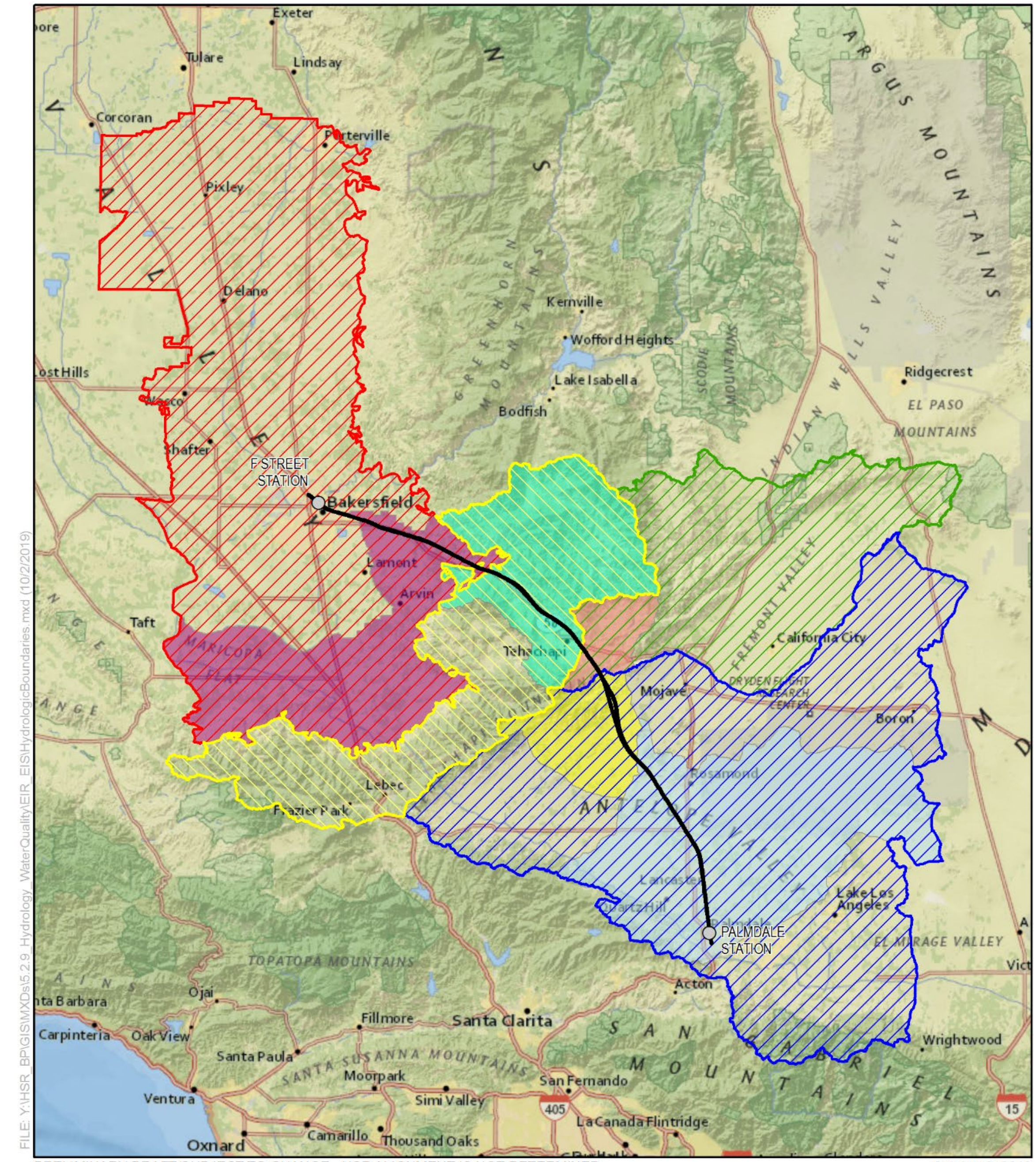
The eastern and southern portions of the RSA are within the western Mojave Desert, which lies within the rain shadow of the Sierra Nevada. The Mojave Desert experiences typical California high-desert climate conditions of extreme temperatures during winter and summer months. The RSA is characterized by intermittent wet periods in the winter months. More than 80 percent of the precipitation in the RSA occurs from November through April.

3.8.5.3 Geology, Soils, and Erosion

Erosion is a major contributing factor to the degradation of surface water quality in areas with a combination of erosive soil types and steep slopes. Certain soil types demonstrate a higher potential for erosion by rainfall and runoff than other soil types. This is expressed in the Revised Universal Soil Loss Equation by the soil erodibility factor, designated as “K.” K is defined as a function of texture, organic matter content and cover, structure size and class, and subsoil-saturated hydraulic conductivity. Fine-textured soils, which are high in clay, express low erodibility (K values between 0.02 and 0.2) because the strong adherence between individual particles reduces their ability to detach. Coarse-textured soils also have low erodibility because their ability to rapidly infiltrate water reduces surface runoff rates. Medium-textured soils, such as silt loams, have a moderate potential for erosion (K values between 0.25 and 0.40) because they are susceptible to detachment and they produce moderate runoff. Soils with high silt content have the highest potential for erosion (K values greater than 0.4) because they easily detach, tend to crust, and produce large amounts and rates of runoff.

Most of the RSA is located in areas that are not particularly susceptible to erosion. However, one area with high soil erodibility is at the northwest end of the RSA, around the Bakersfield Station, and another area is east of the RSA in the Antelope Valley, near the west side of Rosamond Lake. The soils in these areas do not extend to the HSR alignment.

Soils on steep slopes are often erodible, especially during heavy rain events. Some of the soils in the Tehachapi Mountains are on steep slopes and are considered moderately erodible. In addition, soils and alluvial deposits present in stream channels are susceptible to erosional scour, especially around foundation elements where erosive forces can be concentrated. Additional information regarding geology, soil type, and erosion can be found in Section 3.9 Geology, Soils, Seismicity, and Paleontological Resources of this EIR/EIS.



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: National Geographic (2015); FEMA (2012); CHSRA (4/2016, 8/2018)

October 2, 2019

Figure 3.8-2 Hydrologic Units, Areas, and Subareas

(Sheet 1 of 2)

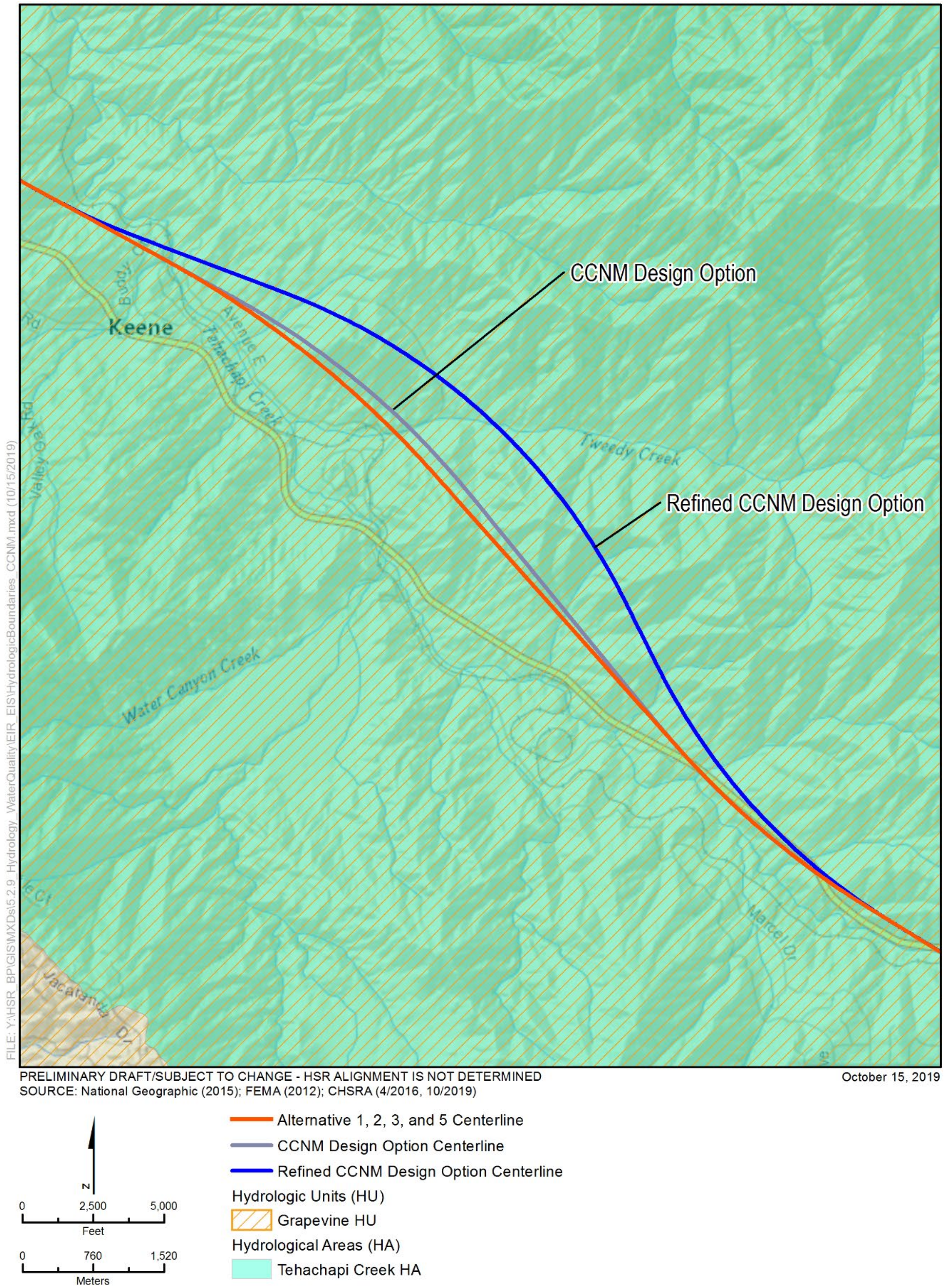


Figure 3.8-2 Hydrologic Units, Areas, and Subareas

(Sheet 2 of 2)

3.8.5.4 Surface Water Hydrology

Surface Water Features

As described above and shown on Figure 3.8-1, the northern portion of the RSA is within the South Valley Floor and Grapevine watersheds of the Tulare Lake Basin, and the southern portion of the RSA is within the Fremont Valley and Antelope Valley watersheds of the South Lahontan Basin. Named surface waters within the RSA are listed in Table 3.8-5, from north to south, and are depicted on Figure 3.8-1. In addition, numerous unnamed ephemeral streams and desert washes cross the RSA. The named surface waters in the project vicinity are discussed in more detail below.

Table 3.8-5 Named Surface Waters within the Resource Study Area

Named Surface Water	Type of Surface Water
Caliente Creek	Intermittent
Clear Creek	Intermittent
Tehachapi Creek	Intermittent
Tweedy Creek	Intermittent
Oak Creek	Perennial
Los Angeles Aqueduct	N/A
Amargosa Creek	Intermittent

N/A = not applicable

Caliente Creek

Caliente Creek is an intermittent stream that is confined in the uplands of sandy canyons. The headwaters of Caliente Creek are in the Grapevine Watershed, and the creek terminates within the South Valley Floor Watershed (Figure 3.8-1). Coarse sand is periodically washed down from the hills and deposited in the streambed or at the mouth of the canyon. A semi-arid alluvial fan has formed at the mouth of the canyon, and the stream channel shifts from year to year in this region. The downstream reach of this creek is often dry. The RSA crosses the downstream reach of Caliente Creek downstream of the Tehachapi and Walker Basin Creek inflows.

Clear Creek

Clear Creek is a tributary of Tehachapi Creek. The RSA crosses Clear Creek near the confluence with Tehachapi Creek (Figure 3.8-1).

Tehachapi Creek

Tehachapi Creek is the southern tributary of Caliente Creek and drains western Tehachapi Valley, a portion of Brite Valley, Keller Valley, and local mountains and foothills to the northwest. The RSA crosses Tehachapi Creek in the Tehachapi Mountains near the community of Keene (Figure 3.8-1).

Tweedy Creek

Tweedy Creek is a tributary of Tehachapi Creek. The RSA crosses Tweedy Creek near the confluence with Tehachapi Creek (Figure 3.8-1). Streamflow data for Tweedy Creek is unavailable.

Oak Creek

The RSA crosses Oak Creek near the Tehachapi Willow Springs Road crossing (Figure 3.8-1).

Los Angeles Aqueduct System

The Los Angeles Aqueduct is one of the water conveyance systems that crosses through the northern portion of the Antelope Valley Watershed, south of Oak Creek in Rosamond. In this region, the Los Angeles Aqueduct is primarily conveyed by buried pipelines. The Los Angeles Aqueduct conveys water from Mono Lake in the Owens Valley to Los Angeles. The Los Angeles Aqueduct system includes two aqueducts. The first aqueduct is 223 miles long and was completed in 1913. This aqueduct consists of unlined and lined channels and concrete pipe and steel pipe sections. The second aqueduct is approximately 137 miles long and was completed in 1970; approximately half of this aqueduct is concrete pipe and the other half is steel pipe. Both of the Los Angeles Aqueducts are piped underground through the RSA.

Amargosa Creek

Amargosa Creek originates in the San Gabriel Mountains and is intermittent or ephemeral for much of its length. It collects runoff from the Sierra Pelona mountain range, initially flowing eastward, then draining northerly through Palmdale and Lancaster, and terminating at Rosamond Lake. The natural course of Amargosa Creek has been altered by built channels and detention basins. The RSA crosses Amargosa Creek south of W Avenue F near Sierra Highway and the Union Pacific Railroad (Figure 3.8-1).

Jurisdictional Wetlands and Waters

The *Aquatic Resources Delineation Report* (Authority 2016) and the *Bakersfield to Palmdale Project Section Biological and Aquatic Resources Technical Report* (Authority 2019a) evaluated the location and extent of aquatic resources in the aquatic resources RSA that included a 250-foot buffer around the project footprint known at the time. As part of this evaluation, field surveys were conducted in 2015 to delineate aquatic features within the aquatic resources RSA. The CCNM Design Option and the Refined CCNM Design Option were finalized after the *Aquatic Resources Delineation Report* and the *Bakersfield to Palmdale Project Section Biological and Aquatic Resources Technical Report* were completed. Although a portion of the CCNM Design Options falls in areas studied and mapped in these reports, not all areas were evaluated previously. Due to lack of access to parcels in the CCNM Design Option and the Refined CCNM Design Option's portion of the aquatic resource study area, a conventional field approach to delineating wetlands and waters was not feasible, and a map review was conducted on the areas outside the original aquatic resources RSA.

Aquatic resources within the aquatic resources RSA include 256.3 acres of wetlands; claypan features and other ponding in developed desert areas; ephemeral, intermittent, and perennial streams; desert washes; canals; ditches; retention/detention basins and instream impoundments; and riparian areas. Recent approved jurisdictional determinations have been issued by the USACE in the watersheds within the aquatic resources RSA. The USACE determined that although many features in these areas meet the federal technical criteria that define wetlands and other waters, these features are not jurisdictional under the CWA due to isolation. Because the waterbodies identified in the aquatic resources RSA are all isolated, USACE has confirmed that it will not assert jurisdiction under Section 404 of the CWA over any areas that would be delineated as wetlands or waters of the U.S., per the USACE letter dated December 11, 2017, and the approved jurisdictional determination from USACE. The CCNM Design Option and the Refined CCNM Design Option were analyzed after the approved jurisdictional determination; however, because waters in the CCNM Design Option and the Refined CCNM Design Option's area adjoin or flow into waters determined to be isolated in the USACE's approved jurisdictional determination, these additional waters are also presumed isolated. It is anticipated that resources within the CCNM Design Option and the Refined CCNM Design Option Aquatic Study Area would not be subject to CWA regulation or U.S. Environmental Protection Agency/USACE jurisdiction under Clean Water Act Section 404.

3.8.5.6 Surface Water Quality

Existing Surface Water Quality

South Valley Floor and Grapevine Watershed

Surface water quality in the South Valley Floor Watershed is strongly influenced by agriculture. Between November and January, fields are sprayed with pesticides that can be conveyed to water bodies through stormwater runoff and agricultural return flows. Pesticides have been detected in South Valley Floor waterbodies that are known to be associated with agricultural operations. In addition, molybdenum and copper are metals that are also used in pesticides and could be used within the watershed.

Elevated levels of arsenic, boron, cadmium, copper, iron, lead, manganese, molybdenum, selenium, and zinc have been detected at multiple locations within the South Valley Floor Watershed. These metals are all naturally occurring and are partially mobilized and concentrated by irrigated agriculture.

In contrast to the South Valley Floor Watershed, there is little to no irrigated agriculture in the Grapevine Watershed and, therefore, few if any agricultural contaminants. The creeks of this watershed are dominated by flashy seasonal flows that contain high levels of sediments for short periods of time, along with the possibility of naturally occurring heavy metals due in part to settled solids in the first few layers of soil from grazing and fires. In mountainous areas, runoff may contain salt and other de-icing chemicals used on roads and parking lots during the winter.

The Kings, Kaweah, Tule, and Kern Rivers, which drain the west face of the Sierra Nevada, are of excellent quality and provide the bulk of the surface water supply native to the Basin.

Buena Vista Lake and Tulare Lake, natural depressions on the valley floor, receive flood water from the major rivers during times of heavy runoff. During extremely heavy runoff, flood flows in the Kings River reach the San Joaquin River as surface outflow through the Fresno Slough. These flood flows represent the only substantial outflows from the Basin.

Besides the main rivers, the basin also contains numerous mountain streams. These streams have been administratively divided into east side streams and west side streams using SR 58 from Bakersfield to Tehachapi. Streams from the Tehachapi and San Emigdio Mountains are grouped with west side streams. In contrast to east side streams, which are fed by Sierra snowmelt and springs from granitic bedrock, west side streams derive from marine sediments and are highly mineralized and intermittent, with sustained flows only after extended wet periods.

Antelope-Fremont Valleys Watershed

Stormwater flow from the mountain areas to the Antelope-Fremont Valleys Watershed traverses highly erodible soils, which can result in significant transport of sediments. On the Antelope-Fremont Valleys Watershed floor, natural drainage channels are poorly defined, and runoff is almost entirely sheet flow. In and near urban areas, such as Lancaster and Palmdale, this sheet flow entrains contaminants as it flows over urban surfaces. The end result is that pollutants, including lead, zinc, copper, arsenic, chromium, cadmium, nickel, cyanide, and asbestos, are found in stormwater runoff.

Stormwater quality in the Lancaster-Palmdale area varies with time. Pollutants accumulate on pavement during dry periods and then are flushed into surface waters in high concentrations by the first significant rainstorm. Urban runoff from later storms may have lower pollutant concentrations. Desert flash floods and summer thunderstorms can also result in high-sediment loads in stormwater.

Surface Water Beneficial Uses

The Central Valley and Lahontan RWQCBs' designated beneficial uses for surface waters within the RSA are identified in Table 3.8-6.

Table 3.8-6 Surface Water Beneficial Uses in the Tulare Lake Basin and Lahontan Region

Waterbody	Basin Plan Beneficial Uses[1]																		303(d) Listed Pollutants[2]
	AGR	BIOL	COLD	COMM	FLD	FRSH	GWR	IND	MUN	NAV	RARE	REC-1	REC-2	PRO	SAL	WARM	WILD	WQE	
Valley floor waters in the Tulare Lake Basin	X						X	X			X	X	X	X		X	X		None
East-side streams in the Tulare Lake Basin[3]	X		X				X		X			X	X			X	X		None
Proctor Dry Lake (south of SR 58)	X						X		X			X	X			X	X		None
Springs south of Proctor Lake	X						X		X			X	X			X	X		None
Tehachapi Willow Springs Road wetlands					X		X		X			X	X				X	X	None
Oak Creek Canyon wetlands	X				X		X		X			X	X			X	X	X	None
Seep south of Cameron Canyon	X						X		X			X	X			X	X		None
Spring west of Cameron Canyon Road	X						X		X			X	X			X	X		None
Minor surface waters in Fremont HA	X			X			X		X			X	X			X	X		None
Minor wetlands in the Fremont HA	X				X	X	X		X			X	X			X	X	X	None
Minor surface waters in East Tehachapi HA	X						X		X	X		X	X			X	X		None
Minor wetlands in East Tehachapi HA	X				X	X	X		X			X	X			X	X	X	None
Oak Creek	X			X		X	X		X			X	X			X	X		None
Minor surface waters in Antelope HU	X		X	X			X		X			X	X			X	X		None
Minor wetlands in Antelope HU	X				X	X	X		X			X	X			X	X	X	None
Minor surface waters in Willow Springs HA	X						X		X			X	X			X	X		None
Minor wetlands in Willow Springs HA	X				X	X	X		X			X	X			X	X	X	None
Amargosa Creek below LACSD discharge	X					X	X						X			X	X		None
Piute Ponds	X	X				X	X				X		X			X	X		None

Waterbody	Basin Plan Beneficial Uses[1]																		303(d) Listed Pollutants[2]
	AGR	BIOL	COLD	COMM	FLD	FRSH	GWR	IND	MUN	NAV	RARE	REC-1	REC-2	PRO	SAL	WARM	WILD	WQE	
Piute Ponds wetlands	X	X			X	X	X				X		X			X	X	X	None
Rosamond Dry Lake[4]							X						X		X	X	X		None
Minor surface waters in Lancaster HA	X						X		X			X	X			X	X		None
Minor wetlands in Lancaster HA	X				X	X	X		X			X	X			X	X	X	None

Sources: Central Valley Regional Water Quality Control Board, 2015; State Water Resources Control Board, 2015b

[1] Surface water beneficial uses identified in the *Water Quality Control Plan for the Tulare Lake Basin*, Central Valley RWQCB, 2015; and *Water Quality Control Plan for the Lahontan Region*, Lahontan RWQCB, 2015b.

[2] 2012 Integrated Report (CWA Section 303(d) List/305(b) Report), SWRCB 2015a.

[3] East-side streams in the Tulare Lake Basin include Caliente Creek, Tehachapi Creek, and their tributaries.

[4] The SAL use does not apply to tributaries of Rosamond Dry Lake.

AGR = agricultural supply
BIOL = preservation of biological habitats of special significance
COLD = cold freshwater habitat
COMM = commercial and sport fishing
CWA = Clean Water Act
FLD = flood peak attenuation/flood storage
FRSH = freshwater replenishment
GWR = groundwater recharge
HA = hydrologic area
HU = hydrologic unit
IND = industrial service supply
LACSD = Sanitation Districts of Los Angeles County
MUN = municipal and domestic supply
NAV = navigation
PRO = industrial process supply
RARE = rare, threatened, or endangered species
RWQCB = Regional Water Quality Control Board
SAL = inland saline water habitat
SR = State Route
SWRCB = State Water Resources Control Board
REC-1 = water contact recreation
REC-2 = noncontact water recreation
WARM = warm freshwater habitat
WILD = wildlife habitat
WQE = water quality enhancement

Surface Water Quality Objectives

As required by the Porter-Cologne Act, the Central Valley and Lahontan RWQCBs developed water quality objectives for waters within their jurisdictions to protect the beneficial uses of those waters. These objectives are published in the Basin Plans. The Basin Plans also establish implementation programs to achieve these water quality objectives and require monitoring to evaluate the effectiveness of these programs. Water quality objectives must comply with the state antidegradation policy (State Board Resolution No. 68-16), which is designed to maintain high-quality waters while allowing some flexibility if beneficial uses are not unreasonably affected.

Surface water quality objectives for all inland waters in the Tulare Lake Basin and Lahontan region, as documented in the Basin Plans, are listed in Table 3.8-7 and Table 3.8-8, respectively. There are no site-specific surface water quality objectives for surface receiving waters in the Tulare Lake Basin or South Lahontan Basin within the RSA.

Table 3.8-7 Surface Water Quality Objectives for All Surface Waters in the Tulare Lake Basin

Constituent	Concentration
Ammonia	Waters shall not contain un-ionized ammonia in amounts that adversely affect beneficial uses. In no case shall the discharge of wastes cause concentrations of un-ionized ammonia to exceed 0.025 mg/L in receiving waters.
Bacteria, Coliform	For waters designated REC-1, the fecal coliform concentration based on a minimum of no fewer than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml nor shall more than 10 percent of the total number of samples taken during any 30-day period exceed 400/100 ml.
Biostimulatory Substances	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths that cause nuisance or adversely affect beneficial uses.
Chemical Constituents	Waters shall not contain concentrations of chemical constituents in amounts that adversely affect beneficial uses. For waters designated MUN, chemical constituents shall not exceed the drinking water standards in Cal. Code Regs. Title 22. Additionally, chemical constituents shall not contain lead in excess of 0.015 mg/L.
Color	Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.
Dissolved Oxygen	Waste discharges shall not cause the monthly median dissolved oxygen concentrations in the main water mass of streams and above the thermocline in lakes to fall below 85 percent of saturation concentration, or the 95th percentile concentration to fall below 75 percent saturation concentration. For waters designated WARM, the dissolved oxygen concentration shall not exceed 5.0 mg/L. For waters designated COLD or SPWN, the dissolved oxygen concentration shall not exceed 7.0 mg/L.
Floating Materials	Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.
Oil and Grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water, or on objects in the water, that causes nuisance or otherwise adversely affects beneficial uses.
Pesticides	Waters shall not contain pesticides in concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations in bottom sediments or aquatic life that adversely affects beneficial uses. For waters designated MUN, pesticide or herbicide constituents shall not exceed the drinking water standards in Cal. Code Regs. Title 22. For waters designated COLD, total identifiable chlorinated hydrocarbon pesticides shall not be present at concentrations detectable within the accuracy of analytical methods prescribed in *Standard Methods for the Examination of Water and Wastewater, 18th Edition,* or equivalent methods.
pH	The pH of water shall not be depressed below 6.5, raised above 8.3, or changed at any time more than 0.3 unit from the normal ambient pH.
Radioactivity	Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life. For waters designated MUN, radionuclide concentrations shall not exceed the drinking water standards in Cal. Code Regs. Title 22.
Salinity	Waters shall be maintained as close to natural concentrations of dissolved matter as is reasonable considering careful use of the water resources. Tables III-2 and III-3 in the *Water Quality Control Plan for the Tulare Lake Basin* identify objectives for electrical conductivity per waterbody and streamflow station.

Constituent	Concentration
Sediment	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
Settleable Materials	Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or that adversely affects beneficial uses.
Suspended Materials	Waters shall not contain suspended materials in concentrations that cause nuisance or that adversely affect beneficial uses.
Taste and Odor	Waters shall not contain taste- or odor-producing substances in concentrations that cause nuisance, adversely affect beneficial uses, or impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or to domestic or municipal water supplies.
Temperature	The natural temperature of waters shall not be altered unless it can be demonstrated that such an alteration in temperature does not adversely affect beneficial uses. For waters designated WARM and COLD, water temperature shall not be altered by more than 5°F above or below the natural receiving water temperature.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in, human, plant, animal, or aquatic life.
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity shall not exceed the following limits: ▪ Where natural turbidity is between 0 and 5 NTU, increases shall not exceed 1 NTU. ▪ Where natural turbidity is between 5 and 50 NTU, increases shall not exceed 20 percent. ▪ Where natural turbidity is equal to or between 50 and 100 NTU, increases shall not exceed 10 NTU. ▪ Where natural turbidity is greater than 100 NTU, increases shall not exceed 10 percent.

Source: California High-Speed Rail Authority, 2018
°F = degrees Fahrenheit
Cal. Code Regs. = California Code of Regulations
COLD = cold freshwater habitat
mg/L = milligrams per liter
ml = milliliter
MUN = municipal and domestic supply
NTU = Nephelometric Turbidity Unit(s)
pH = percentage of hydrogen (acidity level)
REC-1=water contact recreation
SPWN = spawning, reproduction, and development
WARM = warm freshwater habitat

Table 3.8-8 Surface Water Quality Objectives for All Surface Waters in the Lahontan Region

Constituent	Concentration
Ammonia	Varies based on temperature, pH, and beneficial use designation. Refer to Tables 3-19a and 3-19b in the *Water Quality Control Plan for the Lahontan Region* for ammonia concentrations in waters within the Antelope HU, including Amargosa Creek, the Piute Ponds, and associated wetlands. Additionally, the highest 4-day average concentration of total ammonia within the 30-day period shall not exceed 2.5 times the chronic toxicity limit.
Bacteria, Coliform	Waters shall not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock wastes. The fecal coliform concentration during any 30-day period shall not exceed a log mean of 20/100 ml, nor shall more than 10 percent of all samples collected during any 30-day period exceed 40/100 ml.
Biostimulatory Substances	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths that cause nuisance or adversely affect beneficial uses.

Constituent	Concentration
Chemical Constituents	Waters shall not contain concentrations of chemical constituents in amounts that adversely affect beneficial uses. For waters designated MUN, chemical constituents shall not exceed the drinking water standards in Cal. Code Regs. Title 22. For waters designated AGR, chemical constituents shall not exceed concentrations that adversely affect beneficial uses (i.e., agricultural purposes).
Chlorine, Total Residual	Total chlorine residual shall not exceed either a median value of 0.002 mg/L or a maximum value of 0.003 mg/L. Median values shall be based on daily measurements taken within any six-month period.
Color	Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.
Dissolved Oxygen	Dissolved oxygen shall not be depressed by more than 10 percent saturation, nor shall the minimum dissolved oxygen concentration be less than 80 percent of saturation. For waters designated COLD, the 30-day mean, 7-day mean minimum, and 1-day minimum shall not exceed 6.5, 5.0, and 4.0, respectively. For waters designated WARM, the 30-day mean, 7-day mean minimum, and 1-day minimum shall not exceed 5.5, 4.0, and 3.0, respectively. For waters designated COLD and SPWN, the 7-day mean and 1-day minimum shall not exceed 9.5 and 8.0, respectively. For waters designated WARM and SPWN, the 7-day mean and 1-day minimum shall not exceed 6.0 and 5.0, respectively.
Floating Materials	Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses. For natural high-quality waters, the concentrations of floating material shall not be altered to the extent that such alterations are discernable at the 10 percent significance level.
Oil and Grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water; that cause nuisance; or that otherwise adversely affect beneficial uses. For natural high-quality waters, the concentration of oils, greases, or other film- or coat-generating substances shall not be altered.
Nondegradation of Aquatic Communities and Populations	All wetlands shall be free from substances attributable to wastewater or other discharges that produce adverse physiological responses in humans, animals, or plants, or that lead to the presence of undesirable or nuisance aquatic life. All wetlands shall be free from activities that would substantially impair the biological community as it naturally occurs due to physical, chemical, and hydrologic processes.
Pesticides	Pesticide concentrations, individually or collectively, shall not exceed the lowest detectable levels, using the most recent detection procedures available. There shall not be an increase in pesticide concentrations found in bottom sediments. There shall be no detectable increase in bioaccumulation of pesticides in aquatic life. For waters designated MUN, pesticide or herbicide constituents shall not exceed the drinking water standards in Cal. Code Regs. Title 22.
pH	In fresh waters with designated beneficial uses of COLD or WARM, changes in normal ambient pH levels shall not exceed 0.5 pH units. For all other waters, the pH shall not be depressed below 6.5 or raised above 8.5.
Radioactivity	Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life. For waters designated MUN, radionuclide concentrations shall not exceed the drinking water standards in Cal. Code Regs. Title 22.

