3 Affected Environment, Environmental Consequences, and Mitigation Measures

3.8 Hydrology and Water Resources

3.8.1 Introduction

Section 3.8, Hydrology and Water Resources, of the *Merced to Fresno Section: Central Valley Wye Final Supplemental Environmental Impact Report (EIR)/Environmental Impact Statement (EIS)* (Final Supplemental EIR/EIS) updates the *Merced to Fresno Section California High-Speed Train Final Project EIR/EIS* (Merced to Fresno Final EIR/EIS) (California High-Speed Rail Authority [Authority] and Federal Railroad Administration [FRA] 2012) with new and revised information relevant to hydrology and water resources, analyzes the potential impacts of the No Project Alternative and the Central Valley Wye alternatives, and describes impact avoidance and minimization features (IAMF) that would avoid, minimize, or reduce these impacts. Where applicable, mitigation measures are proposed to further reduce, compensate for, or offset impacts of the Central Valley Wye alternatives. Section 3.8 also defines the hydrology and water resources within the region and describes the affected environment in the resource study areas (RSA).

The analysis herein is consistent with the analysis conducted in the Merced to Fresno Final EIR/EIS. Both analyses examine potential impacts on surface water hydrology, surface water quality, groundwater, and floodplains and use the same methods for evaluating impacts within their respective RSAs. The analyses use the same information sources. Where information has changed or new information has become available since the Merced to Fresno Final EIR/EIS was prepared in 2012, the analysis in this Final Supplemental EIR/EIS uses the updated versions of these sources or datasets. Relevant portions of the Merced to Fresno Final EIR/EIS that remain unchanged are summarized and referenced in this section but are not repeated in their entirety.

The *Merced to Fresno Section: Central Valley Wye Hydrology and Water Resources Technical Report* (Hydrology and Water Resources Technical Report) (Authority and FRA 2016a) provides additional technical details on hydrology and water resources.[1] This technical report is available via the Authority's website: https://www.hsr.ca.gov/programs/environmental/eis_eir/draft_supplemental_merced_fresno.aspx.

Additional details on hydrology and water resources are provided in the following appendices in Volume II of this Final Supplemental EIR/EIS:

- Appendix 2-C, Applicable Design Standards, provides the list of relevant design standards for the Central Valley Wye alternatives.
- Appendix 3.8-A, Hydrology and Water Resources Local and Regional Plans and Laws Consistency Analysis, provides a discussion of inconsistencies or conflicts that may exist between the Central Valley Wye alternatives and regional or local plans or laws.

Hydrology and water resources, including surface water and groundwater, in the San Joaquin Valley are important factors for urban and agricultural water supply, fish and wildlife habitat, and

[1] The Hydrology and Water Resources Technical Report was finalized in 2016; however, the content of the Draft Supplemental EIR/EIS continued to evolve to incorporate the most current data and other sources of information relevant to the environmental analyses, some of which were not available at the time that the technical report was prepared. As a result, some of the information presented in the Draft Supplemental EIR/EIS was more current than the information presented in the technical report. To provide clarity on any information and data differences between the Draft Supplemental EIR/EIS and the technical report and the location of the most current information, a Central Valley Wye Technical Report Memorandum of Updates had been produced and included in Appendix 3.1-D, Central Valley Wye Technical Report Memorandum of Updates. Further changes between the Draft and Final Supplemental EIR/EIS are not recorded in that memorandum.

floodwaters. Four other resource sections in this Final Supplemental EIR/EIS provide additional information related to hydrology and water resources:

- **Section 3.6, Public Utilities and Energy**—Impacts of constructing the Central Valley Wye alternatives on water infrastructure, such as irrigation and drainage canals, stormwater systems, water districts, groundwater use, and water supply
- **Section 3.7, Biological Resources and Wetlands**—Impacts of constructing the Central Valley Wye alternatives on wetlands and other aquatic features and aquatic species
- **Section 3.9, Geology, Soils, Seismicity, and Paleontological Resources**—Impacts of constructing the Central Valley Wye alternatives on soil erosion and quality and seismicity
- **Section 3.10, Hazardous Materials and Wastes**—Impacts of constructing the Central Valley Wye alternatives that affect water resources because of contamination of equipment and hazardous material use and storage

Definition of Resources

The following are definitions for hydrology and water resources analyzed in this Final Supplemental EIR/EIS. These definitions are the same as those used in the Merced to Fresno Final EIR/EIS (Authority and FRA 2012).

- **Surface Water Hydrology**—Surface water hydrology refers to the occurrence, distribution, and movement of surface water, including water found in rivers, canals, and stormwater drainage systems. Stormwater runoff and drainage patterns are directed by the topography and the gradient of the land.
- **Surface Water Quality**—Water quality is a measure of the suitability of water relative to the requirements for a particular use based on selected physical, chemical, and biological characteristics. It is most frequently used by reference to a set of standards against which compliance can be assessed.
- **Groundwater**—Groundwater is the water found underground in the cracks and spaces in soil, sand, and rock. It is stored in and moves slowly through geologic formations of soil, sand, and rocks called aquifers. Groundwater supplies are replenished, or recharged, by precipitation that seeps into the land's surface.
- **Floodplains**—Floodplains are areas of land susceptible to inundation by floodwaters from any source. Typically, they are low-lying areas adjacent to waterways and subject to flooding during wet years. A 100-year floodplain differs in that it is an area adjoining a river, stream, or other waterway that is covered by water in the event of a 100-year flood (a flood having a 1 percent chance of being equaled or exceeded in magnitude in any given year).

Since the publication of the Draft Supplemental EIR/EIS, there have been no substantive changes to this section beyond the global changes described in Section S.1.2, Global Changes in the Final Supplemental EIR/EIS, of the Summary.

3.8.2 Laws, Regulations, and Orders

This section identifies laws, regulations, and orders that are relevant to the analysis of hydrology and water resources in this Final Supplemental EIR/EIS. Also provided are summaries of new or updated laws, regulations, and orders that have occurred since publication of the Merced to Fresno Final EIR/EIS.

3.8.2.1 Federal

The following federal laws, regulations, orders, and plans are the same as those described in Section 3.8.2, Laws, Regulations, and Orders, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: pages 3.8-1 through 3.8-2):

- Clean Water Act (33 U.S.C. § 1251 et seq.)
- Basin Planning (33 United States Code [U.S.C.] § 102)
- Clean Water Act Water Quality Certification (33 U.S.C. § 1251 et seq.)
- National Pollutant Discharge Elimination System Program (33 U.S.C. § 1342)
- Permit for Discharge of Fill Material in Wetlands and Other Waters (33 U.S.C. § 1344)
- Sections 9 and 10 of the Rivers and Harbors Act (33 U.S.C. § 401 et seq.)
- Section 14 of the Rivers and Harbors Act (33 U.S.C. § 408)
- National Flood Insurance Act (42 U.S.C. § 4001 et seq.)
- Floodplain Management and Protection (U.S. Department of Transportation Order 5650.2) and Flood Disaster Protection Act (42 U.S.C. §§ 4001–4128)

New, additional, or updated federal laws, regulations and orders follow.

Water Quality Impairments (Section 303(d), 33 U.S.C. § 1313)

As described in Section 3.8.2.1 of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: page 3.8-2), Section 303(d) requires each state to develop a list of impaired surface waters that do not meet, or that the state expects 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 by the state. Since publication of the Merced to Fresno Final EIR/EIS, the State Water Resources Control Board (SWRCB) has combined its 303(d) List and the 305(b) Report into the proposed 2012 California Integrated Report—303(d) and 305(b) Report, known as the Integrated Report—303(d) List of Water Quality Limited Segments and 305(b) Surface Water Quality Assessment. After approval of the 303(d) List portion of the California Integrated Report by the SWRCB, the complete California Integrated Report was submitted to the U.S. Environmental Protection Agency (USEPA). The USEPA partially approved the 303(d) List portion of the California Integrated Report on June 26, 2015.

Omnibus Public Land Management Act of 2009 (16 U.S.C. §§ 10001-10203)

The Omnibus Public Land Management Act (Public Law 111-11) was signed into law by President Obama on March 30, 2009, and includes the San Joaquin River Restoration Settlement Act (16 U.S.C. §§ 10001-10011), which authorizes implementation of the San Joaquin River Restoration Settlement (*Natural Resources Defense Council, et al., v. Kirk Rodgers, et al. Settlement Agreement* (Settlement). The San Joaquin River Restoration Program (SJRRP) was initiated in accordance with the terms and conditions of the Settlement. The SJRRP is a comprehensive long-term effort to restore flows to a 153-mile-long portion of the San Joaquin River from Friant Dam to the confluence of the Merced River. The SJRRP goals are to restore a self-sustaining Chinook salmon fishery while reducing or avoiding adverse water supply effects from restoration flows. The implementing agencies of the SJRRP include the U.S. Bureau of Reclamation (USBR); U.S. Fish and Wildlife Service; National Marine Fisheries Service; California Department of Water Resources (DWR); and California Department of Fish and Wildlife (USBR and DWR 2012).

Stormwater Discharges: Construction General Permit

The statewide General Permit for Stormwater Discharges was included in Section 3.8.2.3, Regional and Local, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: page 3.8-4)

but has since been updated. On July 1, 2010, the SWRCB Water Quality Order No. 2009-0009-DWQ, NPDES No. CAS000002, the statewide Construction General Permit, superseded the previous statewide General Permit. The SWRCB later revised this permit with Order No. 2010-0014-DWQ and Order No. 2012-006-DWQ. The Regional Water Quality Control Boards (RWQCB) oversee compliance with Construction General Permits within their jurisdictions.

A preliminary analysis indicates that the Central Valley Wye alternatives would fall under Risk Level 1, the lowest risk level. The project footprints of the Central Valley Wye alternatives are within the jurisdiction of the Central Valley RWQCB, which is discussed under RWQCBs permits in Section 3.8.2.3, Regional and Local. Because all of the Central Valley Wye alternatives would disturb more than 1 acre of soil, the Authority would be required to obtain coverage under the Construction General Permit.

Stormwater Discharges: California Department of Transportation National Pollutant Discharge Elimination System Permit

The California Department of Transportation (Caltrans) National Pollutant Discharge Elimination System (NPDES) Permit was included in Section 3.8.2.2, State, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: page 3.8-3) but has since been updated. 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 the Caltrans construction program comply with the adopted statewide Construction General Permit. The Caltrans permit is applicable to portions of the Central Valley Wye alternatives that would involve modifications to state highways.

Stormwater Discharges: Municipal Separate Storm Sewer System National Pollutant Discharge Elimination System Permits

CWA Section 402(p) requires that states develop and implement stormwater management programs to meet the requirements for stormwater discharges from MS4 systems. In California, the SWRCB administers the NPDES program, and the RWQCBs have implementation and enforcement responsibilities. The SWRCB and the RWQCBs issue municipal separate storm sewer system (MS4) permits in two phases. Phase I MS4 permits are issued to groups of co-permittees encompassing an entire metropolitan area. The Phase II MS4 General Permit (SWRCB Water Quality Order No. 2013-0001-DWQ, NPDES No. CAS000004) provides NPDES permit coverage to municipalities not covered under the NPDES Phase I Rule (i.e., small MS4s generally for fewer than 100,000 people). The project footprints of the Central Valley Wye alternatives lie within jurisdiction of the Phase II NPDES program. The Authority requested designation as a nontraditional permittee of the Phase II Small MS4 permit (Order No. 2013-0001-DWQ; SWRCB 2014). This order is the only MS4 permit for which the Authority has obtained coverage as a nontraditional discharge, and the permit became effective on August 22, 2014. The Authority's MS4 permit replaces city-specific MS4 permits, which would otherwise be applicable to the Central Valley Wye alternatives. Low-impact development (LID) design standards and a post-construction stormwater management program are required under the MS4 permit.

Stormwater Management Programs

Stormwater management programs were described in Section 3.8.2.3 of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: page 3.8-5) but have since been updated. As part of NPDES Phase I MS4 permit compliance, municipalities implement stormwater management programs to limit to the maximum extent practicable the discharge of pollutants from storm sewer systems. The following stormwater management program is relevant to watersheds within the Central Valley Wye alternatives' project footprints:

- Merced Storm Water Group (MSWG) comprised of the cities of Atwater and Merced, Merced County, and the Merced Irrigation District Storm Water Management Program (MSWG 2007)

Stormwater discharges in the cities of Atwater, Merced, and Chowchilla; Merced and Madera Counties; and the Merced Irrigation District are all permitted under Phase II Small MS4 General Permit Number CAS000004, Water Quality Order No. 2013-0001-DWQ (MSWG 2007). In

accordance with the NPDES permit obligations, the MSWG has developed a Storm Water Management Program that outlines best management practices (BMPs) that the cities of Atwater and Merced, Merced County, Merced Irrigation District, and other co-permittees implement to reduce the quantity of stormwater and to prevent the discharge of pollutants in stormwater (MSWG 2007). Madera County and the City of Chowchilla implement the *Madera County Storm Water Management Plan* (Madera County 2013).

The stormwater management programs and plans identify six BMPs that are necessary for effectively managing stormwater:[2] public education and outreach, public involvement and participation, illicit discharge detection, construction site stormwater runoff management, post-construction runoff controls in new and redevelopments, and pollution prevention for municipal operations (MSWG 2007, Madera County 2013).

Local Flood Protection Works; Maintenance and Operation of Structures and Facilities (33 C.F.R. § 208.10a)

33 Code of Federal Regulations (C.F.R.) Part 208.10a(5) addresses relatively minor, low impact modifications to locally or federally maintained U.S. Army Corps of Engineers (USACE) projects, including modifications to pipes, roads, and infrastructure that do not adversely affect the functioning of a project and flood protection measures. Section 208.10 requires that construction of improvements, including crossings, do not reduce the capacity of a channel within a federal flood control project. A Section 208.10 permission from the USACE would be required where a Central Valley Wye alternative crosses the right-of-way of a federal flood control facility or interferes with its operation or maintenance without changing the system's structural geometry or hydraulic capacity.

Floodplain Management (USEO 11988)

Floodplain Management, U.S. Presidential Executive Order (USEO) 11988 was included in Section 3.8.2.1, Federal, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: page 3.8-2) but has since been updated. USEO 11988 of May 24, 1977 requires executive departments and agencies to avoid, to the extent possible, the long- and short-term adverse effects associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. Furthermore, USEO 11988 stipulates that if the proposed action involves a significant encroachment on a base floodplain, the EIS shall contain a finding that there is no other practicable alternative that avoids significant encroachment on a base floodplain. This finding is required to be supported by a description of why the proposed action must be located in the floodplain, including the alternatives considered and why they were not practicable and accompanied by a statement that the action conforms to applicable State and/or local floodplain protection standards. U.S. Department of Transportation Order 5650.2 contains policies and procedures for the transportation agencies to implement USEO 11988 on transportation projects.

On January 30, 2015, President Obama issued USEO 13690, which amended USEO 11988. Amendments included requiring federal agencies to use, where possible, natural systems, ecosystem processes, and nature-based approaches when identifying alternatives for locating development in floodplains, and an option of establishing a floodplain based on a climate-informed approach. On August 15, 2017, President Trump issued USEO 13807, which revoked USEO 13690 and restored USEO 11988 to its original form. The current USEO 11988 requirements are included, where applicable, to address impacts related to floodplains and flood risks.

[2] As required by the NPDES permit, these BMPs would be incorporated into the design requirements of the Central Valley Wye alternatives. Some of these BMPs have been incorporated into the Central Valley Wye alternatives as IAMFs.

3.8.2.2 State

The following state laws, regulations, orders, and plans are the same as those described in Section 3.8.2.2, State, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: pages 3.8-2 through 3.8-3):

- Porter-Cologne Water Quality Control Act (Cal. Water Code § 13000 et seq.)
- Streambed Alteration Agreement (Cal. Fish and Game Code §§ 1601–1603)
- Colby-Alquist Floodplain Management Act (Cal. Water Code § 8400 et seq.)
- Central Valley Flood Protection Board (Cal. Code Regs., tit. 23, § 1)

New or updated state laws, regulations and orders follow.

California General Plan Law (Gov. Code, § 65302)

California Government Code (Gov. Code) section 65302 requires cities and counties to include in their general plan a statement of development policies setting forth objectives, principles, standards and plan proposals for seven policy areas, including safety. The safety element is to provide for the protection of the community from any unreasonable risks associated with seismic hazards and flooding.

Central Valley Flood Protection Act (Cal. Water Code § 9600 et seq.)

The Central Valley Flood Protection Act was included in Section 3.8.2.2 of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: page 3.8-3) but has since been updated. The Central Valley Flood Protection Act of 2008 establishes the 200-year flood event as the minimum level of 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 DWR and Central Valley Flood Protection Board (CVFPB) collaborated with local governments and planning agencies to prepare the *2012 Central Valley Flood Protection Plan* (DWR 2012a: pages 1-24 to 1-26), which the CVFPB adopted on June 29, 2012. The objective of the *2012 Central Valley Flood Protection Plan* is to create a systemwide approach to flood management and protection improvements for the Central Valley and San Joaquin Valley. The 200-year floodplains are within the area covered by the mapped 500-year floodplains.

Sustainable Groundwater Management Act (Cal. Water Code §§ 113, 10720, 10750.1, 10927, 10933, 12924)

On September 16, 2014 Governor Edmund G. Brown, Jr. signed legislation to strengthen local management and monitoring of groundwater basins. It establishes requirements for locally controlled groundwater sustainability agencies to adopt groundwater sustainability plans for high- and medium-priority basins depending on whether a basin is in critical overdraft. The Sustainable Groundwater Management Act established a new structure for managing groundwater resources at a local level by local agencies. It requires, by June 30, 2017, the formation of locally controlled groundwater sustainability agencies in the state's high- and medium-priority groundwater basins and subbasins. The act phases the adoption of groundwater sustainability plans. Plans are due by January 31, 2020, for all high- or medium-priority basins in overdraft condition and by January 31, 2022, for all other high- and medium-priority basins unless the basin is legally adjudicated or otherwise managed sustainably.

3.8.2.3 Regional and Local

The *Madera County General Plan* (1995), *Fresno County General Plan* (2003), and *Merced Vision 2030 General Plan* (2012) are the same as described in Section 3.8.2.3 Regional and Local, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: pages 3.8-3 through 3.8-7). This section describes new or updated regional and local laws, regulations, and orders.