Constituent	Concentration
Sediment	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
Settleable Materials	Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or that adversely affects beneficial uses. For natural high-quality waters, the concentration of settleable materials shall not be raised by more than 0.1 ml per liter.
Suspended Materials	Waters shall not contain suspended materials in concentrations that cause nuisance or adversely affect beneficial uses. For natural high-quality waters, the concentration of total suspended materials shall not be altered to the extent that such alterations are discernible at the 10 percent significance level.
Taste and Odor	Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish or other edible products of aquatic origin; that cause nuisance; or that adversely affect beneficial uses. For naturally high-quality waters, the taste and odor shall not be altered.
Temperature	The natural receiving water temperature shall not be altered unless it can be demonstrated that such an alteration in temperature does not adversely affect beneficial uses. ▪ For waters designated WARM, the water temperature shall not be altered by more than 5°F above or below the natural temperature. ▪ For waters designated COLD, the temperature shall not be altered.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in, human, plant, animal, or aquatic life.
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity shall not exceed natural levels by more than 10 percent.

Source: California High-Speed Rail Authority, 2018

°F = degrees Fahrenheit
AGR = agricultural supply
Cal. Code Regs. = California Code of Regulations
COLD = cold freshwater habitat
HU = hydrologic unit
mg/L = milligrams per liter
ml = milliliters
MUN = municipal and domestic supply
pH = percentage of hydrogen (acidity level)
SPWN =spawning, reproduction, and development
WARM = warm freshwater habitat

Water Quality Impairments

The SWRCB developed a list of waterbodies (known as 303(d) water quality-limited waterbodies) that do not meet water quality objectives. The SWRCB approved the 2012 Integrated Report (CWA Section 303(d) List) on April 8, 2015. On July 30, 2015, the U.S. Environmental Protection Agency approved the 2012 California 303(d) List of Water Quality Limited Segments. None of the waterbodies crossed by the RSA are on the Section 303(d) list requiring TMDL limits. A TMDL is developed for constituents on the CWA Section 303(d) List to restore the quality of the waterbody. There are currently no proposed or adopted TMDLs that are applicable to surface waters within the RSA.

3.8.5.7 Floodplains

Existing Federal Emergency Management Agency Designated Flood Zones

FEMA identified special flood hazard areas on FIRMs for all communities that participate in the National Flood Insurance Program, including Kern and Los Angeles Counties. State and local governments use these FIRMs for administering floodplain management programs, enforcing building codes, and mitigating flooding losses. The 100-year floodplain corresponds to FEMA's special flood hazard areas. The special flood hazard areas are the land area covered by the base flood to which the FEMA floodplain management regulations apply. FEMA and the local agencies require that an encroachment into a floodplain not increase the water surface elevation of the base flood (i.e., 100-year flood) by more than 1 foot. Special flood hazard areas in the RSA are depicted in Figure 3.8-3. Special flood hazard areas in the RSA include Flood Zones A, AH, and AO. Additional flood hazard areas include Flood Zones X and D. These flood zones are defined in Table 3.8-9.

Table 3.8-9 Federal Emergency Management Agency Flood Hazard Zone Designations in the Resource Study Area

Zone	Zone Description
A	Areas with a 1 percent annual chance of flooding. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.
AH	Areas with a 1 percent annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream flood hazard areas and areas with a 1 percent or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. Average flood depths derived from detailed analyses are shown within these zones.
X	Areas with a 0.2 percent annual chance of flooding (also known as the 500-year floodplain). Zone X comprises floodplains of lesser hazards, such as areas protected by levees from the 100-year flood, shallow-flooding areas with average depths of less than 1 foot, or drainage areas less than 1 square mile.
D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted.

Source: California High-Speed Rail Authority, 2018

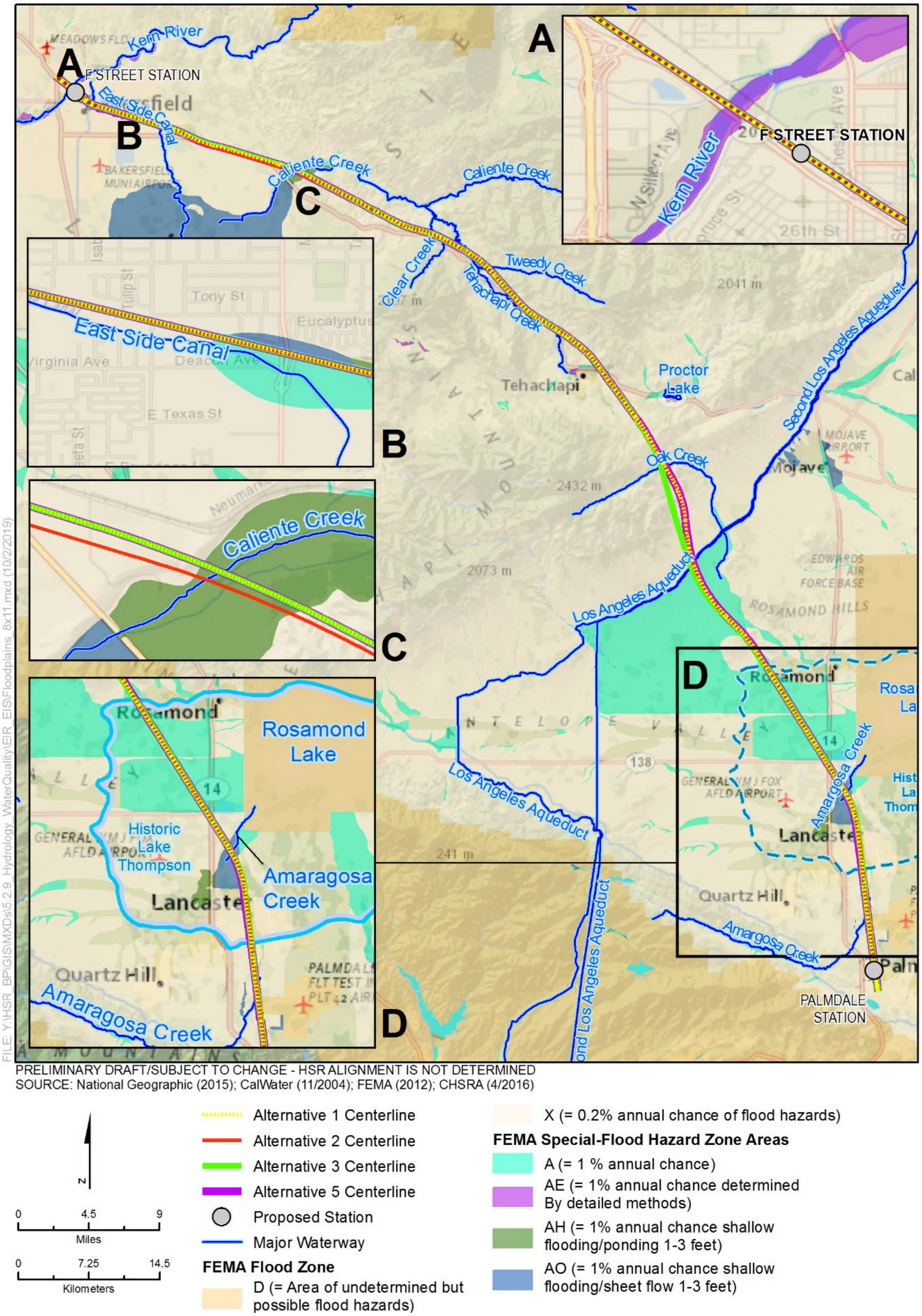


Figure 3.8-3 Floodplains

(Sheet 1 of 2)

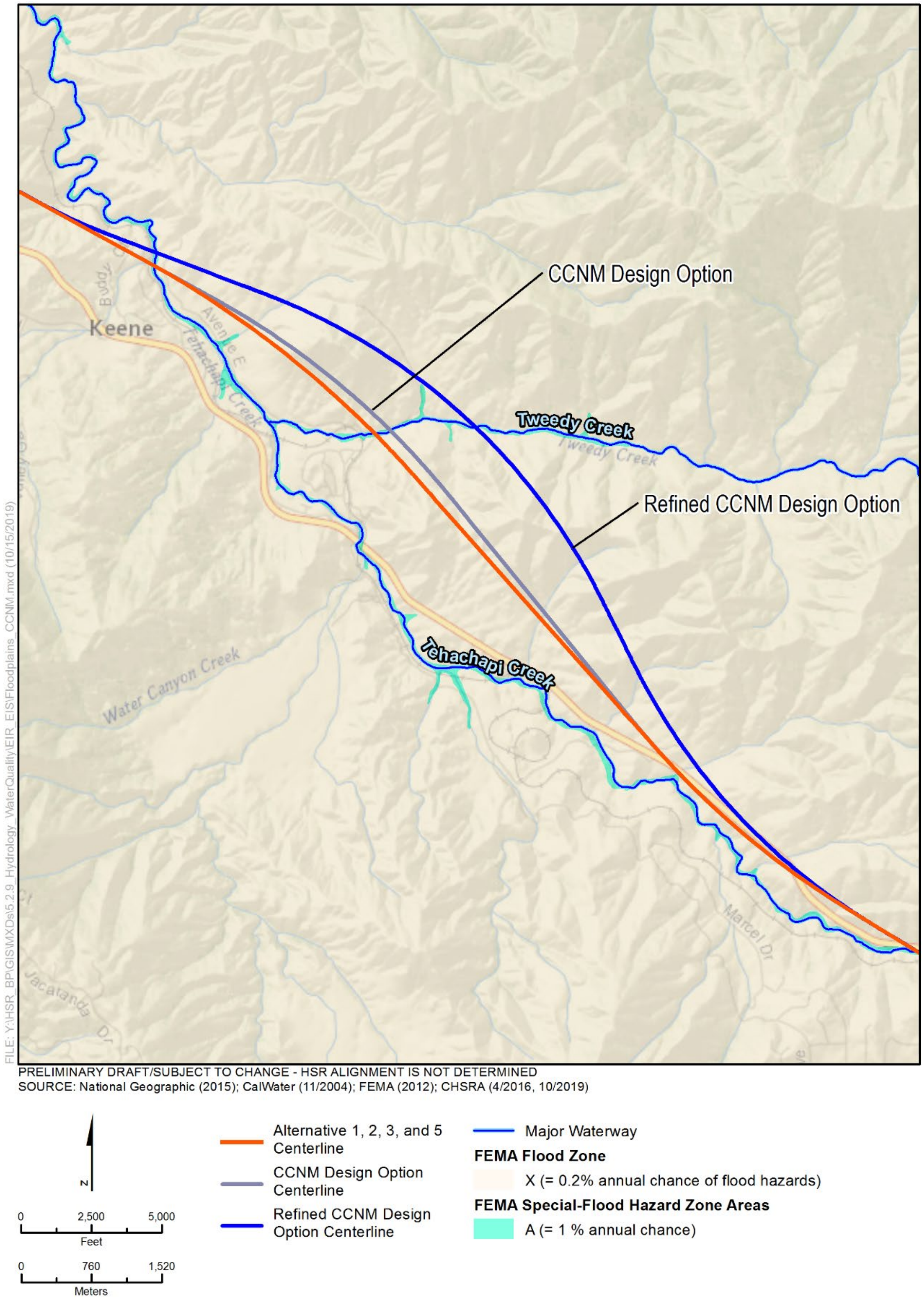


Figure 3.8-3 Floodplains

(Sheet 2 of 2)

Floodplain Functions and Values

Floodplains often provide a suite of functions and values that benefit both human and natural systems. Natural and beneficial floodplain functions and values for floodplains in the RSA include natural moderation of floods; floodwater retention; nutrient cycling, sediment capture, and associated water quality benefits; groundwater recharge; wildlife and plant habitat; wildlife movement; open space; agricultural use; and natural beauty.

Floodways

FEMA defines a floodway as the channel of a stream and any adjacent floodplain area that must be kept free of encroachment so that the 100-year flood can be conveyed without an increase in the base flood elevation. FEMA and the local agencies require that an encroachment into a floodway not increase the base flood level. There are no FEMA-designated floodways in the Bakersfield to Palmdale Project Section.

The CVFPB defines a floodway as the stream channel and that portion of the adjoining floodplain reasonably required to provide for passage of a design flood. The CVFPB further defines a designated floodway as that area between existing levees as adopted by the CVFPB or the state legislature. The floodplain associated with the Kern River in the City of Bakersfield is a CVFPB-designated floodway.

Awareness Flood Zone Areas

DWR also publishes Awareness Floodplain Maps to identify other flood hazard areas. The intent of the DWR Awareness Floodplain Mapping program is to identify all pertinent flood hazard areas by 2015 for areas that are not mapped under the FEMA National Flood Insurance Program and to provide the community and residents an additional tool in understanding potential flood hazards currently not mapped as regulated floodplains. The Awareness Floodplain Maps identify 100-year flood hazard areas by using approximate Zone A assessment procedures. These floodplains depict non-FEMA-approved flood-prone areas without specific flood depths or other flood hazard data. As shown on Figure 3.8-4, the B-P alignment crosses several DWR Awareness Floodplains at several locations that have been geographically grouped together, including adjacent to Caliente Creek, Clear Creek, and Tehachapi Creek, and between Tehachapi Creek and Oak Creek.

3.8.5.8 Groundwater

The RSA crosses through several groundwater basins, including the Kern County Subbasin in the San Joaquin Valley Groundwater Basin, the Tehachapi Valley West Groundwater Basin, the Tehachapi Valley East Groundwater Basin, the Fremont Valley Groundwater Basin, and the Antelope Valley Groundwater Basin (Figure 3.8-5). The groundwater basins in the RSA are discussed in more detail below.

Groundwater levels vary with seasonal rainfall, withdrawal, and recharge. Depth to groundwater in the Kern County Subbasin ranges from approximately 150 to 400 feet. Depth to groundwater in the Tehachapi Valley West Groundwater Basin is between 220 and 300 feet. Depth to groundwater in the Tehachapi Valley East Groundwater Basin is less than 200 feet below ground surface (bgs). Depth to groundwater in the Antelope Valley Basin ranges from approximately 340 feet bgs in the hills to the west of Mojave to approximately 310 feet bgs near 90th Street W, approximately 193 feet bgs near the Willow Springs Motorsports Park and W Rosamond Boulevard, and between 40 to 120 feet bgs between the town of Rosamond and Amargosa Creek. Depth to groundwater increases farther south and is approximately 280 feet bgs near Avenue K and approximately 445 feet bgs between Avenue O and Avenue N (due in part to increased ground elevations).

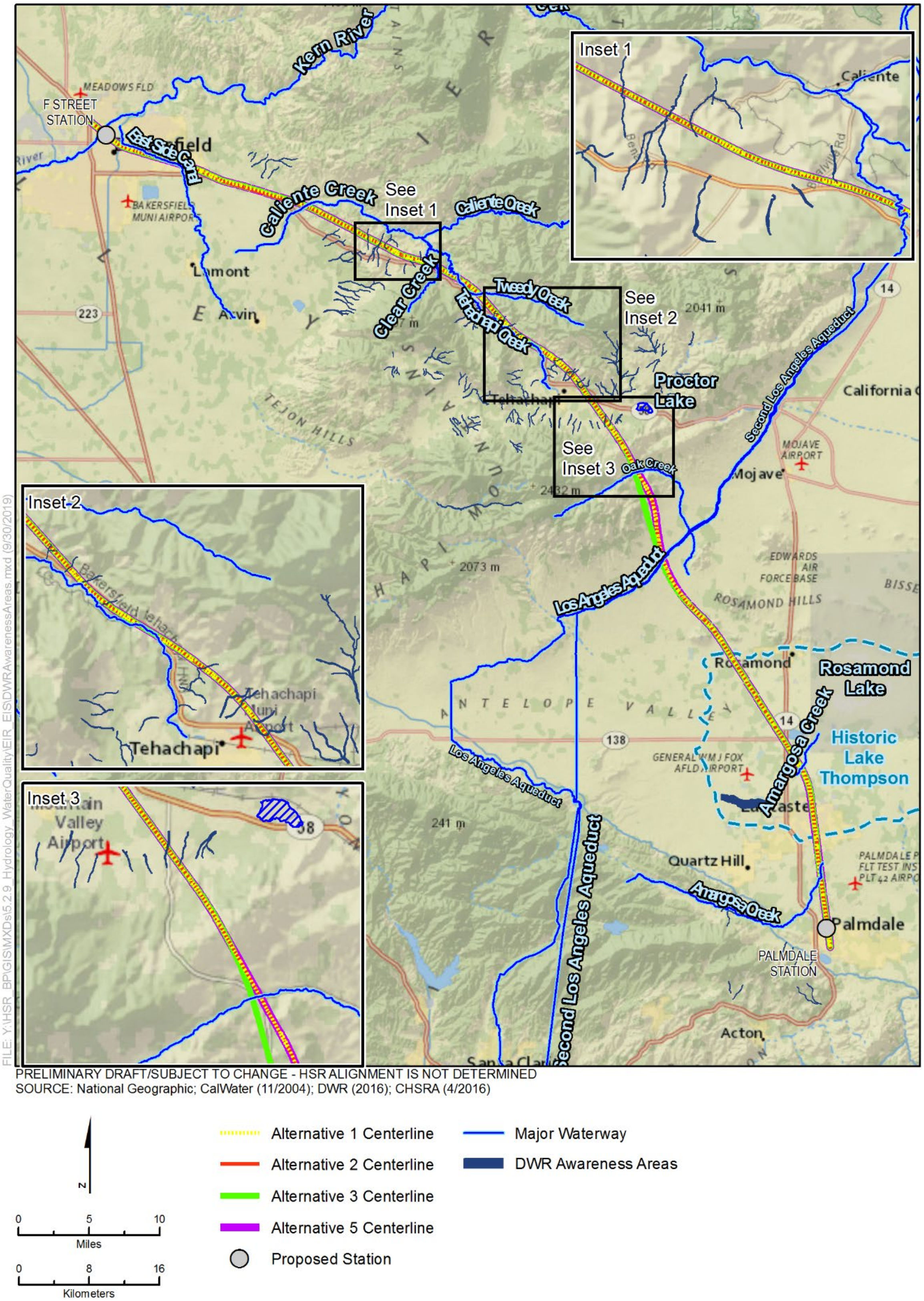


Figure 3.8-4 California Department of Water Resources Awareness Flood Zone Areas

(Sheet 1 of 2)

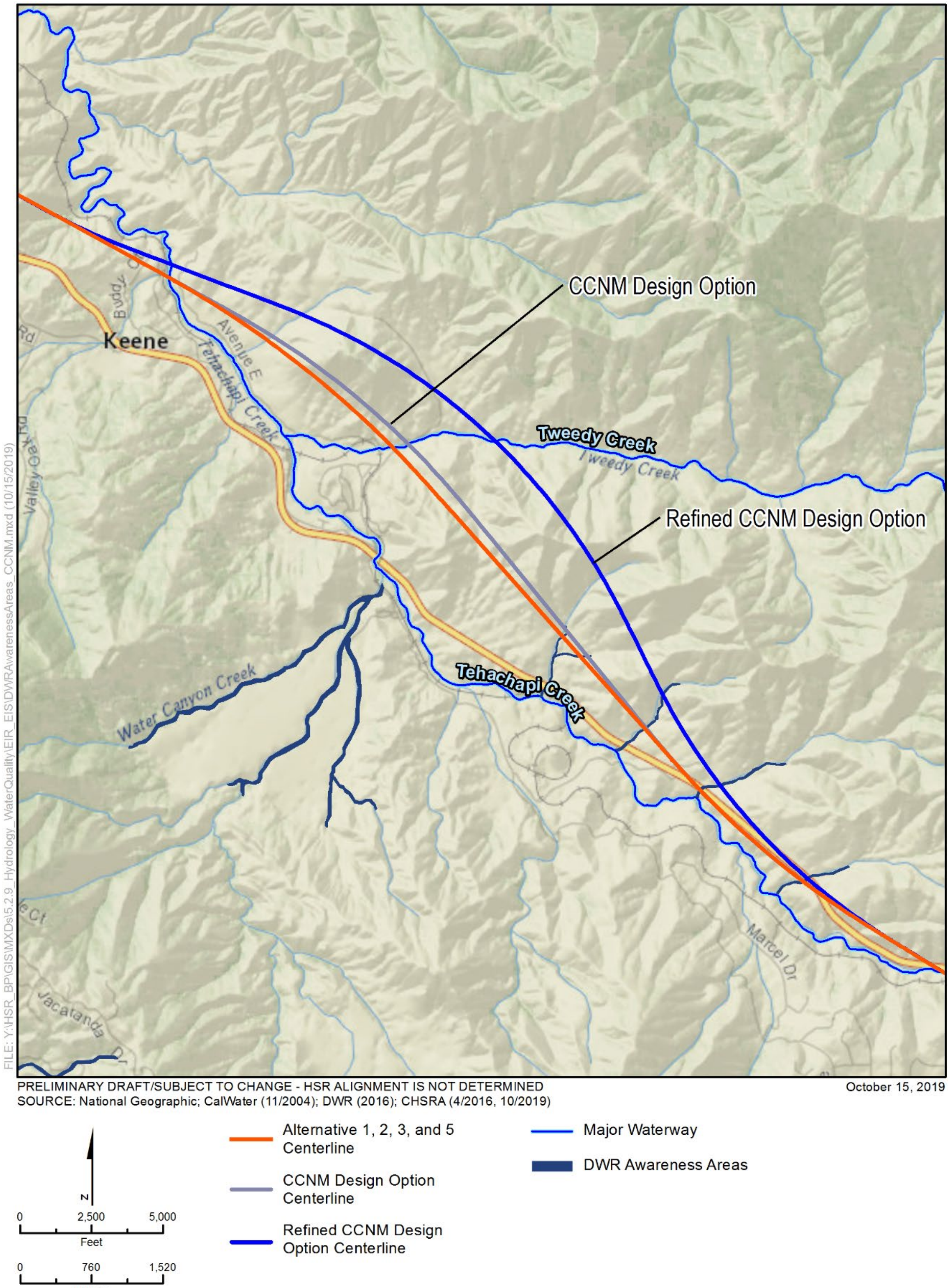
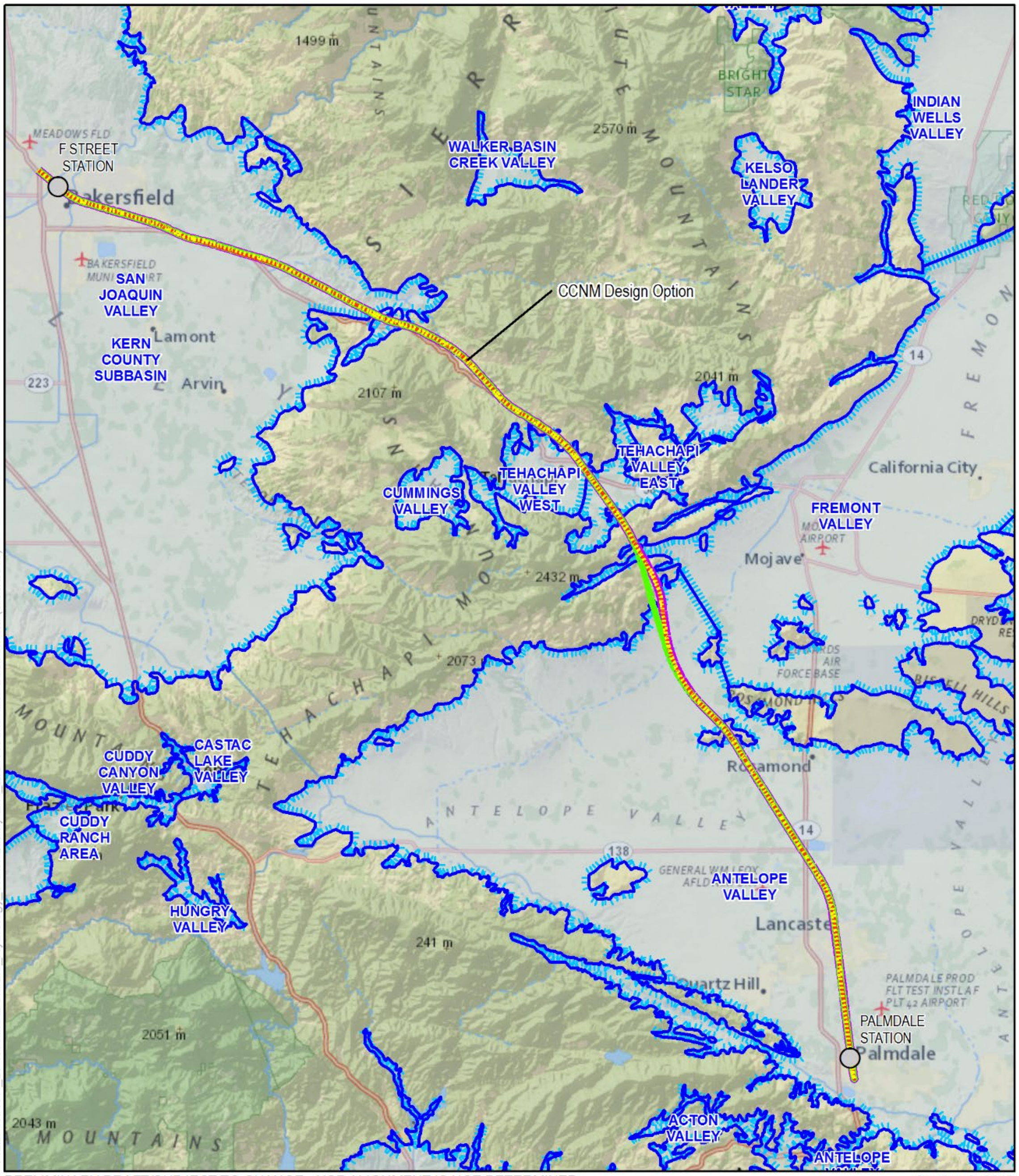


Figure 3.8-4 California Department of Water Resources Awareness Flood Zone Areas

(Sheet 2 of 2)



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: National Geographic (2015); FEMA (2012); CHSRA (4/2016)

October 2, 2019

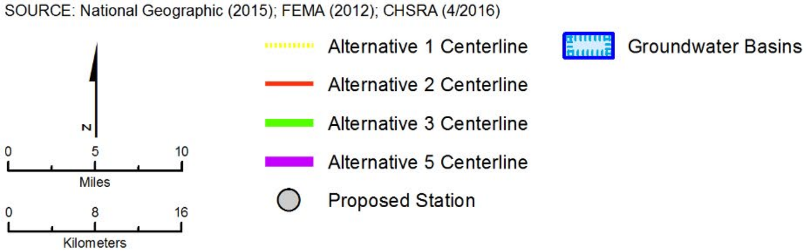


Figure 3.8-5 Groundwater Basins

(Sheet 1 of 2)

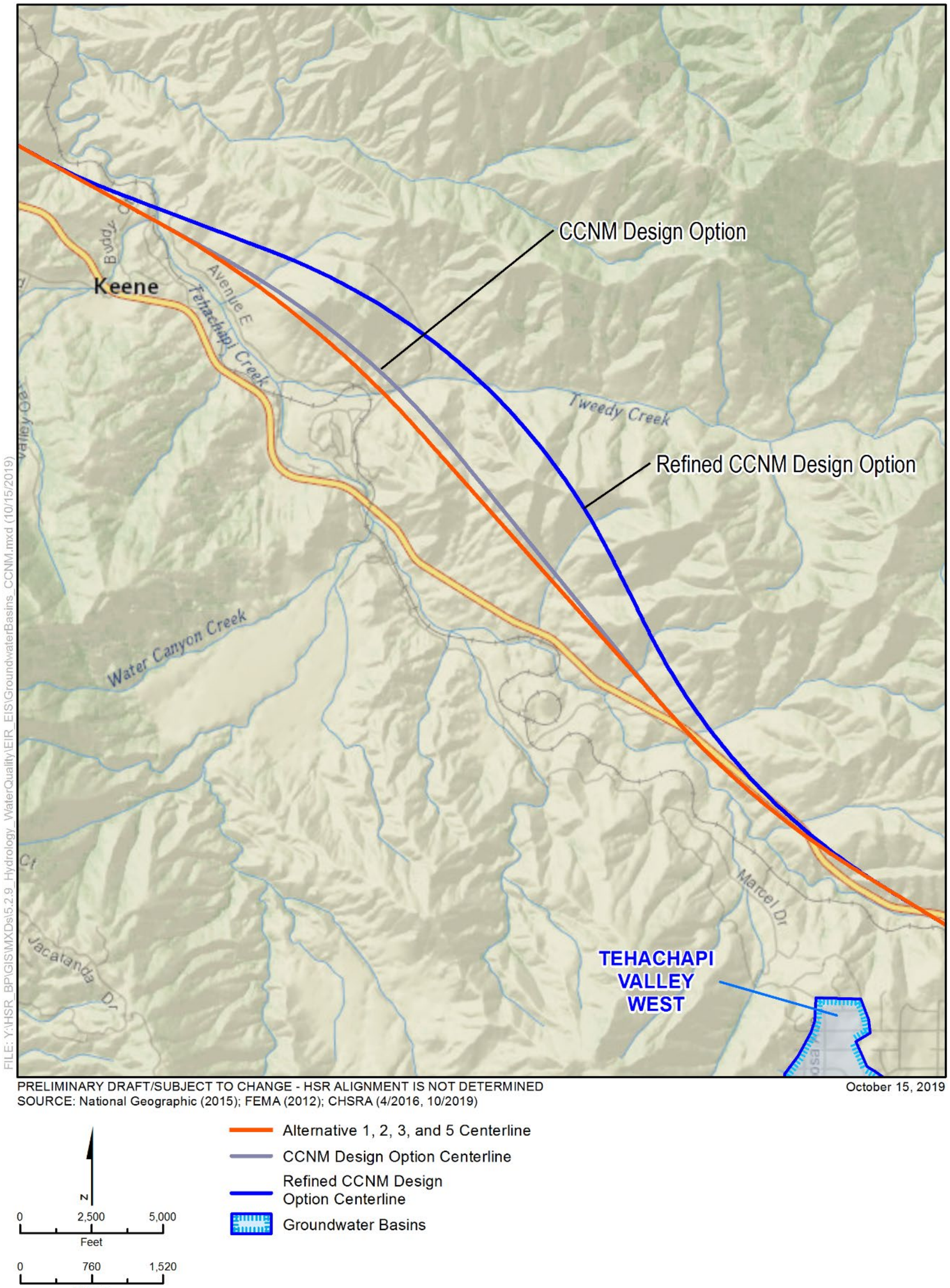


Figure 3.8-5 Groundwater Basins

(Sheet 2 of 2)

Groundwater data sources, including the DWR Water Data library, the SWRCB Groundwater Ambient Monitoring and Assessment Program, GEOTracker, Envirostar, and USGS NWIS, were reviewed for information on groundwater levels in the RSA. Very little reliable data is available on groundwater levels along the alignment, particularly in the Tehachapi Mountains. For most of the alignment, it is anticipated that groundwater levels will be deep. However, there are areas of relatively shallow groundwater, particularly in the Tehachapi Valley groundwater basin.