Dewatering Activities: Regulation by Regional Water Quality Control Board

Dewatering activity permits were described in Section 3.8.2.3 of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: page 3.8-4) but have since been updated. The Central Valley RWQCB's Order No. R5-2013-0074 (NPDES No. CAG95001), Waste Discharge Requirements General Order for Dewatering and Other Low-Threat Discharges to Surface Waters (General Dewatering Permit), updates the regulation of discharges to surface water from dewatering activities. The SWRCB's Order No. 2003-0003-DWQ, General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality (Low-Threat Discharge Permit), as updated by 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, continues to cover discharges to land from dewatering activities.

General Plan Policies and Ordinances

Table 3.8-1 lists county and city general plan goals, policies, and ordinances relevant to the Central Valley Wye alternatives. Refer to Section 3.8.2.3 of the Merced to Fresno Final EIR/EIS for more information.

Table 3.8-1 Local Plans and Policies

Policy Title	Summary
Merced County	
2030 Merced County General Plan (2013)	Merced County adopted the *2030 Merced County General Plan* on December 10, 2013, updating the previous version of the general plan that was included in Section 3.8.2.3 (page 3.8-5) of the Merced to Fresno Final EIR/EIS. The general plan includes the following goals and policies: ▪ Public Facilities and Services Element Goal PFS-3: Ensure the management of stormwater in a safe and environmentally sensitive manner through the provision of adequate storm drainage facilities that protect people, property, and the environment. ▪ Policy PFS-3.1: Require stormwater management plans for all Urban Communities to reduce flood risk, protect soils from erosion, control stormwater runoff, and minimize impacts on existing drainage facilities. ▪ Policy PFS-3.2: Require that new development in unincorporated communities includes adequate stormwater drainage systems. This includes adequate capture, transport, and detention/retention of stormwater. ▪ Policy PFS-3.3: Encourage development of community drainage systems rather than individual project level systems, in order to use land more efficiently and protect people, property and the environment in a more comprehensive manner. ▪ Policy PFS-3.4: Coordinate with the U.S. Army Corps of Engineers and other appropriate agencies to develop stormwater detention/retention facilities and recharge facilities that enhance flood protection and improve groundwater recharge. ▪ Policy PFS-3.5: Require on-site detention/retention facilities and velocity reducers when necessary to maintain pre-development storm flows and velocities in natural drainage systems. ▪ Policy PFS-3.6: Encourage stormwater detention/retention project designs that minimize drainage concentrations and impervious coverage, avoid floodplain areas, are visually unobtrusive and, where feasible, provide a natural watercourse appearance and a secondary use, such as recreation. ▪ Natural Resources Element Goal NR-1: Preserve and protect, through coordination with the public and private sectors, the biological resources, of the County. ▪ Policy NR-1.1: Identify areas that have significant long-term habitat and wetland values including riparian corridors, wetlands, grasslands, rivers and waterways, oak woodlands,

Policy Title	Summary
	vernal pools, and wildlife movement and migration corridors, and provide information to landowners. ▪ Policy NR-1.2: Identify and support methods to increase the acreage of protected natural lands and special habitats, including but not limited to wetlands, grasslands, vernal pools, and wildlife movement and migration corridors, potentially through the use of conservation easements. ▪ Policy NR-1.4: Minimize the removal of vegetative resources which stabilize slopes, reduce surface water runoff, erosion, and sedimentation. ▪ Policy NR-1.5: Identify wetlands and riparian habitat areas and designate a buffer zone around each area sufficient to protect them from degradation, encroachment, or loss. ▪ Policy NR-1.10: Cooperate with local, State, and Federal water agencies in their efforts to protect significant aquatic and waterfowl habitats against excessive water withdrawals or other activities that would endanger or interrupt normal migratory patterns or aquatic habitats. ▪ Policy NR-1.11: Cooperate with local, State, and Federal agencies to ensure that adequate on-going protection and monitoring occurs adjacent to rare and endangered species habitats or within identified significant wetlands. ▪ Policy NR-1.12: Avoid or minimize loss of existing wetland resources by careful placement and construction of any necessary new public utilities and facilities, including roads, railroads, high speed rail, sewage disposal ponds, gas lines, electrical lines, and water/wastewater systems. ▪ Policy NR-1.13: Require an appropriate setback, to be determined during the development review process, for development and agricultural uses from the delineated edges of wetlands. ▪ Policy NR-1.14: Ensure that buildings and structures approved for temporary residential use in significant wetland areas are not converted to permanent residential uses. ▪ Policy NR-1.16: Require new hazardous waste residual repositories (e.g., contaminated soil facilities) to be located at least a mile from significant wetlands, designated sensitive species habitat, and State and Federal wildlife refuges and management areas. ▪ Policy NR-1.17: Consult with private, local, State, and Federal agencies to assist in the protection of biological resources and prevention of degradation, encroachment, or loss of resources managed by these agencies. ▪ Policy NR-1.18: Monitor the San Joaquin River Restoration Program efforts to ensure protection of landowners, local water agencies, and other third parties. ▪ Policy NR-1.19: Support the restoration efforts for the Merced River consistent with the Merced River Corridor Restoration Plan. ▪ Health and Safety Element Goal HS-2: Minimize the possibility of loss of life, injury, or damage to property as a result of flood hazards. ▪ Policy HS-2.1: Prepare and adopt a floodplain management program in flood hazard areas that gives priority to regulation of land uses over development of structural controls as a method of reducing flood damage. ▪ Policy HS-2.2: Coordinate with the cities in Merced County to develop a Countywide flood emergency plan that is consistent with city general plans. ▪ Policy HS-2.3: Work with the cities in Merced County to establish a Countywide flood control authority to coordinate efforts and develop opportunities for expanded Federal funding. ▪ Policy HS-2.4: Coordinate with State and local flood management agencies to develop funding mechanisms to finance the design and construction of flood facilities. ▪ Policy HS-2.5: Support the efforts of local districts and communities in obtaining funding for local flood control projects.

Policy Title	Summary
	▪ Policy HS-2.6: Prohibit new development in existing undeveloped areas (i.e., area devoted to agriculture or open space that is not designated for development) protected by a State flood control project without appropriately considering significant known flooding risks and taking reasonable and feasible action to mitigate the potential property damage to the new development resulting from a flood. ▪ Policy HS-2.7: The County shall not enter into a development agreement, approve any building permit or entitlement, or approve a tentative or parcel map, unless it finds one of the following: a) The flood control facilities provide 200-year level of protection in urban and non-urban areas consistent with the current Central Valley Flood Protection Plan; b) Conditions imposed on the development will protect the property at a 200-year level of protection in urban and non-urban areas consistent with the current Central Valley Flood Protection Plan; or c) The local flood management agency has made "adequate progress" on the construction of a flood protection system which will result in protection equal or greater than the 200-year flood event in urban and non-urban areas consistent with the current Central Valley Flood Protection Plan. ▪ Policy HS-2.8: Require new flood control projects or developments within areas subject to 100- and 200-year frequency floods are done in a manner that will not cause floodwaters to be diverted onto adjacent property or increase flood hazards to property located elsewhere. ▪ Policy HS-2.9: Encourage all agencies that operate public facilities, such as roads, structures, wastewater treatment plants, gas, electrical, and water systems within areas subject to 100- and 200-year frequency floods to locate and construct facilities to minimize or eliminate potential flood damage. ▪ Policy HS-2.10: Prohibit the construction of essential facilities (including hospitals, healthcare facilities, emergency shelters, fire stations, emergency command centers, and emergency communications facilities) in the 100- and 200-year floodplain, unless it can be demonstrated that the structural and operational integrity of the facility can be maintained during flood events. ▪ Policy HS-2.11: Continue to participate in the National Flood Insurance Program. ▪ Policy HS-2.12: Support State and local flood management agencies to provide relocation assistance or other cost-effective strategies for reducing flood risk to existing economically disadvantaged communities located in non-urbanized areas. ▪ Policy HS-2.13: Encourage open-space uses in flood hazard areas. ▪ Policy HS-2.14: Encourage multipurpose flood control projects that incorporate recreation, resource conservation, preservation of natural riparian habitat, and scenic values of the County's streams, creeks, and lakes. ▪ Policy HS-2.15: Encourage flood control designs that respect the natural topography and vegetation of waterways while retaining dynamic flow and functional integrity. ▪ Policy HS-2.16: Encourage increased stormwater and flood protection infrastructure capacity in order to accommodate changes in precipitation and extreme weather events. ▪ Policy HS-2.17: Permit the construction of County flood control facilities in existing developments located within flood hazard areas to proceed only after a complete review of the environmental effect and project costs and benefits. ▪ Policy HS-2.18: Prepare public awareness programs to inform the general public and potentially affected property owners of flood hazards, potential dam failure inundation, and evacuation plans. ▪ Policy HS-2.19: Coordinate and use mutual aid resources to augment local resources in order to perform rescue operations, secure utilities and inundated areas, and control traffic in event of dam failure.

Policy Title	Summary
Merced County Code of Ordinances	Merced County Code of Ordinances include titles for building and construction, including building codes, and zoning, including performance standards. The Ordinances also include construction site requirements for the maintenance of grasses including mowing and watering. Specifically, these ordinances include the following: ▪ Title 16 Building and Construction, Chapter 16.16 Building Code, Section 16.16.010 International Building Code ▪ Title 18 Zoning, Chapter 18.41 Performance Standards, Section 18.41.030 Dust
Madera County	
Madera County Ordinances	Madera County Code of Ordinances include titles for building and construction, including grading and erosion control requirements. Specifically, these include the following: ▪ Title 14 Buildings and Construction, Chapter 14.50 Grading and Erosion Control
City of Chowchilla 2040 General Plan (2011)	An earlier City of Chowchilla general plan was included in Section 3.8.2.3 (page 3.8-6) of the Merced to Fresno Final EIR/EIS but a new one has since been adopted – the *City of Chowchilla 2040 General Plan*. The City of Chowchilla adopted the new general plan on May 2, 2011 and it includes the following objectives and policies: ▪ Objective OS-11: Ensure adequate groundwater reserves are maintained for present and future domestic, commercial, and industrial uses. ▪ Objective OS-12: Ensure groundwater quality is maintained at a satisfactory level for domestic water consumption. ▪ Policy PF-1.3: Develop and maintain Master Plans for water, wastewater collection and treatment, and storm water collection and disposal which address future growth demands and address public facilities and services including schools in a coordinated and comprehensive manner. ▪ Policy PF-6.1: The City shall condition approval of development projects on the provision of adequate storm drainage improvements. ▪ Policy PF-6.2: The City shall require the extension of storm drains to new areas in accordance with the phasing of a storm drainage master plan ▪ Policy PF-7.1: Natural and manmade channels, detention basins, and other drainage facilities shall be maintained to ensure that their full use and carrying capacity is not impaired. ▪ Policy PF-7.2: Continue to require new development to discharge storm water runoff at volumes no greater than the capacity of any portion of the existing downstream system by utilizing detention or retention or other approved methods, unless the project is providing drainage pursuant to an adopted drainage plan. ▪ Policy PF-7.3: When necessary, require new development to prepare hydrologic studies to assess storm runoff effects on the local drainage system and, if warranted, require new development to provide adequate drainage facilities and to mitigate increases in storm water flows and/or volume to avoid cumulative increases in downstream flows. ▪ Policy PF-7.4: New and redevelopment projects shall prepare and provide to the City appropriate drainage studies that assess project storm runoff effects on the City storm drain system, as well as provide appropriate storm drainage facilities to ensure an increased risk of on- or off-site flooding does not result from project implementation. ▪ Policy PF-7.5: All drainage improvements shall comply with the City of Chowchilla Public Works Construction Standards. ▪ Policy PS 2.2: Development of urban uses, with the exception of passive recreation use areas and pedestrian/bicycle trails within a floodway or floodplain subject to a 100-year flood event shall be prohibited. ▪ Policy PS 2.3: Preserve floodways and floodplains for non-urban uses with the exception of passive or active recreational development may be allowed in a floodplain with

Policy Title	Summary
	appropriate measures that avoid or minimize damage to recreation or structural improvements. ▪ Policy PS 2.4: Ensure that potential flooding impacts, including on-site flood damage, and potential inundation, are adequately addressed through the environmental review process and appropriate mitigation is imposed.
City of Chowchilla Code of Ordinances	City of Chowchilla Ordinances include titles for subdivisions, including design and improvement standards and grading requirements. Specifically, these ordinances include the following: ▪ Title 17 Subdivisions, Chapter 17.32 Design and Improvement Standards, Section 17.32.060 Grading Plan
Fresno County	
Fresno County General Plan (2003)	The *Fresno County General Plan* was adopted on October 3, 2000, and reflects amendments through March 25, 2003. Goals and policies of the Fresno County General Plan are included in Section 3.8.2.3 of the Merced to Fresno to Fresno Final EIR/EIS (page 3.8-6). The following policy was not discussed in the Merced to Fresno Final EIR/EIS but is also relevant to the project: ▪ Policy PF-C.3: To reduce demand on the County's groundwater resources, the County shall encourage the use of surface water to the maximum extent feasible.
Stanislaus County	
Stanislaus County General Plan (2016)	The *Stanislaus County General Plan* was adopted on August 23, 2016. The Stanislaus General Plan includes the following goals and policies: ▪ Conservation/Open Space Element, Goal Two: Conserve water resources and protect water quality in the County. ▪ Policy 5: Protect groundwater aquifers and recharge areas, particularly those critical for the replenishment of reservoirs and aquifers. ▪ Policy 6: Preserve vegetation to protect waterways from bank erosion and siltation.
Stanislaus County Code	14.14.050 Discharge of nonstormwater [sic] prohibited. A. Except as provided in Section 14.14.060, it is unlawful for any person to make or cause to be made any nonstormwater [sic] discharge.
Waterford Vision 2025 General Plan (2006)	The *Waterford Vision 2025 General Plan* was adopted on October 26, 2006. The *Waterford Vision 2025 General Plan* contains the following goals and policies: ▪ Open Space and Conservation Element, Goal Area A: Open space for the preservation of natural resources. ▪ Policy OS-A-2: Preserve and enhance Tuolumne River and Dry Creek in their natural state throughout the planning area. ▪ Policy OS-A-5: Preserve and enhance water quality.

Sources: City of Merced, 2015; City of Waterford, 2006; City of Chowchilla, 2011; Fresno County, 2003; Merced County, 2013; Stanislaus County, 2016
EIR/EIS = environmental impact report/environmental impact statement

3.8.3 Compatibility with Plans and Laws

As indicated in Section 3.1.5.3, Compatibility with Plans and Laws, the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) regulations[3] require a discussion of inconsistencies or conflicts between a proposed undertaking and federal, state, regional, or local plans and laws. As such, this Final Supplemental EIR/EIS identifies inconsistencies between the Central Valley Wye alternatives and federal, state, regional, and local plans and laws to provide planning context.

There are a number of federal and state laws and implementing regulations, listed in Section 3.8.2.1, Federal, and Section 3.8.2.2, State, that direct the use and treatment of waters, including surface water quality, stormwater runoff, storm sewer systems, groundwater, and protection from floods. There are also several adopted federal and state management plans and programs that pertain to hydrology and water resources and are applicable to this Final Supplemental EIR/EIS. A summary of the federal and state requirements considered in this analysis follows:

- Federal and state acts and laws that provide comprehensive requirements for water quality maintenance or improvement, including treatment and management of stormwater runoff, and preventing pollutants from entering waters. Applicable acts and laws include the federal Clean Water Act, the Public Lands Management Act, the Rivers and Harbors Act, and the state Porter-Cologne Water Quality Control Act.
- Federal and state acts and laws that provide comprehensive requirements for flood protection and floodplain management, including the federal Flood Insurance Act, and the Floodplain Management Executive Order, and the state Central Valley Flood Protection Act.
- The California Sustainable Groundwater Management Act, which mandates improved local and regional management of groundwater improvements.
- Management plans such as the Omnibus Public Management Act, which includes the San Joaquin River Restoration Program.
- Federal and state permit processes that require an applicant to demonstrate compliance with these acts, laws, and plans prior to, during, and post construction, including obtaining permits associated with the NPDES program, MS4 authorizations, and the state's Streambed Alteration Agreement and Construction General Permit processes.

The Authority, as the NEPA and CEQA lead agency proposing to construct and operate the high-speed rail (HSR) system, is required to comply with all federal and state laws and regulations and to secure all applicable federal and state permits prior to initiating construction on the selected alternative. Therefore, there would be no inconsistencies between the Central Valley Wye alternatives and these federal and state laws and regulations.

The Authority is a state agency and therefore is not required to comply with local land use and zoning regulations; however, it has endeavored to design and construct the HSR project so that it is compatible with land use and zoning regulations. For example, the Central Valley Wye alternatives would incorporate IAMFs to control stormwater and stormwater pollution and to minimize impacts on hydrology and water resources. A total of 147 local and regional policies, goals, objectives, ordinances, and stormwater management programs were reviewed. The Central Valley Wye alternatives would be consistent with 139 local and regional policies, goals, objectives, ordinances, and stormwater management programs, and inconsistent with 8 policies and ordinances within the following regional and local plans and laws:

- **Madera County Code of Ordinances**—Title 14 Buildings and Construction, Chapter 14.50 Grading and Erosion Control. The selected Central Valley Wye alternative would be

[3] NEPA regulations refer to the regulations issued by the Council on Environmental Quality located at 40 C.F.R. Part 1500-1508.

inconsistent with section 14.50.050, Permit Applications because it would not require a local grading permit.

- **City of Chowchilla 2040 General Plan** (City of Chowchilla 2011)—Policy PF-6.1, Policy PF-6.2, Policy PF-7.2, Policy PF-7.3, Policy PF-7.4, and Policy PF-7.5. Construction of the Central Valley Wye alternatives would not comply with these six local stormwater policies that require the development of a local stormwater plan.
- **City of Chowchilla Code of Ordinances**—Title 17 Subdivisions, Chapter 17.32 Design and Improvement Standards, Section 17.32.060 Grading Plan. The Central Valley Wye alternatives would be inconsistent with Section 17.32.060 of this policy requiring a local grading permit.

Further details and reconciliations are discussed in Appendix 3.8-A. As a state agency, the Authority is not required to obtain local grading permits for earthmoving activities or local stormwater permits for construction, and the Authority does not propose to seek local permits voluntarily. Therefore, the inconsistency would not be reconciled. Although the Central Valley Wye alternatives would be inconsistent with these specific provisions, they would be consistent with the public and environmental health and safety objectives of these ordinances and plan policies. For example, the Central Valley Wye alternatives include GEO-IAMF#6, which would require the contactor to document how national and state standards for engineering (including grading profiles) have been incorporated into facility design and construction. Similarly, HYD-IAMF#3 would require preparation and implementation of a construction stormwater pollution prevention plan (SWPPP), which would achieve the same objectives of erosion control and stormwater management as preparation of a local stormwater plan.

3.8.4 Methods for Evaluating Impacts

The evaluation of impacts on hydrology and water resources is a requirement of NEPA and CEQA. The following sections summarize the RSAs and the methods used to analyze impacts on hydrology and water resources. Section 3.6 describes the methods used to analyze impacts on water availability.

3.8.4.1 Definition of Resource Study Areas

As defined in Section 3.1, Introduction, RSAs are the geographic boundaries in which the environmental investigations specific to each resource topic were conducted. The RSA for impacts on hydrology and water resources includes the project footprint for each of the Central Valley Wye alternatives within the associated watersheds, groundwater basins, and floodplains. The RSA also includes water resources adjoining, adjacent, or downstream that could receive runoff and sediment from the potential area of disturbance. RSA boundaries vary for surface water, groundwater, and floodplains. The surface water and groundwater RSAs for the electrical interconnections and network upgrades (EINU) components include the watersheds and groundwater basins that intersect with the EINU footprint that could reasonably receive runoff, sediment, or other waterborne contamination from the area of disturbance. Table 3.8-2 describes these three hydrology and water resources RSAs and includes a general definition and boundary description for each RSA.

Table 3.8-2 Definition of Resource Study Areas

Source	General Definition	RSA Boundary
Surface Water		
Construction and Operations	Receiving waters in areas of disturbance including waters from the Sierra Nevada foothills that drain to the San Joaquin River Basin, runoff resulting from the Central Valley Wye alternatives and waterbodies discussed in this analysis	CalWater watershed boundaries[1] generally defined by 5 miles south of Merced to the north, Madera to the south, 10 miles east of Los Banos to the west, and the Sierra Nevada foothills and reservoirs to the east (Figure 3.8-1) Footprint of EINU components (see detailed Project Description maps in Appendix 2-D, Electrical Interconnections and Network Upgrades)[2]
Groundwater		
Construction and Operations	Aquifer(s) underlying the Central Valley Wye alternatives	Entire DWR groundwater basin boundaries of the aquifers underlying the Central Valley Wye alternatives (Figure 3.8-2) Footprint of EINU components (see detailed Project Description maps in Appendix 2-D)[2]
Floodplain		
Construction and Operations	FEMA-designated flood-hazard areas within the potential areas of disturbance of the Central Valley Wye alternatives, as well as any areas where the Central Valley Wye alternatives could affect flood frequency, extent, and duration	FEMA 100-year and 500-year[3] floodplain boundaries overlapping with the Central Valley Wye alternatives (Figure 3.8-3) Footprint of electrical interconnection components and the southern extent of Site 7—Le Grand Junction/Sandy Mush Road, Warnerville–Wilson 230 kV Transmission Line (see detailed Project Description maps in Appendix 2-D)

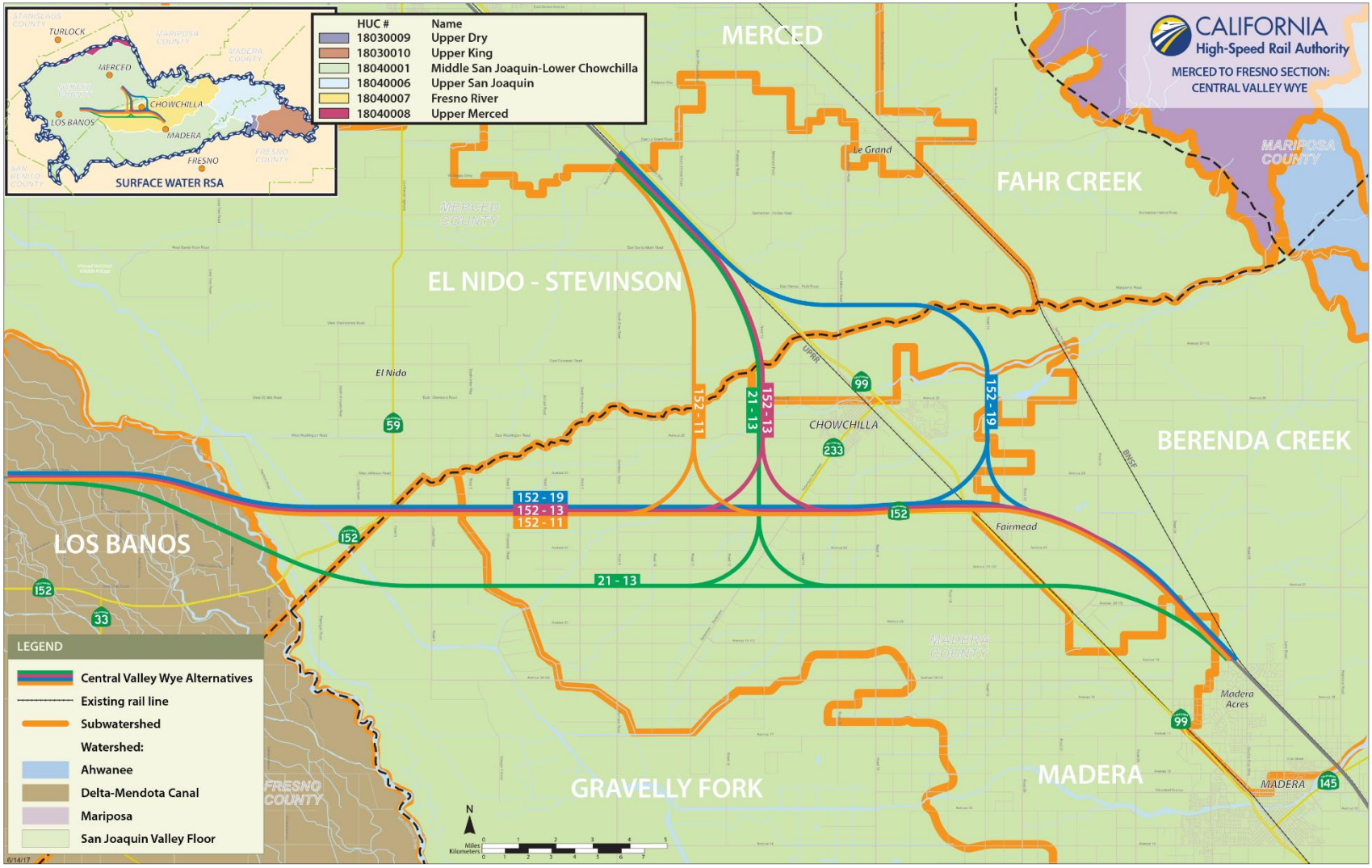
Source: Authority and FRA, 2016a

[1] CalWater is a state program that provides a standard watershed delineation scheme using the State Water Resources Control Board numbering scheme. The watershed designation level used for defining the surface water RSA is the Hydrologic Unit Code 8.

[2] Given the site-specific and low-intensity construction activities involved with the EINU, as well as the minor extent of new, permanent features, the EINU RSAs are limited to the area of disturbance associated with construction and operation. Accordingly, figures in this section do not include the EINU. Detailed project description maps specific to the EINU are available in Appendix 2-D.

[3] The 500-year floodplain boundaries include the 200-year floodplain boundaries, which are subject to the state's floodplain management under the Central Valley Flood Protection Act.

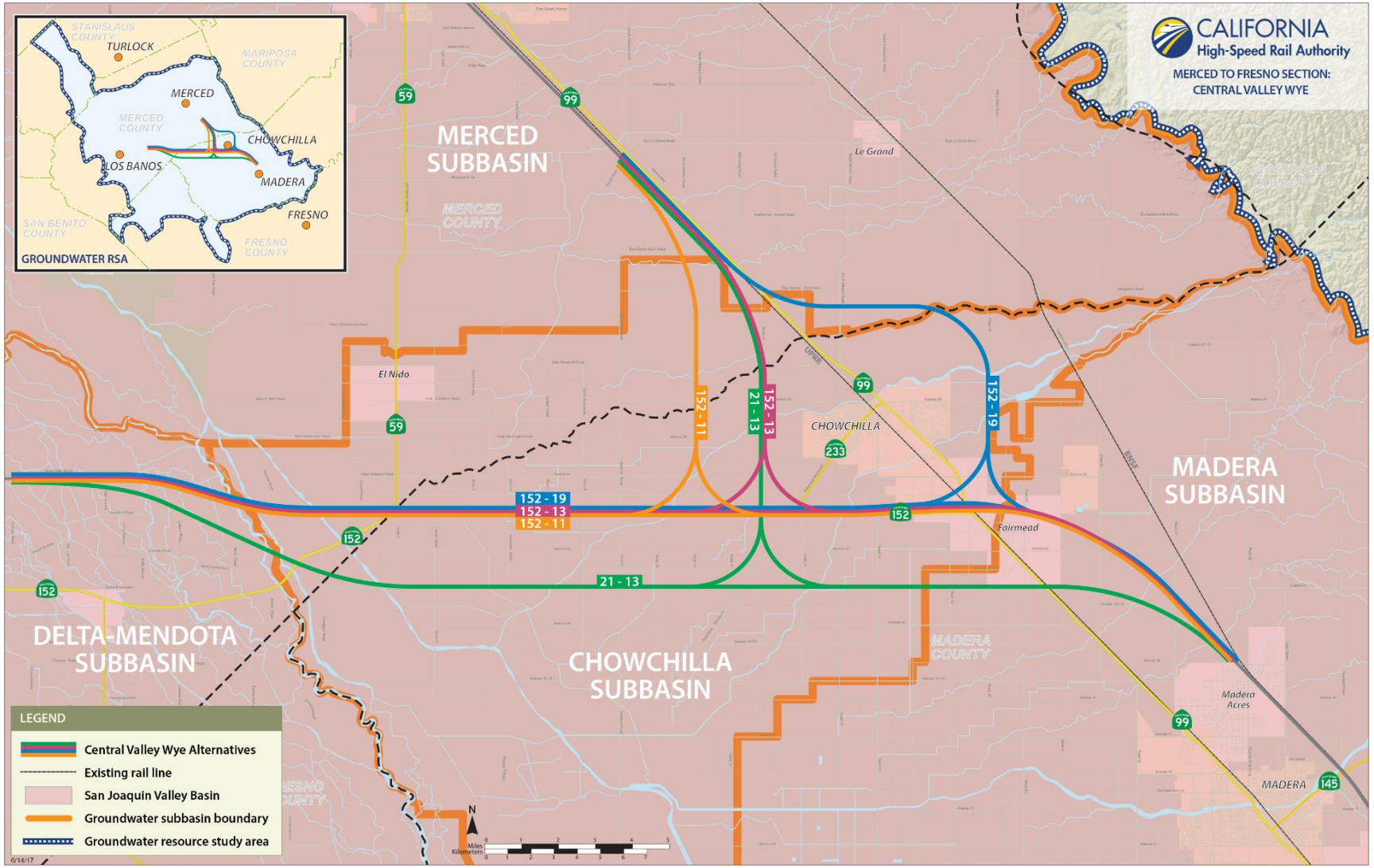
DWR = California Department of Water Resources
EINU = electrical interconnections and network upgrades
FEMA = Federal Emergency Management Agency
RSA = resource study area



Source: CalWater, 2007

JUNE 14, 2017

Figure 3.8-1 San Joaquin River Basin Subwatersheds within the Surface Water Resource Study Area



Source: DWR, 2003

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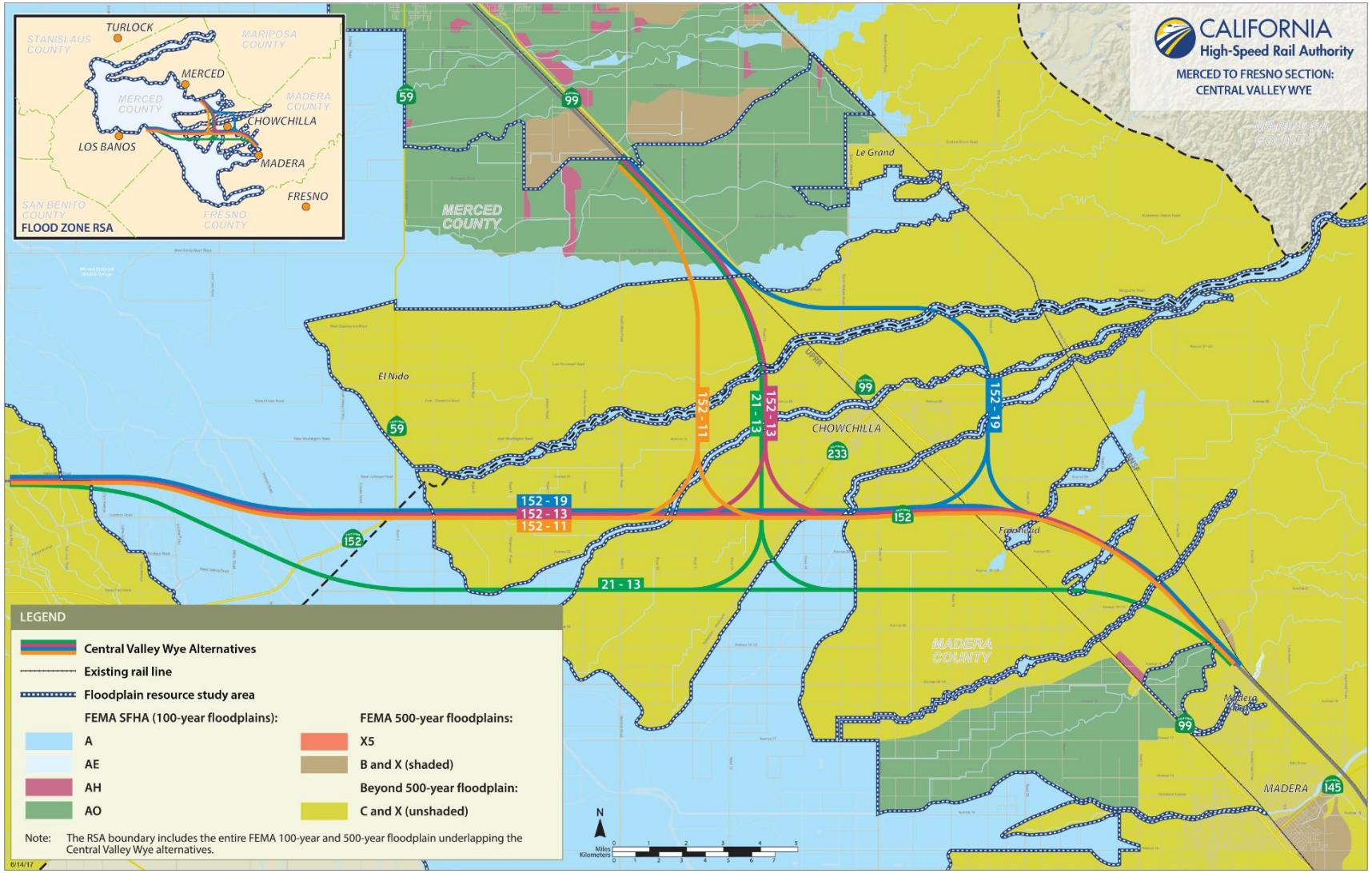
Figure 3.8-2 San Joaquin Valley Groundwater Subbasins within the Groundwater Resource Study Area



Sources: FEMA, 2008a, 2008b

JUNE 14, 2017

Figure 3.8-3 Federal Emergency Management Agency Flood Zones in the Floodplain Resource Study Area

3.8.4.2 Impact Avoidance and Minimization Features

As noted in Section 2.2.3.7, Impact Avoidance and Minimization Features, the Central Valley Wye alternatives incorporate standardized IAMFs to avoid and minimize impacts. The Authority would incorporate IAMFs during design and construction and as such, the analysis of impacts of the Central Valley Wye alternatives in this section factors in all applicable IAMFs. Appendix 2-B, California High-Speed Rail: Impact Avoidance and Minimization Features, provides a detailed description of IAMFs that are included as part of the Central Valley Wye alternatives design. IAMFs applicable to hydrology and water resources include:

- BIO-IAMF#12, Clean Construction Equipment
- BIO-IAMF#14, Dewatering and Water Diversion
- GEO-IAMF#1, Geologic Hazards
- GEO-IAMF#6, Geology and Soils
- HMW-IAMF#1, Transport of Materials
- HMW-IAMF#3, Environmental Management System
- HMW-IAMF#4, Spill Prevention
- HMW-IAMF#5, Undocumented Contamination
- HYD-IAMF#1, Stormwater Management
- HYD-IAMF#2, Flood Protection
- HYD-IAMF#3, Prepare and Implement a Construction Stormwater Pollution Prevention Plan
- HYD-IAMF#4, Prepare and Implement an Industrial Stormwater Pollution Prevention Plan
- SS-IAMF#2, Safety and Security Management Plan
- SS-IAMF#3, Hazard Analyses

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 from implementing the Central Valley Wye alternatives on surface water hydrology, surface water quality, groundwater, and floodplains. These methods apply to both 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. As described in Section 3.8.1 and in the following discussions, the Authority applied the same methods and many of the same data sources from the Merced to Fresno Final EIR/EIS to this Final Supplemental EIR/EIS. Refer to the Hydrology and Water Resources Technical Report (Authority and FRA 2016a) for more information regarding the methods and data sources used in this analysis. Laws, regulations, and orders (see Section 3.8.2, Laws, Regulations, and Orders) that regulate water resources were also considered in the evaluation of impacts on surface water hydrology, surface water quality, groundwater, and floodplains.

This analysis focuses on the direct impacts of the Central Valley Wye alternatives on hydrology and water resources. As discussed in Section 3.13, Land Use and Development, and Section 3.14, Agricultural Farmland, construction and operations of the Central Valley Wye alternatives would not result in large-scale direct or indirect conversion of agricultural land to urban or suburban uses and would not result in large-scale development within Federal Emergency Management Agency (FEMA) floodplains that could result in increased costs for flood protection facilities. Therefore, the Central Valley Wye alternatives would not be anticipated to result in indirect impacts on hydrology and water resources and this section does not evaluate them further. Additional supporting information is provided in Section 4.2, Methodology for Effects Analysis, of the Hydrology and Water Resources Technical Report (Authority and FRA 2016a). Impacts that may occur in relation to other resources areas, that may be inferred as indirect hydrology and water resource impacts in other documents (e.g., downstream effects of water quality on aquatic species) are discussed in the relevant resource sections of this Final Supplemental EIR/EIS.

Climate, Precipitation, and Topography

The Authority used updated sources on climate, precipitation, and topography in this Final Supplemental EIR/EIS. These sources include Western Regional Climate Center (WRCC) (WRCC 2016a, 2016b) and the National Elevation Dataset (National Map 2013).