Existing Groundwater Quality

Kern County Subbasin

Groundwater quality in the Kern County Subbasin is considered to be generally suitable for most urban and agricultural uses, with only local impairments. The primary constituents of concern in the subbasin include high total dissolved solids, nitrate, arsenic, and organic compounds. The high total dissolved solids levels are generally the result of salt concentration from evaporation and poor drainage, as well as dissolution of salts as groundwater moves through marine-derived deposits from the Coast and Temblor Ranges. Nitrates may be naturally occurring or may be due to fertilizers and human or animal wastes. Elevated levels of arsenic have been reported in the Tulare, Kern, and Buena Vista lakebed areas. In addition, the quality of the groundwater in the central and eastern portions of the subbasin is considerably better than the water quality in the western portion. This is most likely due to the pronounced influence of Sierra-Nevada-derived recharge to the subbasin and the movement of the Kern fan area groundwater from east to west. This condition results in a thick layer of fresh groundwater in the eastern Kern County Subbasin.

Tehachapi Valley West Groundwater Basin

Groundwater quality in the Tehachapi Valley West Groundwater Basin is considered to be generally suitable for most urban and agricultural uses, with only local impairments. The primary constituents of concern in the groundwater basin include inorganics, total dissolved solids, and nitrates.

Tehachapi Valley East Groundwater Basin

Groundwater quality in the Tehachapi Valley East Groundwater Basin is considered to be generally suitable for most urban and agricultural uses, with only local impairments. The primary constituents of concern in the groundwater basin include inorganics, total dissolved solids, and nitrates.

Fremont Valley Groundwater Basin

Groundwater in parts of the Fremont Valley Groundwater Basin has high concentrations of fluoride and sodium. Groundwater near Koehn Lake is characterized by high sodium and chloride concentrations. The primary constituents of concern in the groundwater basin include total dissolved soils, chloride, sodium, and fluoride.

Antelope Valley Groundwater Basin

Because the Antelope Valley groundwater basin is an undrained, closed basin that has no outlet for water to flow to the ocean, minerals or chemicals that may be present in the water typically accumulate in the basin. Currently, groundwater quality is considered to be excellent within the principal aquifer but decreases in quality toward the northern portion of the dry lake areas. Some portions of the basin contain groundwater with high fluoride, boron, total dissolved solids, nitrates, and arsenic concentrations. The high levels of nitrates and total dissolved solids in portions of the basin are due to agricultural fertilization practices and the discharge of treated wastewater from the Palmdale Wastewater Treatment Plant located to the east of the RSA. The Sanitation Districts of Los Angeles County owns and operates the Palmdale Wastewater Treatment Plant and has implemented actions to address these concerns and to minimize any impacts from treated wastewater, including treatment upgrades, a change in effluent management practices, the implementation of a recycled water distribution system, and performance of groundwater remediation activities near the plant site.

Groundwater Beneficial Uses

As mentioned above, the Basin Plans designate beneficial uses for groundwater resources, prescribe groundwater quality objectives to protect those uses, and set forth policies to guide the implementation of programs to attain the objectives. The beneficial uses for the groundwater in the basins that underlie the RSA are summarized in Table 3.8-10.

Table 3.8-10 Groundwater Beneficial Uses for the Tulare Lake Basin and the Lahontan Region

Groundwater Basin	Beneficial Uses						
	MUN	AGR	IND	PROC	REC-1	REC-2	WILD
Kern County Subbasin[1]	X	X	X	X	X	X	X
Tehachapi Valley West	X	X	X		X	X	X
Tehachapi Valley East	X	X	X	X			
Fremont Valley	X	X	X	X			
Antelope Valley	X	X	X	X			

Source: California High-Speed Rail Authority, 2018

[1] Groundwater in the Etchegoin Formation within the subbasin is not suitable or potentially suitable for municipal or domestic supply. However, groundwater to a depth of 3,000 feet below ground surface retains the MUN beneficial use.

AGR = agricultural supply
IND = industrial service supply
MUN = municipal supply
PROC = industrial process supply
REC-1 = water contact recreation
REC-2 = noncontact water recreation
WILD = wildlife habitat

Groundwater Quality Objectives

Water quality objectives for all groundwater basins in the Tulare Lake Basin and the Lahontan Region, as documented in the Basin Plans, are provided in Table 3.8-11 and Table 3.8-12, respectively.

Table 3.8-11 General Groundwater Objectives for the Tulare Lake Basin

Constituent	Concentration
Bacteria, Coliform	For groundwaters designated MUN, the median concentration of coliform organisms over any 7-day period shall be less than 2.2/100 ml.
Chemical Constituents	Groundwaters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. For groundwaters designated MUN, chemical constituents shall not exceed the drinking water standards in Cal. Code Regs. Title 22.
Pesticides	No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. For groundwaters designated MUN, pesticides shall not exceed the drinking water standards in Cal. Code Regs. Title 22.
Radioactivity	Radionuclides shall not be present in groundwaters in concentrations that are deleterious to human, plant, animal, or aquatic life, or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.
Salinity	All groundwaters shall be maintained as close to natural concentrations of dissolved matter as is reasonable considering careful use and management of water resources. The maximum average annual increase in salinity measured as electrical conductivity for the Kern River Hydrologic Unit Groundwater Basin shall not exceed 5 µmhos/cm.
Taste and Odor	Groundwaters shall not contain taste- or odor-producing substances in concentrations that cause nuisance or that adversely affect beneficial uses.

Constituent	Concentration
Toxicity	Groundwaters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life associated with designated beneficial uses.

Source: California High-Speed Rail Authority, 2018
µmhos/cm = micromhos per centimeter
Cal. Code Regs. = California Code of Regulations
ml = milliliters
MUN = municipal supply

Table 3.8-12 General Groundwater Objectives for the Lahontan Region

Constituent	Concentration
Bacteria, Coliform	For groundwaters designated MUN, the median concentration of coliform organisms over any 7-day period shall be less than 1.1/100 ml.
Chemical Constituents	For groundwaters designated MUN, chemical constituents shall not exceed the drinking water standards in Cal. Code Regs. Title 22. Groundwaters designated AGR shall not contain concentrations of chemical constituents that adversely affect the water for beneficial uses. Groundwaters shall not contain concentrations of chemical constituents that adversely affect the water for beneficial uses.
Radioactivity	For groundwaters designated MUN, radionuclide concentrations shall not exceed the drinking water standards in Cal. Code Regs. Title 22.
Taste and Odor	Groundwaters shall not contain taste- or odor-producing substances in concentrations that cause nuisance or that adversely affect beneficial uses. For groundwaters designated MUN, odor-producing substances shall not exceed the drinking water standards in Cal. Code Regs. Title 22.

Source: California High-Speed Rail Authority, 2018
AGR = agricultural supply
Cal. Code Regs. = California Code of Regulations
ml = milliliters
MUN = municipal and domestic supply

There are no site-specific groundwater quality objectives for the groundwater basins in the Tulare Lake Basin or South Lahontan Basin within the RSA.

3.8.5.9 Fresno to Bakersfield Locally Generated Alternative from the Intersection of 34th Street and L Street to Oswell Street

This section describes the study area for the hydrology and water resources analysis of the portion of the Fresno to Bakersfield Locally Generated Alternative (F-B LGA) alignment from the intersection of 34th Street and L Street to Oswell Street, as described in the *Fresno to Bakersfield Section Draft Supplemental EIR/EIS* (Authority and FRA 2017) and *Fresno to Bakersfield Section Final Supplemental EIR* (Authority 2018b). The RSA for hydrology and water resources is within the South Valley Floor in the Tulare Lake Basin.

The portion of the F-B LGA from the intersection of 34th Street/L Street to Oswell Street is elevated over the Kern Island Canal and parallels the East Side Canal (the two nearest surface water features). This portion of the F-B LGA is within the boundaries of Kern County Water Agency Improvement District No. 4 and the California Water Services Company district, which both receive water from the Kern River, water from the State Water Project, and groundwater. For more hydrology and water resource information for the study area, refer to Section 3.8.3.2 of the *Fresno to Bakersfield Section Draft Supplemental EIR/EIS* (Authority and FRA 2017).

3.8.5.10 High-Speed Rail Stations

The Bakersfield Station—F-B LGA subsection is in the City of Bakersfield, within the South Valley Floor Watershed. The subsection crosses the following waterbodies: Cross Valley Canal, Calloway Canal, Kern River, Stine Canal, Kern Island Canal, and East Side Canal. The Bakersfield Station—F-B LGA subsection is entirely within the Kern County Subbasin of the San

Joaquin Valley Groundwater Basin. In addition, the Bakersfield Station—F-B LGA subsection crosses through the Kern River Floodplain, which is designated as a Zone AE flood hazard area and a CVFPB-designated floodway.

The Palmdale Station subsection is in the City of Palmdale, within the Antelope Valley Watershed. The Palmdale Station subsection crosses the following waterbodies: Amargosa Creek, Palmdale Playa, Palmdale “A” Canal/Ditch, Palmdale “B” Stream, and Palmdale “C” Canal/Ditch. The Palmdale Station subsection is entirely within the Antelope Valley Groundwater Basin. In addition, the Palmdale Station subsection crosses a Zone AO floodplain associated with Anaverde Creek and an unnamed intermittent stream identified as Palmdale “B” Stream. This Zone AO floodplain has average flood depths of 1 foot and is usually sheet flow on sloping terrain.

3.8.6 Environmental Consequences

3.8.6.1 Overview

This section evaluates how the No Project Alternative and the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) could affect hydrology and water resources. The impacts of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) are described and organized as follows:

- Impact HWR #1: Temporary Construction Impacts to Floodplains and Floodways
- Impact HWR #2: Temporary Construction Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity
- Impact HWR #3: Temporary Construction Impacts to Surface Water Quality
- Impact HWR #4: Temporary Construction Impacts to Groundwater Volume, Quality and Recharge
- Impact HWR #5: Permanent Operation Impacts to Floodplains and Floodways
- Impact HWR #6: Permanent Operation Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity
- Impact HWR #7: Permanent Operation Impacts to Surface Water Quality
- Impact HWR #8: Permanent Operation Impacts to Groundwater Volume, Quality and Recharge

The Bakersfield to Palmdale Project Section would pass through Kern and Los Angeles Counties. The alternative alignments would cross several creeks and streams, as well as 110 unnamed ephemeral streams and desert washes. The track would be on elevated structures/viaducts, through tunnels or trenches, at-grade, on embankments, in open-cut sections, or on retained fill. The exact track elevations and types of support would depend on railroad grade during final design.

The B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) have the potential to affect existing floodplains, surface waters, and groundwater basins, although impacts would be minimized through project design. The impacts of the project related to hydrology and water resources are similar for all of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option). Therefore, for the purposes of this analysis, the impacts would be the same for each B-P Build Alternative. The impacts of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) and No Project Alternative are evaluated below.

3.8.6.2 No Project Alternative

Kern and Los Angeles Counties’ populations are projected to continue to grow, and the land development needed to serve the populations would increase, as would traffic. The effects of the current built environment on hydrology and water resources would continue, including effects from continued operation of existing highways, airports, and railways. Planned and programmed transportation improvements that are constructed and become operational by 2040 under the No Project Alternative would add to the effects on hydrology and water quality. Impacts on hydrologic and water resources, such as increased runoff from additional paved surfaces causing additional pollutant loading and erosion, could result from nonproject transportation improvements under the No Project Alternative. In addition, the demand for domestic water supply would increase and agricultural demand would decrease as a result of increased population and a reduction in irrigated acreage. Net water demand is generally predicted to decrease; however, aquifers could continue to experience drawdown effects if groundwater withdrawals exceed recharge rates. However, these changes would occur whether or not the HSR project is constructed.

Under the No Project Alternative, the Bakersfield to Palmdale Project Section would not be built. Therefore, the No Project Alternative would not result in any short-term water quality impacts from construction-related activities or long-term water quality impacts from operational activities associated with the project. However, higher vehicle miles traveled are expected under the No Project Alternative because the HSR system would not be constructed. This increased vehicle activity could degrade water quality because of increased pollutants in stormwater from roadways. A consequence of the No Project Alternative would be that the project vicinity would not include the higher-density, transit-oriented development around proposed HSR stations, and the continuation of low-density development would be likely to occur on the urban fringe rather than in the urban centers. This development would result in an increase in impervious area and an associated increase in stormwater runoff in the urban fringe. However, stormwater facilities associated with urban fringe development would reduce potential hydrology and water quality impacts on receiving waters.

3.8.6.3 Bakersfield to Palmdale Project Section Build Alternatives

This section evaluates construction- and operation-related impacts on hydrology and water resources, including impacts on floodplains, hydraulics, surface waters, and groundwater from implementation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) pursuant to NEPA and CEQA. Analysis of the stations and maintenance facilities, which are discussed separately in Section 3.8.6.5, Station Sites, and Section 3.8.6.6, Maintenance Facilities, respectively. Impacts are assessed after consideration of the following IAMFs, but before consideration of the project mitigation measures identified in Section 3.8.7.

The impacts of the B-P Build Alternatives related to hydrology and water resources are similar for all of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option). Therefore, the impacts discussed below would be the same for each B-P Build Alternative (including the CCNM Design Option and the Refined CCNM Design Option), unless specifically noted otherwise.

Construction Impacts

Impact HWR #1: Temporary Construction Impacts to Floodplains and Floodways

As discussed previously, floodplains are defined as FEMA-designated flood hazard areas. FEMA requires that an encroachment into a floodplain not increase the water surface elevation of the base flood (i.e. 100-year flood) by more than 1 foot. Project impacts on floodplains are discussed further below. A floodway is defined as the channel of a stream and any adjacent floodplain area that must be kept free of encroachment so that the 100-year flood can be conveyed without an increase in the base flood elevation. No FEMA-designated floodways would be impacted by the B-P Build Alternatives; therefore, the FEMA and local agency “no net rise” requirements for encroachments within a floodway are not applicable to the B-P Build Alternatives and impacts on floodways are not discussed further.

FEMA-designated 100-year floodplains have been identified throughout the RSA. Redirecting or impeding flood flows has the potential to increase flood elevations, redefine flood hazard areas, and cause flooding in areas previously not at risk from the 100-year flood. Redirected flood flows also have the potential to affect other floodplain values, such as conservation of existing flora and fauna, archaeological sites, natural beauty, and open space.

Floodplains the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) cross are summarized in Table 3.8-13 and shown on Figure 3.8-3. Two of the FEMA-designated floodplains crossed by the HSR in Antelope Valley do not convey concentrated flows. The floodplains appear to be shallow local depressions that fill with surface runoff during extreme events due to inadequate local drainage and shallow surface flow. No FEMA-designated floodways are in the Bakersfield to Palmdale Project Section; however, the floodplain associated with the Kern River in the City of Bakersfield is a CVFPB-designated floodway.

Construction activities associated with the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) in floodplains would include grading and excavation; construction of bridges, culverts, embankments, and/or retaining walls; and placement of fill. Construction equipment, materials, and workers would also be present in floodplains during construction and the Antelope Valley construction staging area would be located within a floodplain. Although in-water work during construction would be restricted to the dry season, construction activities within the floodplains could temporarily impede or redirect flood flows during a storm event, which has the potential to increase flood elevations, redefine flood hazard areas, and cause flooding in areas previously not at risk from the 100-year flood.

Construction in a floodplain could temporarily impede or redirect flood flows because of the presence of construction equipment and materials in the floodplain, depending on the activity occurring within a specific area. Additionally, construction activities would increase the risk of release of sediment or construction pollutants during a storm event by increasing potential for erosion and thorough the presence of construction materials and equipment within the floodplain.

Although it is not anticipated that the Bakersfield to Palmdale Project Section would be required to obtain coverage under the Construction General Permit, the Authority has committed to implementing a SWPPP on all HSR project sections, as specified in HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan. As specified in HYD-IAMF#3, construction BMPs would be implemented to manage stormwater runoff generated from the construction soil disturbance areas and to reduce the risk of pollutants during flooding. This IAMF would reduce potential flooding impacts and the release of pollutants resulting from alteration of flood flows during construction of the B-P Build Alternatives through the following mechanisms:

- **HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan**—Implement construction BMPs to provide hydromodification controls to maintain pre-project hydrology and manage stormwater on the construction site.

Even with implementation of HYD-IAMF#3, construction workers and equipment could be exposed to risk of flooding, particularly during work within channels and floodplains. Mitigation Measure WQ-MM#1 requires the construction supervisor to monitor weather conditions for heavy storms (and potential flood flows) to minimize the potential flood risk. In the event a heavy storm or flood event is identified, construction equipment and activities would be relocated outside the floodplain.

Table 3.8-13 Floodplains Crossed by the Bakersfield to Palmdale Project Section Build Alternatives

Floodplain Name or Source	County	FEMA FIRM Panel	FEMA Special Flood Hazard Area[1] and Estimated Floodplain Elevation	Approximate Length of Floodplain Crossed by Each B-P Build Alternative[2,3]	Crossing Type	Existing Water Surface Elevation (feet)	Proposed Water Surface Elevation (feet)	Difference in Water Surface Elevation (feet)
Unnamed floodplain in the City of Bakersfield[4]	Kern	06029C2306E	Zone A (Min: 428 ft; Max: 489 ft)	Alternative 1: 2.11 mi Alternative 2: 2.13 mi Alternative 3: 2.11 mi Alternative 5: 2.11 mi	Viaduct	458.00	458.00	0.00
Caliente Creek	Kern	06029C2334E	Zone AH (Min: 789 ft; Max: 821 ft)	Alternative 1: 0.81 mi Alternative 2: 0.81 mi Alternative 3: 0.81 mi Alternative 5: 0.81 mi	Bridge	798.01	799.35	+1.34
Unnamed tributary of Caliente Creek	Kern	06029C2370E	Zone A (Min: 1,682 ft; Max: 1,691 ft)	Alternative 1: 0.085 mi Alternative 2:0.085 mi Alternative 3:0.085 mi Alternative 5: 0.085 mi	Bridge	1,683.75	1,683.71	-0.04
Unnamed tributary of Caliente Creek	Kern	06029C2370E	Zone A (Min: 1,743 ft; Max: 1,756 ft)	Alternative 1:0.053 mi Alternative 2:0.053 mi Alternative 3:0.053 mi Alternative 5: 0.053 mi	Culvert	1,775.22	1,776.19	+0.97
Tehachapi Creek	Kern	06029C2825E 06029C2400E	Zone A (Min: 2,313 ft; Max: 2,322 ft)	Alternative 1:0.042 mi Alternative 2:0.042 mi Alternative 3:0.042 mi Alternative 5: 0.042 mi CCNM Design Option: 0.042 mi Refined CCNM Design Option: 0.042 mi	Bridge	2,314.57	2,314.78	+0.21

Floodplain Name or Source	County	FEMA FIRM Panel	FEMA Special Flood Hazard Area[1] and Estimated Floodplain Elevation	Approximate Length of Floodplain Crossed by Each B-P Build Alternative[2,3]	Crossing Type	Existing Water Surface Elevation (feet)	Proposed Water Surface Elevation (feet)	Difference in Water Surface Elevation (feet)
Tweedy Creek	Kern	06029C2825E	Zone A (Min: 2,574 ft; Max: 2,598 ft)	Alternative 1:0.054 mi Alternative 2:0.054 mi Alternative 3:0.054 mi Alternative 5 :0.054 mi CCNM Design Options: 0.040 mi Refined CCNM Design Option: 0.035 mi	Low Flow and Bridge	2,462.42 (Low Flow) 2,574.81 (Bridge)	2,462.42 (Low Flow) 2,574.81 (Bridge)	0.00 0.00
Tehachapi Creek	Kern	06029C2850E	Zone A (Min: 3,333 ft; Max: 3,487 ft)	Alternative 1: 0.417 mi Alternative 2: 0.417 mi Alternative 3: 0.417 mi Alternative 5: 0.417 mi	Bridge	3,441.47	3,445.33	+3.86
Mendibury Creek	Kern	06029C3250E	Zone A (Min: 4,110 ft; Max: 4,116 ft)	Alternative 1: 0.096 mi Alternative 2: 0.096 mi Alternative 3: 0.096 mi Alternative 5: 0.096 mi	Bridge	4,119.39	4,119.39	0.00
Oak Creek	Kern	06029C3275E	Zone A (Min: 4,066 ft; Max: 4,128 ft)	Alternative 1: 0.045 mi Alternative 2: 0.045 mi Alternative 3: 0.031 mi Alternative 5: 0.045 mi	Bridge	4,068.06	4,068.06	0.00

Floodplain Name or Source	County	FEMA FIRM Panel	FEMA Special Flood Hazard Area[1] and Estimated Floodplain Elevation	Approximate Length of Floodplain Crossed by Each B-P Build Alternative[2,3]	Crossing Type	Existing Water Surface Elevation (feet)	Proposed Water Surface Elevation (feet)	Difference in Water Surface Elevation (feet)
Antelope Valley 11A Antelope Valley 11B Antelope Valley 11C Antelope Valley 11D Antelope Valley 11E Antelope Valley 11F Antelope Valley 11G Antelope Valley 11H Antelope Valley 11I Antelope Valley 11H Antelope Valley 11K Antelope Valley 11L Antelope Valley 11N Antelope Valley 11M Antelope Valley 11O Antelope Valley 11P	Kern	06029C3650E 06037C0175F	Zone A (Min: 2,353 ft; Max: 3,133 ft)	Alternative 1: 11.48 mi Alternative 2: 11.48 mi Alternative 3: 11.39 mi Alternative 5: 11.48 mi	Bridge Culvert Bridge Culvert Culvert Culvert Culvert Bridge Culvert Culvert Culvert Bridge Culvert Culvert Culvert Culvert	3,124.34 3,127.63 2,976.46 2,726.89 2,700.39 2,678.66 2,624.72 2,570.32 2,376.65 2,373.38 2,368.75 2,364.23 2,360.61 2,360.39 2,358.84 2,354.38	3,124.70 3,127.86 2,976.53 2,726.94 2,699.79 2,679.51 2,625.85 2,570.31 2,377.42 2,373.62 2,368.92 2,364.65 2,361.07 2,360.91 2,359.09 2,355.28	+0.36 +0.23 +0.07 +0.05 -0.60 +0.85 +1.13 -0.01 -0.77 +0.24 +0.17 +0.42 +0.46 +0.52 +0.25 +0.90
Antelope Valley 12A Antelope Valley 12B Antelope Valley 12C Antelope Valley 12D Antelope Valley 12E Antelope Valley 12F	Los Angeles	06029C4025E	Zone A (Min: 2,319 ft; Max: 2,353 ft)	Alternative 1: 3.46 mi Alternative 2: 3.46 mi Alternative 3: 3.46 mi Alternative 5: 3.46 mi	Bridge Culvert Culvert Culvert Culvert	2,350.36 2,346.34 2,341.99 2,334.30 2,332.39 2,328.19	2,352.01 2,348.32 2,342.46 2,334.56 2,332.82 2,328.51	+1.65 +1.98 +0.47 +0.26 +0.43 +0.32

Floodplain Name or Source	County	FEMA FIRM Panel	FEMA Special Flood Hazard Area[1] and Estimated Floodplain Elevation	Approximate Length of Floodplain Crossed by Each B-P Build Alternative[2,3]	Crossing Type	Existing Water Surface Elevation (feet)	Proposed Water Surface Elevation (feet)	Difference in Water Surface Elevation (feet)
Amargosa Creek	Los Angeles	06029C4025E 06037C0410F	Zone AO (Min: 2,308 ft; Max: 2,311 ft)	Alternative 1: 0.85 mi Alternative 2: 0.85 mi Alternative 3: 0.85 mi Alternative 5: 0.87 mi	Bridge	2,310.32	2,311.30	+0.98

Source: California High-Speed Rail Authority, Floodplain Impact Report, 2016

[1] Special flood hazard areas (i.e., 100-year flood areas) designated by FEMA. In the RSA, these include: Zone A: No BFE determined, Zone AH: Flood depth of 1 to 3 feet and BFE determined, Zone AO: Flood depth of 1 to 3 feet and average depth determined

[2] Crossing lengths estimated using GIS based on FEMA FIRMs and the alignment centerline, unless otherwise noted.

[3] The B-P Build Alternatives are inclusive of the CCNM Design Option and the Refined CCNM Design Option except at Tehachapi Creek and Tweedy Creek, where the alignments cross at a different location.

[4] Although mapped by FEMA, the Zone A floodplain in the City of Bakersfield is a remnant flood zone from a historic condition and no longer exists.

B-P = Bakersfield to Palmdale Project Section
BFE= base flood elevation
CCNM = César E. Chávez National Monument
FEMA = Federal Emergency Management Agency
FIRM = Flood Insurance Rate Map
ft = foot/feet
GIS = geographic information systems
Max = maximum
mi = mile(s)
Min = minimum

Construction of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) could also affect existing floodplain functions and values by disturbing the floodplain and associated vegetation. Mitigation Measure WQ-MM#1 requires implementation of BMPs, including preserving existing vegetation to the maximum extent practicable, limiting the number of equipment trips across a floodplain crossing, working from each side of a floodplain crossing, selecting equipment that exerts the least amount of ground surface pressure, installing vegetated buffers on slopes, and applying hydraulic mulch on disturbed streambanks. In addition, floodplains and riparian areas would be revegetated and BMPs would be implemented during construction to further minimize impacts on floodplains and natural and beneficial floodplain values, as specified in Mitigation Measures WQ-MM#1 and BIO-MM#32 in Section 3.8.7.

CEQA Conclusion

Construction activities within the floodplains could temporarily impede or redirect flood flows or risk the release of pollutants during flooding, which would be considered a significant impact under CEQA. Therefore, CEQA requires mitigation. Mitigation Measures WQ-MM#1 and BIO-MM#32, included in Section 3.8.7, Mitigation Measures, would be implemented to reduce construction-related impacts on floodplains by restoring and revegetating floodplains, applying BMPs to preserve existing floodplains, and monitoring weather conditions for heavy storms and potential flood flows. Therefore, through implementation of Mitigation Measures WQ-MM#1, and BIO-MM#32, temporary impacts on floodplains associated with construction activities would be less than significant pursuant to CEQA.

Impact HWR #2: Temporary Construction Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity

Construction activities associated with the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) include grading, hauling, and excavating; pile driving; constructing power substations, concrete and ballast track bed, elevated structures, retaining walls, tunnels, and embankments; realigning existing roads; and constructing new roadway underpasses, overpasses, and roadways. Construction of the HSR track could take several years; however, construction at one site would not take place continuously for this period.

Construction activities such as grading and excavation could alter existing drainage patterns and redirect stormwater runoff. During ground-disturbing activities, soil would be compacted, resulting in a decrease in infiltration and an increase in the volume and rate of stormwater runoff during storm events. Although it is not anticipated that the Bakersfield to Palmdale Project Section would be required to obtain coverage under the Construction General Permit, the Authority has committed to implementing a SWPPP on all HSR project sections, as specified in HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan. HYD-IAMF#3 is included as part of the project design and would be implemented for all B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) to avoid or minimize temporary hydraulic effects associated with construction activities. This IAMF would reduce potential impacts on the existing drainage pattern resulting from construction activities during construction through the following mechanisms:

- **HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan**—Implement BMPs to provide hydromodification controls to maintain pre-project hydrology and to manage the amount and quality of stormwater runoff emanating off of the construction sites.

The SWPPP would identify project-specific construction BMPs to be implemented as part of the project. The SWPPP would be prepared prior to construction and would describe temporary drainage patterns within the construction sites and indicate stormwater discharge locations from the construction sites to the existing drainage system.

In-water work during construction would be restricted to the dry season where feasible, as specified in HYD-IAMF#3. In the case where a stream or aqueduct has year-round flows, the contractor would develop a water diversion plan and water crossing plan prior to construction. A water diversion plan includes the installation of cofferdams or sandbag barriers around the work areas (such as in locations where piers or abutments would be removed or constructed) to keep water out of the construction area. The water inside the cofferdam or sandbag barrier would be pumped out and treated by a filter bag for small flows and by water tanks (a self-contained water treatment system within a tank) for larger flows. Construction in the stream during the dry season would minimize the amount of pumped and treated water from the construction area. The larger streams may require construction of a temporary stream crossing, which would be constructed by placing large-diameter pipes underneath the crossing to convey the flow. Once construction is complete, the temporary crossings would be removed, and the stream would be restored to its pre-construction condition.

In summary, a SWPPP would be prepared for construction of the B-P Build Alternatives (including the CCNM Design Options) and surface and in-water construction BMPs would be implemented to minimize impacts on the existing drainage system, as required by HYD-IAMF#3.

CEQA Conclusion

Implementation of HYD-IAMF#3 would require hydromodification and stormwater management measures to control drainage during construction of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option). With implementation of HYD-IAMF#3, construction activities would not substantially alter the existing drainage pattern of the site or area in a manner that would result in substantial erosion or siltation, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site. Nor would construction create or contribute runoff water that would exceed the capacity of existing drainage systems or provide substantial additional sources of polluted runoff. Accordingly, the impact under CEQA would be less than significant. Therefore, CEQA does not require mitigation.

Impact HWR #3: Temporary Construction Impacts to Surface Water Quality

Pollutants of concern during construction include sediments, trash, petroleum products, concrete waste (dry and wet), sanitary waste, and chemicals. Each of these pollutants on its own or in combination with other pollutants could have a detrimental effect on water quality. During construction activities, excavated soil would be exposed and there would be an increased potential for soil erosion compared to existing conditions. Construction areas with steep slopes and/or erodible soils, such as in mountainous areas, would have a greater potential for erosion to occur. In addition, chemicals, liquid products, petroleum products (such as paints, solvents, and fuels), and concrete-related waste may be spilled or leaked during construction. Any of these pollutants have the potential to be transported via storm runoff into receiving waters.

The potential impacts on water quality during construction of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would occur both on land and within the channels. Refer to Table 3.8-14 for the total disturbed area during construction per alternative. Alternative 1 would temporarily disturb the largest amount of acreage (9,825 acres), while Alternative 5 would temporarily disturb the least amount of acreage (8,733 acres). Alternatives 2 and 3 would temporarily disturb 8,753 and 8,865 acres, respectively. The B-P Build Alternatives with the CCNM Design Option would result in an additional 4 acres of disturbed soil area compared to the B-P Build Alternatives without the CCNM Design Option. The B-P Build Alternatives with the Refined CCNM Design Option would result in an additional 577 acres of disturbed soil area compared to the B-P Build Alternatives without the Refined CCNM Design Option. The additional disturbed soil area associated with the Refined CCNM Design Option is primarily from the proposed stockpile area at the north end of the Refined CCNM Design Option alignment.