Hydrology and Water Resources

Surface Water Hydrology

Surface water features include lakes, reservoirs, rivers, streams, canals, and floodplains.[4] Analysts overlaid geographic information system (GIS) layers for the designs of the Central Valley Wye alternatives with GIS layers for surface waters, U.S. Geological Survey topographic maps, and aerial photography from web mapping services to identify the potential impacts such as, disruptions of the movement of surface waters from disturbance associated with construction and operations. Analysts then used these GIS layers to identify crossings of streams and irrigation canals by each Central Valley Wye alternative. Analysts used GIS to determine the locations and lengths of rivers, creeks, and canals crossed by the Central Valley Wye alternatives, and to estimate areas of temporary and permanent disturbance, and to identify locations of stream segments with impaired water quality.

Analysts performed a qualitative assessment of how stream crossings and in-water construction or maintenance could impede flood flows and affect downstream hydrology of rivers and creeks, resulting in erosion and sedimentation, runoff, and drainage patterns. Analysts also performed a qualitative assessment of potential changes in drainage infrastructure within the Central Valley Wye alternatives alignments based on existing land uses, such as agricultural areas (i.e., open irrigation ditches) and urban areas (i.e., storm drain pipes and roadside ditches). This drainage infrastructure is further discussed in Section 3.6.4, Affected Environment.

Surface Water Quality

Surface water quality is governed by major water quality impairments, beneficial uses, and water quality objectives.[5] Analysts evaluated impacts of construction and operations activities on waterbodies, beneficial uses, and water quality. Using GIS, analysts identified the location of stream segments with impaired water quality under CWA Section 303(d) (SWRCB 2015) in relation to each project footprint. Analysts then evaluated construction activities for the potential to affect surface water quality of all waterbodies (i.e., those listed as impaired and those that are not) as a result of runoff and discharges. Construction activities could include accidental releases of construction-related hazardous materials, as noted in Section 3.10, including ground disturbance and associated erosion and sedimentation, stormwater discharges, and dewatering discharges, particularly in locations within or close to a surface waterbody. Finally, operations activities were reviewed for the potential to introduce pollutants into the environment, with a particular focus on stormwater runoff from Central Valley Wye alternatives facilities.

Groundwater

Analysts evaluated potential impacts on major groundwater aquifers (as defined by DWR's groundwater basin boundaries) and groundwater resources using information available from the DWR; the Central Valley RWQCB; Merced, Madera, Stanislaus, and Fresno Counties; and other agencies. The analysis used GIS software to estimate the length and acreage of groundwater basins beneath each Central Valley Wye alternative project footprint to determine which groundwater basins would be crossed by the Central Valley Wye alternatives and documented

[4] Major surface water features in the surface water RSA are of two primary types—stream and irrigation: Type I—stream or other intermittent natural waterbody (e.g., natural sloughs, rivers, and creeks); Type C—irrigation or flood control canal or ditch (e.g., channelized sloughs, rivers, and creeks). The types distinguish the unique categories of each waterbody.

[5] Major water quality impairments are those included in the Integrated Report - 303(d) List of Water Quality Limited Segments and 305(b) Surface Water Quality Assessment. Although other water quality impairments may exist, only those included in the 303(d) List are considered major impairments. Similarly, only water quality objectives and beneficial uses listed in the Central Valley RWQCB's (2016) Basin Plan are considered major water quality objectives and beneficial uses.

the characteristics of the basins and aquifers that could be affected by construction or operations. Analysts also reviewed available documentation from the DWR (e.g., DWR Bulletin 118) to obtain estimates of the depth to groundwater within the groundwater RSA. Using this information, analysts qualitatively evaluated how construction and operations of the Central Valley Wye alternatives could affect groundwater quality and quantity through the addition of impervious ground surfaces. A quantitative evaluation of potential changes to groundwater elevations related to the use of groundwater is not provided because, as discussed in Section 3.6, construction of the Central Valley Wye alternatives would not result in a net increase in groundwater use, and the Central Valley Wye alternatives do not include stations or other facilities that would use groundwater during operations. Potential impacts related to land subsidence from ongoing aquifer overdraft are discussed in Section 3.9. Similarly, a quantitative approach was not used to evaluate existing groundwater wells. Numerous agricultural and domestic wells are intersected by each of the alignments and are of varying age and depth and are generally not mapped. All operational wells removed during construction would be replaced in the same aquifer and would pump at a similar depth and rate as the original wells, resulting in no net change in groundwater quality impact or draw.

Floodplains

To evaluate potential construction and operations impacts on floodplains and safety impacts related to floodplains, analysts overlaid GIS layers for the Central Valley Wye alternatives on the GIS floodplain and floodway layers from FEMA and CVFPB to identify how much of the Central Valley Wye alternatives project footprints lie within the 100-year floodplain and to determine the potential for a change in flows along designated floodways. Analysts mapped floodplain boundaries using digital flood insurance rate maps (FIRM) obtained from FEMA (FEMA 2008a, 2008b). Analysts identified the FEMA-designated 100-year floodplain areas and base flood elevations (BFE) using GIS based on FEMA's FIRMs for Merced, Madera, Stanislaus, and Fresno Counties. Peak flows in major rivers were found in FEMA flood insurance studies for Merced and Madera Counties (FEMA 2008a, 2008b). The FIRMs have effective dates of December 2, 2008, for Merced County and September 26, 2008, for Madera County (FEMA 2008a, 2008b). These resources are used to obtain a Preliminary Section 408 determination from the USACE for the proposed crossing of a federal civil works project and to formally initiate the CVFPB encroachment permit process. Preliminary engineering designs, a floodplain impact assessment, and hydrology and hydraulic modeling results may also be required for a Final Section 408 determination.

San Joaquin River Restoration Program

This analysis also considered the activities and plans of the SJRRP in relation to the Central Valley Wye alternatives. The SJRRP divides the San Joaquin River into multiple segments, and segment 4A of the river restoration area crosses the project footprints of the Central Valley Wye alternatives in a general north-south direction south of the City of Merced (DWR 2008b).

The USBR initiated interim flows in 2009. Interim flows are experimental flows and assist in obtaining data concerning flows, temperatures, fish needs, seepage losses, recirculation, recapture, and reuse. Prior to interim flows, the reach between Friant Dam and the Mendota Pool rarely had sustained river flows that could support the Chinook salmon life cycle (USBR and DWR 2012). Beginning in 2014, the SJRRP initiated full restoration flows to support this species and these flows have continued to date.

During the initial design of the Merced to Fresno Section, the Authority took part in a coordination meeting on June 6, 2011, with the USBR and the DWR. During this meeting, it was determined that the design of the Central Valley Wye alternatives would not conflict with the SJRRP. As the design has progressed, the Authority has continued working with the implementing agencies of the SJRRP to avoid any Central Valley Wye alternatives-related impacts to the goals of the SJRRP or impacts from the interim flows provided by the SJRRP on the HSR crossings of the San Joaquin River. Therefore, the SJRRP is not discussed further in this analysis.

3.8.4.4 Determining Significance under CEQA

CEQA requires that an EIR identify the significant environmental impacts of a project (CEQA Guidelines § 15126). One of the primary differences between NEPA and CEQA is that CEQA requires a significance determination for each impact using a threshold-based analysis (see 3.1.3.4 for further information). By contrast, under NEPA, significance is used to determine whether an EIS will be required; NEPA requires that an EIS is prepared when the proposed federal action (project) as a whole has the potential to "significantly affect the quality of the human environment." Accordingly, Section 3.8.9, CEQA Significance Conclusions, summarizes the significance of the environmental impacts on hydrology and water resources for each Central Valley Wye alternative. 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 Central Valley Wye alternatives. A significant impact is one that would:

- Violate any water quality standards or waste discharge requirements
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)
- Substantially alter the existing drainage pattern of an area, including through the alteration of a stream or river, in a manner which would result in substantial erosion or siltation on-site or off-site
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on-site 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
- Otherwise substantially degrade water quality
- Place housing within a 100-year flood-hazard area as mapped on FIRMs or other flood hazard delineation map
- Place structures within a 100-year flood-hazard area which would impede or redirect flood flows
- Expose people or structures to loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam

3.8.5 Affected Environment

This section describes the affected environment for hydrology and water resources in the Central Valley Wye RSAs, including climate, precipitation, and topography; surface water hydrology and quality; groundwater hydrology and quality; and floodplains. It also discusses changes to hydrology and water resources in the San Joaquin Valley since publication of the Merced to Fresno Final EIR/EIS. This information provides the context for the environmental analysis and evaluation of impacts.

3.8.5.1 Climate, Precipitation, and Topography

Climate, precipitation, and topography in the vicinity of the Central Valley Wye alternatives are similar to the conditions described in the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: pages 3.8-9 through 3.8-11). Updated information is provided here for Merced, Madera and Fresno Counties and new information is provided for Stanislaus County. The area is semi-arid, with dry summers of extended hot weather and cool winter temperatures with fog and light to intermediate rain. Temperatures range from average lows of 36–42 degrees Fahrenheit in the winter to average highs of 88–98 degrees Fahrenheit in the summer. Average annual

precipitation is approximately 12 inches at the Merced Municipal Airport and Turlock #2 monitoring station and 11 inches at the Madera and Fresno Yosemite International Airport monitoring station annually, with most precipitation at both stations occurring from November through April (WRCC 2016a, 2016b, 2016c, 2016d). The topography in this part of the Central Valley is generally flat; there are approximately 260 feet of relief within an area approximately 28.5 miles in an east-west direction and 75 miles in a north-south direction. Refer to Section 3.3, Air Quality and Global Climate Change, for additional information regarding climate and local meteorological conditions of the San Joaquin Valley.

3.8.5.2 Surface Water Hydrology

The Central Valley Wye alternatives are in the San Joaquin River Basin, which drains to the Sacramento-San Joaquin Delta via the San Joaquin River and its major tributaries, the Fresno, Merced, Tuolumne, and Stanislaus Rivers (DWR 2003). Watercourses in the San Joaquin Valley include improved flood control or drainage channels, river and stream channels, and sloughs. Figure 3.8-1 shows San Joaquin River Basin Subwatersheds in the surface water RSA (river and stream system), including the Hydrologic Unit Code unit names and boundaries used for defining the surface water RSA.

Impermeable surfaces are common in the urbanized portions of the surface water RSA because of past land development, and in most cases, existing stormwater systems convey runoff into drainage ditches or basins for infiltration. In the City of Merced, the storm drainage collection system consists of 112 miles of underground storm drain lines, underground storage pipes, and 141 acres of detention ponds (City of Merced n.d.), and the City of Madera includes approximately 140 miles of sanitary sewer mains and aboveground and underground collection and transmission systems for stormwater (City of Madera 2016).

There are numerous natural waterbodies and constructed irrigation and flood control canals in the surface water RSA. Canals typically provide irrigation water from riverine diversions and convey agricultural drainage. Such channels often have little to no slope so that water can be moved in either direction. Stream flow consists of natural flows, irrigation runoff, and other point- and nonpoint-source discharges (USEPA 2005, 2009). Table 3.8-3 lists the major waterbodies (both streams and canals) that would be crossed by at least one of the Central Valley Wye alternatives. Section 3.8.4.2, Regional Hydrology and Water Quality, of the Merced to Fresno Final EIR/EIS provides additional descriptions of the surface water hydrology of these waterbodies crossed by the HSR (Authority and FRA 2012: pages 3.8-11 through 3.8-13). The Hydrology and Water Resources Technical Report (Authority and FRA 2016a) provides details on stream and canal crossings and detailed maps of waterbody crossings for all the Central Valley Wye alternatives.[6]

What is Point- and Nonpoint-Source Pollution?

A point-source discharge usually refers to waste emanating from a single, identifiable place (Central Valley RWQCB 2016). Nonpoint-source pollution is caused by rainfall moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water (USEPA 2005).

[6] The Hydrology and Water Resources Technical Report does not include features crossed by EINU facilities; however, the United States Geological Survey (USGS) National Hydrography Dataset was queried to determine potential streams and canals crossed by EINU components, as shown in Table 3.8-3.

Table 3.8-3 Waterbodies Crossed by the Central Valley Wye Alternatives

Waterbody Name[1]	Type	Number of Alternatives Crossing Waterbody
San Juan Drain	Constructed irrigation/flood control canal	4
Temple Santa Rita Canal	Constructed irrigation/flood control canal	4
West Santa Rita Drain	Constructed irrigation/flood control canal	4
Escano Branch No. 1 Ditch	Constructed irrigation/flood control canal	4
Escano Ditch	Constructed irrigation/flood control canal	1
Orchard Ditch	Constructed irrigation/flood control canal	4
Santa Rita Slough	Constructed irrigation/flood control canal	4
Santa Rita Drain No. 1	Constructed irrigation/flood control canal	4
Santa Rita Drain No. 1a	Constructed irrigation/flood control canal	4
Santa Rita Ditch	Constructed irrigation/flood control canal	4
Island Field Drain #1	Constructed irrigation/flood control canal	1
Island Field Drain	Constructed irrigation/flood control canal	4
Lucerne Ditch	Constructed irrigation/flood control canal	4
Historical Wood Slough	Constructed irrigation/flood control canal	3
Wood Slough	Intermittent stream or natural waterbody	4
Riverside Canal	Constructed irrigation/flood control canal	4
San Joaquin River[2]	Intermittent stream or natural waterbody	4
Fresno River	Constructed irrigation/flood control canal	1
Mariposa Slough No. 1	Constructed irrigation/flood control canal	3
Mariposa Slough No. 2	Constructed irrigation/flood control canal	1
Eastside Bypass	Intermittent stream or natural waterbody	4
Ash Slough	Intermittent stream or natural waterbody	4
Berenda Slough	Intermittent stream or natural waterbody	4
Berenda Creek	Intermittent stream or natural waterbody	4
Dry Creek	Intermittent stream or natural waterbody	3
Schmidt Creek	Intermittent stream or natural waterbody	2
Schmidt Creek Tributary	Intermittent stream or natural waterbody	2
Ash Slough	Intermittent stream or natural waterbody	3
Chowchilla River	Intermittent stream or natural waterbody	4
Dutchman Creek	Intermittent stream or natural waterbody	4
Deadman Creek	Intermittent stream or natural waterbody	4
Canal #5 – Canal #7 (3 features)[3]	Constructed irrigation/flood control canal	3
Unnamed canal[4]	Constructed irrigation/flood control canal	1

Sources: Authority and FRA, 2016b; USGS, 2016

[1] Features identified are based on data from the *Merced to Fresno Section Central Valley Wye Hydrology and Hydraulics Engineering Report* (Authority and FRA 2016b). Unnamed irrigation canals and distribution pipelines are also crossed by the Central Valley Wye alternatives but are not listed in this report, nor are multiple crossings of the same waterbody if the waterbody is crossed two or more times. The *Merced to Fresno Section: Central Valley Wye Hydrology and Water Resources Technical Report* (Authority and FRA 2016a) includes information of waterbodies with multiple crossings.

[2] Navigable waters of the United States, as defined in 33 CFR Part 329, include the San Joaquin River within the surface water RSA. Temporary construction activities associated with all four of the Central Valley Wye alternatives may include the use of cofferdams or other equipment within the waterway for construction of a bridge over the San Joaquin River, and these activities may partially or completely impede navigation of the San Joaquin River for the duration of construction activities within the San Joaquin River. All four Central Valley Wye alternatives include the permanent placement of one or more bridge piers within the San Joaquin River, which could partially obstruct navigation in this portion of the waterway. Because construction of the Central Valley Wye alternatives would affect navigation of a navigable water of the United States, the Authority will need to obtain a permit under Section 10 of the Rivers and Harbors Act from the USACE prior to initiation of construction.
[3] These three features would be crossed by EINU components only, specifically the Site 7—Wilson, 230 kV Tie-Line.
[4] This feature would be crossed by EINU components only, specifically the Site 6—El Nido, 115 kV Tie-Line.

The type of crossing for these different waterbodies is important to help understand the potential for impacts. In general, there are four types of water crossings used by the California HSR project to maintain the flow of water across the rail alignments and other linear features, such as realigned roads. The types of crossings used in the design of the Central Valley Wye alternatives are:

- **Viaduct.** An aerial crossing used for maintaining the rail elevation when crossing longer or more complicated spans, including crossings that involve multiple features, such as a road or rail line and a waterbody. Viaducts are supported on multiple piers (four or more) and the viaducts used in the Central Valley Wye alternatives would span the active channel of a waterbody. Construction of the footings for these piers would require excavation with the banks and floodplain of the waterbody. This type of work is generally undertaken during dry seasons or in low water times when in-water work can be avoided and when sensitive biological species are not likely to be present (see Section 3.7 for more information).
- **Bridge.** An aerial crossing shorter than a viaduct that is used for connecting the HSR or a road over a road, waterbody, or over a combination of these. Bridges used in the design of Central Valley Wye alternatives would have three support piers or fewer and the structure would span the active channel of waterbodies. Similar to construction techniques for viaducts, piers may be placed within the larger floodplain for the waterbody, including within the portion of the channel that is dry during non-rainy seasons of the year.
- **Culvert.** Culverts consist of a wide pipe or concrete box that conveys water under the rail or road alignment and are used primarily for intermittent waterbodies and/or for conveying water from constructed irrigation or flood control canals. A culvert structure generally consists of a concrete headwalls at the inlet and outlet connected by a buried pipeline or concrete box. Installation of a culvert requires the temporary diversion of water and excavation of a portion of the canal or channel equivalent to the length of the culvert. Where possible, construction would include a straight culvert rather than a U-shaped siphon because the straight culvert can more easily flush out sediment and debris.
- **Tunnel.** A cut-and cover tunnel would carry the HSR alignment under a highway, railroad, and waterbody. The construction method would involve excavation of a deep trench to build the tunnel in place from the surface, followed by construction of a tunnel roof and restoration of the ground surface. Water would be temporarily diverted during construction.

3.8.5.3 Surface Water Quality

Pollutant sources in urban areas within or surrounding the project footprints of the Central Valley Wye alternatives include:

- Parking lots and streets
- Residential, commercial, and industrial development
- Exposed earth at construction sites
- Unlandscaped, undeveloped areas

Pollutant sources in rural and agricultural areas primarily include agricultural fields and operations. The Central Valley Wye alternatives are in areas where the majority of the soils have

a high or moderate degree of water erosion potential.[7] However, the generally flat topography within the surface water RSA reduces the overall erosion risk to low (refer to Table 5-2 in the *Merced to Fresno Section: Central Valley Wye Geology, Soils, and Seismicity Technical Report* [Authority and FRA 2016c: page 5-7]). Section 3.9 provides more details regarding soil erosion.

The Central Valley Wye alternatives would be located within the boundaries of the Central Valley RWQCB's Basin Plan (Central Valley RWQCB 2016), which designates beneficial uses for specific surface water and groundwater resources, establishes water quality objectives to protect those uses, and sets forth policies to guide the implementation of programs to attain the objectives. The beneficial uses listed for these waterbodies generally apply to upstream tributary streams as well. The Basin Plan does not identify beneficial uses for canals. Table 5-12 of the Hydrology and Water Resources Technical Report (Authority and FRA 2016a) describes and lists the objectives of water quality constituents in the Basin Plan. Table 3.8-4 lists the beneficial uses in the Central Valley Wye surface water RSA.[8]

Consistent with CWA § 303(d), the SWRCB developed a list of waterbodies (known as 303(d) water quality-limited waterbodies) that are impaired and do not meet water quality objectives. Limiting discharges of pollutants into listed waterbodies is necessary to restore their quality. Contributing additional pollutants from the 303(d) list or for which a TMDL has been developed could be considered to substantially degrade water quality. Table 3.8-4 provides the 303(d)-listed impairments of waterbodies in the Central Valley Wye surface water RSA. Each of the four Central Valley Wye alternatives would cross the floodplains or floodways of each of these impaired waterbodies, to a varying extent. For additional information on the extent of this floodplain crossing, refer to Table 5-14 in the Hydrology and Water Resources Technical Report (Authority and FRA 2016a).

Table 3.8-4 Beneficial Uses and 303(d) Listed Pollutants within the Surface Water Resource Study Area

Waterbody[1]	Central Valley Region Basin Plan Beneficial Uses[2]																	303(d) Listed Pollutants[3]
	MUN	AGR–IRRIGATION	AGR–STOCK WATERING	PRO	IND	POW	REC-1– CONTACT	REC-1–CANOEING/RAFTING	REC-2	WARM	COLD	MIGR–WARM	MIGR–COLD	SPWN–WARM	SPWN–COLD	WILD	NAV	
Chowchilla River (Buchanan Dam to San Joaquin River)	P	E		E			E	P	E	E						E		N/A
San Joaquin River (Sack Dam to Mouth of Merced River)[4]	P	E	E	E			E	E	E	E		E	E	E	P	E		Boron, Chlorpyrifos, DDT, Diazinon, Group A Pesticides Unknown Toxicity (Mendota Pool to Bear Creek)
Ash Slough (Madera County)[5]																		Chlorpyrifos
Berenda Slough (Madera County)[5]																		Chlorpyrifos

[7] Water erosion potential refers to the capacity for soil to erode by water, resulting in the removal of soil or reducing water storage capacity. Water erosion potential is influenced by topography, soil management, soil type and structure, and precipitation.

[8] None of the waterbodies crossed by EINU components are on the Section 303(d) list of impaired waters.

Waterbody[1]	Central Valley Region Basin Plan Beneficial Uses[2]																	303(d) Listed Pollutants[3]
	MUN	AGR–IRRIGATION	AGR–STOCK WATERING	PRO	IND	POW	REC-1– CONTACT	REC-1–CANOEING/RAFTING	REC-2	WARM	COLD	MIGR–WARM	MIGR–COLD	SPWN–WARM	SPWN–COLD	WILD	NAV	
Berenda Creek (Madera County)[5]																		Chlorpyrifos, Unknown Toxicity
Deadman Creek (Merced County)[5]																		Chlorpyrifos, *Escherichia coli* (*E. coli*)

Source: SWRCB 2015

[1] Features identified from review of U.S. Geological Survey topographic maps and aerial photographs. Waterbody names as defined in the Central Valley RWQCB Basin Plan.

[2] Surface water existing and potential beneficial uses identified in the Sacramento River and San Joaquin River Basins Plan (Central Valley RWQCB 2016).

[3] 2012 Integrated Report (CWA § 303(d) List / 305(b) Report) (SWRCB 2015).

[4] The San Joaquin River is impaired from Mendota Pool, approximately 20 miles south of the surface water RSA, passing through the surface water RSA until Bear Creek in Merced County.

[5] The Central Valley RWQCB has not identified beneficial uses for these constructed water features.

MUN = municipal and domestic water supply
AGR = agricultural supply
IND = industrial service supply
PRO = industrial process supply
POW = hydropower generation
REC-1 = water contact recreation
REC-2 = noncontact water recreation
COLD = cold freshwater habitat
WILD = wildlife habitat
MIGR = migration
NAV = navigation
E = existing beneficial use
P = potential beneficial use
DDT = dichlorodiphenyltrichloroethane
RARE = rare, threatened, or endangered species
SPWN = spawning, reproduction, or early development
N/A = not applicable

3.8.5.4 Groundwater

The Central Valley Wye alternatives lie within the larger San Joaquin Valley Groundwater Basin and cross the Merced, Chowchilla, Madera, and Delta-Mendota Subbasins, shown on Figure 3.8-2. EINU components also lie within the Tulare Lake Groundwater Basin and cross the Modesto, Turlock, and Westside Subbasins. Beneficial uses of groundwater in these subbasins include municipal, industrial, and agricultural supply.

Depth to groundwater ranges from less than 50 feet in the Merced Subbasin to more than 250 feet in the Madera Subbasin (DWR 2012b). Table 3.8-5 presents characteristics (e.g., acreages, lengths) of the groundwater basins within the RSA for the Central Valley Wye alternatives. Section 5.3, Groundwater, in the Hydrology and Water Resources Technical Report (Authority and FRA 2016a) provides more detail on the groundwater basins.

What is Recharge?

Recharge is the natural replenishment of groundwater from rain or other surface water. *Overdraft* describes the condition when water pumped from a groundwater basin exceeds the supply flowing into the basin.

Groundwater levels fluctuate with seasonal rainfall, withdrawal, and recharge. DWR considers the Chowchilla, Delta-Mendota, Madera, Merced, and Westside Subbasins in the groundwater RSA to be in critical overdraft (DWR 2016), with groundwater levels in the Chowchilla Water District falling at a rate of 1.5 feet per year over the last 25-year period (USBR 2008). Water levels in the Chowchilla and Madera Subbasins declined approximately 30 feet between 1970 and 1978, stabilized and rebounded 25 feet between 1978 and 1987, declined between 1987 and 1996, and rose 8 feet from 1996 to 2000 with a total decrease of nearly 40 feet between 1970 and 2000 (DWR 2004a, 2004b). Groundwater levels in the Merced Subbasin declined nearly 30 feet from 1970 to 2000, with groundwater levels fluctuating over the 30-year period (DWR 2004c). Groundwater levels in the

Delta-Mendota Subbasin fluctuated more than 17 feet from 1970 to 2000, but water levels in 2000 were approximately 2 feet above 1970 levels (DWR 2006a).

Table 3.8-5 Groundwater Subbasins within the Resource Study Area

Groundwater Basin	Total Groundwater Basin Area (acres)[1]	Groundwater Storage (AF)[1]	Typical Well Depths (feet)[1]	Designated Sole-Source Aquifer[2]
Chowchilla Subbasin	159,000	5,500,000	100–800	No
Delta-Mendota Subbasin	747,000	26,600,000	50–800	No
Madera Subbasin	394,000	12,600,000	100–600	No
Merced Subbasin	491,000	15,700,000	100–800	No
Modesto Subbasin	247,000	14,000,000	50–500	No
Turlock Subbasin	347,000	12,800,000[3]	50–350	No
Westside Subbasin	640,000	52,000,000	120–3,000	No

Sources: Authority and FRA, 2016a
[1] Basin areas, storage, and well depths are from Bulletin 118 (DWR 2004a, 2004b, 2004c, 2004d, 2006a, 2006b, 2006c). DWR issues Bulletin 118 descriptions of groundwater basins throughout the state. The update to Bulletin 118 was released in 2003. These data are the most recent available for the groundwater subbasins within the RSA. Basin descriptions (Bulletin 118s) are based on the best available information. In basins where many studies have been completed, the basin response is fairly well understood and the boundaries are well defined, and no further studies are expected. However, there are many unknowns and the boundaries may change as more information is collected and evaluated.
[2] The U.S. Environmental Protection Agency defines a sole- or principal-source aquifer as an aquifer that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas may have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend on the aquifer for drinking water. For convenience, all designated sole- or principal-source aquifers are referred to as *sole-source aquifers*.
[3] Estimated groundwater storage to a depth of 300 feet below ground surface (DWR 2006a).
AF = acre-feet

Groundwater levels in the Westside Subbasin were lowest in the late 1960s, prior to importation of surface water. Water levels gradually increased to a maximum in about 1987–88, falling briefly during the 1976–77 drought. Water levels began dropping again during the 1987–92 drought, with water levels showing the effects until 1994. Through a series of wet years, after the drought, 1998 water levels recovered to nearly 1987–88 levels (DWR 2006b). Groundwater level data for the Chowchilla, Delta-Mendota, Merced, Madera, and Westside Subbasins were most recently updated by the DWR between 2004 and 2006; however, more recent data show that these declines have continued in recent years. Wells monitored in the Madera Regional Groundwater Management Plan area, which include the Chowchilla, Delta-Mendota, and Madera Subbasins, have declined on average between 31 and 155 feet from 1980 to 2011 (City of Chowchilla et al. 2014). Table 3.8-6 presents the approximate depth to groundwater of subbasins near the Central Valley Wye alternatives according to the DWR monitoring stations as of 2012.

Table 3.8-6 Depth to Groundwater in the Vicinity of the Central Valley Wye Alternatives

Groundwater Subbasin	City	Approximate Depth to Groundwater (feet bgs)
Chowchilla	Chowchilla	180–190
Delta-Mendota	Mendota	50
Merced	Merced	40–80
Madera	Madera	150–260
Modesto	Waterford Oakdale	90 90
Turlock	Stanislaus-Merced County Line	200+
Westside	Los Banos–Dos Palos	90–120

Source: DWR, 2012b; SJRECWA, 2012
bgs = below ground surface

3.8.5.5 Floodplains

The regional topography is relatively flat and the Central Valley Wye alternatives span multiple FEMA flood zones, as shown on Figure 3.8-3. Existing flood control in the Central Valley includes levees at the major rivers and bypasses segments along the San Joaquin River and at Millerton Lake, which moderate flood inflows into the Central Valley (DWR 2011).

The San Joaquin Area Flood Control Agency has partnered with local agencies to develop regional flood management plans for flood management planning regions within the Central Valley. The floodplain RSA is within the Upper San Joaquin River Region and Delta South Region (DWR 2012a). FEMA has identified special flood-hazard areas (SFHA) on FIRMs for all communities that participate in the National Flood Insurance Program. State and local governments use these FIRMs for administering floodplain management programs, enforcing building codes, and mitigating flooding losses. Merced, Madera, Fresno, and Stanislaus Counties participate in the National Flood Insurance Program. The floodplain information on the FIRM is based on historical data and hydrologic and hydraulic computations.

The 100-year floodplain, or the areas inundated by a storm having a 1 percent annual chance of occurrence (known as the *base flood*), is designated as an SFHA.[9] SFHAs represent high-risk areas (FEMA flood zones A or V). The SFHA is the land area covered by the base flood to which the FEMA floodplain management regulations apply (FEMA 2011). Development in an SFHA is restricted and regulated by federal, state, and local agencies. Table 3.8-7 defines the 100-year to 500-year flood zones located within the floodplain RSA.

FEMA-delineated 100-year floodplains exist along most of the minor creeks and streams in the floodplain RSA. In urban areas and along most of the reaches of the major rivers, the 100-year floodplains are generally contained within the riverbanks. As shown on Figure 3.8-3, portions of the western, northern, and central segments of the floodplain RSA are in an SFHA (within the 100-year floodplain) or within the 500-year floodplains associated with the San Joaquin River and its tributaries. However, much of the project footprint of each of the Central Valley Wye alternatives lies outside the 100-year floodplain; these areas are not considered SFHAs. Areas above the 500-year flood level are areas of minimal flood hazard (Zones C and X on Figure 3.8-3). Areas within the 500-year floodplain are considered of moderate risk or designated base floodplains of lesser hazards or shallow flooding. Seven acres associated the SR 152 (North) to Road 19 Wye Alternative—specifically, Site 7—Le Grand Junction/Sandy Mush Road, Warnerville – Wilson 230 kV Transmission Line—would be located within the 500-year floodplain (Zone X5).

Detailed floodplain studies have been conducted for Chowchilla River, Ash Slough, Berenda Slough, Berenda Creek, Dry Creek, Schmidt Creek, Schmidt Creek Tributary, Dutchman Creek, and Deadman Creek. FEMA generally designates these flood-prone areas as Zone A, indicating a floodplain for which FEMA has determined approximate inundation area(s), but without detailed flow or water surface elevation information. Table 3.8-8 shows the 100-year flow data that is available from FEMA flood insurance studies. Not all streams have flow data available for 100-year floodplain areas.[10]

[9] The land area covered by the floodwaters of the base flood is the SFHA on National Flood Insurance Program maps. The SFHA is the area where the National Flood Insurance Program's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. The SFHA includes Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, and V (FEMA 2011).

[10] Given the low level and small spatial extent of new electrical infrastructure that would be located within floodplains (less than 1 percent of floodplains would be affected by new electrical structures), information specific to the EINU is not shown in Table 3.8-9.

Table 3.8-7 Flood Zone Designations in the Floodplain Resource Study Area

Zone[1]	Zone Description
A	Areas with a 1% annual chance of flooding (i.e., within 100-year floodplain). Because detailed analyses are not performed for such areas, no depths or BFEs are shown within these zones.
AE	Areas with a 1% annual chance of flooding. BFEs are determined and shown on FEMA flood maps.[2]
AH	Areas with a 1% annual chance of shallow flooding, usually areas of ponding, with an average depth ranging from 1 to 3 feet. BFEs were determined and are shown on FEMA flood maps.
AO	River or stream flood-hazard areas and areas with a 1% or greater annual chance of shallow flooding, 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 (shaded) or B	Areas with a 0.2% annual chance of flooding; areas with a 1% annual chance of flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance of flooding. Areas of minimal to moderate flood hazard and therefore not a designated SFHA.
X (unshaded) or C	Low-lying areas of minimal flood hazard outside the 100-year and 500-year floodplains. Areas of minimal to moderate flood hazard and therefore not a designated SFHA.
X5	An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding.

Source: FEMA, 2011
[1] Zones beginning with A are high-risk areas and are known as SFHAs.
[2] AE Zones should have BFEs, but they were not available from dataset for the Central Valley Wye Floodplain resource study area.
FEMA = Federal Emergency Management Agency
BFE = base-flood elevation
SFHA = special flood-hazard area

Table 3.8-8 Flow Data for Streams in Flood-Prone Areas (Zone A)

Location	Flow (cfs) (areas with a 1% annual chance)	Flood Insurance Study
Dry Creek—At a point upstream of AT&SF Railroad	2,830	Madera County
San Joaquin River—Below Little Dry Creek	74,300	Madera County
Schmidt Creek—At SR 99	1,270	Madera County
At Avenue 18	650	
Schmidt Creek Tributary—At confluence with Schmidt Creek	600	Madera County

Source: FEMA, 2008b
cfs = cubic feet per second
AT&SF = Atchison, Topeka, and Santa Fe
FEMA = Federal Emergency Management Agency
SR = State Route

As shown in Table 3.8-9, portions of each Central Valley Wye alternative project footprint lie within the flood zones defined in Table 3.8-7. However, much of the project footprints for the Central Valley Wye alternatives lie outside the limits of the 100-year flood. Figure 3.8-3 shows floodplains in the Central Valley Wye floodplain RSA, and the Hydrology and Water Resources Technical Report (Authority and FRA 2016a) includes more detailed maps.

Table 3.8-9 Floodplains and Floodways Crossed by the Central Valley Wye Alternatives

Floodplain Name or Flooding Source	County	FEMA Special Flood-Hazard Area[1]	Alternative			
			SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye
San Joaquin River	Merced Madera	Zone A	X	X	X	X
Eastside Bypass [2]	Merced Madera	Zone A	X	X	X	
Chowchilla River	Merced Madera	Zone A	X	X	X	X
Ash Slough	Madera	Zone A	X	X		X
Berenda Slough	Madera	Zone A	X	X	X	X
Floodplain #1	Madera	Zone A	X	X	X	X
Floodplain #2	Madera	Zone A	X	X		X
Berenda Creek	Madera	Zone A	X	X	X	X
Dry Creek	Madera	Zone AO	X	X	X	X
Schmidt Creek	Madera	Zone AE	X	X	X	
Schmidt Creek Tributary	Madera	Zone AE	X	X	X	
Dutchman Creek	Merced	Zone A	X	X	X	X
Deadman Creek	Merced	Zone AO	X	X	X	X

Sources: FEMA, 2008a, 2008b; Authority and FRA, 2016a

[1] Special flood-hazard areas or the 100-year floodplain designated by FEMA. In the floodplain RSA, these include:
- Zone A—no BFE determined.
- Zone AE—FEMA has determined BFEs.
- Zone AO—flood depth of 1–3 feet and average depth determined.

[2] According to the FEMA data, the flood zone for the Eastside Bypass is combined with the San Joaquin River into one large flood zone, and therefore, it is incorporated into the area of San Joaquin River floodplain.

FEMA = Federal Emergency Management Agency
SR = State Route

FEMA defines a floodway as the channel of a stream plus any adjacent floodplain area that must be kept free of encroachment so that the 100-year flood can be conveyed without a substantial increase in the BFE (i.e., less than 1 foot) (FEMA 2009). FEMA has delineated designated floodways for the San Joaquin River, Chowchilla River, Fresno River, Ash Slough, and Berenda Slough. Table 5-14 in the Hydrology and Water Resources Technical Report (Authority and FRA 2016a) summarizes information about the floodways and floodplains (e.g., length, type, depth) crossed by the Central Valley Wye alternatives.

The CVFPB defines the 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 legislature (CVFPB 2011). CVFPB-designated floodways within the floodplain RSA include the San Joaquin River, Stanislaus River, Merced River, Eastside Bypass, Fresno River, Chowchilla River, Ash Slough, and Berenda Slough. The CVFPB website provided maps of CVFPB-designated floodways (CVFPB 2016).