Table 3.8-14 Acres Disturbed during Construction of the Bakersfield to Palmdale Project Section Build Alternatives

B-P Build Alternative	Acres Temporarily Disturbed[1]
Alternative 1	9,825
Alternative 2	8,753
Alternative 3	8,865
Alternative 5	8,733
CCNM Design Option	+4.0
Refined CCNM Design Option	+577

Source: California High-Speed Rail Authority, 2018
[1] Acreage of temporary disturbance includes the limits of construction. Construction footprints will be refined during further design.
B-P = Bakersfield to Palmdale Project Section CCNM = César E. Chávez National Monument

During ground-disturbing activities, land and vegetation would be cleared, thereby exposing soil to the potential for erosion. When new structures are installed (e.g., HSR track bed, overpasses, underpasses), concrete and/or asphalt applications could be a source of fine sediment, metals, and chemicals that could affect downstream waterbodies. Grading and other earthmoving activities during construction could be a source of petroleum products and heavy metals if construction equipment has leaks of petroleum products, such as engine oil, hydraulic oil, and antifreeze. Furthermore, temporary or portable sanitary facilities provided for construction workers could be a source of sanitary waste. In addition, water crossings associated with construction in the channels would provide a direct path for construction-related contaminants to reach surface waters.

The SWPPP would be prepared to identify project-specific construction BMPs to be implemented as described in HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan. BIO-IAMF#11 requires preparation of a construction site BMP field manual and implementation of BMPs during construction. As specified in BIO-IAMF#8, equipment staging areas and traffic routes would be established in areas that minimize impacts on sensitive areas, including surface waters. HYD-IAMF#3, BIO-IAMF#8, and BIO-IAMF#11 are included as part of the project design and would be implemented for all B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) to avoid or minimize temporary water quality effects associated with construction activities. These IAMFs would reduce potential impacts on water quality resulting from construction activities during construction through the following mechanisms:

- **HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan**—Implement BMPs aimed at reducing pollutants of concern to maintain current water quality and reduce erosion on-site.
- **BIO-IAMF#8: Delineate Equipment Staging Areas and Traffic Routes**—Stage construction equipment in areas that minimize effects to sensitive biological resources, including from risk of spills and erosion from equipment.
- **BIO-IAMF#11: Maintain Construction Sites**—Prepare a construction site BMP field manual and implement standard construction site housekeeping practices.

Construction BMPs to be implemented include, but are not limited to, Erosion and Sediment Control BMPs (e.g., hydromulch, temporary silt fences, and check dams) designed to minimize erosion and retain sediment on-site and Good Housekeeping BMPs (e.g., spill prevention and control, and stockpile management) to prevent spills, leaks, and discharges of construction debris and waste into receiving waters.

Construction activities have the potential to introduce waste or hazardous wastes into receiving waters. HMW-IAMF#8 requires preparation of a hazardous materials and waste plan for hazardous waste handling. HMW-IAMF#6 requires preparation of a Construction Management Plan (CMP) to address hazardous material releases and ensure cleanup of any hazardous material releases during construction. Waste management and materials pollution controls (as detailed in BIO-IAMF#9 and HMW-IAMF#7) would also be included to ensure trash is properly disposed of on a daily basis and would minimize impacts on water quality. These measures would help reduce the risk of spills of waste and hazardous waste to surface waters through the following mechanisms:

- **BIO-IAMF#9: Dispose of Construction Spoils and Waste**—Excavated materials produced will be stored in areas at or near construction sites within the project footprint, returned to their original location, or disposed of at an off-site location.
- **HMW-IAMF#6, Spill Prevention**—A CMP and SPCC plan (or Soil Prevention and Response Plan addressing spill prevention) will be prepared and implemented.
- **HMW-IAMF#7, Transport of Materials**—A hazardous materials and waste plan describing responsible parties and procedures for hazardous waste and hazardous materials transport will be prepared and implemented.
- **HMW-IAMF#8: Permit Conditions**—Includes requirements for transport, labeling, containment, cover, and other BMPs for storage of hazardous materials.

As described previously under Impact HWR #2, in-water work during construction would be restricted to the dry season. However, if water is present in the channel during in-water work, the contractor would develop a water diversion plan prior to construction. The water diversion plan would include the use of cofferdams or sandbag barriers around the work areas to keep water out and to reduce sediment pollution from construction. The larger streams may require construction of a temporary stream crossing to minimize erosion and downstream sedimentation from construction. However, even with implementation of a water diversion plan and temporary stream crossing, there would be a potential for water quality impacts to occur from increased erosion from the dewatering and diversion activities. To avoid or minimize the potential turbidity and siltation effects from dewatering activities, Mitigation Measure BIO-MM#62 requires the Authority to prepare a dewatering plan for construction dewatering or work requiring a water diversion where open or flowing water is present. The dewatering plan would identify how to divert water from the work area in a manner that avoids or minimizes impacts on resources to the maximum extent practicable, including monitoring of water quality. These efforts would minimize any changes to overall water quality so that dewatering and diversion of surface waters would not contribute to a violation of regulatory standards or waste discharge requirements. Additionally, Mitigation Measure BIO-MM#34 requires a project biologist to monitor construction activities within or adjacent to aquatic resources to ensure compliance with the CWA and the Porter-Cologne Act.

Once construction is complete, the water diversion structures or temporary crossings would be removed and the stream would be restored to its pre-construction condition. According to the *Biological and Aquatic Resources Technical Report* (Authority 2019a), the waterbodies identified in the RSA are all isolated. Therefore, the USACE and the RWQCB are not expected to assert jurisdiction under Section 404 or Section 401 of the CWA over any areas that would be delineated as waters of the U.S., respectively. Although the waters are not anticipated to be jurisdictional under federal law and the project would not be required to obtain coverage under Construction General Permit, a SWPPP and BMPs would be implemented in accordance with the requirements of the permit, as specified in HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan.

Dewatering during construction of the concrete columns associated with the waterbody crossings could impact surface water quality. Groundwater extracted during dewatering activities could contain sediments and contaminants that could degrade water quality if the water were to be discharged directly to surface water or land without treatment. However, due to the depth of groundwater and the depth of proposed excavation activities, it is unlikely that dewatering would be required. In the unlikely event that groundwater is encountered during construction, it would be removed and disposed of according to the requirements of the Central Valley RWQCB and Lahontan RWQCB's Dewatering Permits, described in Section 3.8.2.3, Regional and Local, by the RWQCB. Adherence to the requirements of the Dewatering Permits would ensure the water discharged to surface water or land would not degrade existing water quality by requiring testing prior to discharge as described in Mitigation Measure WQ-MM#2. For any contaminated groundwater, the water may be collected and off-hauled to a local sanitary sewer or an active treatment system that may be required to treat the water prior to discharge.

There are no existing water quality impairments for TMDLs for the surface waters in the RSA; therefore, the project would not contribute to an existing water quality impairment. Additionally, preparation of a SWPPP, implementation of construction BMPs, compliance with the Dewatering Permits, and testing and treatment of groundwater prior to release to surface waters would reduce the potential for pollutants to be discharged to surface waters. Therefore, construction activities would not adversely affect beneficial uses of surface waters or attainment of water quality objectives established in the water quality control plans applicable to the RSA (i.e. the Tulare Lake Basin Plan and Lahontan Region Basin Plan). Therefore, the HSR Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would not conflict with the implementation of the Tulare Lake Basin Plan and the Lahontan Region Basin Plan. In summary, a SWPPP would be prepared and construction BMPs implemented during construction of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) as specified in HYD-IAMF#3. In addition, dewatering activities would adhere to the requirements set forth by the Dewatering Permits, as required by Mitigation Measures WQ-MM#2.

CEQA Conclusion

HYD-IAMF#3, BIO-IAMF#8, BIO-IAMF#11, BIO-IAMF#9, HMW-IAMF#6, HMW-IAMF#7, and HMW-IAMF#8 require preparation of a SWPPP, a construction site BMP field manual, a CMP, an SPCC plan, and a hazardous materials and waste plan; implementation of construction BMPs; delineation of equipment staging areas and traffic routes; and reuse or disposal of construction spoils to reduce impacts on surface water quality during construction. With implementation of these IAMFs, impacts on surface water quality during ground-disturbing activities would be less than significant because the project would not violate any water quality standards or waste discharge requirements, otherwise substantially degrade surface water quality, or conflict with the implementation of a water quality control plan.

Even with implementation of the above-stated IAMF during construction of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option), there would still be a potential for dewatering activities to impact surface water quality, and the impact under CEQA would be significant. Therefore, CEQA requires mitigation. Mitigation Measures WQ-MM#2, BIO-MM#34, and BIO-MM#62, included in Section 3.8.7, Mitigation Measures, would be implemented to reduce construction-related impacts on surface water quality by targeting pollutants of concern dewatering activities, preparing a dewatering plan, and monitoring dewatering activities. Through implementation of Mitigation Measures WQ-MM#2, BIO-MM#34, and BIO-MM#62, temporary impacts on surface water quality from dewatering activities would be less than significant pursuant to CEQA.

Impact HWR #4: Temporary Construction Impacts to Groundwater Volume, Quality, and Recharge

As previously discussed in Section 3.8.5.8, groundwater levels adjacent to most of the HSR alignment are anticipated to be generally deep. However, very little reliable data is available on groundwater levels along the alignment, particularly near the proposed tunnels in the Tehachapi Mountains.

Shallow groundwater may be encountered during construction of the concrete columns (piers) associated with the waterbody crossings. Pier construction methods have not yet been finalized and would be based on local conditions. Due to the depth of groundwater and the depth of proposed excavation activities, it is unlikely that dewatering would be required during excavation and grading (other than at the bridge piers). Dewatering during construction activities could reduce the amount of groundwater available in the groundwater basin. The volume of groundwater that would be removed would be relatively minor due to the size of the groundwater basin. The amount of groundwater dewatering is likely to be relatively small and conducted in widely spaced locations. Any effects from groundwater dewatering would be temporary, because dewatering would cease once construction has been completed. Additionally, the Authority would control the amount of groundwater withdrawal and re-inject groundwater at specific locations if necessary (GEO-IAMF#1). Therefore, groundwater dewatering activities from construction of piers are not anticipated to substantially affect groundwater levels or supplies.

Water supplied for construction purposes would be sourced from existing surface and groundwater supply systems or water trucks. Furthermore, it is not anticipated that groundwater extraction for construction activities associated with the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would be greater than the existing water demand for agricultural purposes due to the elimination of existing water use (including agriculture) within the HSR construction footprint (as detailed in Section 3.6, Public Utilities and Energy).

The majority of the tunneling activities would occur in the Tehachapi Mountains, where deep groundwater basins are present below the anticipated tunnel elevations. In addition, groundwater could still be encountered in the Tehachapi foothills and mountains, in areas outside of groundwater basins. Seasonal springs are also mapped along and across the HSR alignment. Therefore, it is anticipated that construction of tunnels and portal excavation work would encounter perched or seasonal water tables. In particular, fractured zones of hard rock could yield significant water inflows upon excavation.

Tunnels 1 through 3 (south of General Beale Road and north of State Route 223) may be located below the groundwater table; therefore, groundwater may be encountered during construction of these tunnels and water inflow may occur. However, not enough groundwater information is available at this time to identify the extent to which the tunnels may be below the water table. It is anticipated that Tunnels 4 through 9 (south of Bealville Road and north of Willow Springs Road) would be constructed above the water table. However, available information indicated the possible presence of perched groundwater or seasonal springs in the vicinity of these tunnels. Therefore, local water inflows during portal and tunnel excavations are anticipated.

The tunnels would be constructed by four excavation methods: (1) the sequential excavation method, (2) the drill and blast excavation method, (3) the mechanized open-face tunnel-boring machine excavation method, and (4) the cut-and-cover method. Because of the presence of groundwater, perched groundwater, and seasonal springs, tunneling could provide a conduit for groundwater to drain into the excavation as the advancing tunnel intersects fractures and faults. For all excavation methods, the excavation face would not be pressurized and would allow for groundwater inflow during construction activities. A relatively dry tunnel is required during construction; therefore, where groundwater is present, a system would be implemented to control the volume of groundwater running into the tunnel.

In singular occurrences (limited reaches), tunnel construction may interfere with the groundwater flow systems, may occasionally cause dewatering of overlying springs and riparian areas that also provide critical habitat for flora and fauna, and may locally affect groundwater quality. Tunneling activities have a high probability of encountering fractures with groundwater that may be of varying water quality. However, the risk of encountering water that is contaminated by natural or anthropogenic chemical and mineral substances that could result in release of toxic or contaminated water to the surface and to surface waters is not known. Potential impacts on groundwater depend on the construction method. Blasting on rock fractures and joints may impact groundwater flow and quality. For tunnels dug with tunnel boring machines, tunnel grouting, operation and maintenance of the machine, shaft excavation, and dewatering associated with shaft excavation could potentially affect groundwater quantity and quantity. For sequential excavation method tunnels, grouting and dewatering could affect groundwater quality and quantity.

Multiple methods may be utilized during construction to control groundwater inflows at the tunnel face, depending on the volume of groundwater inflows and local geology. For all excavation methods, pre-excavation grouting may be required to prevent groundwater inflow, improve ground strength characteristics, and limit preferential or new pathways for groundwater.

Mitigation Measure WQ-MM#3 would be implemented to reduce impacts on groundwater during construction. As required in this measure, once additional groundwater information is available during final design, hydrogeological modeling would be conducted to assess, in greater detail, the potential impacts of removing groundwater from bedrock storage during construction (including long-term drainage into the tunnel). The objective of the modeling is to simulate the impact of the project on the hydrogeological regime of the area and, in particular, to undertake predictive modeling to assess: (1) the extent and amount of water level drawdown in the surrounding area as a result of inflow to the tunnels and construction sites; (2) the potential groundwater inflow volumes to the tunnels; and (3) the sensitivity to a drawdown of the groundwater table. The modeling would determine the exact measures to be implemented to address the specific impact. For example, if any active wells would be affected, the wells could be re-drilled deeper to reach the groundwater level, relocated to a different location, or the water injected back. During tunneling, continuous probing would be conducted ahead of the tunnel face and the pre-excavation grouting could be implemented, in the areas with high water flow, to reduce the potential for groundwater to enter the tunnel. According to the Tunnel Safety Orders of the California Code of Regulations, the California Occupational Safety and Health Administration requires a minimum 20 feet of tested ground ahead of the excavation face in tunnels where there is a likelihood of dangerous accumulations of water, gas, or mud within 200 feet of the working area.

Available information on the geologic conditions in the project vicinity is insufficient to determine whether the tunnels would interfere with the groundwater system. If further information to be gathered during final design indicates that groundwater interference is a possibility, monitoring plans targeting selected groundwater resources in the vicinity of the affected tunnel segments may be required during the pre-construction, construction, and post-construction periods, as specified in Mitigation Measure WQ-MM#3. The water level and water quality would be monitored on a regular basis and compared to results from hydrogeological modeling. Depending on the collected monitoring data, corrective actions will be implemented. Possible data collection may include water temperature, pH, chemical analysis, and groundwater elevation. Measurements may include water levels in wells, tunnel-heading inflows, probe-hole flows, and portal discharges.

Additionally, Mitigation Measure WQ-MM#3 requires groundwater levels, flow, and quality to be monitored at domestic wells, springs, and seeps prior to, during, and after construction. Regular monitoring would indicate potential changes in the depth to groundwater beyond the expected seasonal variations. The tunnels would be lined to minimize groundwater seepage and the tunnel lining would be inspected regularly throughout the construction phase to monitor for potential leaks. Should leaks be found, the lining would be repaired immediately and assessed for future integrity. Any freestanding water that leaks into the tunnel would be treated prior to discharge to minimize impacts from pollutants such as sediment or other contamination. Mitigation Measure WQ-MM#3 would minimize pollutants introduced to groundwater during tunnel construction so that tunnel construction would not adversely affect beneficial uses of groundwater or attainment of water quality objectives.

As discussed previously, SGMA requires GSPs to be developed in medium- and high-priority basins to manage the sustainability of groundwater basins. The Kern County Subbasin is the only high-priority basin within the RSA and for which a GSP is required to be developed by the GSA. The Kern County Subbasin GSPs are not currently available, and are due to the DWR by January 31, 2020. The majority of tunneling activities would take place outside of the Kern County Subbasin, with the exception of Tunnels 1 through 3. Because groundwater flow into the tunnels would be controlled during tunnel construction, tunneling activities would not interfere with groundwater supplies in a manner that would interfere with the sustainable management of the groundwater basins.

Other construction activities (e.g., grading and construction of the track) would not affect groundwater quality because there would not be a direct path for construction-related contaminants to reach groundwater due to the depth of groundwater in the vicinity of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) and implementation of construction BMPs to remove pollutants from stormwater runoff that could infiltrate the groundwater basin. Furthermore, construction BMPs (e.g., Erosion and Sediment Control and Good Housekeeping BMPs) would be implemented at construction sites as part of the SWPPP to remove pollutants from stormwater runoff that could infiltrate the groundwater basin, as required by HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan. HYD-IAMF#3 is included as part of the project design and would be implemented for all B-P Build Alternatives to avoid or minimize the potential for construction-related pollutants to infiltrate the groundwater basin. This IAMF would reduce potential impacts on groundwater quality during construction through the following mechanisms:

- **HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan**—Implement BMPs aimed at reducing pollutants of concern to maintain current water quality and reduce erosion on-site.

Because there would not be a direct path for construction-related contaminants to reach groundwater due to the depth of groundwater and because construction BMPs would be implemented to remove pollutants from stormwater runoff that could infiltrate the groundwater basin, construction activities would not adversely affect beneficial uses of groundwater or attainment of groundwater quality objectives.

The length of groundwater basins the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) cross are shown in Table 3.8-15. Alternatives 1, 2, and 5 (including the CCNM Design Option and the Refined CCNM Design Option) would cross approximately 61 miles of groundwater basins. Alternative 3 (including the CCNM Design Option and the Refined CCNM Design Option) would only cross 60.5 miles, the shortest distance of the B-P Build Alternatives. While all the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would cross groundwater basins, Alternative 3 (including the CCNM Design Option and the Refined CCNM Design Option) would result in the greatest acreage crossed (6,761 acres) and Alternative 2 (including the CCNM Design Option and the Refined CCNM Design Option) would cross the least acreage (6,664 acres). Alternatives 1 and 5 (including the CCNM Design Option and the Refined CCNM Design Option) would cross 6,733 and 6,761 acres, respectively. Grading and construction activities would compact soil, which can decrease infiltration during construction. However, construction activities would be temporary, and any reduction in infiltration would not interfere with groundwater recharge due to the small area of construction relative to the size of the groundwater basins underlying the RSA (Table 3.8-15).

Table 3.8-15 Groundwater Basins Crossed by the Bakersfield to Palmdale Project Section Build Alternatives

Groundwater Basin Name (Basin Number)[1]	Total Groundwater Basin Area (acres)[1]	Groundwater Storage (acre-feet)[1]	B-P Build Alternatives	Length of Groundwater Basin Crossed[1,2]	Area of Groundwater Basin Crossed[2,3]
Kern County Subbasin of the San Joaquin Valley Groundwater Basin (5-22.14)	1,945,000	40,000,000	Alternative 1	21.7 mi	1,864 ac
			Alternative 2	21.7 mi	1,795 ac
			Alternative 3	21.7 mi	1,864 ac
			Alternative 5	21.7 mi	1,863 ac
Tehachapi Valley West (5-28)	14,800	225,000	Alternative 1	2.6 mi	324 ac
			Alternative 2	2.6 mi	324 ac
			Alternative 3	2.6 mi	324 ac
			Alternative 5	2.6 mi	324 ac

Groundwater Basin Name (Basin Number)[1]	Total Groundwater Basin Area (acres)[1]	Groundwater Storage (acre-feet)[1]	B-P Build Alternatives	Length of Groundwater Basin Crossed[1,2]	Area of Groundwater Basin Crossed[2,3]
Tehachapi Valley East (6-45)	24,000	150,000	Alternative 1	3.0 mi	399 ac
			Alternative 2	3.0 mi	399 ac
			Alternative 3	2.8 mi	400 ac
			Alternative 5	3.0 mi	399 ac
Fremont Valley (6-46)	335,000	4,800,000	Alternative 1	1.0 mi	273 ac
			Alternative 2	1.0 mi	273 ac
			Alternative 3	0.7 mi	229 ac
			Alternative 5	1.0 mi	273 ac
Antelope Valley (6-44)	1,010,000	68,000,000	Alternative 1	32.7 mi	3,873 ac
			Alternative 2	32.7 mi	3,873 ac
			Alternative 3	32.7 mi	3,944 ac
			Alternative 5	32.7 mi	3,873 ac

Source: California High-Speed Rail Authority. 2018
[1] Length is subject to change once the Bakersfield to Palmdale Project Section alignment is finalized.
[2] The B-P Build Alternatives are inclusive of the CCNM Design Option and the Refined CCNM Design Option.
[3] Area is dependent on alternative alignments.
ac = acres
B-P = Bakersfield to Palmdale Project Section
CCNM = César E. Chávez National Monument
mi = mile(s)

CEQA Conclusion

Tunnel construction can interfere with the groundwater flow systems, can cause dewatering of overlying springs and riparian areas, and can affect groundwater quality. Mitigation Measure WQ-MM#3 would be implemented to reduce impacts on groundwater through a variety of methods, including probing ahead of the tunnel face during tunneling, construction methods to reduce inflow of groundwater into the tunnel, tunnel waterproofing, groundwater modeling, groundwater monitoring, and tunnel inspections. In addition, the pre-excavation grouting would be implemented in the areas with high water inflow to minimize the groundwater inflow into the tunnel and thereby minimize the drawdown. With implementation of Mitigation Measure WQ-MM#6, tunneling impacts on groundwater quality or groundwater supplies such that the project may impede sustainable groundwater management of the basin, or conflict with a sustainable groundwater management plan, would be less than significant.

Dewatering during construction is not anticipated except during construction of bridge piers. In addition, any reduction in infiltration from soil compaction during construction would be minimal compared to the size of the groundwater basin. For these reasons, groundwater recharge during construction would not be substantially decreased. Therefore, impacts related to the decrease in groundwater supplies or interference with groundwater recharge such that the project may impede sustainable groundwater management of the basin, or conflict with a sustainable groundwater management plan, would be less than significant.

Impacts on groundwater quality during construction activities other than tunneling would be less than significant because there would not be a direct path for construction-related contaminants to reach groundwater due to implementation of construction BMPs to reduce pollutants before they can migrate to the groundwater basin (HYD-IAMF#3). Therefore, the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would not substantially degrade groundwater quality. CEQA does not require mitigation.

Operations Impacts

Impact HWR #5: Permanent Operation Impacts to Floodplains and Floodways

As discussed previously, FEMA-designated, 100-year floodplains have been identified throughout the RSA. FEMA and the local agencies require that an encroachment into a floodplain not increase the water surface elevation of the base flood by more than 1 foot. In the event that a project increases floodplain elevations by more than 1 foot, FEMA requires the project to obtain a Conditional Letter of Map Revision and a Letter of Map Revision to revise the FIRM to reflect the new floodplain elevations and boundaries. The Conditional Letter of Map Revision and Letter of Map Revision would be processed through the Central Valley Flood Protection Board and FEMA during final design.

Floodplains the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) cross are summarized in Table 3.8-13 and shown on Figure 3.8-3. Floodplain crossings are generally perpendicular; however, floodplains in the Antelope Valley cover large areas, and crossings could be perpendicular or longitudinal, depending on the direction of flow within the floodplain. Alternatives 1, 2, and 5 (including the CCNM Design Option and the Refined CCNM Design Option) would cross 19.5 miles of floodplains. Alternative 3 (including the CCNM Design Option and the Refined CCNM Design Option) would only cross 19.4 miles of floodplains. Both crossing types (elevated and surface) would be designed to provide flood flow conveyance and connectivity. The hydraulic design of the crossings would comply with the hydraulic criteria of the Authority's *Hydraulics and Hydrology Guidelines* (Authority 2011). Per the Authority's guidelines, the crossings would be designed to pass the 100-year flow in urban areas and the 50-year flow in rural areas. Because portions of the alignment are in FEMA-designated floodplains, the project would be designed and engineered in compliance with the requirements set forth in USEO 11988, Floodplain Management and FEMA Regulations. If the floodplain encroachment is found to be the only practicable alternative, the design must minimize potential harm to or within the floodplain. As such, floodplain crossing would be designed to minimize increases in flood elevations and to minimize changes to the floodplain limits, as required by FEMA and the local cities and counties.

As shown in Table 3.8-13, a majority of the HSR track would cross over floodplains on elevated structures (bridges). The bridges would be designed to span the main channels and to convey the 100-year flood without increasing the existing water surface elevation by more than 1 foot or by changing the floodplain limits, as required by FEMA and the local cities and counties. A minimum of 3 feet of freeboard above the design frequency water surface elevation would be provided for bridges. For this section of the HSR project, no proposed levees or alterations to existing levees would take place. Piers or column support structures associated with bridges would be placed within the floodplain as needed to support the bridge. However, the size and number of support structures would be minimized to reduce potential floodplain impacts. In addition, the design of the bridges would avoid placing abutment fill within the limits of the floodplain to the maximum extent practicable.

Surface (rail on embankment or retaining wall) crossings would have the highest probability of impacting floodplains because these types of crossings involve placing large amounts of fill inside the floodplain. Placing fill within the floodplain can change the existing water surface elevation and the limits of the floodplain. These types of crossings would include an opening in the embankment (e.g., culverts or wildlife crossing structures) to pass floodwater from one side of the embankment to the other. Culverts would be designed to meet FEMA and local agency design standards and to maintain hydraulic conveyance capacity to pass the 100-year flood without raising the existing water surface elevation by more than 1 foot, as required by FEMA. Culverts would range in size from relatively small-diameter pipe (ranging from 3 feet to 6 feet) to large, pre-cast, concrete-box structures with maximum dimensions of 10 feet by 10 feet.

Constricting flood flows through bridges/viaducts and culverts may cause some rise in water surface elevation downstream of the HSR alignment. However, the design standards detailed in HYD-IAMF#2: Flood Protection would minimize increases in flood elevations so that most areas would not experience an increase greater than 1 foot, as shown in Table 3.8-13. HYD-IAMF#2 is included as part of the project design and would be implemented for all B-P Build Alternatives (including the CCNM Design Options) to avoid or minimize impacts on floodplains. This IAMF would reduce potential impacts resulting from encroachment in the floodplain during operation through the following mechanisms:

- **HYD-IAMF#2: Flood Protection**—By designing the project to remain operational during flood events and to minimize increases in water surface elevation of no greater than 1 foot in compliance with state and local agencies. The floodplain crossings would be designed to minimize the placement of structures within the floodplain.

However, there are several locations where the increase in water surface elevation would still exceed a 1-foot rise. As shown in Table 3.8-13, the Caliente Creek, Tehachapi Creek, Antelope Valley 11J, Antelope Valley 12A, and Antelope Valley 12B floodplains would exceed the 1-foot increase in water surface elevation during a 100-year flood event due to fill placed within the 100-year floodplain, conflicting with the requirements set forth in USEO 11988 and the FEMA regulations. The crossing over Caliente Creek would exceed the 1-foot rise in water surface elevation; however, no structures would be impacted and the flow would still be contained within the channel. Additionally, the greater-than-1-foot-rise in water surface elevation would occur within 500 feet on the upstream side of the HSR alignment. At a distance greater than 500 feet upstream, the water surface elevation would not change substantially.

The HSR alignment in the Tehachapi Creek area is a longitudinal encroachment. The alignment at this location would be on a viaduct, and viaduct columns would be placed within the Tehachapi Creek floodplain. This encroachment would increase the water surface elevation by more than 1 foot. The change in water surface elevation would occur within 1,000 feet of the HSR alignment. Additionally, due to the steep slope of the creek, all rises would be localized, with little backwater effect.[2] In addition, flows would be contained completely within the banks of the creek and no structures would be impacted.

The Antelope Valley floodplain would exceed the 1-foot rise in water surface elevation at three locations, and flooding would occur in a narrow strip along the HSR alignment. Much of the Antelope Valley is a large, flat, Zone A floodplain as defined by FEMA FIRM maps. FEMA's Zone A indicates that the area has a 1 percent chance of annual flooding; however, no direct FEMA analysis has been completed. This flood zone is an extremely flat area where the floodwaters fan out to an approximate width of greater than 10 miles as they flow toward Thompson Lake to the east. The width of the crossing with the HSR tracks is roughly 18 miles, which requires that the HSR alignment be constructed on a raised embankment with intermediate openings to allow the floodwaters to pass to the east.[3] Floodplain modeling for pre- and post-project conditions showed a minor (less than 1-foot) change in water surface elevation beyond approximately 1,000 feet from the project boundaries.

In summary, increases in water surface elevation that would exceed 1 foot would occur in three floodplains within 1,000 feet of the HSR alignment. These areas are in close proximity to the openings in the HSR alignment embankment, which allow floodwaters to pass to the east. However, the change in water surface elevation would normalize and reduce as floodwaters proceed farther downstream until the changes to the water surface elevation for post-project are negligible.

Even though the water surface elevation would rise by more than 1 foot, no existing structures or planned future development are located in the areas of where the increase would be more than 1 foot. Therefore, no existing structures or planned future development would be impacted by the

[2] Backwater effect is the rise in surface elevation of water upstream from and as a result of an obstruction to flow.

[3] No well-defined channels exist in the Antelope Valley; thus, flooding generally occurs as large sheet flows. It would be difficult to maintain the existing water surface elevation and drainage pattern in this area without either installing culverts across the entire Antelope Valley floodplain, which would not be practicable or feasible from a design and cost standpoint. Therefore, bridges/viaducts would be installed in the Antelope Valley to pass the 100-year flood flows, and additional culverts and spur dikes would be installed to collect sheet flow. Please refer to the *Hydrology and Water Resources Technical Report* (Authority 2018a) for a detailed discussion of drainage improvements within the Antelope Valley.

increase in flood levels at these locations. Further, a Conditional Letter of Map Revision and a Letter of Map Revision would be required for all floodplain crossings at which a rise of 1 foot in water surface elevation is anticipated, as required by Mitigation Measure WQ-MM#4. The Conditional Letter of Map Revision and Letter of Map Revision would be processed through the Central Valley Flood Protection Board and FEMA during final design. The Conditional Letter of Map Revision serves as FEMA's acknowledgement that a project would affect the base flood elevations of a floodplain. The Letter of Map Revision officially revises the FIRM to reflect the new flood elevations and boundaries. Because the increase in floodplain elevation would be contained in the existing channels, would occur within 1,000 feet of the HSR alignment, and would not affect any structures, and because the FEMA FIRM would be revised to reflect the new floodplain condition, the HSR project would minimize potential harm to or within the floodplain to the maximum extent practicable.

In summary, in locations where the water surface elevation would increase by more than 1 foot (Caliente Creek, Tehachapi Creek, Antelope Valley 11J, Antelope Valley 12A, and Antelope Valley 12B floodplains), no structures would be impacted and the flooding would occur within the channel or within the project footprint. No hydraulic impacts such as backwater effects are anticipated. Additionally, any change in floodplain elevations and boundaries would be reflected on the revised FIRM so that the project would not violate regulatory floodplain standards. Therefore, through compliance with HYD-IAMF#2 and implementation of WQ-MM#4, the HSR project would not place structures within a 100-year flood hazard area in a manner that would impede or redirect flood flows or expose people or structures to loss, injury, or death involving flooding.