The Central Valley Wye alternatives have the potential to affect facilities regulated by Section 408 of the Rivers and Harbors Act (33 U.S.C. § 408) (federal facilities and federal watercourses including dams, basins, levees, channels, navigational channels, and any other local flood protection works constructed by the USACE) within Ash Slough, Berenda Slough, and the Chowchilla River. DWR manages FloodSAFE California, a program to improve flood management in California, particularly as it relates to the state/federal flood protection system in the Central Valley (DWR 2008a). One of the foundational objectives of the FloodSAFE program is to provide a 200-year (or greater) level of flood protection to all urban and urbanizing areas in the Sacramento–San Joaquin Valley by the end of 2025. The FloodSAFE program's southern boundary is located at the San Joaquin River (DWR 2003). As part of the Central Valley Flood Protection Act of 2008, the state's FloodSAFE program protects urban areas within flood control project levees from the 200-year flood event.

The Central Valley Wye alternatives would pass through levee-protected flood zones. The San Joaquin River, Eastside Bypass, Ash Slough, Berenda Slough, and Chowchilla River levees are listed in the USACE Levee Safety Program, which includes safety measures to reduce flood risk associated with the levee systems. As the local sponsor, DWR receives funding for the operation and maintenance of these levees.

Seismically Induced Flooding

As described in Section 3.9, two types of primary seismic hazards are present in the geology RSA: surface fault ruptures and ground shaking. If strong ground shaking occurred, a number of secondary seismic hazards may result including flooding from induced dam failure. Seismically induced flood hazards in the seismicity, faulting, and dam failure inundation RSA include the potential for inundation or erosion from flood waters associated with the breach of a dam. A review of dam inundation maps and risk assessments prepared by Stanislaus, Merced, Madera, and Fresno Counties and the cities of Chowchilla and Merced show that each Central Valley Wye alternative crosses the inundation area of several large dams: Buchanan Dam on the Chowchilla River, Hidden Dam on the Fresno River, Friant Dam on the San Joaquin River, and Pine Flat Dam on the Kings River. In addition, one of the EINU (Site 7–Le Grand Junction/Sandy Mush Road, Warnerville – Wilson 230 kV transmission line) crosses the inundation area of the New Melones Dam on the Stanislaus River and the Don Pedro Dam on the Tuolumne River. Only reconductoring of an existing transmission line would occur; therefore, seismically induced flooding risks would not change and these dams are not discussed further.

3.8.6 Environmental Consequences

3.8.6.1 Overview

This section evaluates how the No Project Alternative and the Central Valley Wye alternatives could affect surface water hydrology, water quality, floodplains, and groundwater. The impacts of

the Central Valley Wye alternatives are described and organized in Section 3.8.6.3, Central Valley Wye Alternatives, as follows:

Construction Impacts

- Surface Water Hydrology Impacts
  - Impact HYD#1: Temporary Changes to Drainage Patterns and Stormwater Runoff
  - Impact HYD#2: Permanent Changes to Drainage Patterns and Stormwater Runoff
- Surface Water Quality Impacts
  - Impact HYD#3: Temporary Surface Water Quality Impacts
  - Impact HYD#4: Permanent Surface Water Quality Impacts
- Groundwater Quality and Volume Impacts
  - Impact HYD#5: Temporary Groundwater Quality and Volume Impacts
  - Impact HYD#6: Permanent Groundwater Quality and Volume Impacts
- Floodplain and Flood Risk Impacts
  - Impact HYD#7: Temporary Changes to Floodplain Flows
  - Impact HYD#8: Permanent Changes to Floodplain Flows

Operations Impacts

- Surface Water Hydrology Impacts
  - Impact HYD#9: Intermittent Permanent Changes in Hydraulic Capacity and Connectivity
- Surface Water Quality Impacts
  - Impact HYD#10: Intermittent Permanent Surface Water Quality Impacts
  - Impact HYD#11: Continuous Permanent Surface Water Quality Impacts
- Groundwater Quality and Volume Impacts
  - Impact HYD#12: Continuous Permanent Groundwater Quality and Volume Impacts
- Floodplain and Flood Risk Impact
  - Impact HYD#13: Intermittent Permanent Floodplain Impacts
  - Impact HYD#14 Continuous Permanent Exposure to Flood Hazards from Seismic Events

3.8.6.2 No Project Alternative

The population in the San Joaquin Valley is expected to grow through 2040 (see Section 2.2.2.2, Planned Land Use). Development in the San Joaquin Valley to accommodate the population increase would continue under the No Project Alternative and result in associated direct and indirect impacts on hydrology and water resources. Such planned projects anticipated to be constructed by 2040 include residential, commercial, industrial, recreational, transportation, and agricultural projects.

As described in Section 3.8.5, Affected Environment, past development has led to conditions affecting hydrology and water resources. Urban areas include impermeable surfaces, along with residential, commercial, and industrial development, and exposed earth at construction sites, which can lead to hydrologic changes and water quality impairment through increased or altered runoff patterns, reduced groundwater recharge, pollutant runoff, and erosion. In rural and agricultural areas, pollutant sources include agricultural fields and operations. A common contributor to water quality impairment in the Central Valley Region is chlorpyrifos, an insecticide found in five waterbodies that did not meet water objectives (Table 3.8-4). From 1970 to 2000, groundwater levels have decreased nearly 40 feet in the Chowchilla and Madera Subbasins and nearly 30 feet in the Merced Subbasin; both of these subbasins have been characterized as critically in overdraft since 1980 (City of Chowchilla et al.

2014). Only the Delta-Mendota Subbasin, which is not considered to be in overdraft, showed a small increase in 2000 of 2 feet above 1970 levels.

Future development projects in Merced and Madera Counties include dairy farm expansions, implementation of airport development and land use plans, and implementation of general and specific plans throughout both counties. Planned projects under the No Project Alternative would also include transportation projects, such as the expansion of SR 99, and residential, commercial and industrial developments. A full list of anticipated future development projects is provided in Appendix 3.19-A, Cumulative Plans and Non-Transportation Projects List, and Appendix 3.19-B, Cumulative Transportation Projects List. The residential and commercial growth expected in and around the City of Chowchilla, as described in Introduction and Land Use sections of the *City of Chowchilla 2040 General Plan* (City of Chowchilla 2011; pages LU-1 through LU-69), is anticipated to affect hydrology and water resources through increased runoff that can occur from additional paved surfaces, associated erosion and other pollutant discharges, introduction of new pollutants to surface water or discharges of pollutants into waterbodies, and changes in groundwater use and recharge patterns. In addition, development around the City of Chowchilla and Merced and Madera Counties could lead to changes in groundwater use and recharge patterns, and development within a floodplain could lead to increased obstructions to flood flows.

Under the No Project Alternative, recent development trends are anticipated to continue, leading to impacts on hydrology and water resources. Existing land would be converted for residential, commercial, and industrial development, as well as for transportation infrastructure, to accommodate future growth, placing potential pressures on hydrology and water resources. In addition, the demand for domestic water supplies would increase as a result of increased population from newly planned development, leading to decreased groundwater supplies. Planned development and transportation projects that would occur as part of the No Project Alternative would likely include various forms of mitigation to address impacts on hydrology and water resources.

3.8.6.3 Central Valley Wye Alternatives

Construction and operations of the Central Valley Wye alternatives could result in temporary and permanent impacts on hydrology and water resources. Impacts could potentially include changes in drainage patterns, stormwater runoff and other related impacts, surface water quality, groundwater quality and volume, floodplain and flood risk, and hydraulic capacity and connectivity of natural waterbodies.

Construction Impacts

Construction of the Central Valley Wye alternatives would involve, for example, demolition of existing structures; clearing and grubbing; reduction of permeable surface area; handling, storing, hauling, excavating, and placing fill; possible pile driving; and construction of aerial structures, bridges, road modifications, utility upgrades and relocations, HSR electrical systems, and railbeds. Construction activities are further described in Chapter 2, Alternatives.

Surface Water Hydrology Impacts

Impact HYD#1: Temporary Changes to Drainage Patterns and Stormwater Runoff

As discussed in Section 3.8.5, all four alternatives would pass primarily through agricultural areas with relatively flat topography. Annual precipitation is roughly 11 to 12 inches occurring mostly between November and April. All four alternatives would cross largely through the same types of geologic units and soil types (as shown in Figure 3.9-1 and Figure 3.9-2 in Section 3.9), and the project footprint of each alternative would cross a network of natural and constructed water features that provides irrigation water in dry months. All four alternatives cross a similar number of these water features. During wet periods of the year these water features convey runoff during heavy rainfall events when the ground becomes saturated and infiltration is reduced, as well as runoff from impermeable surfaces.

Construction activities associated with the Central Valley Wye alternatives would require excavation and placement of fill, construction of features, and establishment of construction

staging areas. Each alternative would result in areas of temporary ground disturbance, where the land would be returned to its prior use after construction, as well as areas of permanent ground disturbance where new HSR facilities, roads, and other associated elements of the Central Valley Wye alternatives would replace existing land uses. Such ground disturbance during construction could alter drainage patterns resulting in redirection of stormwater runoff, changes in runoff volume and rates, and diversion of stream flow. These effects would be especially pronounced in the winter during heavy, lengthy, or repeated rain events when the ground becomes saturated and excess rainfall becomes runoff. Conversely, these effects could also be more pronounced at the end of the dry summer or during periods of drought, conditions that result in hardened soil with diminished rainfall infiltration rates. These changes in stormwater runoff during construction could also result in increased pollutant loads in stormwater runoff (see Impact HYD#3) and on- or off-site flooding (see Impact HYD#7).

Because the affected environment, number of water features crossed, and type of construction activities are similar among the four Central Valley Wye alternatives for hydrology, this analysis uses the total area of land disturbance during construction as a measure of the potential for an alternative to change runoff and drainage patterns. As shown in Table 3.8-10, areas indicated as temporarily disturbed would be restored after construction, but hydrology would be affected during construction; areas shown as permanently disturbed would experience both temporary and permanent changes in stormwater flows. In total, Central Valley Wye alternatives would temporarily disturb between 2,900 and 4,031 acres. The SR 152 (North) to Road 19 Wye Alternative would temporarily disturb the largest area both temporarily (1,227 acres) and permanently (2,804 acres) compared to the other alternatives. Construction of the Avenue 21 to Road 13 Wye Alternative would disturb the smallest area overall, both temporarily (486 acres) and permanently (2,414 acres).

Table 3.8-10 Acres of Land Disturbed during Construction by Central Valley Wye Alternative

Alternative	Area of Temporary Disturbance (acres)[1]	Area of Permanent Disturbance (acres)[1]	Total Area of Disturbance (acres)[1]
SR 152 (North) to Road 13 Wye	657	2,615	3,272
SR 152 (North) to Road 19 Wye	1,227	2,804	4,031
Avenue 21 to Road 13 Wye	486	2,414	2,900
SR 152 (North) to Road 11 Wye	549	2,566	3,115

Source: Calculated using ESRI ArcGIS versions 10.1, 10.2, and 10.3 using area of Central Valley Wye alternatives' project footprints in computer-aided design plans (Authority and FRA, 2016a; PG&E, 2016).
[1] Acreages are rounded to the nearest whole number.
SR = State Route

As discussed in Section 3.8.4.2, numerous design features (IAMFs) would be incorporated as part of the Central Valley Wye alternatives design to avoid and minimize impacts. HYD-IAMF#1 would require the contractor to prepare and implement a stormwater management and treatment plan that includes measures to minimize stormwater flows during construction. These measures may include temporary or permanent features such as detention basins to disperse flows and increase infiltration and evaporation, and the incorporation of LID design standards to detain runoff on-site and minimize off-site runoff (LID design standards are also required under the Authority's MS4 permit and are subject to state review). The Central Valley Wye alternatives would also incorporate HYD-IAMF#3, as required by the Construction General Permit. This IAMF would require maintaining pre-construction hydrology, as well as detain on-site stormwater runoff and provide treatment prior to discharge.

All of the Central Valley Wye alternatives would result in potential changes to drainage patterns resulting from construction. Because some waterbodies are intermittent streams, and not continuous flowing, changes in drainage patterns from construction would not affect all

waterbodies. The design of the Central Valley Wye alternatives, specifically related to the incorporation of HYD-IAMF#1 and HYD-IAMF#3, would minimize the effects of changes in drainage patterns during construction and the potential to redirect stormwater runoff, change runoff volume and rates, and divert stream flow. Although impacts would be minimized, they would not be avoided altogether and some effects associated with ground disturbance during construction would remain. These effects are anticipated to be greatest for the alternative with the largest total ground disturbance area, namely the SR 152 (North) to Road 19 Wye Alternative (4,031 acres), and least for the Avenue 21 to Road 13 Wye Alternative, which would disturb a smaller area (2,900 acres).

CEQA Conclusion

With incorporation of IAMFs, the impact under CEQA would be less than significant because drainage features and stormwater management and treatment would be implemented during construction of the Central Valley Wye alternatives. These IAMFs would minimize the effects of changes to existing drainage patterns such that ground disturbance during construction would not result in significant redirection of stormwater runoff, changes in runoff volume and rates, or diversion of stream flow. Therefore, CEQA does not require any mitigation.

Impact HYD#2: Permanent Changes to Drainage Patterns and Stormwater Runoff

Construction activities associated with the Central Valley Wye alternatives would involve ground disturbance for the construction of bridge and overcrossing structures, bridge abutments, support piers, electrical interconnections, as well as the expansion of the Site 6—El Nido, El Nido Substation. These activities would result in localized permanent changes in drainage patterns caused by permanent topography changes during construction. For each alternative, permanent ground disturbance during construction would alter local drainage patterns potentially resulting in permanent redirection of stormwater runoff, changes in runoff volume and rates, and diversion of stream flow. These effects on runoff and drainage would be greatest when stormwater runoff volumes are greatest (see descriptions of rainfall events and drought discussed under Impact HYD#1). Similar to the approach used under Impact HYD#1, this analysis uses the area of permanent ground disturbance as a relative measure of the potential of each alternative to result in impacts. Table 3.8-10 shows that the largest permanent area of disturbance potentially resulting in the greatest permanent changes in runoff would occur under the SR 152 (North) to Road 19 Wye Alternative. The least overall change in runoff patterns would be anticipated under the Avenue 21 to Road 13 Wye alternative.

Of the approximately 100-foot-wide track bed, the central part of the at-grade track bed, approximately 40 feet wide, would consist of ballast and tie or slab railbed over a dense subballast and subgrade. This portion of the embankment would be impermeable, or very minimally permeable, and stormwater would largely flow off the track bed onto the remainder of the right-of-way for surface drainage. The approximate 30-foot-wide peripheral areas on each side of the central embankment would be more permeable and would provide infiltration comparable to existing conditions. The drainage system would direct stormwater runoff from the railbed, aerial structures, and roads into drainage ditches or basins for infiltration or conveyance to an existing stormwater drainage system. Stormwater would drain from the track embankment toward swales running parallel to at-grade sections of track. Although the Central Valley Wye alternatives would alter on-site drainage patterns within the project footprints, runoff would be directed to pervious ground surface, unlined drainage ditches, or basins within the project footprints. New/modified impervious areas associated with the electrical infrastructure (i.e., Site 6—El Nido, El Nido Substation; Site 7—Wilson, Wilson Substation; and Site 7—Le Grand Junction/Sandy Mush Road, Dutchman Switching Station) would also include stormwater retention basin improvements.

Drainage systems within the portions of elevated track would collect and drain stormwater to the ground through downspouts at the columns. Depending on location, drainage from the downspouts would be retained on-site, discharged to a detention basin, conveyed to a nearby stormwater collection system, or dispersed in a manner that minimizes off-site flows. 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 (HYD-IAMF#1). On-site stormwater management facilities would be designed and constructed to capture runoff from impervious surfaces, including access roads, new road over- and underpasses, and new or relocated roads and highways, and to provide treatment of that runoff prior to discharge. LID design techniques would be used to detain runoff on-site and to minimize off-site runoff. LID design standards are also part of the required post-construction measures and post-construction stormwater management program under the MS4 permit (see Section 3.8.2). With incorporation of these LID design standards and implementation of the stormwater management and treatment plan (HYD-IAMF#1) during construction, it is anticipated that there would be no additional permanent changes to drainage or stormwater flows under any of the Central Valley Wye alternatives. Therefore, while there would be a difference in the amount of permanent ground disturbance, the design of the Central Valley Wye alternatives would effectively minimize effects such that there would be no permanent impacts under any of the alternatives.

CEQA Conclusion

The impact under CEQA would be less than significant because effective drainage features, LID design standards, and stormwater management and treatment would be implemented during construction of the Central Valley Wye alternatives, and substantial changes in existing drainage patterns that could result in erosion or siltation on-site or off-site would not occur. Therefore, CEQA does not require any mitigation.

Surface Water Quality Impacts

Impact HYD#3: Temporary Surface Water Quality Impacts

This analysis uses two different measurements to compare the potential of each of the four alternatives to degrade surface water quality: 1) the total area of land disturbance caused by construction and 2) the number of waterway crossings that may require construction within the water channel itself. Each Central Valley Wye alternative would cross numerous waterbodies within the RSA on different types of structures. The waterbodies potentially affected by the Central Valley Wye alternatives, along with other surface water resources in the RSA, are subject to degradation from agricultural runoff and pollutants that are discharged from transportation sources such as streets and highways. The specific waterbody crossings for each alternative are identified in Section 3.8.5.2, Surface Water Hydrology, and details on surface water quality, including sources of surface water pollutants, is provided in Section 3.8.5.3, Surface Water Quality.

Construction activities associated with the Central Valley Wye alternatives would require excavation, grading, and establishing construction staging areas. Construction activities that remove vegetation and expose soil to erosion (such as grading) could contribute to accelerated erosion rates, which could result in runoff containing sediment and pollutants that ultimately flow into surface waters. Pollutants in runoff could include sediment, oil and grease, hydrocarbons (e.g., fuels, solvents), heavy metals, organic fertilizers and pesticides, pathogens, nutrients, and debris. These effects on runoff quality would be greatest when stormwater runoff volumes are highest (see descriptions of rainfall events and drought discussed under Impact HYD#1) and in areas most susceptible to soil erosion.

Compared to the overall size of the surface water RSA (shown on Figure 3.8-1), the area of disturbance potentially affecting surface water resources during construction (including water quality) is relatively small for all Central Valley Wye alternatives. As shown in Table 3.8-10, the SR 152 (North) to Road 19 Wye Alternative would temporarily disturb 4,031 acres, resulting in the largest disturbed area. The Avenue 21 to Road 13 Wye Alternative would disturb 2,900 acres, resulting in the smallest disturbed area. The SR 152 (North) to Road 13 Wye Alternative and the SR 152 (North) to Road 11 Wye Alternative would disturb 3,272 acres and 3,115 acres, respectively. Impact GEO#1 documents that all four alternatives would remove vegetation and disturb areas containing soils susceptible to erosion (see Table 3.9-12 in Section 3.9 for more information). The SR 152 (North) to Road 19 Wye Alternative would disturb the largest area of soils susceptible to erosion and the SR 152 (North) to Road 11 Wye Alternative would affect the smallest area of soils susceptible to erosion.