No chemicals or hazardous materials would be used with in the floodplains. In addition, the HSR tracks would not be within areas subject to flooding; therefore, pollutants of concern from operation of the HSR trains would not be released from the tracks during flooding. In addition, Mitigation Measure WQ-MM#4 requires implementation of a Spill, Prevention, Containment and Control Plan to reduce the potential for released chemicals to migrate into flood zones during operation. However, the placement of piers within channels and abutments within waterways has the potential to cause localized scour. Eroded material gradually decreases channel capacity and sediment deposition can cause braided stream channels and alluvial fans. Erosion would release pollutants, such as sediment, during storm events. Mitigation Measure WQ-MM#4 requires the implementation of erosion control measures at piers and/or bridge abutments to minimize scour and siltation, and requires the design of piers in channels to allow hydraulically smooth flow and to minimize scour and erosion and the release of pollutants.

Floodplain Functions and Values

As described above, there are two types of floodplain crossings: (1) elevated structures (e.g., bridges) that would span the entire FEMA flood zone or the active flood channel and (2) surface crossings that would incorporate a system of drainage ditches and culverts to pass floodwater from one side of the embankment to the other. Where feasible, the drainage improvements would be sized to avoid an increase greater than a 1-foot rise in water surface elevation at the floodplain crossing locations. Therefore, the proposed crossings would generally retain the existing floodplain functions and values. In locations where the existing water surface elevation would increase by more than 1 foot (i.e., Caliente Creek, Tehachapi Creek, and Antelope Valley), the existing flow patterns would be maintained and all flow would eventually reach the same location downstream, generally retaining the existing floodplain functions and values. In Antelope Valley, flooding on the downstream side of the alignment would decrease; however, flooding upstream of the alignment may change. Therefore, the existing floodplain functions and values would generally be retained; however, the post-project distribution of where these functions and values occur may shift.

As discussed in Section 3.7, Biological and Aquatic Resources, direct permanent impacts on surface waters, including floodplains, include modification of local hydrology, the redirection of flow, and the placement of fill material. Heavy machinery would be used to recontour the landscape and place permanent fill materials (e.g., culverts, dirt, and/or engineering structures) in surface waters, including floodplains. There is a slight chance of hydrology and water resources-related effects occurring in downstream surface waters, including erosion, siltation, chemical spills or leaks, and runoff into natural and constructed aquatic features and fill downstream of the construction footprint. For most aquatic features (e.g., streams and washes), the hydrologic changes would be minimal, as hydrology would be retained through culverts and other structures. The downstream hydrologic effects of placing cross culverts in the natural channels in locations that are affected by the HSR alignment would be contained within a few feet of the riprap pad at the discharge point of the culverts. However, for a few natural features (e.g., seasonal wetlands and claypan depressions and wetlands outside the project footprint) that may be dependent on very localized hydrology, the effects may result in changes in the natural hydrological regime. In some areas, the hydroperiod may be either reduced or extended where sheet flow is limited. Indirect impacts on seasonal riverine and riparian areas may include localized changes in water temperature caused by the removal of riparian trees that provide shade, shading of open water, and reduced contribution to and ability to recycle nutrients. While there may be some changes to the downstream areas, most would be negligible outside of the project footprint. Therefore, the existing floodplain functions and values related to hydraulics would maybe affected within a few feet of the B-P Build Alternative; however, any hydraulic changes to functions and values would be negligible outside of the project footprint.

CEQA Conclusion

Even with implementation of HYD-IAMF#2 (which requires design measures to reduce increases in floodplain water surface elevation) and compliance with the requirements set forth in USEO 11988 and the FEMA regulations during operation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option), the increase in water surface elevation of several floodplains would exceed 1 foot. Because the increase would exceed FEMA requirements, this would be considered a significant impact under CEQA. Therefore, CEQA requires mitigation. Mitigation Measure WQ-MM#4, included in Section 3.8.7, Mitigation Measures, would be implemented to avoid hydraulic impacts on floodplains, such as raising the water surface elevation, by requiring the preparation of a Conditional Letter of Map Revision/Letter of Map Revision. The Conditional Letter of Map Revision would serve as FEMA's acknowledgement that the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would affect the base flood elevation of a floodplain. The Letter of Map Revision would officially revise the FIRM to reflect the change in floodplain conditions so that design of future projects and development can take the changes in the floodplain into account. Because the increase in floodplain elevation would be contained in the existing channels, would take place within 1,000 feet of the HSR alignment, and would not affect any structures, and because the FEMA FIRM would be revised to reflect the new floodplain condition as required by Mitigation Measure WQ-MM#4, permanent impacts on the floodplain would be less than significant pursuant to CEQA.

The placement of piers within channels and abutments within waterways has the potential to cause localized scour and erosion and increase the risk of release of pollutants during flooding, which would be significant under CEQA. Therefore, CEQA requires mitigation. Mitigation Measure WQ-MM#4, included in Section 3.8.7, Mitigation Measures, would be implemented to reduce operation-related impacts related to release of pollutants by requiring erosion control measures to minimize scour. Mitigation Measure WQ-MM#4 also requires implementation of a Spill, Prevention, Containment and Control Plan to reduce the potential for released chemicals to migrate into flood zones during operation. Therefore, after implementation of mitigation, permanent impacts related to release of pollutants would be less than significant pursuant to CEQA.

Impact HWR #6: Permanent Operation Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity

Implementation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would result in alteration of the existing drainage patterns due to the HSR project. An alteration to the existing drainage patterns has the potential to increase surface water volume or rates. On-site infiltration or conveyance of stormwater to retention basins would minimize the alteration of drainage patterns. In addition, as shown in Table 3.8-16, the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would increase impervious surface area. Alternative 2 would result in the greatest net increase (771 acres) and Alternative 3 would result in the smallest net increase (743 acres). Alternatives 1 and 5 would result in a net increase in impervious surface of 764 and 760 acres, respectively. The B-P Build Alternatives with the CCNM Design Option would result in 1 acre less of impervious surface area compared to the B-P Build Alternatives without the CCNM Design Option. The B-P Build Alternatives with the Refined CCNM Design Option would result in 5.9 acres less of impervious surface area compared to the B-P Build Alternatives without the Refined CCNM Design Option. Introducing new impervious surfaces where they currently do not exist (especially directly connected impervious surfaces) has the potential to increase the rate and volume of stormwater runoff reaching receiving waters.

Table 3.8-16 Acres of Impervious Surface Area

B-P Build Alternative	Acres of Existing Impervious Surface Area[1]	Acres of Proposed Impervious Surface Area[2,3]	Net Increase in Impervious Surface Area
Alternative 1	615	1,379	764
Alternative 2	549	1,320	771
Alternative 3	612	1,355	743
Alternative 5	642	1,402	760
CCNM Design Option compared to B-P Build Alternatives	+0.0	-1.0	-1.0
Refined CCNM Design Option compared to B-P Build Alternatives	+0.0	-5.9	-5.9

Source: California High-Speed Rail Authority, 2018
[1] The existing amount of impervious surface area includes existing roads and existing buildings located within the study area.
[2] The proposed amount of impervious surface area includes roadway crossings, improvements to existing roads, access roads, viaducts, ballasted and concrete track bed sections, maintenance facilities, tunnel portal building, and traction power facilities. Both ballast and concrete track bed sections are impervious.
[3] Permanent footprints will be refined during further design.
B-P = Bakersfield to Palmdale Project Section
CCNM = César E. Chávez National Monument

As discussed in Section 3.7, Biological and Aquatic Resources, direct permanent impacts on surface waters include modification of local hydrology, the redirection of flow, and the placement of fill material. Heavy machinery would be used to recontour the landscape and place permanent fill materials (e.g., culverts, dirt, and/or engineering structures) in surface waters. There is a slight chance of hydrology and water resources-related effects occurring in downstream surface waters, including erosion, siltation, chemical spills or leaks, and runoff into natural and constructed aquatic features and fill downstream of the construction footprint. For most aquatic features (e.g., streams and washes), the hydrologic changes would be minimal, as hydrology would be retained through culverts and other structures. The downstream hydrologic effects of placing cross culverts in the natural channels in locations that are affected by the B-P Build Alternatives would be contained within a few feet of the riprap pad at the discharge point of the culverts. However, for a few natural features (e.g., seasonal wetlands and claypan depressions and wetlands outside the project footprint) that may be dependent on very localized hydrology, the effects may result in changes in the natural hydrological regime. In some areas, the hydroperiod may be either reduced or extended where sheet flow is limited. Indirect impacts on seasonal riverine and riparian areas may include localized changes in water temperature caused by the removal of riparian trees that provide shade, shading of open water, and reduced contribution to and ability to recycle nutrients. While there may be some changes to the downstream areas, most would be negligible outside of the project footprint.

The proposed drainage system would collect, convey, and discharge surface water runoff from the track right-of-way through a network of channels, ditches, and culverts, while maintaining the existing drainage pattern to the maximum extent practicable. New drainage facilities may incorporate vegetation or gravel linings of ditches/channels/basins to control erosion and decrease velocities, and vegetation of exposed cut-and-fill slopes to prevent slope face erosion. Table 3.8-17 includes a description of the proposed track drainage system and adjacent facilities, such as road crossings.

Table 3.8-17 Proposed Drainage System

Track and Adjacent Facilities	Description of Proposed Drainage System
Embankments with retaining walls	▪ Weep holes would be located near the base of the wall to prevent the buildup of stormwater in the embankment. ▪ Drainage from the track bed would be collected through piped drainage systems. ▪ Storm drains may be incorporated behind the top of the retaining walls to accommodate peak events. ▪ Runoff would drain to the pervious ground surface or unlined drainage ditches and basins.
Embankments with fill	▪ Fill would be used to support sections of the track. The side slopes of the proposed embankment would be no steeper than 2:1 (H:V). ▪ A crown would be added to the track bed to facilitate drainage. ▪ On-site stormwater would be discharged into ditches along each side of the embankment within the right-of-way. All on-site stormwater runoff would be conveyed to detention basins. ▪ In flatter rural areas, zero-sloped detention ditches would be installed on both the upstream and downstream sides of the fill embankment. The upstream ditch would be connected to the downstream ditch with a culvert. Runoff would be collected in the upstream ditch and then flow through the culvert into the downstream ditch. Runoff would be allowed to pond in the downstream ditch until it overflows over the side of the downstream ditch and infiltrates into the soil. ▪ Off-site runoff would be conveyed to the existing drainage system via sheet flow or drainpipe connections. ▪ Separate drainage facilities would be used to collect and convey off-site and on-site stormwater flow to avoid mixing of on-site and off-site runoff.
Viaducts (i.e., bridges)	▪ Bridge decks would be impervious. ▪ Bridges would involve the installation of piers to support the structures. ▪ In rural areas, the areas underneath the bridges would remain pervious. ▪ Stormwater from the elevated portions of track would drain to the ground through downspouts at the columns. ▪ Drainage from the downspouts would be discharged directly to retention/detention basins to infiltrate or discharge into bioswales underneath the bridge and then into detention/retention facilities where the water would infiltrate on-site.

Track and Adjacent Facilities	Description of Proposed Drainage System
Areas with deep cuts	▪ Stormwater runoff would be collected along the top of the cut slope and directed through down drains every 300 to 500 feet, depending on the height of the cut slope. Collected stormwater would be pumped to the original ground outside the cut trench and directed to a drainage facility. ▪ Additional benches would be installed to intercept slope runoff. Runoff collected along the benches would be intercepted every 300 to 500 feet. ▪ Cross-culverts would be used to pass concentrated flows from one side of the open-cut section to the other.
Below-grade	▪ Drainage systems would collect stormwater and direct it to a pump station. ▪ Stormwater would be pumped to the original ground surface outside the cut section and released into an infiltration/detention basin. ▪ BMPs, including energy dissipation controls, constructed of sound materials (e.g., stones or concrete), would be used.
Tunnels	▪ Drainage systems would collect runoff inside the tunnels to the low point in the tunnel. ▪ The collected runoff would be tested and discharged to detention basins at the portals to infiltrate pervious surface areas, treated prior to discharge, or hauled off and disposed of if contaminated. ▪ BMPs would be used to dissipate velocity at the discharge locations.
Roadway overpasses	▪ Roadway overpasses would slightly increase impervious area because of the lengthening of paved surfaces compared with the existing at-grade roadway. ▪ Stormwater would be collected at the toe of embankments and conveyed to detention basins.
New paved access or frontage roads	▪ On-site stormwater runoff would flow into roadside ditches and infiltrate the soil. ▪ Off-site stormwater runoff would flow to a separate existing storm drain system dedicated to off-site flows. ▪ Additional catch basins and/or storm drains would be installed as required to meet Caltrans', the Authority's, and local jurisdictions' hydrologic criteria.

Source: California High-Speed Rail Authority, 2018a
Authority = California High-Speed Rail Authority
BMP = best management practice
Caltrans = California Department of Transportation
H:V = horizontal to vertical

The project would include 20 permanent dirt access roads. To address concerns related to stormwater dissipation and diversion at the proposed road locations, curbs or roadside ditches are proposed at the tops and toes of slopes on the upstream side of the roads to collect and channelize the roadway stormwater flows. To reduce hydrologic impacts, the channelized flows would discharge into an energy dissipater before exiting to a natural channel to slow the concentrated flows to a non-erosive velocity. Specifically, stormwater runoff would be discharged to riprap pads upstream of the culvert crossings. These riprap pads would reduce the potential of local scour at the upstream culvert entrance. Once the runoff is conveyed through the culvert, another riprap energy dissipater is proposed downstream to slow down the concentrated runoff to non-erosive velocities to reduce impacts to downstream natural drainage channels. The grading and ditch locations would be designed such that the diversion of drainage areas would be avoided where feasible. If necessary, the ditches could be designed to buck grade to match the pre-project drainage areas to reduce the potential impacts of hydromodification. In the event there are constrained locations where the diversion of the tributary drainage area is unavoidable, small basins on either the upstream (preferred) or downstream ends of the culvert could be designed to store and slowly release runoff to offset any potential impacts of hydromodification.

Streams or canals would be crossed at the surface level by culverts, underground through tunnels or trenches, and on elevated structures/bridges. Refer to Table 3.8-18 for a list of the surface waterbodies crossed by alternative, the widths of the crossings, and the types of crossings. Each culvert or set of culverts would be sized individually based on hydrologic (runoff) and hydraulic (capacity) modeling. Culverts would be designed to maintain the hydraulic conveyance capacity of the existing waterbody and freeboard. In addition, these culverts may also provide wildlife crossing opportunities.

Table 3.8-18 Named Waterbodies Crossed by the Bakersfield to Palmdale Project Section Build Alternatives

Named Waterbody[1]	Type[2]	Alternative(s)	Approximate Crossing Width[3, 4]	Type of Crossing
Caliente Creek	I	Alternative 1 Alternative 2 Alternative 3 Alternative 5	50 ft 50 ft 50 ft 50 ft	Bridge
Clear Creek	I	Alternative 1 Alternative 2 Alternative 3 Alternative 5	80 ft 80 ft 80 ft 80 ft	Tunnel
Tehachapi Creek	I	Alternative 1 Alternative 2 Alternative 3 Alternative 5 CCNM Design Option Refined CCNM Design Option	150 ft 150 ft 150 ft 150 ft 150 ft 155 ft	Bridge
Tweedy Creek	I	Alternative 1 Alternative 2 Alternative 3 Alternative 5 CCNM Design Option Refined CCNM Design Option	30 ft 30 ft 30 ft 30 ft 45 ft 25 ft	Low Flow and Bridge
Tehachapi Creek (second crossing)	I	Alternative 1 Alternative 2 Alternative 3 Alternative 5	850 ft (multiple crossings) 850 ft (multiple crossings) 850 ft (multiple crossings) 850 ft (multiple crossings)	Bridge
Oak Creek	P	Alternative 1 Alternative 2 Alternative 3 Alternative 5	70 ft 70 ft 80 ft 70 ft	Bridge
Los Angeles Aqueduct[5]	N/A	Alternative 1 Alternative 2 Alternative 3 Alternative 5	70 ft (underground) 70 ft (underground) 70 ft (underground) 70 ft (underground)	Bridge

Named Waterbody[1]	Type[2]	Alternative(s)	Approximate Crossing Width[3, 4]	Type of Crossing
Second Los Angeles Aqueduct[4]	N/A	Alternative 1 Alternative 2 Alternative 3 Alternative 5	20 ft (underground) 20 ft (underground) 20 ft (underground) 20 ft (underground)	Bridge
Amargosa Creek	I	Alternative 1 Alternative 2 Alternative 3 Alternative 5	20 ft 20 ft 20 ft 20 ft	Surface
Amargosa Creek (second crossing)	I	Alternative 1 Alternative 2 Alternative 3 Alternative 5	30 ft 30 ft 30 ft 30 ft	Surface

Source: California High-Speed Rail Authority, 2018
[1] Features were identified from USGS quadrangle maps, aerial photographs, and field surveys. Ephemeral streams are not listed.
[2] Type: P = perennial, I = intermittent, N/A = not applicable.
[3] Crossing widths are subject to change once the alternative alignments are finalized.
[4] The B-P Build Alternatives are inclusive of the CCNM Design Option and the Refined CCNM Design Option except at Tehachapi Creek and Tweedy Creek, where the alignments cross at a different location.
[5] The Los Angeles Aqueduct is piped below ground at the crossing.
B-P = Bakersfield to Palmdale Project Section
CCNM = César E. Chávez National Monument
ft = feet
HSR = high-speed rail
USGS = U.S. Geological Survey

On-site stormwater runoff captured along the HSR alignment would be directed to on-site infiltration/detention basins, as specified in HYD-IAMF#1: Stormwater Management. Off-site stormwater would be conveyed to the existing drainage system. These infiltration/detention BMPs would provide hydromodification controls to offset the increase in volume and rate of runoff. HYD-IAMF#1 is included as part of the project design and would be implemented for all B-P Build Alternatives (including the CCNM Design Options) to avoid or minimize hydraulic effects associated with operation of the HSR project. This IAMF would reduce potential impacts on the existing drainage pattern resulting from operation of the HSR project through the following mechanisms:

- **HYD-IAMF#1: Stormwater Management**—By reviewing each receiving stormwater system's capacity to accommodate additional project runoff, selecting upgrades designed to provide adequate capacity in compliance with design standards, and incorporating on-site facilities to capture runoff and provide hydromodification controls.

CEQA Conclusion

HYD-IAMF#1 requires on-site infiltration/detention basins to capture, manage, and convey stormwater runoff to the existing drainage system and to offset the increase in volume and rate of runoff. With implementation of these drainage control measures, the project would not substantially alter the existing drainage pattern of the site or area in a manner that would result in substantial erosion or siltation on- or off-site, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site. Nor would the project create or contribute runoff water that would exceed the capacity of existing drainage systems or provide substantial additional sources of polluted runoff. Therefore, the permanent impacts on drainage patterns, stormwater runoff, and hydraulic capacity under CEQA would be less than significant.

Impact HWR #7: Permanent Operation Impacts to Surface Water Quality

During operation and maintenance activities, anticipated pollutants associated with a railway facility include heavy metals, nutrients, sediments, organic compounds, trash and debris, and oil and grease. The technology proposed for the HSR system does not require large amounts of lubricants or hazardous materials for operation. Greases may be used to lubricate switching equipment along the trackway. Additionally, herbicides and/or pesticides may be used along the right-of-way to control weeds and vermin as required by state and federal regulations. Appropriate laws and regulations pertaining to the use of pesticides and herbicides and safety standards for employees and the public (including the Federal Insecticide, Fungicide and Rodenticide Act [7 U.S. Code § 136 and 40 Code of Federal Regulations Parts 152.1–171], the federal Occupational Safety and Health Act of 1970, the California Health and Safety Code, and the California Occupational Safety and Health Act) would be followed to minimize impacts on the environment. The Authority would implement environmental management system and hazardous materials monitoring plans to limit the potential for spills, limit the amount of hazardous substances used for HSR operations, and establish cleanup protocols and provide trained personnel to prevent accidental spills of hazardous materials and other pollutants from reaching surface waterbodies during operation (as specified in HMW-IAMF#9 and HMW-IAMF#10).

Operation of the HSR system would increase the amount of the pollutants associated with rail operations. Specifically, dust generated by braking would be continuously generated and released by trains. Brake dust consists of particulate metals (primarily iron) but may also include copper, silicon, calcium, manganese, chromium, and barium. Although brake dust consists primarily of particulate metals, some of these metals could become dissolved in rainwater. Although brake dust would be released into the environment during operations, the electric trains would use regenerative braking technology, resulting in reduced physical braking and associated wear compared to conventional petroleum-fueled trains. Brake dust would not be generated in equal amounts throughout the HSR alignment. The primary locations where brake dust would be generated are areas where the trains must reduce their travel speed, such as approaches to stations, turns, and elevation changes (primarily descents). Long stretches of flat terrain with a straight rail alignment would generate less brake dust than other areas. In addition, brake dust is generally anticipated to be retained in track ballast.

In consideration of the potential for brake-pad particles to be conveyed to surface waters during rain events, the Authority would prepare a stormwater management and treatment plan that complies with the Phase II MS4 permit requirements (HYD-IAMF#1). The plan would include post-construction BMPs and low-impact development techniques to reduce the quantity and improve the quality of stormwater runoff before runoff is discharged into a surface waterbody. A variety of BMPs would be considered, including, but not limited to, biofiltration swales, biofiltration strips, infiltration devices, detention devices, media filters, multichambered treatment trains, wet basins, dry-weather diversion, and gross solids removal devices. Of these potential treatment BMPs, all are capable of reducing particulate and dissolved metal concentrations in runoff. Post-construction BMPs would minimize potential continuous impacts from brake dust deposited on impervious surfaces by capturing runoff and improving the quality of runoff prior to discharge into waterbodies. Along at-grade, cut, and fill sections of the HSR alignment, brake dust is generally anticipated to be retained in track ballast. Accordingly, post-construction BMPs would minimize potential continuous impacts from brake dust deposited on impervious surfaces by capturing and improving the quality of runoff prior to discharge into waterbodies.

Although not quantifiable at this time, the amount of brake dust that could be discharged into surface waterbodies is not anticipated to be sufficient to substantially alter water quality because the electric trains would use regenerative braking technology to reduce brake pad wear and the amount of potential metal particles deposited within the track right-of-way. Even though certain heavy metals have the potential to bioaccumulate within the aquatic environment or stimulate the growth of microbes (e.g., algae), resulting in adverse effects on aquatic life, the discharge of metals into surface waterbodies is not likely to cause a violation of the water quality objectives for bioaccumulation and biostimulatory substances. Considering that the project would implement treatment BMPs to reduce the quantity and improve the quality of stormwater runoff prior to discharge to surface waters, the project would minimize potential water quality impacts from brake dust to the maximum extent practicable using the best available technology.

In some areas, the existing railways within Kern and Los Angeles Counties are not close to the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option). Therefore, the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would introduce new types of pollutants to the RSA. The presence of the HSR could also increase the amount of the pollutants associated with rail operations in areas where the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) are close to existing railways because of increased rail service. None of the waterbodies in the RSA are on the 303(d) List, and TMDLs have not been developed; therefore, operation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would not contribute to any existing water quality impairments. At each crossing, the HSR alignment would span the primary flow channel or the flow would be carried below the tracks through a culvert. During storm events, runoff from the track could come into contact with pollutants and transport pollutants into the river or creek. However, runoff from the project would not be discharged directly to surface waterbodies. Runoff from these crossings would be collected and conveyed to infiltration/detention basins or a nearby stormwater collection system. The stormwater conveyance systems and BMPs would be designed to disperse stormwater runoff in a nonerosive manner. Runoff from the track right-of-way would be retained on-site, dispersed in a nonerosive fashion, conveyed to a nearby stormwater collection system, or directed through swales to infiltration basins within the project right-of-way. Therefore, there would be no direct discharge into a surface waterbody.

In addition, the placement of piers within channels and abutments near waterways has the potential to cause localized scour. Eroded material gradually decreases channel capacity and sediment deposition can cause braided stream channels and alluvial fans.

As stated above, permanent treatment BMPs would be incorporated into the design of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) to reduce pollutants in stormwater, thereby reducing potential water quality impacts. Permanent treatment BMPs being considered for the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) include biofiltration swales, biofiltration strips, infiltration devices, detention devices, media filters, multichambered treatment trains, wet basins, dry-weather diversion, and gross solids removal devices. In addition, stormwater discharges would comply with project-specific waste discharge requirements and the Phase II Small MS4 Permit, for which the Authority is a permittee. Furthermore, discharges associated with the operation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would comply with the respective county and city general plans, ordinances, and stormwater requirements to minimize impacts on water quality. HYD-IAMF#1: Stormwater Management, is included as part of the project design and would be implemented for all B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) to avoid or minimize water quality impacts associated with operation of the HSR project. This IAMF would reduce potential impacts on water quality resulting from operation of the HSR project through the following mechanisms:

- **HYD-IAMF#1: Stormwater Management**—By providing on-site stormwater management facilities to treat stormwater runoff and target pollutants of concern prior to discharge to the storm drain system.

Mitigation Measure WQ-MM#4 requires the implementation of erosion control measures at piers and/or bridge abutments to minimize scour and siltation, and designing piers located in channels to allow hydraulically smooth flow and to minimize erosion.

There are no existing water quality impairments for TMDLs for the surface waters in the RSA; therefore, the project would not contribute to an existing water quality impairment. Additionally, compliance with the Phase II Small MS4 Permit and implementation of permanent treatment BMPs would reduce the potential for pollutants to be discharged to surface waters. Therefore, project operations would not adversely affect beneficial uses of surface waters or attainment of water quality objectives established in the water quality control plans applicable to the RSA (i.e. the Tulare Lake Basin Plan and Lahontan Region Basin Plan). Therefore, the HSR Build

Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would not conflict with the implementation of the Tulare Lake Basin Plan and the Lahontan Region Basin Plan.

Any water that accumulates within the tunnels would collect at a low point inside the tunnels. The collected runoff would be tested and discharged to detention basins at the portals to infiltrate pervious surface areas, treated prior to discharge if necessary, or hauled off and disposed of if contaminated.

In summary, the Bakersfield to Palmdale Project Section would not directly discharge pollutants to surface waters and would implement treatment BMPs to target pollutants in stormwater runoff and erosion control measures to minimize scour during operation, as required by HYD-IAMF#1 and Mitigation Measure WQ-MM#4.

CEQA Conclusion

HYD-IAMF#1 requires implementation of treatment BMPs to capture and treat stormwater runoff to remove pollutants of concern. With implementation of treatment BMPs, the impact on surface water quality from stormwater runoff would be less than significant under CEQA because the project would not violate any water quality standards or waste discharge requirements, otherwise substantially degrade surface water quality, or conflict with the implementation of the Tulare Lake Basin Plan and the Lahontan Region Basin Plan.

Even with implementation of HYD-IAMF#1 during operation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option), impacts on water quality from scour at new bridge piers would still be significant under CEQA. Therefore, CEQA requires mitigation. Mitigation Measure WQ-MM#4, included in Section 3.8.7, Mitigation Measures, would be implemented to reduce operation-related impacts on surface water quality by requiring erosion control measures to minimize scour. Therefore, after implementation of mitigation, permanent impacts on surface water quality associated with the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would be less than significant pursuant to CEQA.

Impact HWR #8: Permanent Operation Impacts to Groundwater Volume, Quality, and Recharge

Increases in impervious surfaces have the potential to interfere with groundwater recharge by decreasing the amount of water that is able to recharge the aquifer/groundwater basin. However, when compared to the size of the groundwater basins (Table 3.8-15), the increase in impervious surface area resulting from implementation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) (Table 3.8-16) would not result in a reduction in infiltration to an extent that would interfere with groundwater recharge. In addition, the soils along the RSA have a fairly high infiltration rate, and the proposed drainage improvements and treatment BMPs would promote infiltration through the use of retention/detention basins which can increase groundwater recharge, as specified in HYD-IAMF#1: Stormwater Management. HYD-IAMF#1 is included as part of the project design and would be implemented for all B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) to avoid or minimize impacts related to infiltration into the groundwater basin during operation of the HSR project. This IAMF would reduce potential impacts on infiltration resulting from operation of the HSR project through the following mechanisms:

- **HYD-IAMF#1: Stormwater Management**—By providing on-site stormwater management facilities that promote infiltration.

Additionally, the project design would include the use and retention of native materials with high infiltration potential at the ground surface in areas that are critical to infiltration for groundwater recharge, where feasible. Furthermore, it is not anticipated that groundwater extraction would be used during operational activities associated with the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option).

Implementation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would displace existing agricultural and domestic wells within the HSR right-of-way. The displacement of these wells would not further deplete groundwater supplies through additional groundwater pumping or change the water level in neighboring wells, because the replacement wells would be located in the same vicinity as the original wells and would pump at the same rate and depth as they did prior to being relocated. The Authority would work with individuals on a case-by-case basis to provide equal utility for wells affected by the alignment. Other than the replacement wells, no new wells are anticipated. Therefore, it is not anticipated that there would be any changes to groundwater pumping at wells between the proposed and existing condition.

Operational activities would not affect groundwater quality because there would not be a direct path for operation-related contaminants to reach groundwater and implementation of BMPs would target pollutants of concern and prevent pollutants from infiltrating the underlying groundwater basin. In addition, because the HSR system is electrical, operation of the track runoff would carry few pollutants. Because there would not be a direct path for construction-related contaminants to reach groundwater due to the depth of groundwater, and because permanent BMPs would be implemented to remove pollutants from stormwater runoff that could infiltrate the groundwater basin, project operation would not adversely affect beneficial uses of groundwater or attainment of groundwater quality objectives.

There is a potential for groundwater seepage into the tunnels during operation, which could affect surface resources (i.e., seeps, springs, and wells) that rely on groundwater. However, the tunnels can be designed as either undrained or drained. Undrained tunnels are fully waterproofed around the entire perimeter and are designed to withstand full hydrostatic pressure. Drained tunnels are usually waterproofed along the perimeter (walls and crown), the invert is not waterproofed, and longitudinal drainage is installed along the tunnel invert to release the hydrostatic pressure on the tunnel lining. The lack of groundwater information at this design stage precludes an evaluation of the final lining of the conventionally mined tunnels. The tunnels can be designed as waterproofed or watertight, depending on the degree of groundwater protection needed. In areas with high groundwater pressure, the tunnel lining system would be designed to allow controlled drainage of water from around the tunnel lining. The rate of groundwater losses would be minimized by grouting the native rock to lower its hydraulic conductivity immediately around the tunnel lining. Design of the tunnels would reduce the amount of seepage into tunnels in areas of high groundwater pressure, reducing the potential for adverse impacts to occur on surface resources (i.e., seeps, springs, and wells) that rely on groundwater.

In summary, through compliance with HYD-IAMF#1, operation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would not deplete groundwater volumes, affect groundwater quality, or reduce groundwater recharge in the groundwater basins.

CEQA Conclusion

HYD-IAMF#1 requires implementation of BMPs, which would include infiltration/detention basins. Impacts on groundwater volume and recharge would be less than significant with implementation of infiltration basins, combined with the existing high infiltration rates and minimal increase in impervious surface area compared to the size of the groundwater basin. Tunnels would be designed to reduce groundwater seepage into the tunnels. Therefore, impacts related to the decrease in groundwater supplies or interference with groundwater recharge such that the project may impede sustainable groundwater management of the basin or conflict with a sustainable groundwater management plan would be less than significant.

Impacts on groundwater quality during operation would be less than significant because there would not be a direct path for operation-related contaminants to reach groundwater due to the depth of groundwater. Therefore, the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would not substantially degrade groundwater quality. For these reasons, operations impacts on groundwater volume, quality, and recharge associated with the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design

Option) would be less than significant pursuant to CEQA. Therefore, CEQA does not require mitigation.

3.8.6.4 Fresno to Bakersfield Locally Generated Alternative from the Intersection of 34th Street and L Street to Oswell Street

This section describes the environmental consequences to hydrology and water resources resulting from the construction and operation of the portion of the F-B LGA from the intersection of 34th Street and L Street to Oswell Street. This portion of the alignment was analyzed in the *Fresno to Bakersfield Section Draft Supplemental EIR/EIS* (Authority and FRA 2017) and *Fresno to Bakersfield Section Final Supplemental EIR* (Authority 2018b), and the analysis in those documents is incorporated into this EIR/EIS by reference. No FEMA-designated floodways or floodplains would be impacted by the F-B LGA from the intersection of 34th Street and L Street to Oswell Street, as BMPs would be incorporated into design to avoid or minimize impacts on floodplains during construction and operation (Impacts HWR #1 and HWR #5 in this Draft EIR/EIS). The portion of the F-B LGA from the intersection of 34th Street and L Street to Oswell Street would minimally impact drainage patterns, stormwater runoff, and hydraulic capacity, as this portion of the F-B LGA is already in an urbanized portion of Bakersfield and measures would be implemented to reduce such effects (Impacts HWR #2 and HWR #6 in this Draft EIR/EIS). Surface water quality may be impacted during construction and operation of the portion of the F-B LGA from the intersection of 34th Street and L Street to Oswell Street; however, such effects would be minimal, because it would be within an urbanized area of Bakersfield and measures would be implemented to reduce such occurrences (Impact HWR #3 and HWR #7 in this Draft EIR/EIS). There is low potential for groundwater (Impacts HWR #4 and HWR #8 in this Draft EIR/EIS) to be affected during construction and operation of the portion of the F-B LGA from the intersection of 34th Street and L Street to Oswell Street, as this portion is in an urbanized area of Bakersfield and groundwater levels are generally deep in this portion of the city.

CEQA Conclusion

Impacts on drainage patterns/stormwater runoff/hydraulic capacity resulting from construction and operation and impacts on groundwater resulting from operation of the portion of the F-B LGA alignment from the intersection of 34th Street and L Street to Oswell Street would have less than significant impacts under CEQA.

Impacts on floodplains, surface water quality, and groundwater resulting from construction and operation of the portion of the F-B LGA alignment from the intersection of 34th Street and L Street to Oswell Street could potentially result in significant impacts under CEQA.

Implementation of Mitigation Measure WQ-MM#1, as described in Section 3.8.7.2 of this Draft EIR/EIS, would reduce impacts on floodplains during construction and operation activities. Implementation of Mitigation Measures WQ-MM#2, and WQ-MM#4, as described in Section 3.8.7.2 of this Draft EIR/EIS, would reduce impacts on surface water quality during construction and operation activities. Implementation of WQ-MM#3, as described in Section 3.8.7.2 of this Draft EIR/EIS, would reduce impacts on groundwater during construction activities. With implementation of mitigation, all impacts on hydrology and water resources would be reduced to less than significant levels under CEQA.

3.8.6.5 Station Sites

Stations included as part of the Bakersfield to Palmdale Project Section include the Bakersfield Station—F-B LGA and the Palmdale Station.

Impacts associated with the Bakersfield Station—F-B LGA, and the Palmdale Station are discussed below. In some cases, impacts associated with the station subsections are similar and are, therefore, discussed together. However, in cases where the impacts associated with the station subsections vary, the station subsections are discussed separately. Below is a brief summary of the station subsections.

Bakersfield Station—Fresno to Bakersfield (Locally Generated Alternative)

As described previously in Section 3.8.5.9, the Authority and the City of Bakersfield have agreed to consider an alternate station location at F Street and State Route 204 since the approved 2014 Record of Decision. This alternative was evaluated in the Fresno to Bakersfield Section Draft Supplemental EIR/EIS (Authority and FRA 2017) and Fresno to Bakersfield Section Final Supplemental EIR (Authority 2018b), which are incorporated by reference into the Bakersfield to Palmdale Project Section environmental documents.

Palmdale Station

For purposes of this analysis, the impacts of the two design options in the Palmdale Station subsection are analyzed together by topic instead of discussed individually by design option because impacts on hydrology and water resources are similar.

Construction Impacts

Impact HWR #1: Temporary Construction Impacts to Floodplains and Floodways

Bakersfield Station—Fresno to Bakersfield (Locally Generated Alternative)
The Bakersfield Station—F-B LGA would travel through the Kern River floodplain. Construction activities associated with the subsection in the floodplain include the construction of the viaduct structure. Construction activities within the floodplain could temporarily impede or redirect flood flows. As specified in HYD-IAMF#3, a SWPPP would be prepared for the project, which would include construction BMPs to manage the overall amount of stormwater runoff generated from the construction soil disturbance areas. Construction activities within floodplains would be short-term, and equipment and materials would be required to be stored outside of the floodplain to minimize the potential flood risk. In addition, all floodplains and riparian areas impacted by construction activities would be restored to their pre-existing conditions, as required by Mitigation Measures WQ-MM#1 and BIO-MM#32 in Section 3.8.7. In addition, BMPs would be implemented during construction to further minimize impacts on floodplains, as described under Mitigation Measures WQ-MM#1 and F-B LGA HWR-MM#1. Further, Mitigation Measure WQ-MM#1 and F-B LGA HWR-MM#1 require the construction supervisor to monitor weather conditions for heavy storms (and potential flood flows) during the construction period to minimize the potential flood risk. In the event that a heavy storm or flood event is identified, construction equipment would be relocated outside of the floodplain.

The Kern River floodplain is regulated by the CVFPB; therefore, construction within the Kern River floodplain would require an encroachment permit. In addition, work activities such as excavation, cut-and-fill construction, and obstruction in the floodway are not allowed during the flood season (typically from November 1 to July 15).

CEQA Conclusion
Even with compliance with an encroachment permit from the CVFPB during construction of the Bakersfield Station—F-B LGA, construction activities within the floodplains could temporarily impede or redirect flood flows, which may increase flood elevations, redefine flood hazard areas, cause flooding in areas previously not at risk from the 100-year flood, and risk the release of pollutants during flooding. This would be considered a significant impact under CEQA. Therefore, CEQA requires mitigation. Mitigation Measures WQ-MM#1, F-B LGA HWR-MM#1, and BIO-MM#32, included in Section 3.8.7, Mitigation Measures, would be implemented to reduce construction-related impacts on floodplains by restoring floodplains to pre-existing conditions, applying BMPs to preserve existing floodplains, and monitoring weather conditions for heavy storms and potential flood flows. Therefore, through implementation of Mitigation Measures WQ-MM#1, F-B LGA HWR-MM#1, and BIO-MM#32, temporary impacts on floodplains associated with construction activities would be less than significant pursuant to CEQA.

Palmdale Station
The Palmdale Station subsection would travel through two FEMA-designated floodplains: (1) the floodplain associated with the Palmdale "B" Stream, and (2) the Anaverde Creek floodplain. Disturbance to the Palmdale "B" Stream floodplain would occur due to the construction of a

second drainage facility and an 84-acre detention area. Disturbance to the Anaverde Creek floodplain would occur from the construction of a drainage facility and a 93-acre detention area. Construction activities within the 100-year floodplains would involve removing stabilizing vegetation and disturbing and compacting floodplain soils. Construction activities within the floodplain could temporarily impede or redirect flood flows. As specified in HYD-IAMF#3, a SWPPP would be prepared for the project that would include construction BMPs to manage the overall amount of stormwater runoff generated from the construction soil disturbance areas. Construction activities within floodplains would be short-term, and equipment and materials would be required to be stored outside of the floodplain to minimize the potential flood risk. In addition, construction activities would be short-term, and all floodplains and riparian areas impacted by construction activities would be restored to their pre-existing conditions, as required by Mitigation Measures WQ-MM#1 and BIO-MM#32 in Section 3.8.7, Mitigation Measures. In addition, BMPs would be implemented during construction to further minimize impacts on floodplains, as described under Mitigation Measure WQ-MM#1. Further, Mitigation Measure WQ-MM#1 requires the construction supervisor to monitor weather conditions for heavy storms (and potential flood flows) during the construction period to minimize the potential flood risk. In the event that a heavy storm or flood event is identified, construction equipment would be relocated outside of the floodplain.

CEQA Conclusion

Construction activities within the floodplains could temporarily impede or redirect flood flows, which has the potential to increase flood elevations, redefine flood hazard areas, cause flooding in areas previously not at risk from the 100-year flood, and risk the release of pollutants during flooding. This would be considered a significant impact under CEQA. Therefore, CEQA requires mitigation. Mitigation Measures WQ-MM#1 and BIO-MM#32, included in Section 3.8.7, would be implemented to reduce construction-related impacts on floodplains by restoring floodplains to pre-existing conditions, applying BMPs to preserve existing floodplains, and monitoring weather conditions for heavy storms and potential flood flows. Therefore, through implementation of Mitigation Measures WQ-MM#1 and BIO-MM#32, temporary impacts on floodplains associated with construction activities would be less than significant pursuant to CEQA.

Impact HWR #2: Temporary Construction Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity

Construction of all stations would be similar and is anticipated to take between 1 and 3 years. Construction activities associated with the stations include grading, hauling, excavating, and constructing facilities. Construction activities such as grading and excavation could alter existing drainage patterns and redirect stormwater runoff. During ground-disturbing activities, soil would be compacted, resulting in a decrease in infiltration and an increase in the volume and rate of stormwater runoff during storm events. A SWPPP would be prepared to identify project-specific construction BMPs to be implemented as part of the project. The SWPPP would be prepared prior to construction and would describe temporary drainage patterns within the construction sites and indicate stormwater discharge locations from construction sites to the existing drainage system. These specifications are included in HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan. HYD-IAMF#3 is included as part of the project design and would be implemented for the HSR stations to avoid or minimize temporary hydraulic effects associated with construction activities. This IAMF would reduce potential impacts on the existing drainage pattern resulting from construction activities during construction through the following mechanisms:

- **HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan**—Implement BMPs to provide hydromodification controls to maintain pre-project hydrology and to manage the amount and quality of stormwater runoff emanating off of the construction sites.

CEQA Conclusion

Implementation of HYD-IAMF#3 would require hydromodification and stormwater management measures to control drainage during construction of the stations. With implementation of this

IAMF, the impact under CEQA would be less than significant because construction activities would not substantially alter the existing drainage pattern of the site or area in a manner that would result in substantial erosion or siltation, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site. Nor would construction create or contribute runoff water that would exceed the capacity of existing drainage systems or provide substantial additional sources of polluted runoff.

Impact HWR #3: Temporary Construction Impacts to Surface Water Quality

Pollutants of concern during construction include sediments, trash, petroleum products, concrete waste (dry and wet), sanitary waste, and chemicals. Each of these pollutants on its own or in combination with other pollutants could have a detrimental effect on water quality. During construction activities, excavated soil would be exposed and there would be an increased potential for soil erosion compared to existing conditions. In addition, chemicals, liquid products, petroleum products (such as paints, solvents, and fuels), and concrete-related waste may be spilled or leaked during construction. Any of these pollutants have the potential to be transported via storm runoff into receiving waters.

A SWPPP would be prepared to identify project-specific construction BMPs to be implemented as part of the project, as specified in HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan. BIO-IAMF#11 requires preparation of a construction site BMP field manual and implementation of BMPs during construction. As specified in BIO-IAMF#8, equipment staging areas and traffic routes would be established in areas that minimize impacts on sensitive areas, including surface waters. HYD-IAMF#3, BIO-IAMF#8, and BIO-IAMF#11 are included as part of the project design and would be implemented for all HSR stations to avoid or minimize temporary water quality effects associated with construction activities. These IAMFs would reduce potential impacts on water quality resulting from construction activities during construction through the following mechanisms:

- **HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan**—Implement BMPs aimed at reducing pollutants of concern to maintain current water quality and reduce erosion on-site.
- **BIO-IAMF#8: Delineate Equipment Staging Areas and Traffic Routes**—Stage construction equipment in areas that minimize effects to sensitive biological resources, including from risk of spills and erosion from equipment.
- **BIO-IAMF#11: Maintain Construction Sites**—Prepare a construction site BMP field manual and implement standard construction site housekeeping practices.

Construction BMPs include, but are not limited to, Erosion and Sediment Control BMPs designed to minimize erosion and retain sediment on-site and Good Housekeeping BMPs to prevent spills, leaks, and discharges of construction debris and waste into receiving waters.

Construction activities have the potential to introduce wastes or hazardous wastes into receiving waters. HMW-IAMF#8 requires the preparation of a hazardous materials and waste plan and for hazardous waste handling. HMW-IAMF#6 requires the preparation of a CMP to address hazardous material releases and to ensure cleanup of any hazardous material releases during construction. Waste management and materials pollution controls (as detailed in BIO-IAMF#9 and HMW-IAMF#7) would also be included to ensure trash is properly disposed of on a daily basis and would minimize the impacts on water quality. These measures would help reduce risk of spills of waste and hazardous waste to surface waters through the following mechanisms:

- **BIO-IAMF#9: Dispose of Construction Spoils and Waste**—Excavated materials produced will be stored in areas at or near construction sites within the project footprint, returned to their original location, or disposed of at an off-site location.
- **HMW-IAMF#6, Spill Prevention**—A CMP and SPCC plan (or Soil Prevention and Response Plan) addressing spill prevention will be prepared and implemented.

- **HMW-IAMF#7, Transport of Materials**—A hazardous materials and waste plan describing responsible parties and procedures for hazardous waste and hazardous materials transport will be prepared and implemented.
- **HMW-IAMF#8: Permit Conditions**—Includes requirements for transport, labeling, containment, cover, and other BMPs for storage of hazardous materials.

As described previously under Impact HWR #2, in-water work during construction would be restricted to the dry season. However, if water is present in the channel during in-water work, the contractor would develop a water diversion plan prior to construction, which would include the use of cofferdams or sandbag barriers around the work areas to keep water out and to reduce sediment pollution from construction. The larger streams may require construction of a temporary stream crossing to minimize erosion and downstream sedimentation from construction. However, even with implementation of a water diversion plan and a temporary stream crossing, there would be a potential for water quality impacts to occur from increased erosion from the dewatering and diversion activities. To avoid or minimize the potential turbidity and siltation effects from dewatering activities, Mitigation Measure BIO-MM#62 requires the Authority to prepare a dewatering plan for construction dewatering or work requiring a water diversion where open or flowing water is present. The dewatering plan would identify how to divert water from the work area in a manner that avoids or minimizes impacts on resources to the maximum extent practicable, including monitoring of water quality. These efforts would minimize any changes to overall water quality so that dewatering and diversion of surface waters would not contribute to a violation of regulatory standards or waste discharge requirements. Additionally, Mitigation Measure BIO-MM#34 requires a project biologist to monitor construction activities within or adjacent to aquatic resources to ensure compliance with the CWA and the Porter-Cologne Act.

Due to the deep groundwater levels adjacent to the station subsections (greater than 50 feet), there is an extremely low potential for groundwater to be encountered during excavation activities. If groundwater is encountered during construction of the stations, the disposal of groundwater to surface waters could impact surface water quality. The removal and disposal of groundwater would be conducted in accordance with the requirements of the Dewatering Permits (Mitigation Measure WQ-MM#2). Adherence to the requirements of the applicable Dewatering Permit would ensure the water discharged to surface water or land would not degrade existing water quality.

There are no existing water quality impairments for TMDLs for the surface waters in the RSA; therefore, the construction of the stations would not contribute to an existing water quality impairment. Additionally, preparation of a SWPPP, implementation of construction BMPs, compliance with the Dewatering Permits, and testing and treatment of groundwater prior to release to surface waters would reduce the potential for pollutants to be discharged to surface waters. Therefore, construction activities would not adversely affect beneficial uses of surface waters or attainment of water quality objectives established in the water quality control plans applicable to the RSA (i.e. the Tulare Lake Basin Plan and Lahontan Region Basin Plan). Therefore, construction of the stations would not conflict with the implementation of the Tulare Lake Basin Plan and the Lahontan Region Basin Plan.

CEQA Conclusion

HYD-IAMF#3, BIO-IAMF#8, BIO-IAMF#11, BIO-IAMF#9, HMW-IAMF#6, HMW-IAMF#7, and HMW-IAMF#8 require preparation of a SWPPP, a construction site BMP field manual, a CMP, an SPCC plan, and a hazardous materials and waste plan; implementation of construction BMPs; delineation of equipment staging areas and traffic routes; and reuse or disposal of construction spoils to reduce impacts on surface water quality during construction. With implementation of these IAMFs, impacts on surface water quality during ground-disturbing activities would be less than significant, because the project would not violate any water quality standards or waste discharge requirements, otherwise substantially degrade surface water quality, or conflict with the implementation of a water quality control plan.

Even with implementation of the above-stated IAMFs during construction of the stations, there would still be a potential for dewatering activities to impact surface water quality, and the impact under CEQA would be significant. Therefore, CEQA requires mitigation. Mitigation Measures WQ-MM#2, BIO-MM#34, and BIO-MM#62, included in Section 3.8.7, Mitigation Measures, would be implemented to further reduce construction-related impacts on surface water quality by targeting pollutants of concern in dewatering activities, preparing a dewatering plan, and monitoring dewatering activities. Through implementation of Mitigation Measures WQ-MM#2, BIO-MM#34, and BIO-MM#62, temporary impacts on surface water quality from dewatering activities would be less than significant pursuant to CEQA.

Impact HWR #4: Temporary Construction Impacts to Groundwater Volume, Quality, and Recharge

Groundwater would be pumped for construction of the Bakersfield Station subsections, which could locally increase groundwater withdrawals. However, the amount of water used for construction of the Bakersfield Station subsections would be similar to the water requirements associated with existing agricultural and urban land uses in the RSA due to the elimination of existing water use (including agriculture) within the HSR footprint, as detailed in Section 3.6, Public Utilities and Energy).

Groundwater in the vicinity of the Palmdale Station is deeper than 110 feet bgs. Minimal to no dewatering activities are anticipated because the alignment in this subsection would be constructed at-grade or on elevated structures, and the station building would not require unusually deep foundations.

It is not anticipated that groundwater extraction would be used for construction activities associated with the stations.

Construction activities associated with the stations would not affect groundwater quality, because there would not be a direct path for construction-related contaminants to reach groundwater due to the depth of groundwater in the vicinity of the station sites. Furthermore, construction BMPs (e.g., Erosion and Sediment Control and Good Housekeeping BMPs) would be implemented at construction sites as part of the SWPPP to remove pollutants from stormwater runoff that could infiltrate the groundwater basin as required by HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan. HYD-IAMF#3 is included as part of the project design and would be implemented for all HSR stations to avoid or minimize the potential for construction-related pollutants to infiltrate the groundwater basin. This IAMF would reduce potential impacts on groundwater quality during construction through the following mechanisms:

- **HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan**—Implement BMPs aimed at reducing pollutants of concern to maintain current water quality and reduce erosion on-site.

Grading and construction activities would compact soil, which can decrease infiltration during construction. However, construction activities would be temporary, and any reduction in infiltration would not interfere with groundwater recharge due to the size of the groundwater basins underlying the station sites (Table 3.8-15). In addition, construction of the station subsections would be in urbanized areas; thus, there is little existing potential for groundwater recharge.

CEQA Conclusion

Dewatering and extraction are not anticipated during construction of the stations. In addition, any reduction in infiltration from soil compaction during construction would be minimal compared to the size of the groundwater basin. For these reasons, impacts on groundwater volume recharge during construction would be less than significant and construction of the stations would not degrade water quality or impede sustainable groundwater management of the basin or conflict with a sustainable groundwater management plan.

Impacts on groundwater quality during construction would be less than significant, because there would not be a direct path for construction-related contaminants to reach groundwater due to the depth of groundwater and implementation of construction BMPs to reduce pollutants before they can migrate to the groundwater basin (HYD-IAMF#3). Therefore, CEQA does not require mitigation.

Operations Impacts

Impact HWR #5: Permanent Operation Impacts to Floodplains and Floodways

Bakersfield Station—Fresno to Bakersfield (Locally Generated Alternative)
The Bakersfield Station—F-B LGA would cross the levees on the northwestern and southwestern banks of the Kern River via a viaduct structure supported by eight octagonal, 15-foot-diameter concrete columns within the Kern River floodplain. The concrete columns would reduce the floodplain storage capacity, obstruct the flow of the Kern River, and increase the water surface elevation upstream of the F-B LGA crossing. However, the volume of fill inside the 100- and 200-year floodplain would be limited to the concrete columns, which are negligible in comparison to the size of the Kern River floodplain. The crossing would result in a 0.7-foot increase in water surface elevation during the design 100- and 200-year storm events, complying with FEMA regulations, as specified in HYD-IAMF#2: Flood Protection. HYD-IAMF#2 is included as part of the project design and would be implemented for the Bakersfield Station—F-B LGA subsection to avoid or minimize impacts on floodplains. This IAMF would reduce potential impacts effects resulting from encroachment in the floodplain through the following mechanisms:

- **HYD-IAMF#2: Flood Protection**—By designing the project to minimize increases in water surface elevation of no greater than 1 foot in compliance with state and local regulations. The floodplain crossing would be designed to minimize the placement of structures within the floodplain.

However, in instances where fill would be placed within the floodplain, a Conditional Letter of Map Revision and Letter of Map Revision to revise the FIRM to reflect the new floodplain elevations and boundaries would be required, as well as coordination among the CVFPB, the USACE, the City of Bakersfield, and the County of Kern to minimize potential flood impacts from redirected flows. The requirements to obtain a Conditional Letter of Map Revision and Letter of Map Revision are specified in Mitigation Measure WQ-MM#4 and F-B LGA HWR-MM#2.

No chemicals or hazardous materials would be used or stored within the floodplains, as the station site would be elevated above the floodplain. In addition, Mitigation Measure WQ-MM#4 requires implementation of a Spill, Prevention, Containment and Control Plan to reduce the potential for released chemicals to migrate into flood zones during operation. However, the placement of station structures has the potential to cause localized scour. Eroded material gradually decreases channel capacity and sediment deposition can cause braided stream channels and alluvial fans. Erosion would release pollutants, such as sediment, during storm events. However, the station sites would be designed to reduce scour and minimize release of pollutants during storm events.

CEQA Conclusion
With implementation of HYD-IAMF#2, which requires design measures to reduce increases in floodplain water surface elevation, and compliance with the requirements set forth in USEO 11988 and the FEMA regulations during operation of the Bakersfield Station—F-B LGA, any increases in water surface elevation would be less than the FEMA requirement of a less-than-1-foot increase. Therefore, floodplain impacts under CEQA from operation of the Bakersfield Station—F-B LGA would be less than significant because flood flows would not be substantially disturbed and existing structures in the vicinity would not be exposed to additional flooding. Regardless, Mitigation Measure WQ-MM#4, included in Section 3.8.7, Mitigation Measures, would be required for locations where fill would be placed in the floodplain. Mitigation Measures WQ-MM#4 and F-B LGA HWR-MM#2 require a Conditional Letter of Map Revision/Letter of Map Revision to reflect the new floodplain elevations and boundaries and coordination among the CVFPB, the USACE, the City of Bakersfield, and the County of Kern to minimize potential flood impacts from redirected flows.

The placement of the Bakersfield Station—F-B LGA within a 100-year floodplain has the potential to cause localized scour and erosion and increase the risk of release of pollutants during flooding, which would be significant under CEQA. Therefore, CEQA requires mitigation. Mitigation Measures WQ-MM#4 and F-B LGA HWR-MM#2, included in Section 3.8.7, Mitigation Measures, would be implemented to reduce operation-related impacts related to release of pollutants by requiring erosion control measures to minimize scour. Mitigation Measure WQ-MM#4 also requires implementation of a Spill, Prevention, Containment and Control Plan to reduce the potential for released chemicals to migrate into flood zones during operation. Therefore, after implementation of mitigation, permanent impacts related to release of pollutants would be less than significant pursuant to CEQA.

Palmdale Station

The Palmdale Station subsection would travel through two floodplains. Development of the Palmdale Station subsection would construct a drainage facility and an 84-acre detention area within the Palmdale "B" Stream floodplain and another drainage facility and a 93-acre detention area within the Anaverde Creek floodplain. However, increases in floodplain elevations would not exceed 1 foot, consistent with FEMA regulations, as specified in HYD-IAMF#2: Flood Protection. HYD-IAMF#2 is included as part of the project design and would be implemented for the Palmdale Station to avoid or minimize impacts on floodplains. This IAMF would reduce potential impacts resulting from encroachment in the floodplain through the following mechanisms:

- **HYD-IAMF#2: Flood Protection**—By designing the project to minimize increases in water surface elevation of no greater than 1 foot in compliance with state and local regulations. The floodplain crossing would be designed to minimize the placement of structures within the floodplain.

Structures placed in the floodplain would remain throughout the life of the project and could block or channelize flood flows associated with Anaverde Creek and the State Route 14 Palmdale "B" Stream. Floodplains would also be incorporated into the design of drainage basins to maintain existing flow patterns. This would allow flood flows during project operation to remain consistent with pre-project flow conditions. Based on the floodplain and drainage analysis, the 15 percent design shows the existing drainage facilities would be adequate to maintain the existing level of drainage.

No chemicals or hazardous materials would be used or stored within the floodplains, as the station site would be elevated above the floodplain. In addition, Mitigation Measure WQ-MM#4 requires implementation of a Spill, Prevention, Containment and Control Plan to reduce the potential for released chemicals to migrate into flood zones during operation. However, the placement of station structures has the potential to cause localized scour. Eroded material gradually decreases channel capacity and sediment deposition can cause braided stream channels and alluvial fans. Erosion would release pollutants, such as sediment, during storm events. However, the station sites would be designed to reduce scour and minimize release of pollutants during storm events.

CEQA Conclusion

With implementation of HYD-IAMF#2, which requires design measures to reduce increases in floodplain water surface elevation, and compliance with the requirements set forth in USEO 11988 and the FEMA regulations during operation of the Palmdale Station, any increases in water surface elevation would be less than the FEMA requirement of a less-than-1-foot increase. Therefore, the impact related to impeding or redirecting flood flows would be less than significant and CEQA does not require mitigation.

The placement of the Palmdale Station within a 100-year floodplain has the potential to cause localized scour and erosion and increase the risk of release of pollutants during flooding, which would be significant under CEQA. Therefore, CEQA requires mitigation. Mitigation Measures WQ-MM#4, included in Section 3.8.7, Mitigation Measures, would be implemented to reduce operation-related impacts related to release of pollutants by requiring erosion control measures to minimize scour. Mitigation Measure WQ-MM#4 also requires implementation of a Spill, Prevention, Containment and Control Plan to reduce the potential for released chemicals to migrate into flood zones during operation. Therefore, after implementation of mitigation, permanent impacts related to release of pollutants would be less than significant pursuant to CEQA.

Impact HWR #6: Permanent Operation Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity

The stations would consist primarily of impermeable surfaces, such as roofs, platforms, ramps, stairs, buildings, parking areas, and other hard structures. Impermeable surfaces could increase the volume and rate of stormwater runoff. The stations would be required to implement stormwater design features and BMPs that would reduce the volume and rate of stormwater runoff draining to the stormwater system, as specified in HYD-IAMF#1: Stormwater Management, and as discussed in Impact HWR #6: Permanent Operation Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity. HYD-IAMF#1 is included as part of the project design and would be implemented for all HSR stations to avoid or minimize hydraulic effects associated with operation of the HSR project. This IAMF would reduce potential impacts on the existing drainage pattern resulting from operation of the HSR project through the following mechanisms:

- **HYD-IAMF#1: Stormwater Management**—By reviewing each receiving stormwater system's capacity to accommodate additional project runoff, selecting upgrades designed to provide adequate capacity in compliance with design standards, and incorporating on-site facilities to capture runoff and provide hydromodification controls.

Further, all drainage improvements and surface water crossings would be designed in accordance with the Authority's *Hydraulics and Hydrology Guidelines* (Authority 2011) and the existing drainage pattern would be maintained to the maximum extent practicable.

CEQA Conclusion

HYD-IAMF#1 requires stormwater design features and BMPs to capture, manage, and convey stormwater runoff to the existing drainage system and offset the increase in volume and rate of runoff so that the capacity of the downstream storm drainage system would not be exceeded. With implementation of these drainage control measures, the stations would not substantially alter the existing drainage pattern of the site or area in a manner that would increase erosion or siltation on- or off-site, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site. Nor would the stations create substantial additional sources of polluted runoff. Accordingly, the impact under CEQA would be less than significant.

Impact HWR #7: Permanent Operation Impacts to Surface Water Quality

Development of the station subsections would result in an increase in impervious surface area, which would increase the volume of runoff during a storm, thereby increasing the potential for more effectively transporting pollutants to receiving waters. Also, an increase in impervious surface area would also increase the total amount of pollutants in stormwater runoff. The main sources of pollutants would be from parking lots associated with the stations and would include heavy metals, organic compounds, trash and debris, oil and grease, nutrients, pesticides, and sediments. Project-specific BMPs would treat runoff before it enters the stormwater drainage system, as described in HYD-IAMF#1: Stormwater Management. HYD-IAMF#1 is included as part of the project design and would be implemented for all HSR stations to avoid or minimize water quality impacts associated with operation of the HSR project. This IAMF would reduce potential impacts on water quality resulting from operation of the HSR project through the following mechanisms:

- **HYD-IAMF#1: Stormwater Management**—By providing on-site stormwater management facilities to treat stormwater runoff and target pollutants of concern prior to discharge to the storm drain system.

There are no existing water quality impairments for TMDLs for the surface waters in the RSA; therefore, the project would not contribute to an existing water quality impairment. Additionally, compliance with the Phase II Small MS4 Permit and implementation of permanent treatment BMPs would reduce the potential for pollutants to be discharged to surface waters. Therefore, project operations would not adversely affect beneficial uses of surface waters or attainment of water quality objectives established in the water quality control plans applicable to the RSA (i.e. the Tulare Lake

Basin Plan and the Lahontan Region Basin Plan). Therefore, operation of the stations would not conflict with the implementation of the Tulare Lake Basin Plan and the Lahontan Region Basin Plan.

CEQA Conclusion
HYD-IAMF#1 requires implementation of treatment BMPs to capture and treat stormwater runoff to remove pollutants of concern. With implementation of treatment BMPs, the impact on surface water quality from stormwater runoff would be less than significant under CEQA because the project would not violate any water quality standards or waste discharge requirements, otherwise substantially degrade surface water quality, or conflict with the implementation of the Tulare Lake Basin Plan and the Lahontan Region Basin Plan.