Construction of waterway crossings could also contribute to temporary surface water quality impacts. Bridge and viaducts structures in the Central Valley Wye alternatives would require support piers near channel and canal crossings which could provide a path for construction-related contaminants to reach surface waters (for a discussion of potential floodplain impacts, see Impact HYD#7). Final design would minimize structure supports in close proximity to channels to the maximum extent feasible and would therefore allow for most potential direct surface water quality impacts to be avoided. Where construction of support piers is required within the stream channel itself, the pier foundations may in some circumstances be installed in the portion of the channel that is dry during the non-rainy season and in these cases the piers would not be expected to greatly contribute to particulates in receiving waterbodies. In-water work required during construction, such as the installation of a culvert, would require the dewatering of the area and a temporary diversion of the waterbody away from the construction area.

These activities may result in temporary sediment release into the waterbody, which could degrade water quality. Similarly, the cut-and-cover construction method proposed for the tunnel for the SR 152 (North) to Road 19 Wye Alternative would require temporary excavation across one waterbody. Table 3.8-11 shows the number and type of waterbody crossings anticipated under each alternative. Based on this information, the Avenue 21 to Road 13 Wye alternative would have the greatest potential for surface water quality impacts associated with installation of culverts, and the SR 152 (North) to Road 11 Wye Alternative would have the least potential for impacts.

Table 3.8-11 Types of Crossings Installed during Construction by Central Valley Wye Alternative

Alternative	Viaduct	Bridge	Culvert	Tunnel	Total
SR 152 (North) to Road 13 Wye	8	2	19	0	29
SR 152 (North) to Road 19 Wye	9	1	19	1[1]	30
Avenue 21 to Road 13 Wye	10	3	22	0	35
SR 152 (North) to Road 11 Wye	9	5	16	0	30

Source: Calculated using computer-aided design plans compiled for Hydrology Technical Report (Authority and FRA, 2016a)
[1] The tunnel that crosses under SR 99 would also cross under one waterbody, Dutchman Creek.
SR = State Route

To avoid or minimize the potential for these impacts, the Central Valley Wye alternatives incorporate a requirement to conduct construction in compliance with the SWRCB Construction General Permit (HYD-IAMF#3) to minimize the potential of contaminants to be discharged into groundwater and minimize short-term increases in sediment transport caused by construction, including erosion control requirements, stormwater management, and channel dewatering for affected stream crossings. Dewatering activities would also comply with the Central Valley RWQCB's General Dewatering Permit, Order No. 5-00-175 [NPDES No. CAG995001], Waste Discharge Requirements General Order for Dewatering and Other Low-Threat Discharges to Surface Waters.

Various controls, design features, and waste, dewatering, and Construction General Permit requirements detailed in the SWPPP (HYD-IAMF#3 and HYD-IAMF#4) would minimize the risk of polluted runoff and the potential for sedimentation impacts on water quality, in addition to the stormwater management requirements to treat and discharge runoff (HYD-IAMF#1). In addition, where the discharge of fill is planned in streams or rivers, the Authority would comply with Sections 401 and 404 of the CWA and Section 10 of the Rivers and Harbors Act, which require authorizations for such discharges in specific surface water features, as described in Section 3.8.2.

Before construction, the Authority would notify the California Department of Fish and Wildlife and other regulatory agencies of planned alterations of channels, if any, pursuant to California Fish and Game Code sections 1601–1603 (CDFG 2009). These procedures identify pollutant sources

that could affect water quality and require project proponents to identify, implement, and maintain BMPs to reduce pollutants and non-stormwater discharges in construction site runoff. The design of the Central Valley Wye alternatives would include erosion and sedimentation controls to reduce erosion, stabilize soils and manage non-stormwater (HYD-IAMF#3, GEO-IAMF#1, and GEO-IAMF#6), as well as waste management and materials pollution controls (HMW-IAMF#4, HMW-IAMF#1, BIO-IAMF#12, and BIO-IAMF#14) to control and minimize the extent of potential spills of hazardous materials that could leach into soils and waterbodies.

Although impacts would be minimized through the incorporation of IAMFs, impacts would not be completely avoided and some water quality effects associated with temporary disturbance of ground surfaces would still remain. These effects would be greatest for the alternative with the largest temporary ground disturbance area and largest area of disturbance of soils susceptible to erosion, namely the SR 152 (North) to Road 19 Wye Alternative, as well as for the alternative with the most culverts being installed, the Avenue 21 to Road 13 Wye Alternative. Taken as a whole, it is anticipated that the IAMFs would be effective in reducing these impacts so that none of the Central Valley Wye alternatives would degrade water quality such that there would be a violation of water quality standards.

CEQA Conclusion

The impact under CEQA would be less than significant because measures to manage stormwater and prevent the potential for introduction of pollutants to surface waters would be implemented during construction of the Central Valley Wye alternatives and substantial changes in surface water quality would not occur. Therefore, CEQA does not require any mitigation.

Impact HYD#4: Permanent Surface Water Quality Impacts

Each of the Central Valley Wye alternatives would introduce new features into the RSA, including HSR tracks and embanked or elevated trackbeds, relocated roads, new grade-separated road structures, and installation of communication and electrical infrastructure. As the affected environment is largely similar between the four Central Valley Wye alternatives for hydrology, this analysis uses areas of permanent disturbance as a measure of the potential to affect surface water quality during and immediately following rain events. The Central Valley Wye alternatives would result in permanent areas of disturbance that range between 2,414 acres and 2,804 acres (Table 3.8-10). These features would have different topography than that which presently exists and include new embanked and hardscape features, all of which have the potential to change drainage patterns and volumes and result in associated impacts on water quality.

The SR 152 (North) to Road 19 Wye Alternative would result in a permanent impact area of 2,804 acres (Table 3.8-10), the largest permanent impact area compared to the other alternatives. The SR 152 (North) to Road 13 Wye Alternative would result in the second-largest permanent impact area (2,615 acres), followed by the SR 152 (North) to Road 11 Wye Alternative (2,566 acres) and the Avenue 21 to Road 13 Wye Alternative (2,414 acres).

The new hardscape areas under any alternative would result in new impervious surface areas, which could reduce stormwater infiltration (see Impacts HYD#5 and HYD#6 for a discussion of impacts related to reduced stormwater infiltration) and increase stormwater runoff volumes if no stormwater management and treatment measures were to be implemented, such as HYD-IAMF#1.

The Central Valley alternatives are designed with integrated stormwater management requirements (HYD-IAMF#1) to prevent runoff from the tracks or track rights-of-way from discharging directly to any surface waterbodies, irrigation canals, private property, or county roads. The Central Valley Wye alternatives' drainage system would retain runoff from the track rights-of-way on-site, disperse it in a non-erosive fashion, convey it to a nearby stormwater collection system, or direct it through swales to infiltration basins within the Central Valley Wye alternatives' right-of-way. The Authority would design infiltration basins as a water quality control measure (HYD-IAMF#3). Any discharges to stormwater drainage systems would be pursuant to requirements of the local irrigation or flood control entity responsible for the stormwater drainage system.

The technology proposed for the electric HSR system does not require large amounts of lubricants or hazardous materials that could otherwise degrade water quality. This approach minimizes the potential for release of these substances.

The design of the Central Valley Wye alternatives would also include drainage systems to collect and treat stormwater in accordance with the requirements of the CWA Section 401 permit. Road underpasses would require pump stations that would pump runoff from the low point of the road to either a municipal drainage system or a treatment system that would treat runoff. This approach would meet or exceed the treatment and post-construction stormwater requirements of Section XIII of the Construction General Permit. It would also meet or exceed the treatment and post-construction and hydromodification control requirements for compliance with any active Phase I or Phase II permit applicable in those areas of the Central Valley Wye alternatives with active MS4 permits (Authority and FRA 2016a).

The Authority would implement these water quality design measures to avoid water quality impacts. Therefore, the design of the Central Valley Wye alternatives would avoid potential release of pollutants or sediment that could permanently degrade water quality or aquatic resources or violate water quality standards.

All of the Central Valley Wye alternatives would also involve the construction of new grade-separated roads at a number of rail crossings in the surface water RSA. The Central Valley Wye alternatives incorporate requirements that the road crossings be designed so runoff is conveyed to a stormwater collection system to avoid direct discharge to surface waterbodies (HYD-IAMF#1).

Therefore, the design of the Central Valley Wye alternatives incorporates stormwater management and treatment features that ensure that any potential impacts associated with changes in stormwater patterns or flows on water quality are avoided or minimized. Such comprehensive stormwater management and treatment measures are not currently being implemented in the locations of the Central Valley Wye alternatives' project footprints and, as such, stormwater runoff from some of the roads in these areas flows into local waterbodies. Therefore, it is anticipated that none of the Central Valley Wye alternatives, regardless of area disturbed, would result in a permanent degradation in surface water quality and would likely result in improved conditions compared to existing conditions.

CEQA Conclusion

The impact under CEQA would be less than significant because the design of the Central Valley Wye alternatives includes effective measures to manage stormwater and prevent the introduction of pollutants to surface waters such that substantial changes in surface water quality would not occur. Therefore, CEQA does not require any mitigation.

Groundwater Quality and Volume Impacts

Impact HYD#5: Temporary Groundwater Quality and Volume Impacts

Certain construction activities associated with the Central Valley Wye alternatives require the use of water, which would involve drawing from existing permitted commercial sources of water supplies, some of which is taken from existing wells that draw water from groundwater basins within the RSA. Section 3.8.5.4, Groundwater, documents that several of the groundwater basins in the Central Valley Wye groundwater RSA are presently in a state of critical overdraft. Unrestricted use of these water supplies to construct the Central Valley Wye alternatives could further exacerbate this situation.

Water would be used during construction activities to prepare concrete, control dust, and re-seed disturbed areas. As described in Section 3.6.5.1, Public Utilities, water is provided by local water districts within the RSA. The water districts' sources of water supply include primarily groundwater and surface water. It is anticipated that the same water sources currently used to supply water for municipal and agricultural uses along the alignment would be used to meet construction-related water needs for the Central Valley Wye alternatives. Therefore, groundwater may be pumped for construction use, which could increase local groundwater withdrawals.

However, construction of any of the Central Valley Wye alternatives would reduce water use within the project footprints because construction-related water use would be less intensive than current water use associated with existing agricultural land uses within the project footprints.

An analysis of the changes to water use patterns and intensities from construction of the Central Valley Wye alternatives is included in Section 3.6.6, Environmental Consequences, in the discussion under Impact PUE#3: Temporary Impacts from Water Use. Existing water use within the project footprints of the Central Valley Wye alternatives, primarily for agriculture, is 8,916–11,147 acre-feet/year, using both surface water and groundwater. Annual water use for construction would be 1,405 acre-feet/year (14.1 percent of existing water use) under SR 152 (North) to Road 13 Wye Alternative, 1,519 acre-feet/year (13.6 percent of existing water use) under SR 152 (North) to Road 19 Wye Alternative, 1,286 acre-feet/year (14.4 percent of existing water use) under Avenue 21 to Road 13 Wye Alternative, and 1,304 acre-feet/year (13.9 percent of existing water use) under SR 152 (North) to Road 11 Wye Alternative.

Using the USGS estimate of 33 percent groundwater usage in the San Joaquin Basin, existing groundwater use within the public utilities and energy RSA for irrigation would be 3,278 acre-feet/year under the SR 152 (North) to Road 13 Wye Alternative, 3,679 acre-feet/year under the SR 152 (North) to Road 19 Wye Alternative, 2,942 acre-feet/year under the Avenue 21 to Road 13 Wye Alternative, and 3,086 acre-feet/year under the SR 152 (North) to Road 11 Wye Alternative. The amount of groundwater used for construction could be approximately 424 to 501 acre-feet/year, assuming 33 percent of the 1,286 to 1,519 acre-feet/year used for construction is drawn from groundwater sources. This amount of groundwater would be considerably less than the current estimated groundwater use within the project footprints. It is likely that further reductions in groundwater use for construction would also be achieved through implementation of the Authority's *Water Conservation Guidance* (Authority 2015), which requires use of nonpotable water, non-water dust suppressants, and other water conservation measures. Therefore, there would not be a contribution from any of the Central Valley Wye alternatives to these overdraft conditions related to the use of groundwater during construction.

The constructed features proposed for the Central Valley Wye alternatives are very small relative to the size of the groundwater basins and, because permanent stormwater recharge features are included in the design of the Central Valley Wye alternatives, it is anticipated that the natural recharge rates of the affected groundwater zones would re-establish following the completion of construction. The temporary effects would be approximately the same for all four Central Valley Wye alternatives.

Groundwater levels in the project footprints of the Central Valley Wye alternatives are generally deeper than anticipated excavation depths. Typical track, substation, and switching station construction remains on the surface and may go 1–2 feet below the surface for clearing and grading. Auguring, varying from depths of approximately 6 to 24 feet, would be required for installation of structures associated with network upgrades and tie-lines. The SR 152 (North) to Road 19 Wye Alternative is the only Central Valley Wye alternative with a tunnel section. The tunnel section under SR 99 would be up to 60 feet deep, including subgrade. The HSR aerial structure foundations sit on drilled shaft piles that would be 60 feet deep, depending on geotechnical conditions, and the roadway underpasses could be as deep as 40 feet, including subgrade. While the water depths in the groundwater RSA are greater than 50 feet (Table 3.8-6), it is possible that construction of these piles or of the tunnel floor would encounter groundwater and may require dewatering.

The Central Valley Wye alternatives would require the implementation of GEO-IAMF#1, which would require monitoring and controlling the amount of groundwater withdrawal during construction. If groundwater withdrawals are required and levels are changing, then GEO-IAMF#1 requires the contractor to re-inject water based on site-specific conditions to protect groundwater levels and supply, and to maintain groundwater quality and ground surface conditions. If a slurry is used as part of the drilling method, any groundwater encountered would be removed and disposed of along with the drilling slurry. If a drilled hole needs to be dewatered, groundwater would be treated and disposed of according to Central Valley RWQCB's Regional Dewatering

Permit, which includes treating the water prior to discharge such that pollutants in discharged water reach *de minimis* levels, or hauling the water to a permitted treatment facility. Construction dewatering is further discussed in Section 3.9. While the IAMFs incorporated in the design of the Central Valley Wye alternatives would minimize the potential for temporary impacts related to water quality if groundwater is encountered during excavation, some effects to groundwater quality may occur under the SR 152 (North) to Road 19 Wye Alternative.

All of the Central Valley Wye alternatives would require concrete batch plants for construction of concrete elements of the railbed and roadway under- and overpasses, as well as the establishment of construction staging areas. There would be a similar number of these stationary construction material and staging sites under each of the four Central Valley Wye alternatives. The Central Valley Wye alternatives design includes stormwater management measures to protect groundwater quality through erosion and sedimentation controls and through managing and controlling surface runoff at these sites to minimize the potential for contaminants to reach groundwater (HYD-IAMF#1 and HYD-IAMF#3). The Central Valley Wye alternatives design would include measures specified in the spill prevention, control, and countermeasure plan to control and minimize the extent of possible spills of hazardous materials (HMW-IAMF#4), which may leach into soils and waterbodies and contaminate groundwater supplies. The Central Valley Wye alternatives design would also include IAMFs to address and minimize impacts on groundwater resources from undocumented contamination, such as previously contaminated soil or other materials (HMW-IAMF#5 and HMW-IAMF#3).

These IAMFs would include mechanisms for minimizing impacts from undocumented contamination, including preparation of a Construction Management Plan to address provisions for the disturbance of undocumented contamination; procedures for working with responsible agencies and steps for cleaning up undocumented contamination; and identifying, avoiding, and minimizing hazardous substances. Should undocumented contamination of groundwater be encountered during construction, the Authority would work closely with local agencies to resolve any such encounters, such as conducting site investigation and remediation activities and proper treatment and/or disposal of contaminated materials. Therefore, the design of the Central Valley Wye alternatives would minimize the impacts of accidental releases of construction-related hazardous materials that might affect groundwater quality, disturbance of known and undocumented soil or groundwater contamination, the migration of contaminated groundwater further into the groundwater table, or inadvertent contamination of groundwater.

CEQA Conclusion

The impact under CEQA would be less than significant because management of stormwater, pollution prevention measures, waste disposal measures, protocols for groundwater withdrawal and water diversion, and pollution reduction and prevention measures would be implemented during construction of the Central Valley Wye alternatives, and substantial changes in groundwater quality and volume would not occur. Therefore, CEQA does not require any mitigation.

Impact HYD#6: Permanent Groundwater Quality and Volume Impacts

The majority of the land area in the project footprints of the Central Valley Wye alternatives is presently agricultural in nature and is pervious, allowing rainfall and irrigation water to percolate to underground groundwater basins. Construction activities associated with the Central Valley Wye alternatives would result in the creation of areas of new impervious surfaces, including at-grade railbed, aerial structures, electrical infrastructure, and roads. While these features would not make up a large proportion of the project footprints, and in some cases would replace existing impervious areas, these new surfaces could reduce the infiltration of surface water to groundwater supplies. This reduction of infiltration would be continuous throughout the life of the HSR, occurring intermittently during precipitation events.

The amount of new impervious surface would be small relative to the overall size of the groundwater RSA (see Table 3.8-5). The four groundwater basins in the groundwater RSA make up a combined land area of 3,025,000 acres, which includes both pervious and impervious surfaces. As shown in Table 3.8-5, the total area of permanent disturbance potentially affecting

groundwater resources is relatively small for all four Central Valley Wye alternatives, the greatest being 2,804 acres for the SR 152 (North) to Road 19 Wye Alternative and the fewest being 2,414 for the Avenue 21 to Road 13 Wye Alternative.

The central part of the at-grade track, approximately 40 feet wide, would consist of ballast and tie or slab railbed over a dense subballast and subgrade. This portion of the embankment would be impermeable, or very minimally permeable. The construction contractor would grade the remainder of the right-of-way for surface drainage. This peripheral area would be more permeable than the central embankment and would continue to provide infiltration comparable to existing conditions. The drainage system would direct stormwater runoff from the railbed, aerial structures, and roads into drainage ditches or basins for infiltration or conveyance to an existing stormwater drainage system that includes groundwater recharge. Stormwater would drain from the track embankment toward swales running parallel to at-grade sections of track. Although the Central Valley Wye alternatives would slightly alter the location of infiltration and recharge areas, runoff would drain to the pervious ground surface, unlined drainage ditches, or basins. In addition, the new/modified impervious areas associated with the electrical infrastructure (i.e., Site 6—El Nido, El Nido Substation; Site 7—Wilson, Wilson Substation; and Site 7—Le Grand Junction/Sandy Mush Road, Dutchman Switching Station) would include stormwater retention basin improvements.