Impact HWR #8: Permanent Operation Impacts to Groundwater Volume, Quality, and Recharge

The station subsections are all within existing or planned municipal water distribution areas that are served from groundwater sources. Therefore, the use of municipal water during operation could affect groundwater levels in the groundwater basins. It is not anticipated that groundwater extraction in the Kern County Subbasin would be required for operational activities associated with the Bakersfield Station subsections. Groundwater withdrawal from the Antelope Valley Groundwater Basin would increase due to the operation of the Palmdale Station subsection; however, because the station is replacing existing facilities that currently use municipal water, groundwater withdrawal associated with the Palmdale Station subsection would be similar to the existing conditions.

Development of the stations would result in an increase in impervious surface area. An increase in impervious surface area decreases infiltration, which can decrease the amount of water that is able to recharge the aquifer/groundwater basin. However, this reduction in infiltration would not interfere with groundwater recharge due to the size of the groundwater basins (Table 3.8-15). In addition, the proposed drainage improvements would promote infiltration through the use of infiltration/detention basins, which can increase groundwater recharge, as specified in HYD-IAMF#1: Stormwater Management. HYD-IAMF#1 is included as part of the project design and would be implemented for all HSR stations to avoid or minimize impacts related to infiltration into the groundwater basin during operation of the HSR project. This IAMF would reduce potential impacts on infiltration resulting from operation of the HSR project through the following mechanisms:

- **HYD-IAMF#1: Stormwater Management**—By providing on-site stormwater management facilities that promote infiltration.

Additionally, the *Hydraulics and Hydrology Guidelines* (Authority 2011) requires the use and retention of native materials with high infiltration potential at the ground surface in areas that are critical to infiltration for groundwater recharge, where feasible.

Operational activities would not affect groundwater quality, because there would not be a direct path for operation-related contaminants to reach groundwater due to the depth of groundwater in the project vicinity.

CEQA Conclusion
HYD-IAMF#1 requires implementation of BMPs, which would include infiltration/detention basins. Impacts on groundwater volume and recharge would be less than significant with implementation of infiltration basins, combined with the existing high infiltration rates and minimal increase in impervious surface area compared to the size of the groundwater basin. Impacts on groundwater quality during operation would be less than significant, because there would not be a direct path for operation-related contaminants to reach groundwater due to the depth of groundwater.
For these reasons, operations impacts on groundwater volume, quality, and recharge associated with the stations would be less than significant pursuant to CEQA and operation of the stations would not degrade water quality or impede sustainable groundwater management of the basin or conflict with a sustainable groundwater management plan.

3.8.6.6 Maintenance Facilities

Maintenance facilities included as part of the Bakersfield to Palmdale Project Section are the Lancaster North B MOWF and the Avenue M LMF. Impacts associated with the MOWF and LMF are discussed below.

Construction Impacts

Impact HWR #1: Temporary Construction Impacts to Floodplains and Floodways

The LMF would not be located within a floodplain; however, the MOWF would be located within a 100-year floodplain in the Antelope Valley. Construction activities in floodplains would include grading and excavation, and construction of MOWF facilities. These construction activities could temporarily impede or redirect flood flows. Additionally, construction activities would increase the risk of release of sediment or construction pollutants during a storm event by increasing potential for erosion and thorough the presence of construction materials and equipment within the floodplain. Although the B-P Build Alternatives are not anticipated to be required to obtain coverage under the Construction General Permit, construction BMPs would be implemented to manage the overall amount of stormwater runoff generated from the construction soil disturbance areas, as specified in HYD-IAMF#3. Construction activities within floodplains would be short-term, and equipment and materials would be required to be stored outside of the floodplain to minimize the potential flood risk. In addition, construction activities would be short-term, and all floodplains and riparian areas impacted by construction would be restored to their pre-existing conditions, as required by Mitigation Measures WQ-MM#4 and BIO-MM#32. In addition, BMPs would be implemented during construction to minimize impacts on floodplains as specified in Mitigation Measure WQ-MM#1. Additionally, in the event that a heavy storm or flood event is identified, construction equipment would be relocated outside the floodplain to minimize the potential flood risk, as required by Mitigation Measure WQ-MM#1.

CEQA Conclusion

The MOWF construction activities would occur within a 100-year floodplain and could temporarily impede or redirect flood flows or risk release of pollutants during flooding, which has the potential to increase flood elevations, redefine flood hazard areas, and cause flooding in areas previously not at risk from the 100-year flood. This would result in a significant impact under CEQA. Therefore, CEQA requires mitigation. Mitigation Measures WQ-MM#1, and BIO-MM#32, included in Section 3.8.7, Mitigation Measures, would be implemented to further reduce construction-related impacts on floodplains by restoring and revegetating floodplains to pre-existing conditions, applying BMPs to minimize impacts on existing floodplains, and monitoring weather conditions for heavy storms and potential flood flows. Therefore, through implementation of Mitigation Measures WQ-MM#1 and BIO-MM#32, temporary impacts on floodplains associated with construction activities would be less than significant pursuant to CEQA.

Impact HWR #2: Temporary Construction Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity

Construction would be temporary and is anticipated to take between 2 and 3 years. Construction activities associated with the LMF and MOWF include grading, hauling, excavating, and constructing LMF and MOWF facilities. Construction activities such as grading and excavation could alter existing drainage patterns and redirect stormwater runoff. During ground-disturbing activities, soil would be compacted, resulting in a decrease in infiltration and an increase in the volume and rate of stormwater runoff during storm events. A SWPPP would be prepared to identify project-specific construction BMPs to be implemented as part of the project. The SWPPP would be prepared prior to construction and would describe temporary drainage patterns within the construction sites and indicate stormwater discharge locations from construction sites to the existing drainage system. These specifications are included in HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan. HYD-IAMF#3 is included as part of the project design and would be implemented for the LMF and MOWF to avoid or minimize temporary hydraulic effects associated with construction activities. This IAMF would reduce potential impacts on the existing drainage pattern resulting from construction activities during construction through the following mechanisms:

- **HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan**—Implement BMPs to provide hydromodification controls to maintain pre-project hydrology and to manage the amount and quality of stormwater runoff emanating off of the construction sites.

CEQA Conclusion

Implementation of HYD-IAMF#3 would require hydromodification and stormwater management measures to control drainage during construction of the LMF and the MOWF. With implementation of this IAMF, the impact under CEQA would be less than significant because the construction would not would not substantially alter the existing drainage pattern of the site or area, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site. Nor would construction create substantial additional sources of polluted runoff. Therefore, CEQA does not require mitigation.

Impact HWR #3: Temporary Construction Impacts to Surface Water Quality

Pollutants of concern during construction include sediments, trash, petroleum products, concrete waste (dry and wet), sanitary waste, and chemicals. Each of these pollutants on its own or in combination with other pollutants could have a detrimental effect on water quality. During construction activities, excavated soil would be exposed and there would be an increased potential for soil erosion compared to existing conditions. In addition, chemicals, liquid products, petroleum products (such as paints, solvents, and fuels), and concrete-related waste may be spilled or leaked during construction. Any of these pollutants have the potential to be transported via storm runoff into receiving waters.

A SWPPP would be prepared to identify project-specific construction BMPs, such as Erosion and Sediment Control BMPs designed to minimize erosion and retain sediment on site and Good Housekeeping BMPs to prevent spills, leaks, and discharges of construction debris and waste into receiving waters, as specified in HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan. BIO-IAMF#11 requires preparation of a construction site BMP field manual and implementation of BMPs during construction. As specified in BIO-IAMF#8, equipment staging areas and traffic routes would be established in areas that minimize impacts on sensitive areas, including surface waters. HYD-IAMF#3, BIO-IAMF#8, and BIO-IAMF#11 are included as part of the project design and would be implemented for the LMF and MOWF to avoid or minimize temporary water quality effects associated with construction activities. This IAMF would reduce potential impacts on water quality resulting from construction activities during construction through the following mechanisms:

- **HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan**—Implement BMPs aimed at reducing pollutants of concern to maintain current water quality and reduce erosion on-site.
- **BIO-IAMF#8: Delineate Equipment Staging Areas and Traffic Routes**—Stage construction equipment in areas that minimize effects to sensitive biological resources, including from risk of spills and erosion from equipment.
- **BIO-IAMF#11: Maintain Construction Sites**—Prepare a construction site BMP field manual and implement standard construction site housekeeping practices.

Construction BMPs include, but are not limited to, Erosion and Sediment Control BMPs designed to minimize erosion and retain sediment on-site and Good Housekeeping BMPs to prevent spills, leaks, and discharges of construction debris and waste into receiving waters.

Construction activities have the potential to introduce waste or hazardous wastes into receiving waters. HMW-IAMF#8 requires preparation of a hazardous materials and waste plan for hazardous waste handling. HMW-IAMF#6 requires preparation of a CMP to address hazardous material releases and to ensure cleanup of any hazardous material releases during construction. Waste management and materials pollution controls (as detailed in BIO-IAMF#9 and HMW-

IAMF#7) would also be included to ensure trash is properly disposed of on a daily basis and would minimize the impacts on water quality. These measures would help reduce risk of spills of waste and hazardous waste to surface waters through the following mechanisms:

- **BIO-IAMF#9: Dispose of Construction Spoils and Waste**—Excavated materials produced will be stored in areas at or near construction sites within the project footprint, returned to their original location, or disposed of at an off-site location.
- **HMW-IAMF#6, Spill Prevention**—A CMP and SPCC plan (or Soil Prevention and Response Plan) addressing spill prevention will be prepared and implemented.
- **HMW-IAMF#7, Transport of Materials**—A hazardous materials and waste plan describing responsible parties and procedures for hazardous waste and hazardous materials transport will be prepared and implemented.
- **HMW-IAMF#8: Permit Conditions**—Includes requirements for transport, labeling, containment, cover, and other BMPs for storage of hazardous materials.

As described previously under Impact HWR #2, in-water work during construction would be restricted to the dry season. However, if water is present in the channel during in-water work, the contractor would develop a water diversion plan prior to construction. The water diversion plan would include the use of cofferdams or sandbag barriers around the work areas to keep water out and to reduce sediment pollution from construction. The larger streams may require construction of a temporary stream crossing to minimize erosion and downstream sedimentation from construction.

However, even with implementation of a water diversion plan and temporary stream crossing, there would be a potential for water quality impacts to occur from increased erosion from the dewatering and diversion activities. To avoid or minimize the potential turbidity and siltation effects from dewatering activities, Mitigation Measure BIO-MM#62 requires the Authority to prepare a dewatering plan for construction dewatering or work requiring a water diversion where open or flowing water is present. The dewatering plan would identify how to divert water from the work area in a manner that avoids or minimizes impacts on resources to the maximum extent practicable, including monitoring of water quality. These efforts would minimize any changes to overall water quality so that dewatering and diversion of surface waters would not contribute to a violation of regulatory standards or waste discharge requirements. Additionally, Mitigation Measure BIO-MM#34 requires a project biologist to monitor construction activities within or adjacent to aquatic resources to ensure compliance with the CWA and the Porter-Cologne Act.

Due to the deep groundwater levels (greater than 50 feet), there is an extremely low potential for groundwater to be encountered during excavation activities. If groundwater is encountered during construction of the LMF and the MOWF, the disposal of groundwater to surface waters could impact surface water quality. The removal and disposal of groundwater would be conducted in accordance with the requirements of the Dewatering Permits (Mitigation Measure WQ-MM#2), described above in Impact HWR #3. Therefore, adherence to the requirements of the applicable Dewatering Permit would ensure the water discharged to surface water or land would not degrade existing water quality.

There are no existing water quality impairments for TMDLs for the surface waters in the RSA; therefore, the construction of the MOWF would not contribute to an existing water quality impairment. Additionally, preparation of a SWPPP, implementation of construction BMPs, compliance with the Dewatering Permits, and testing and treatment of groundwater prior to release to surface waters would reduce the potential for pollutants to be discharged to surface waters. Therefore, construction activities would not adversely affect beneficial uses of surface waters or attainment of water quality objectives established in the water quality control plans applicable to the RSA (i.e. the Tulare Lake Basin Plan and the Lahontan Region Basin Plan). Therefore, construction of the MOWF would not conflict with the implementation of the Tulare Lake Basin Plan and the Lahontan Region Basin Plan.

CEQA Conclusion

HYD-IAMF#3, BIO-IAMF#8, BIO-IAMF#11, BIO-IAMF#9, HMW-IAMF#6, HMW-IAMF#7, and HMW-IAMF#8 require preparation of a SWPPP, a construction site BMP field manual, a CMP, an SPCC plan, and a hazardous materials and waste plan; implementation of construction BMPs; delineation of equipment staging areas and traffic routes; and reuse or disposal of construction spoils to reduce impacts on surface water quality during construction. With implementation of these IAMFs, impacts on surface water quality during ground-disturbing activities would be less than significant because the project would not violate any water quality standards or waste discharge requirements, otherwise substantially degrade surface water quality, or conflict with the implementation of a water quality control plan..

Even with implementation of the above-stated IAMF during construction of the stations, there would still be a potential for dewatering activities to impact surface water quality, and the impact under CEQA would be significant. Therefore, CEQA requires mitigation. Mitigation Measures WQ-MM#2, BIO-MM#34, and BIO-MM#62, included in Section 3.8.7, Mitigation Measures, would be implemented to further reduce construction-related impacts on surface water quality by targeting pollutants of concern in dewatering activities, preparing a dewatering plan, and monitoring dewatering activities. Through implementation of Mitigation Measures WQ-MM#2, BIO-MM#34, and BIO-MM#62, temporary impacts on surface water quality from dewatering activities would be less than significant pursuant to CEQA.

Impact HWR #4: Temporary Construction Impacts to Groundwater Volume, Quality, and Recharge

Groundwater levels adjacent to the Bakersfield to Palmdale Project Section are generally deep; most of the water depths in the RSA are greater than 60 feet bgs. Grading and excavation activities would be required for construction of the MOWF. These construction activities would be on the surface and would not extend to great depths. The LMF would be constructed below-grade, at a maximum depth of 45 feet. Due to the depth of groundwater, groundwater is not expected to be encountered during construction of the LMF. However, dewatering during construction activities could reduce the amount of groundwater available in the groundwater basin. However, due to the depth of groundwater and the depth of proposed excavation activities, it is unlikely that dewatering would be required. If groundwater is encountered, it would be removed and disposed of according to the requirements of the Dewatering Permits, as mentioned above (Mitigation Measure WQ-MM#2). Furthermore, it is not anticipated that groundwater extraction would be used for construction activities associated with the LMF and the MOWF.

Construction activities associated with the LMF and the MOWF would not affect groundwater quality, because there would not be a direct path for construction-related contaminants to reach groundwater due to the depth of groundwater in the project vicinity. Furthermore, construction BMPs (e.g., Erosion and Sediment Control and Good Housekeeping BMPs) would be implemented at construction sites as part of the SWPPP to remove pollutants from stormwater runoff that could infiltrate the groundwater basin, as specified in HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan. HYD-IAMF#3 is included as part of the project design and would be implemented for the LMF and MOWF to avoid or minimize the potential for construction-related pollutants to infiltrate the groundwater basin. This IAMF would reduce potential impacts on groundwater quality during construction through the following mechanisms:

- **HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan**—Implement BMPs aimed at reducing pollutants of concern to maintain current water quality and reduce erosion on-site.

Grading and construction activities would compact soil, which can decrease infiltration during construction. However, construction activities would be temporary, and the reduction in infiltration would not interfere with groundwater recharge due to the size of the groundwater basins underlying the MOWF and LMF sites (the Antelope Valley Groundwater Basin is approximately 1,101,000 acres in size [Table 3.8-15]).

CEQA Conclusion

Dewatering is not anticipated during construction of the LMF or the MOWF. In addition, any reduction in infiltration from soil compaction during construction would be minimal compared to the size of the groundwater basin. For these reasons, impacts on groundwater volume recharge during construction would be less than significant and construction of the stations would not degrade water quality or impede sustainable groundwater management of the basin or conflict with a sustainable groundwater management plan.

Impacts on groundwater quality during construction would be less than significant, because there would not be a direct path for construction-related contaminants to reach groundwater due to the depth of groundwater and implementation of construction BMPs to reduce pollutants before they can migrate to the groundwater basin (HYD-IAMF#3). Therefore, CEQA does not require mitigation.

Operations Impacts

Impact HWR #5: Permanent Operation Impacts to Floodplains and Floodways

The MOWF would be within a 100-year floodplain in the Antelope Valley. However, the MOWF would be elevated on fill, at the same grade as the proposed track, approximately 30 feet above the existing ground level. Flood depths in the area generally range from 3 to 5 feet. Because the MOWF would be well above the potential flood levels, flooding would not affect the MOWF. In addition, the MOWF's design would be required to comply with the requirements set forth in USEO 11988. USEO 11988 requires compliance with the National Flood Insurance Program, which is managed by FEMA. FEMA regulates development within floodplains. FEMA regulations require a floodplain analysis to prevent projects from increasing the base flood elevation greater than 1 foot in floodplains or changing the floodplain limits. The MOWF would be designed and engineered to comply with these requirements and regulations, including documentation of the alternatives analysis and description of the methods to be used in the floodplain. These design standards are detailed in HYD-IAMF#2: Flood Protection below.

- **HYD-IAMF#2: Flood Protection**—By designing the project to remain operational during flood events and to minimize increases in water surface elevation of no greater than 1 foot in compliance with state and local agencies.

However, even with implementation of the IAMFs, potential flood impacts due to fill within the floodplain and redirected flows could occur. Therefore, additional mitigation measures have been prescribed to further reduce floodplain impacts associated with the MOWF. Mitigation Measure WQ-MM#4 would be implemented to avoid potential flood impacts due to changes in water surface elevation and redirection of flows by requiring preparation of a Conditional Letter of Map Revision/Letter of Map Revision to revise the FIRM to reflect the new floodplain elevations and boundaries.

No chemicals or hazardous materials would be used with in the floodplains. In addition, the MOWF would be located above areas subject to flooding; therefore, pollutants of concern from operation of the MOWF would not be released during flooding. In addition, Mitigation Measure WQ-MM#4 requires implementation of a Spill, Prevention, Containment and Control Plan to reduce the potential for released chemicals to migrate into flood zones during operation. However, the fill within floodplains has the potential to cause localized scour. Eroded material gradually decreases channel capacity and sediment deposition can cause braided stream channels and alluvial fans. Erosion would release pollutants, such as sediment, during storm events. Mitigation Measure WQ-MM#4 requires the implementation of slope protection at embankment fill to allow hydraulically smooth flow and to minimize scour and erosion and release of pollutants.

CEQA Conclusion

The MOWF would be in a floodplain but would be designed to be located well above potential flood levels. In addition, implementation of HYD-IAMF#2 requires design measures to reduce increases in floodplain water surface elevation. It also requires compliance with USEO 11988 and the FEMA regulations during operation of the MOWF to reduce increases in water surface elevation to less than the FEMA requirement of a less-than-1-foot increase. Even with implementation of HYD-IAMF#2, operation of the MOWF could still result in potentially significant floodplain impacts under CEQA by disrupting flood flows. Therefore, CEQA requires mitigation. Mitigation Measure WQ-MM#4, included in Section 3.8.7, Mitigation Measures, would be implemented to further reduce operational flood impacts from changes in water surface elevation by requiring a Conditional Letter of Map Revision/Letter of Map Revision. Through implementation of Mitigation Measure WQ-MM#4, permanent impacts on floodplains associated with operation of the MOWF would be less than significant pursuant to CEQA.

The placement of fill within floodplains has the potential to cause localized scour and erosion and increase the risk of release of pollutants during flooding, which would be significant under CEQA. Therefore, CEQA requires mitigation. Mitigation Measure WQ-MM#4, included in Section 3.8.7, Mitigation Measures, would be implemented to reduce operation-related impacts related to release of pollutants by requiring erosion control measures to minimize scour. Mitigation Measure WQ-MM#4 also requires implementation of a Spill, Prevention, Containment and Control Plan to reduce the potential for released chemicals to migrate into flood zones during operation. Therefore, after implementation of mitigation, permanent impacts related to release of pollutants would be less than significant pursuant to CEQA.

Impact HWR #6: Permanent Operation Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity

The LMF and the MOWF would cover a large area consisting primarily of impermeable surfaces, which could produce large amounts of stormwater runoff. Stormwater would be collected by an extensive system of pipes and ditches. If soil conditions are found to be supportive, all or most of the stormwater may be infiltrated on-site. If on-site infiltration cannot be accomplished, then stormwater detention must be provided, as specified in HYD-IAMF#1: Stormwater Management, discussed more below.

Further, the LMF and the MOWF would be subject to the requirements of the Industrial NPDES Permit as transportation facilities that conduct vehicle maintenance, as specified in HYD-IAMF#4: Prepare and Implement an Industrial Stormwater Pollution Prevention Plan.

HYD-IAMF#1 and HYD-IAMF#4 are included as part of the project design and would be implemented for the LMF and the MOWF to avoid or minimize hydraulic effects associated with operation of the HSR project. The IAMFs would reduce potential impacts on the existing drainage pattern resulting from operation of the HSR project through the following mechanisms:

- **HYD-IAMF#1: Stormwater Management**—By reviewing each receiving stormwater system's capacity to accommodate additional project runoff, selecting upgrades designed to provide adequate capacity in compliance with design standards, and incorporating on-site facilities to capture runoff and provide hydromodification controls.
- **HYD-IAMF#4: Prepare and Implement an Industrial Stormwater Pollution Prevention Plan**—By requiring the preparation of a site-specific operational SWPPP and annual monitoring and reporting. The operational SWPPP would implement measures to minimize runoff and promote on-site infiltration and/or retention basins, reducing hydrologic impacts.

Further, all drainage improvements and surface water crossings would be designed in accordance with the Authority's *Hydraulics and Hydrology Guidelines* (Authority 2011) and the existing drainage pattern would be maintained to the maximum extent practicable.

CEQA Conclusion

HYD-IAMF#1 and HYD-IAMF#4 require stormwater design features and BMPs to capture, manage, and convey stormwater runoff to the existing drainage system and to offset the increase in volume and rate of runoff. With implementation of these drainage control measures, the impact under CEQA would be less than significant because the LMF and MOWF would not substantially alter the existing drainage pattern of the site or area in a manner that would increase erosion or siltation on- or off-site, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off site. Nor would the LMF and the MOWF create substantial additional sources of polluted runoff.

Impact HWR #7: Permanent Operation Impacts to Surface Water Quality

The LMF and the MOWF would include large parking areas and several outdoor maintenance facilities that would produce runoff that would require water quality treatment. The main sources of pollutants would be from maintenance areas associated with the LMF and the MOWF and would include litter and spillages, vehicle lubrication system losses, vehicle/tire wear, vehicle exhaust emissions, and road surface wear. Potential pollutants generated by the new parking lots include heavy metals, organic compounds, trash and debris, oil and grease, nutrients, pesticides, and sediments. Project-specific BMPs, such as oil/water separators or infiltration/detention basins would treat runoff from the parking lots and maintenance sites before it enters the stormwater drainage system. As described previously, if on-site infiltration cannot be accomplished, stormwater detention would be provided, as specified in HYD-IAMF#1: Stormwater Management.

Further, the LMF and the MOWF are subject to the requirements of the Industrial NPDES Permit and would be required to prepare a site-specific operational SWPPP, which would require the implementation of measures to target pollutants of concern, reducing impacts on surface water quality, as specified by HYD-IAMF#4: Prepare and Implement an Industrial Stormwater Pollution Prevention Plan.

HYD-IAMF#1 and HYD-IAMF#4 are included as part of the project design and would be implemented for the LMF and the MOWF to avoid or minimize water quality impacts associated with operation of the HSR project. The IAMFs would reduce potential impacts on water quality resulting from operation of the HSR project through the following mechanisms:

- **HYD-IAMF#1: Stormwater Management**—By providing on-site stormwater management facilities to treat stormwater runoff and target pollutants of concern prior to discharge to the storm drain system.
- **HYD-IAMF#4: Prepare and Implement an Industrial Stormwater Pollution Prevention Plan**—By requiring the preparation of a site-specific operational SWPPP and annual monitoring and reporting to implement measures to target pollutants of concern during operation.

There are no existing water quality impairments for TMDLs for the surface waters in the RSA; therefore, the project would not contribute to an existing water quality impairment. Additionally, compliance with the Phase II Small MS4 Permit and implementation of permanent treatment BMPs would reduce the potential for pollutants to be discharged to surface waters. Therefore, project operations would not adversely affect beneficial uses of surface waters or attainment of water quality objectives established in the water quality control plans applicable to the RSA (i.e. the Tulare Lake Basin Plan and Lahontan Region Basin Plan). Therefore, operation of the MOWF would not conflict with the implementation of the Tulare Lake Basin Plan and the Lahontan Region Basin Plan.

CEQA Conclusion
HYD-IAMF#1 and HYD-IAMF#4 require implementation of treatment BMPs to capture and treat stormwater runoff to remove pollutants of concern. With implementation of treatment BMPs, the impact on surface water quality from stormwater runoff would be less than significant under CEQA because the project would not violate any water quality standards or waste discharge requirements, otherwise substantially degrade surface water quality, or conflict with the implementation of the Tulare Lake Basin Plan and the Lahontan Region Basin Plan.

Impact HWR #8: Permanent Operation Impacts to Groundwater Volume, Quality, and Recharge

As described previously, development of the LMF and the MOWF would result in an increase in impervious surface area, which can decrease the amount of water that is able to recharge the aquifer/groundwater basin. However, this reduction in infiltration would not interfere with groundwater recharge due to the size of the groundwater basins (Table 3.8-15). In addition, the proposed drainage improvements would promote infiltration through the use of infiltration/ detention basins, which can increase groundwater recharge, as specified in HYD-IAMF#1:

Stormwater Management. HYD-IAMF#1 is included as part of the project design and would be implemented for the LMF and the MOWF to avoid or minimize impacts related to infiltration into the groundwater basin during operation of the HSR project. This IAMF would reduce potential impacts on infiltration resulting from operation of the HSR project through the following mechanisms:

- **HYD-IAMF#1: Stormwater Management**—By providing on-site stormwater management facilities that promote infiltration.

Additionally, project design would include the use and retention of native materials with high infiltration potential at the ground surface in areas that are critical to infiltration for groundwater recharge, where feasible. Furthermore, it is not anticipated that groundwater extraction would be used during operational activities associated with the LMF or the MOWF.

Operational activities would not affect groundwater quality because there would not be a direct path for operation-related contaminants to reach groundwater due to the depth of groundwater in the vicinity of the LMF and the MOWF.

In summary, through compliance with HYD-IAMF#1, operation of the LMF and the MOWF would not deplete groundwater volumes, affect groundwater quality, or reduce groundwater recharge in the groundwater basins.

CEQA Conclusion

HYD-IAMF#1 requires implementation of BMPs, which would include infiltration/detention basins. Impacts on groundwater volumes and recharge would be less than significant with implementation of infiltration basins, combined with the existing high infiltration rates and minimal increase in impervious surface area compared to the size of the groundwater basin. Impacts on groundwater quality during operation would be less than significant because there would not be a direct path for operation-related contaminants to reach groundwater due to the depth of groundwater. For these reasons, operations impacts on groundwater volumes, quality, and recharge associated with the stations would be less than significant pursuant to CEQA and construction of the stations would not degrade water quality or impede sustainable groundwater management of the basin or conflict with a sustainable groundwater management plan. Therefore, CEQA does not require mitigation.

3.8.7 Mitigation Measures

NEPA requires federal agencies to identify potential impacts and to identify measures to mitigate those effects. This is accomplished through the impact avoidance and minimization features that are part of project design and the mitigation measures proposed in this EIR/EIS. CEQA requires that each significant impact of a project be identified and that feasible mitigation measures be stated and implemented. Mitigation measures are identified for impacts (NEPA) and significant (CEQA) construction or operations impacts that cannot be avoided or minimized adequately by refining project design.

3.8.7.1 Fresno to Bakersfield Locally Generated Alternative Mitigation Measures from 34th Street and L Street to Oswell Street

The *Fresno to Bakersfield Section Final Supplemental EIR* (2018) and the *Fresno to Bakersfield Section: Locally Generated Alternative Final Supplemental EIS* (2019d) identified mitigation measures that are applicable to the entire length of the F-B LGA from just north of Poplar Avenue to Oswell Street. Not all measures identified in the Final Supplemental EIR and the Final Supplemental EIS are applicable to the portion of the F-B LGA from 34th Street and L Street to Oswell Street. See Section 3.1.3.7 for further description. The following hydrology and water quality-related mitigation measures are applicable to the portion of the F-B LGA from 34th Street and L Street to Oswell Street:

- **F-B LGA HWR-MM#1:** The following measures shall be implemented during the construction period to mitigate potential impacts to floodplains, including the following:

- Implement standard floodplain measures, including best management practices (BMPs), during construction. BMPs may include preservation of existing vegetation to the maximum extent practicable, limiting the number of equipment trips across floodplain crossing, selecting equipment that exerts the least amount of ground surface pressure, use of vegetated buffers on slopes, and application of hydraulic mulch on disturbed streambanks.
- Designated construction employees and local districts shall monitor weather for heavy storms and potential flood flows. If a heavy storm or flood event is identified, construction equipment shall be relocated outside of the floodplain.

- **F-B LGA HWR-MM#2:** The following measures shall be implemented as part of the project to reduce impacts to floodplains:
  - A Conditional Letter of Map Revision to Federal Emergency Management Agency shall be required for all construction activities inside the Kern River.
  - Potential impacts and mitigation measures for the Kern River shall require coordination with the Central Valley Flood Protection Board, the United States Army Corps of Engineers, the City of Bakersfield, and County of Kern.

3.8.7.2 Mitigation Measures for the Bakersfield to Palmdale Project Section

Additional mitigation measures address project-level impacts that expand on the Statewide Program EIR/EIS mitigation strategies. These strategies are further discussed in the following technical reports prepared for the Bakersfield to Palmdale Project Section:

- *Technical Memorandum 2.6.5 Hydraulics and Hydrology Guidelines* (Authority 2011)
- *Bakersfield to Palmdale Project Section Preliminary Engineering for Project Definition Floodplain Impact Report* (Authority 2017b)
- *Bakersfield to Palmdale Project Section Storm Water Management Report* (Authority 2017c)
- *Bakersfield to Palmdale Project Section Hydrology, Hydraulics, and Drainage Report* (Authority 2017a)

In addition to the mitigation measures mentioned above, the mitigation measures would be included would be included with implementation of the HSR project.

- **Construction Measures**
  - **WQ-MM#1: Floodplain Protection: Construction:** The Bakersfield to Palmdale Project Section would implement the following measures during the construction period:
    - Standard floodplain measures would be implemented, including revegetation BMPs during construction. BMPs may include preservation of existing vegetation to the maximum extent practicable, limiting the number of equipment trips across floodplain crossing, selecting equipment that exerts the least amount of ground surface pressure, use of vegetated buffers on slopes, application of hydraulic mulch on disturbed streambanks, and restoration of floodplains impacted by construction activities.
    - Weather would be monitored by construction works for heavy storms and potential flood flows. If a heavy storm or flood event is identified, construction equipment would be relocated outside of the floodplain.
  - **WQ-MM#2: Regional Dewatering Permits:** The Bakersfield to Palmdale Project Section would be required to comply with statewide and regional Dewatering Permits per SWRCB and RWQCB requirements. For portions of the project section under the jurisdiction of the Central Valley RWQCB, the Central Valley RWQCB Dewatering Permits would apply:
    - The Central Valley RWQCB’s Order No. R5-2013-0074, NPDES No. CAG995001, Waste Discharge Requirements General Order for Dewatering and Other Low Threat

Discharges to Surface Waters, allows discharges provided they do not contain significant quantities of pollutants and either (1) the discharge is four months or less in duration, or (2) the average dry-weather discharge does not exceed 0.25 million gallons per day.

- The Central Valley RWQCB's Resolution No. R5-2013-0145, Approving Waiver of Reports of Waste Discharge and Waste Discharge Requirements for Specific Types of Discharge within the Central Valley Region, covers discharges to land from dewatering activities.
- For portions of the project section under the jurisdiction of the Lahontan RWQCB, the Lahontan RWQCB Dewatering Permits would apply:
- The Lahontan RWQCB's Order No. R6T-2014-0049, NPDES No. CAG996001, Renewed Waste Discharge Requirements and General Permit for Limited Threat Discharges to Surface Waters, encourages the disposal of wastewater on land, where practicable, and requires applicants for this general permit to evaluate land disposal as the first alternative. This general permit covers discharges provided that the discharge does not contain significant quantities of pollutants.
- The Lahontan RWQCB's Order No. R6T-2010-0024, NPDES No. CA G916001, Waste Discharge Requirements for Surface Water Disposal of Treated Groundwater, covers discharges of water from a groundwater treatment unit to surface waters.

– **WQ-MM#3: Tunnel Constructability and Hydrogeological Monitoring:** The Authority would implement the following measures during tunnel construction:

- Excavation of the tunnels would include continuous probing ahead of the tunnel face to assess the ground and groundwater conditions.
- Pre-excavation grouting would be used to control groundwater inflows and provide face stability where applicable
- All tunnels would be waterproofed.
- The tunneling and lining methods chosen, the pretreatment of the ground mass, and the tunnel lining design, would be implemented to reduce groundwater inflows.
- The tunnel lining would be inspected regularly throughout the construction phase to monitor for potential leaks. Should leaks be found, the lining would be repaired immediately and assessed for future integrity. Any freestanding water that leaks into the tunnel would be treated prior to discharge to minimize impacts from pollutants such as sediment or other contamination.
- All construction water shall be captured and treated prior to discharge to minimize impacts from pollutants such as sediment or other contamination.
- In the event that any active wells would be affected by tunnel construction activities, the wells would be re-drilled deeper to reach the groundwater level, relocated to different location, or the water reinjected.
- Hydrogeological modeling would be conducted to assess the potential impacts of removing groundwater from bedrock storage during construction (including long term drainage into the tunnel).
- Groundwater depth, flow, and quality would be monitored at nearby domestic wells, springs, and seeps prior, during, and after construction. Monitoring of groundwater, if impacted, would continue until the water system has normalized to pre-construction conditions.
- If it is determined that tunnels below the water table could interfere with groundwater, a groundwater monitoring plan would be prepared and implemented. Monitoring may

include measurements of water levels in wells, tunnel-heading inflows, probe-hole flow, and portal discharges.

- **BIO-MM#32: Restore Temporary Riparian Habitat Impacts:** Within 90 days of completing construction in a work area, the project biologist will direct the revegetation of any riparian areas temporarily disturbed as a result of the construction activities, using appropriate native plants and seed mixes. Native plants and seed mixes will be obtained from stock originating from areas within the local watershed to the extent feasible. The project biologist will monitor restoration activities consistent with provisions in the Restoration and Revegetation Plan (BIO-MM#6).
- **BIO-MM#34: Monitor Construction Activities within Aquatic Resources.** The project biologist will monitor construction activities that occur within or adjacent to aquatic resources, including activities associated with the installation of protective barriers (e.g., silt fencing, sandbags, fencing), installation and/or removal of creek material to accommodate crossings, construction of access roads, and removal of vegetation. As part of this effort, the project biologist will document compliance with applicable avoidance and minimization measures, including measures set forth in regulatory authorizations issued under the CWA and/or the Porter-Cologne Act.
- **BIO-MM#62: Prepare Plan for Dewatering and Water Diversions:** Prior to initiating any construction activity that occurs within open or flowing water, the Authority will prepare a dewatering plan, which will be subject to review and approval by the applicable regulatory agencies. The plan will incorporate measures to minimize turbidity and siltation. The project biologist will monitor the dewatering and/or water diversion sites, including collection of water quality data, as applicable. Prior to the dewatering or diverting of water from a site, the project biologist will conduct pre-activity surveys to determine the presence or absence of special-status species within the affected waterbody. In the event that special-status species are detected during pre-activity surveys, the project biologist will relocate the species (unless the species is Fully Protected under state law), consistent with any regulatory authorizations applicable to the species.

- **Operations Measures**
  - **WQ-MM#4: Floodplain Protection: Operation:** The project would be designed to remain operational during flood events and to minimize increases in base flood elevations. Measures for floodplain protection would include the following:
    - HSR system sites and critical facilities would be located above the 500-year flood elevation.
    - If the floodplain cannot be spanned, a Conditional Letter of Map Revision and Letter of Map Revision would be required to be processed through the Central Valley Flood Protection Board and FEMA during final design where the increase in water surface elevation exceeds a 1-foot rise in the 100-year base flood elevation. All floodplain crossings would be analyzed in more detail for FEMA compliance during subsequent engineering phases.
    - Embankment fill would be protected with slope protection such as rock-slope protection or gabions.
    - A Spill, Prevention, Containment and Control Plan would be implemented to reduce the amount of sediment deposited within 100-year floodplains and reduce the potential for released chemicals to migrate into flood zones during operation.
    - In cases where piers or column support structures would need to be placed within the flow channel to support the aerial or bridge structure, analysis of the flow within the channel and analysis of the scour at the piers would be performed. The results of this analysis would determine the optimal shape and depth of the piers and pier footings to mitigate the impacts flood waters would have on the structure supports. Backwater

would be minimized by optimizing the pier's shape and minimizing the number of piers within the channel.

3.8.7.3 Impacts from Implementing Mitigation Measures

Impacts from implementing the above mitigation measures (such as BMPs and floodplain crossing design measures) have been considered in the analysis in Section 3.8.6, and no additional impacts would result from implementing these measures. All measures would be implemented within the project footprint analyzed in the impact analysis and therefore do not raise the potential for impacts in any area not already analyzed for this project. All the proposed mitigation measures, with proper implementation, serve only to reduce potential impacts of the project, and by nature of their design do not result in additional environmental impacts on hydrology and water resources.

3.8.8 NEPA Impact Summary

This section summarizes and compares the impacts of the Bakersfield to Palmdale Project Section alternatives. The NEPA process takes into account the potential impacts on hydrology and water quality resources in conjunction with potential impacts on all resources to determine the effects of each B-P Build Alternative. The No Project Alternative provides a benchmark for resource impacts.

Under the No Project Alternative, existing development trends affecting hydrology and water resources are expected to continue. Expanded development in the region would continue to result in an increase in runoff from additional paved surfaces. Net water demand is generally predicted to decrease; however, aquifers could continue to experience drawdown effects if groundwater withdrawals exceed recharge rates. Vehicle miles traveled are expected to increase, which could degrade water quality because of increased pollutants in stormwater from roadways. Although low-density development along the urban fringe is likely to continue to occur, and would result in an increase in impervious area and an associated increase in stormwater runoff, these projects would also implement stormwater facilities that would reduce potential hydrology and water quality impacts on receiving waters.

Table 3.8-19 provides a comparison of the impacts of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) to hydrology and water resources. Data from this table and the information summarized below are described in detail in Section 3.8.6. The HSR B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) incorporate IAMFs that would avoid or minimize impacts on hydrology and water quality resources during construction and operation. These IAMFs would include features for addressing flood protection, stormwater management, erosion and sedimentation controls, protection of groundwater quality, and pollution prevention.

Table 3.8-19 Comparison of Bakersfield to Palmdale Project Section Build Alternative[1] Impacts for Hydrology and Water Resources

Impact	Alternative 1	Alternative 2	Alternative 3	Alternative 5	CCNM Design Option	Refined CCNM Design Option
Construction						
Impact HWR #1: Temporary Construction Impacts to Floodplains and Floodways	All B-P Build Alternatives would avoid or minimize impacts on floodplains during construction.					
Impact HWR #2: Temporary Construction Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity	All B-P Build Alternatives would avoid or minimize impacts on drainage patterns, stormwater runoff, and hydraulic capacity during construction.					

Impact	Alternative 1	Alternative 2	Alternative 3	Alternative 5	CCNM Design Option	Refined CCNM Design Option
Impact HWR #3: Temporary Construction Impacts to Surface Water Quality (Area Temporarily Disturbed)	9,825 acres	8,753 acres	8,865 acres	8,733 acres	+4 acres compared to B-P Build Alternatives	+577 acres compared to B-P Build Alternatives
Impact HWR #4: Temporary Construction Impacts to Groundwater Volume, Quality, and Recharge	All B-P Build Alternatives would avoid or minimize impacts on groundwater during construction.					
Operations						
Impact HWR #5: Permanent Operation Impacts to Floodplains and Floodways	19.5 miles	19.5 miles	19.4 miles	19.5 miles	-0.014 mile compared to Build Alternatives	-0.019 mile compared to Build Alternatives
Impact HWR #6: Permanent Operation Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity (Net Increase in Impervious Surface Area)	764 acres	771 acres	743 acres	760 acres	-1 acre compared to B-P Build Alternatives	-5.9 acres compared to B-P Build Alternatives
Impact HWR #7: Permanent Operation Impacts to Surface Water Quality	All B-P Build Alternatives would avoid or minimize impacts on surface water quality during operation.					
Impact HWR #8: Permanent Operation Impacts to Groundwater Volume, Quality, and Recharge (Length of Groundwater Basin Crossed)	61 miles	61 miles	60.5 miles	61 miles	Same as B-P Build Alternatives	Same as B-P Build Alternatives
Area of Groundwater Basin Crossed	6,733 acres	6,664 acres	6,761 acres	6,732 acres	Same as B-P Build Alternatives	Same as B-P Build Alternatives

Source: California High-Speed Rail Authority, 2020
B-P = Bakersfield to Palmdale Project Section
CCNM = César E. Chávez National Monument

Construction activities within the floodplains could temporarily impede or redirect flood flows, potentially resulting in increased flood elevations, redefined flood hazard areas, and flooding in areas previously not at risk from the 100-year flood. The Palmdale Station would also construct drainage facilities and a detention area within a floodplain. In addition, the MOWF would be constructed within a 100-year floodplain. However, construction activities would be short-term, all floodplains impacted by construction activities would be restored to their pre-existing conditions, and BMPs would be implemented during construction as required by Mitigation Measures WQ-MM#1 and BIO-MM#32.

Alternatives 1, 2, and 5 would cross 19.5 miles of floodplains. Alternative 3 would only cross 19.4 miles of floodplains, which is the least amount of mileage. The B-P Build Alternatives (including the CCNM Design Options) would result in several locations where the increase in water surface elevation would exceed 1 foot. The Palmdale Station would also result in drainage facilities and a detention area within a floodplain. The MOWF would also be constructed within a floodplain.

However, through compliance with HYD-IAMF#2 and implementation of Mitigation Measure WQ-MM#4, the HSR project would not place structures within a 100-year flood hazard area in a manner that would impede or redirect flood flows or expose people or structures to loss, injury, or death involving flooding. Any change in floodplain elevations and boundaries would be reflected on the revised FIRM so that the HSR project would not violate regulatory floodplain standards.

Construction activities could alter existing drainage patterns, redirect stormwater runoff, decrease infiltration, and increase the volume and rate of stormwater runoff during storm events. However, the HSR B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would implement surface and in-water construction BMPs, as required by HYD-IAMF#3 and Mitigation Measure to avoid or minimize impacts on the existing drainage system and temporary hydraulic effects associated with construction activities.

While all of the HSR B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would result in a net increase in impervious surface, Alternative 2 would result in the greatest net increase (771 acres) and Alternative 3 would result in the smallest net increase (743 acres). Alternatives 1 and 5 would result in a net increase in impervious surface of 764 and 760 acres, respectively. The HSR B-P Build Alternatives with the CCNM Design Option would result in 1 acre less of impervious surface area compared to the B-P Build Alternatives without the CCNM Design Option. The HSR B-P Build Alternatives with the Refined CCNM Design Option would result in 5.9 acres less of impervious surface area compared to the B-P Build Alternatives without the Refined CCNM Design Option. An alteration to the existing drainage patterns or introduction of new impervious surfaces has the potential to increase the rate and volume of stormwater runoff. On-site stormwater runoff captured along the HSR alignment would be directed to on-site infiltration/detention basins, as specified in HYD-IAMF#1. Off-site stormwater would be conveyed to the existing drainage system. Infiltration/detention BMPs would provide hydromodification controls to offset the increase in volume and rate of runoff. Both the LMF and the MOWF would also be subject to the requirements of the Industrial NPDES Permit as transportation facilities that conduct vehicle maintenance, as specified in HYD-IAMF#4.

Alternative 1 would temporarily disturb the largest amount of acreage (9,825 acres), while Alternative 5 would temporarily disturb the least amount of acreage (8,865 acres). Alternatives 2 and 3 would temporarily disturb 8,753 and 8,865 acres, respectively. The B-P Build Alternatives with the CCNM Design Option and the Refined CCNM Design Option would result in an additional 4 acres of disturbed soil area compared to the B-P Build Alternatives without the Design Option. During construction activities, excavated soil would be exposed and there would be an increased potential for soil erosion compared to existing conditions. In addition, chemicals, liquid products, petroleum products (e.g., paints, solvents, and fuels), and concrete-related waste may be spilled or leaked during construction. Any of these pollutants have the potential to be transported via storm runoff into receiving waters. HYD-IAMF#3 stipulate preparation of a SWPPP to identify project-specific construction BMPs to be implemented to avoid or minimize temporary water quality effects associated with construction activities. Dewatering during construction of the concrete columns associated with the waterbody crossings could also impact surface water quality. However, adherence to the requirements of the Dewatering Permits would ensure the water discharged to surface water or land would not degrade existing water quality by requiring testing prior to discharge as described in Mitigation Measure WQ-MM#2. Any contaminated groundwater may be collected and off-hauled to a local sanitary sewer, or an active treatment system may be required to treat the water prior to discharge. Additionally, Mitigation Measure BIO-MM#62 requires the Authority to prepare and implement a dewatering plan for construction dewatering or work requiring a water diversion where open or flowing water is present. Mitigation Measure BIO-MM#34 requires a project biologist to monitor construction activities within or adjacent to aquatic resources to ensure compliance with the CWA and the Porter-Cologne Act.

During operation and maintenance activities, anticipated pollutants associated with a railway facility include heavy metals, nutrients, sediments, organic compounds, trash and debris, and oil and grease. HYD-IAMF#1 would require runoff from the HSR project to not be discharged directly to surface waterbodies, but to be collected and conveyed to infiltration/detention basins or a nearby stormwater collection system, or dispersed in a nonerosive manner. The placement of piers within channels and abutments near waterways also has the potential to cause localized scour. Mitigation Measure WQ-MM#4 requires the implementation of erosion control measures at piers and/or bridge abutments to minimize scour and siltation, and designing piers located in channels to allow hydraulically smooth flow and to minimize erosion. The LMF and the MOWF would also be subject to the requirements of the Industrial NPDES Permit and would be required to prepare a site-specific operational SWPPP. This would require the implementation of measures to target pollutants of concern, reducing impacts on surface water quality, as specified by HYD-IAMF#4.

Due to the depth of groundwater and the depth of proposed excavation activities, it is unlikely that dewatering would be required. Water supplied for construction purposes would be sourced from existing surface and groundwater supply systems or water trucks. It is not anticipated that groundwater extraction for construction activities associated with the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would be greater than the existing water demand for agricultural purposes due to the elimination of existing water use (including agriculture) within the HSR construction footprint (as detailed in Section 3.6, Public Utilities and Energy). Grading and construction activities would compact soil, which can decrease infiltration during construction. However, construction activities would be temporary, and any reduction in infiltration would not interfere with groundwater recharge due to the size of the groundwater basins underlying the RSA.

Tunnel construction would not be expected to affect groundwater levels or quality because the excavation method would control the groundwater inflows into the tunnel. For all excavation methods, grouting may be required after excavation to prevent groundwater inflow, improve ground strength characteristics, and limit preferential or new pathways for groundwater.

In singular occurrences (limited reaches), tunnel construction may interfere with the groundwater flow systems, occasionally cause dewatering of overlying springs and riparian areas that also provide critical habitat for flora and fauna, and locally affect groundwater quality. Mitigation Measure WQ-MM#3 would be implemented to reduce impacts on groundwater through a variety of methods, including probing ahead of the tunnel face during tunneling, construction methods to reduce inflow of groundwater into the tunnel, tunnel waterproofing, groundwater modeling, groundwater monitoring, and tunnel inspections. In addition, pre-excavation grouting would be implemented in the areas with high water inflow to minimize groundwater inflow into the tunnel and therefore minimize drawdown.

Other construction activities (e.g., grading and construction of the track) would not affect groundwater quality because there would not be a direct path for construction-related contaminants to reach groundwater due to the depth of groundwater in the vicinity of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option). Furthermore, construction BMPs (e.g., Erosion and Sediment Control and Good Housekeeping BMPs) would be implemented at construction sites as part of the SWPPP to remove pollutants from stormwater runoff that could infiltrate the groundwater basin, as required by HYD-IAMF#3.

Alternatives 1, 2, and 5 would cross approximately 61 miles of groundwater basins. Alternative 3 would only cross 60.5 miles, which is the least amount of mileage. While all the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would cross groundwater basins, Alternative 3 would result in the greatest acreage crossed (6,761 acres) and Alternative 2 would cross the least acreage (6,664 acres). Alternatives 1 and 5 would cross 6,733 and 6,761 acres, respectively. The tunnels would be waterproofed or watertight to minimize groundwater seepage into the tunnels during operation. As described previously above, the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would increase the amount of impervious surface. This increase in impervious surfaces has the potential to interfere with groundwater recharge by decreasing the amount of water that is able to recharge the aquifer/groundwater basins. However, when compared to the size of the groundwater basins, the increase in impervious surface area resulting from implementation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design

Option) would not result in a reduction in infiltration to an extent that would interfere with groundwater recharge. The largest increase in impervious surface area would be 743 acres for Alternative 2. The Kern County Subbasin is 1,945,000 acres and the Antelope Valley Subbasin is 1,010,000 acres. Therefore, the increase in impervious surface area represents a small fraction of the overall size of the groundwater basins. In addition, the soils along the RSA have a fairly high infiltration rate, and the proposed drainage improvements and treatment BMPs would promote infiltration through the use of retention/detention basins, which can increase groundwater recharge, as specified in HYD-IAMF#1. Additionally, project design would include the use and retention of native materials with high infiltration potential at the ground surface in areas that are critical to infiltration for groundwater recharge, where feasible. Furthermore, it is not anticipated that groundwater extraction would be used during operational activities associated with the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option).

3.8.9 CEQA Significance Conclusions

This section summarizes the impacts discussed in Section 3.8.6, Environmental Consequences; reports the level of significance prior to mitigation; indicates mitigation measures available to reduce the level of significance for each impact; and concludes by reporting on the level of significance after mitigation is implemented. If implementing a measure would reduce the potential impact below the applicable significance threshold, the impact would be considered less than significant after mitigation. If implementing a mitigation measure cannot reduce the level of impact below the significance threshold, however, the impact would be considered significant and unavoidable. Table 3.8-20 summarizes the project impacts pursuant to CEQA thresholds for hydrology and water resources and identifies the CEQA level of significance before and after mitigation.

The Bakersfield to Palmdale Project Section would not result in any significant impacts under CEQA. Impacts of the project section related to floodplains; drainage patterns, stormwater runoff, and hydraulic capacity; surface water quality; and groundwater volume, quality, and recharge would be less than significant under CEQA.

Table 3.8-20 Summary of CEQA Significant Conclusions and Mitigation Measures for Hydrology and Water Resources

Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Construction			
Impact HWR #1: Temporary Construction Impacts to Floodplains and Floodways *B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)* Construction in a floodplain could temporarily impede or redirect flows in the following floodplains: ▪ Caliente Creek ▪ Two unnamed tributaries to Caliente Creek ▪ Tehachapi Creek ▪ Tweedy Creek ▪ Mendibury Creek ▪ Oak Creek ▪ Antelope Valley 11A-11F and 12A-12C ▪ Amargosa Creek ▪ Unnamed floodplain in the City of Bakersfield *Station Sites* Construction of the Bakersfield Station—F-B LGA and Palmdale Station subsections would occur within the 100-year floodplain. Therefore, construction activities could potentially affect 100-year flood flows. *Maintenance Facilities* The LMF would not be located within a floodplain. However, the MOWF would be within a 100-year floodplain in the Antelope Valley. Construction activities in the FEMA-designated floodplains would include grading and excavation, and construction of MOWF facilities.	Significant	WQ-MM#1: Floodplain Protection: Construction BIO-MM#32: Restore Temporary Riparian Habitat Impacts	Less than Significant

Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact HWR #2: Temporary Construction Impacts to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity *B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)* Construction activities such as grading and excavation could alter existing drainage patterns and redirect stormwater runoff. During ground-disturbing activities, soil would be compacted, resulting in a decrease in infiltration and an increase in the volume and rate of stormwater runoff during storm events. Affected watersheds include the following: ▪ South Valley Floor Watershed ▪ Grapevine Watershed ▪ Fremont Valley Watershed ▪ Antelope Valley Watershed *Station Sites* Construction activities associated with the stations include grading, hauling, excavating, and constructing facilities. Construction activities such as grading and excavation could alter existing drainage patterns and redirect stormwater runoff. During ground-disturbing activities, soil would be compacted, resulting in a decrease in infiltration and an increase in the volume and rate of stormwater runoff during events. *Maintenance Facilities* Construction activities associated with the LMF and the MOWF include grading, hauling, excavating, and constructing LMF and the MOWF facilities. During ground-disturbing activities, soil would be compacted, resulting in a decrease in infiltration and an increase in the volume and rate of stormwater runoff during storm events.	Less than Significant	No mitigation is required.	Less than Significant

Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact HWR #3: Temporary Construction Impacts to Surface Water Quality *B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)* During construction activities, excavated soil would be exposed and there would be an increased potential for soil erosion compared to existing conditions. Construction areas with steep slopes and/or erodible soils, such as in mountainous areas, would have a greater potential for erosion to occur. In addition, chemicals, liquid products, petroleum products, and concrete-related waste may be spilled or leaked during construction. Potentially affected hydrologic basins include the Tulare Lake and Lahontan Basins. Excavation activities during construction also create a potential for encountering groundwater during construction that would require removal and discharge. *Station Sites* During construction activities, excavated soil would be exposed and there would be an increased potential for soil erosion compared to existing conditions. In addition, chemicals, liquid products, petroleum products, and concrete-related waste may be spilled or leaked during construction. Any of these pollutants have the potential to be transported via storm runoff into receiving waters. Excavation activities during construction also create a potential for encountering groundwater during construction that would require removal and discharge. *Maintenance Facilities* During construction activities, excavated soil would be exposed and there would be an increased potential for soil erosion compared to existing conditions. In addition, chemicals, liquid products, petroleum products, and concrete-related waste may be spilled or leaked during construction. Any of these pollutants have the potential to be transported via storm runoff into receiving waters. Excavation activities during construction also create a potential for encountering groundwater during construction that would require removal and discharge.	Significant	WQ-MM#2: Regional Dewatering Permits BIO-MM#34: Monitor Construction Activities Within Aquatic Resources BIO-MM#62: Prepare Plan for Dewatering and Water Diversions	Less than Significant

Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact HWR #4: Temporary Construction Impacts to Groundwater Volume, Quality, and Recharge *B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)* Groundwater levels adjacent to the HSR alignment are generally deep, but shallow groundwater may be encountered during construction of the concrete columns (piers) associated with the waterbody crossings. It is not anticipated that groundwater extraction during construction would be greater than the existing water demand for agricultural purposes due to the elimination of existing water use (including agriculture) within the HSR construction footprint. The proposed tunnels may be located below the groundwater table; therefore, groundwater may be encountered during construction of these tunnels and water inflow may occur. However, not enough groundwater information is available at this time to identify the extent to which the tunnels may be below the water table. Available information indicated the possible presence of perched groundwater or seasonal springs in the vicinity of these tunnels. Therefore, local water inflows during portal and tunnel excavations are anticipated. There would not be a direct path for construction-related contaminants to reach groundwater due to implementation of construction BMPs to reduce pollutants before they can migrate to the groundwater basin. *Station Sites* There is a low potential for groundwater to be encountered during excavation activities associated with construction. If groundwater is encountered, groundwater would be removed, treated (if necessary), and disposed of according to the requirements of regional groundwater dewatering permits. It is not expected that activities associated with the stations would affect groundwater quality. Grading and construction activities would compact soil, which can decrease infiltration during construction. However, construction activities would be temporary and the reduction in infiltration would not interfere with groundwater recharge. Groundwater would be pumped for construction of the Bakersfield Station subsections However, the amount of water used for construction of the Bakersfield Station subsections would be less intense than water requirements associated with existing agricultural land uses. *Maintenance Facilities* Grading and excavation activities would be required for construction of the MOWF. These construction activities would be on the surface and would not extend to great depths. The LMF would be constructed below grade at a maximum depth of 45 feet. Groundwater is unlikely to be encountered during construction; if it is, groundwater would be removed, treated (if necessary), and disposed of according to the requirements of regional groundwater dewatering permits.	Significant	WQ-MM#3: Tunnel constructability and hydrogeological monitoring	Less than Significant

Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Operations			
Impact HWR #5: Permanent Operation Impacts to Floodplains and Floodways *B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)* The two types of floodplain crossings include elevated and surface crossings. Both would be designed to provide flood flow conveyance and connectivity. Bridges would be designed to convey the 100-year flood capacity without increasing the existing water surface elevation by more than 1 foot or changing the floodplain limits. Piers and column support structures associated with bridges would be placed in the floodplain as needed. *Station Sites* Both the Bakersfield Station—F-B LGA and Palmdale Station subsections would be within 100-year floodplains. Therefore, operation of the station subsections could affect flood flows. *Maintenance Facilities* The MOWF would be within the 100-year floodplain in the Antelope Valley. FEMA regulations require a floodplain analysis to prevent projects from increasing the base flood elevation greater than 1 foot or changing the floodplain limits. The floodplain crossings would be designed to comply with these requirements and regulations.	Significant	WQ-MM#4: Floodplain Protection: Operation	Less than Significant
Impact HWR #6: Permanent Operation Impacts Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity *B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)* Implementation of the alternatives would result in alteration of the existing drainage patterns due to the HSR project. An alteration of the existing drainage pattern has the potential to increase surface water volume or rates. Construction of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would also increase impervious surface area. Introducing new impervious surfaces where they currently do not exist has the potential to increase the rate and volume of stormwater runoff reaching receiving waters. *Station Sites* The stations would consist primarily of impermeable surfaces, which would increase the volume and rate of stormwater runoff. *Maintenance Facilities* The LMF and the MOWF would cover a large area consisting of primarily impermeable surfaces, which could produce large amounts of stormwater runoff.	Less than Significant	No mitigation is required.	Less than Significant

Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact HWR #7: Permanent Operation Impacts to Surface Water Quality *B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option)* During operation and maintenance activities, anticipated pollutants associated with a railway facility include heavy metals, nutrients, sediments, organic compounds, trash and debris, and oil and grease. The technology proposed for the HSR system does not require large amounts of lubricants or hazardous materials for operation. Regenerative braking technology would reduce brake pad wear and the amount of potential metal particles deposited within the track right-of-way. Greases may be used to lubricate switching equipment along the trackway, and herbicides and pesticides may be used to control weeds and vermin. Placement of piers within channels and abutments near waterways has the potential to cause localized scour, which can increase sediment deposition and degrade water quality. Development of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would increase impervious surface area, increasing the volume of runoff during a storm and thereby increasing the potential for transporting pollutants to receiving waters. The presence of the HSR could increase the amount of pollutants associated with rail operations because of increased rail service. *Station Sites* The main source of pollutants would be from stations and would include heavy metals, organic compounds, trash and debris, oil and grease, nutrients, pesticides, and sediments. *Maintenance Facilities* The LMF and the MOWF would include large parking areas and several outdoor maintenance facilities, which would produce runoff that would require water quality treatment. The main sources of pollutants would be from maintenance areas associated with the LMF and the MOWF, and would include litter and spillages, vehicle lubrication system losses, vehicle/tire wear, vehicle exhaust emissions, and road surface wear. Potential pollutants generated by the new parking lots include heavy metals, organic compounds, trash and debris, oil and grease, nutrients, pesticides, and sediments.	Significant	WQ-MM#4: Floodplain Protection: Operation	Less than Significant

Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact HWR #8: Permanent Operation Impacts to Groundwater Volume, Quality, and Recharge *B-P Build Alternatives (including the CCNM Design Option* and the Refined CCNM Design Option*)* An increase in impervious surface area has the potential to interfere with groundwater recharge by causing a decrease in infiltration. Implementation of the B-P Build Alternatives (including the CCNM Design Option and the Refined CCNM Design Option) would increase impervious surface area; however, this reduction in infiltration would not interfere with groundwater recharge due to the size of the groundwater basin. *Station Sites* An increase in groundwater withdrawal associated with the station subsections is not anticipated to affect groundwater levels. The increase in impervious surface area from development of the stations would decrease infiltration, which can decrease the amount of water that is able to recharge the aquifer/groundwater basin. However, this reduction in infiltration would not interfere with groundwater recharge due to the size of the groundwater basin. It is not expected that operational activities would affect groundwater quality, because there would not be a direct path for operation-related contaminants to reach groundwater due to the depth of groundwater in the project vicinity. *Maintenance Facilities* The increase in impervious surface area from development of the LMF and the MOWF would decrease infiltration, which can decrease the amount of water that is able to recharge the aquifer/groundwater basin. However, the reduction in infiltration would not interfere with groundwater recharge due to the size of the groundwater basin. Implementation of the HSR project would displace existing agricultural and domestic wells within the HSR right-of-way. Displacement of these wells would not further deplete groundwater supplies through additional groundwater pumping or change the water level in neighboring wells, because the replacement wells would pump at the same rate and depth as they did prior to relocation.	Less than Significant	No mitigation is required.	Less than Significant

B-P = Bakersfield to Palmdale Project Section
BMP = best management practice
CCNM = César E. Chávez National Monument
F-B LGA = Fresno to Bakersfield Locally Generated Alternative
FEMA = Federal Emergency Management Agency
HSR = high-speed rail
LMF = Light Maintenance Facility
MOWF = Maintenance of-Way Facility