The Central Valley Wye alternatives incorporate a requirement to maintain pre-construction hydrology (HYD-IAMF#3) and to implement stormwater management plans (HYD-IAMF#1). Stormwater would be collected at the toe of embankments and directed to detention basins. Road underpasses would require pump stations that would pump runoff from the low point of the road to either a municipal drainage system or a detention basin. Several rail-crossing improvements would require new paved access or frontage roads. In most locations, proposed new roads are in rural areas, and stormwater would run off into unlined roadside ditches designed to convey stormwater flows and allow for infiltration in the ditch. In more urban locations, runoff would flow to an existing storm drain system. Therefore, the design of the Central Valley Wye alternatives would minimize the impacts of increased rates and amounts of stormwater runoff, decreased infiltration, and erosion in areas adjacent to new impervious surfaces and in new or existing drainage channels.

The Central Valley Wye alternatives would include the installation of drainage swales running parallel to at-grade track within the HSR right-of-way, which would minimize the compaction of soil beneath the track. Stormwater would drain toward the swales, minimizing the impact by increasing infiltration capacity and groundwater recharge. In areas where the right-of-way is constrained and does not allow for the installation of drainage swales, drainage pipes or lined channels leading to established discharge locations would be installed instead of swales. 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 and the latest version of Authority *Technical Memorandum* 2.6.*5 Hydraulics and Hydrology Design Guidelines* (Authority 2011).

The construction of roadway overcrossings would slightly increase the total of impervious area because of the lengthening of paved surfaces when compared to existing at-grade roadways. However, the Authority, in coordination with the local government with jurisdiction, would design roads with drainage systems that minimize changes to pre-construction runoff volumes and rates. In addition, the Central Valley Wye alternatives would comply with the Caltrans NPDES permit and California HSR MS4 Permit. The placement of piers in stream channels and areas with shallow groundwater and new impervious cover in recharge areas could reduce infiltration capacity and groundwater recharge. The piers would have a narrow, linear permanent impact area and new impervious areas for roads and other infrastructure would be minimized, such that a relatively limited amount of new impermeable surface would result.

Therefore, only a small portion of the permanent area of disturbance would be impervious and some of it may replace or remove existing impervious surfaces. Taken as a whole, the total area of permanent disturbance for any of the four Central Valley Wye alternatives (ranging from 2,414

to 2,804 acres) would still constitute less than one tenth of one percent of the total 3.5 million acres of groundwater basin area. As the areas of new impervious surface is small relative to the size of the groundwater basin and as the Central Valley Wye alternatives include design features that allow runoff water to percolate into groundwater basins, any changes in permanent groundwater recharge would not result in a net deficit in aquifer volume or a lowering of the local groundwater table.

The Authority would also require contractors to implement measures to protect groundwater quality, such as implementation of biofiltration and bioretention systems, and to manage and treat surface runoff prior to soil infiltration (HYD-IAMF#1), which would limit the potential for contaminants to reach groundwater. Therefore, the features incorporated into the Central Valley Wye alternatives would minimize the impacts on groundwater quality from the discharge of pollutants into groundwater aquifers, the potential release of construction-related hazardous materials and pollutants into groundwater aquifers, or lowering of the groundwater table because of interference with groundwater recharge, including a decrease in recharge area.

CEQA Conclusion

The impact under CEQA would be less than significant because effective management and treatment of stormwater would be implemented during construction of the Central Valley Wye alternatives, and substantial changes in groundwater quality and volume would not occur. Therefore, CEQA does not require any mitigation.

Floodplain and Flood Risk Impacts

Impact HYD#7: Temporary Changes to Floodplain Flows

Construction activities associated with the Central Valley Wye alternatives would require the placement of various structures and equipment within floodplains that could result in temporary impedances of stormwater flows that could cause on- or off-site flooding. Each of the Central Valley Wye alternatives would be constructed in multiple different parts of the 100-year floodplain (Figure 3.8-3). This work would include placement of construction staging areas in all of the floodplains the alternatives would cross (Table 3.8-9), as well as in CVFPB-designated floodways for the Stanislaus River, Merced River, Chowchilla River, Ash Slough, and Berenda Slough. Table 3.8-12 shows acreages of 100-year flood zone areas that would be within the project footprint of each of the Central Valley Wye alternatives.

Table 3.8-12 Area of Project Footprint in the Special Flood-Hazard Area (100-Year Federal Emergency Management Area Flood Zones) by Central Valley Wye Alternative

Alternative	Area within 100-Year FEMA Flood Zones (acres)[1]		Total
	A	AO	
SR 152 (North) to Road 13 Wye	674	215	889
SR 152 (North) to Road 19 Wye	803	254	1,057
Avenue 21 to Road 13 Wye	905	213	1,118
SR 152 (North) to Road 11 Wye	648[2]	143	791[2]

Source: Calculated using FEMA special flood-hazard data for each county in ESRI ArcGIS versions 10.1, 10.2, and 10.3 (FEMA 2008a, 2008b)
[1] Acreages are rounded to the nearest whole number. Table 3.8-7 defines special flood-hazard area designations.
[2] This value has been updated to reflect refinements to the Site 6 electrical interconnection. Refer to Section 2.2.3, Description of the Central Valley Wye Alternatives.
FEMA = Federal Emergency Management Agency
SR = State Route

As shown, the SR 152 (North) to Road 11 Wye Alternative would affect the smallest area of 100-year flood zone (791 acres) and the Avenue 21 to Road 13 Wye Alternative would cross the largest area—1,118 acres of 100-year flood zone. Although construction activities would be temporary, a construction staging area may be active between 1 and 3 years, spanning multiple rainy seasons. Construction equipment and materials stored in staging areas within the floodplain

RSA would not create a large obstruction to surface flows should storm events result in flooding and no compensatory flood storage is proposed during construction for these staging areas. The Authority would prepare a SWPPP for construction activities (HYD-IAMF#3), which includes BMPs to provide permeable surfaces where feasible to manage the overall amount of stormwater runoff and minimize potential impacts contributing to flooding. Consistent with typical SWPPP requirements, the person or persons responsible for water quality monitoring or the stormwater monitoring plan, usually a qualified stormwater practitioner, and local districts would monitor weather conditions for heavy storms (and potential flood flows) such that the construction workers would be able to relocate construction equipment to minimize the risk of such equipment obstructing flood flows.

The CVFPB requires applicants to obtain an encroachment permit for construction areas in a CVFPB-designated floodway. Work activities such as excavation, cut-and-fill construction, and obstruction in the floodway are not allowed during the flood (or wet) season. Because construction is expected to occur over a period of up to 3 years, the Authority or other assigned party (e.g., construction contractor), would need to request a CVFPB exemption for work proposed to be conducted during wet seasons. The CVFPB grants exemptions to this time restriction if they determine that forecasts for weather or river flood conditions are favorable. This exemption can be included as a condition of the CVFPB approval or encroachment permit. The CVFPB permits uses that do not impede the free flow in the floodway or jeopardize public safety in a designated floodway. These permitted uses include structures that do not impede flows and that are anchored to prevent the structure from floating; roads, pipelines, fences, and walls that do not obstruct flood flows; and storage yards for equipment and materials that are securely anchored or can be removed upon notice. The Authority would comply with CVFPB requirements for water crossings that enhance or maintain flood system and flood flow capacity, and reduce potential impedances of stormwater flows and flood risks.

Taken as a whole, all of the Central Valley Wye alternatives would temporarily place equipment and construction staging areas within FEMA-designated floodplains. Because the design of the Central Valley Wye alternatives includes flood and stormwater protection measures and would meet CVFPB requirements, it is not anticipated that there would be any changes in flood risk or other large-scale changes in floodplain flows. Therefore, there would be no related impacts for any of the alternatives.

CEQA Conclusion

The impact under CEQA would be less than significant because flood planning and protection measures, stormwater management, and compliance would be implemented during construction of the Central Valley Wye alternatives, which would avoid impeding or redirecting flood flows. Therefore, CEQA does not require any mitigation.

Impact HYD#8: Permanent Changes to Floodplain Flows

This discussion is limited to permanent floodplain and flood risk impacts and impacts on drainage patterns related to flooding. For hydrology impacts related to drainage patterns and stormwater runoff impacts, see Impact HYD#1: Temporary Changes to Drainage Patterns and Stormwater Runoff and Impact HYD#2: Permanent Changes to Drainage Patterns and Stormwater Runoff.

Each of the Central Valley Wye alternatives result in the placement of permanent features within designated FEMA flood zones. These features would include at-grade and elevated track, bridges and road under- or over-crossings, communications and electrical interconnections and infrastructure, and could cause on- or off-site flood risk. These impacts would vary greatly based on the location of permanent HSR infrastructure within flood zones. As presented in Table 3.8-12, the Avenue 21 to Road 13 Wye Alternative would result in the largest area (1,118 acres) within 100-year FEMA flood zones, while the SR 152 (North) to Road 11 Wye Alternative would have the smallest area in the 100-year FEMA flood zones (791 acres). The SR 152 (North) to Road 13 Wye Alternative and SR 152 (North) to Road 19 Wye Alternative would result in 889 acres and 1,057 acres, respectively, within 100-year FEMA flood zones.

All of the Central Valley Wye alternatives require multiple stream crossings and would cross the same waterbody multiple times. Where the Central Valley Wye alternatives are adjacent to existing rail or highway embankments, flood barriers may already exist. The Central Valley Wye alternatives would incorporate design features (HYD-IAMF#2) that require adequately sized culverts and waterbody crossings be provided to avoid the possibility of diverting or redirecting flood flows or increasing the water surface elevation in the 100-year floodplain by more than 1 foot, or as required by state or local agencies. These design standards would be implemented across the entire HSR project, are consistent with other state design standards (e.g., Caltrans), and would meet or exceed local requirements. The design of the Central Valley Wye alternatives would maintain the existing hydraulic capacity, avoiding a rise in existing flood or high-water elevations, and therefore would not increase existing 100-year floodwater surface elevation in FEMA-designated floodways, or as otherwise agreed upon with the county floodplains manager.

In areas where the Central Valley Wye alternatives are elevated, there would be no potential for diversion of shallow floods from overflowing channels because overland flow could pass beneath the elevated structure because of the design of the Central Valley Wye alternatives. At river and stream crossings, the Authority would design openings beneath the railbed (e.g., through the use of bridges and culverts) to allow the same volume of water to pass along the same flow path. The construction contractor would design each stream crossing to maintain existing hydrology and connectivity, but some physical changes would be necessary.

Most canals and channels would require new culverts. Most river and creek crossings would require bridges and may require the placement of piers in the floodway or floodplain. Design of these bridge crossings would include measures to minimize the impacts of placing piers in the floodplains and floodways. For example, the Authority would place piers parallel to the expected high-water flow direction and design the shape of the piers to minimize flow disturbance, negative hydraulic impacts, and erosion potential. Design features for each crossing would maintain the existing hydraulic capacity and would not contribute to a rise in existing flood or high-water elevations (HYD-IAMF#2). Therefore, the design of the Central Valley Wye alternatives would avoid flooding, changes to drainage patterns, risks to floodplains, obstructions of waterbodies limiting the ability to convey peak flows, and overtopping of existing embankments during construction.

The SR 152 (North) to Road 13 Wye Alternative would pass through levee-protected flood zones. These levees could fail if they are not properly maintained or reinforced to withstand potential stresses, such as seismic events or high volumes of water storage during storm events. In the event of levee failure, there could be flooding of areas along the HSR alignment. DWR has estimated that if one of the levees fails when the water surface elevation is at the top of a levee, between 3 and 9 feet of flooding depths would occur adjacent to the Eastside Bypass and the San Joaquin River (Authority and FRA 2016c). The San Joaquin River, Eastside Bypass, Ash Slough, Berenda Slough, and Chowchilla River levees are listed in the USACE Levee Safety Program, which protects safety and reduces flood risk of the nation’s levee systems. As the local sponsor, DWR receives funding for the operation and maintenance of these levees. The construction contractor would coordinate any future levee improvements beyond the scope of this environmental document with DWR and other relevant agencies. As a result, the Central Valley Wye alternatives would not change the existing flooding potential because of levee failure.

The floodplain RSA has a relatively flat gradient that slopes gently to the west or southwest. In areas subject to shallow flooding during a 100-year event, floodwater would pond and drain slowly across the flat topography and shallow land gradient of the RSA. During periods of high stream flow, shallow overland flooding, which ranges from 1 to 3 feet in depth, tends to pond against canal berms, levees, and road and railroad embankments that are perpendicular to the land gradient. Openings in the embankment (e.g., culverts) would continue to allow drainage to pass in the down-gradient direction and water would continue to pond on both sides of the embankment as it does under existing conditions. Because there would be no large-scale changes in flow paths, there would be no new impacts on upstream or downstream landowners.

All of the Central Valley Wye alternatives may trigger a lateral shift in flood flows outside of the existing floodplains. A lateral shift is an indicator of a river system's instability. Lateral shifts are responses to natural or human actions such as climate, discharge, sediment loading, aggradation/degradation, headcut, or development within the fluvial system. Prior to construction, the Authority would develop a flood protection plan specifying how the Central Valley Wye would be designed to remain operational during flood events and would minimize increases in 100-year or 200-year flood elevations (HYD-IAMF#2).

These measures provide specific requirements to avoid increasing flood depths, including minimizing development within the floodplain so water surface elevation in the floodplain would not increase by more than 1 foot during the 100-year or 200-year flood flow; raising the ground with fill above the base-flood elevation; designing the floodplain crossings to maintain a 100-year floodwater surface elevation; and elevating bridge crossings at least 3 feet above the high-water surface elevation to provide adequate clearance for floating debris. A geomorphology study would be prepared during the design phase, if required, which would address lateral flows. These design requirements and compliance with CVFPB requirements would enhance or maintain flood system and flood flow capacity and reduce potential impedances of stormwater flows and flood risks. Therefore, the design of the Central Valley Wye alternatives would avoid the potential for impacts from construction in the floodplain or disruption to the channels and floodplains.

All Central Valley Wye alternatives require bridge abutments associated with bridges or road overcrossings, utility relocation areas, and traction power substations (TPSSs). The Central Valley Wye alternatives would include requirements to minimize impediments or redirection of flood flows in the immediate vicinity of structures, maintain the existing flow conveyance capacity at each of these crossings, avoid impacts from pier construction techniques, minimize increases in flood elevations (HYD-IAMF#2), and retain pre-construction hydrology (HYD-IAMF#3). Therefore, the design of the Central Valley Wye alternatives would avoid the potential for permanent impedances or redirection of flood flows in the immediate vicinity of the structure and it is not anticipated that there would be an impact under any of the alternatives.

CEQA Conclusion

The impact under CEQA would be less than significant because bridge and design components, drainage features, agency coordination, and a flood protection plan would be implemented during construction of the Central Valley Wye alternatives. These actions would avoid impeding or redirecting flood flows. Therefore, CEQA does not require any mitigation.

Operations Impacts

Operations of the Central Valley Wye alternatives would include inspection and maintenance along the track and railroad right-of way, as well as on the structures, fencing, power system, train control, electric interconnection facilities, and communications. The operations and maintenance activities associated with the network upgrades would not change from baseline conditions. Operations and maintenance activities are more fully described in Chapter 2.

Surface Water Hydrology Impacts

Impact HYD#9: Intermittent Permanent Changes in Hydraulic Capacity and Connectivity

Operations activities associated with the Central Valley Wye alternatives would require intermittent maintenance activities, including bridge maintenance over waterways or maintenance performed on viaduct or bridge structures within the waterbody floodplain (such as bridge maintenance over the San Joaquin river and river floodplain). Maintenance of these structures and of the HSR right-of-way could impede or redirect surface flows by introducing equipment and barriers that would create a temporary obstacle to shallow overland flows. For example, impacts on the existing flow of a stream or river could occur within the water column during in-water bridge maintenance activities, such as those requiring temporary coffer dams, or other activities conducted within floodplains or near active waterbody channels during rainy times of year. If not properly managed, these activities could have intermittent ongoing effects on hydraulic capacity and connectivity (refer to Impact HYD#10 for a discussion of potential impacts from the discharge of pollutants and release of hazardous pollutants into surface water from operations).

Although these maintenance activities themselves are relatively short in duration, because they would be required over the life of the HSR, they would be considered to result in intermittent and permanent changes. As noted in Table 3.8-3 and Table 3.8-9, each of the four Central Valley Wye alternatives cross the same waterbodies and floodplains in most cases; therefore, these potential changes would be largely similar among the four alternatives.

The Authority would incorporate into the design of the Central Valley Wye alternatives HYD-IAMF#4, which would require preparation and implementation of an industrial SWPPP and a monitoring plan for any discharges of stormwater associated with transportation operations. Although not required to comply with local requirements, the Authority has also committed to coordinate with local agencies and to adhere to the local drainage and floodplain requirements to the maximum extent practicable (HYD-IAMF#2 and HYD- IAMF#3). Working together, these measures would prevent conducting maintenance activities in such a manner that there would not be changes to flow patterns or connectivity. Therefore, it is anticipated that all of the Central Valley Wye alternatives would avoid intermittent permanent changes to hydraulic capacity and connectivity.

CEQA Conclusion

The impact under CEQA would be less than significant because stormwater management measures would be implemented during operations of the Central Valley Wye alternatives and substantial changes in hydraulic capacity and connectivity in natural waterbodies would not occur. Therefore, CEQA does not require any mitigation.

Surface Water Quality Impacts

Impact HYD#10: Intermittent Permanent Surface Water Quality Impacts

Maintenance activities associated with any of the Central Valley Wye alternatives may require the use of herbicides or pesticides to control weeds and vermin anywhere within the permanent HSR right-of-way, but particularly along the trackbeds. This use would be periodic and ongoing and would be considered a permanent intermittent impact. The Central Valley Wye alternatives include requirements for the Authority or other assigned party (e.g., maintenance contractors) to follow appropriate laws and regulations pertaining to the use of herbicides and safety standards for employees and the public, as established by the USEPA and state authorities, including the California Department of Pesticide Regulation. With respect to the pollutants listed on the 303(d) List, the Central Valley Wye alternatives would not contribute chlorpyrifos, DDT, diazinon, or *Escherichia coli*. Applications would adhere to label directions for application rates and methods, storage, transportation, mixing, and container disposal. The Authority would use contracted applicators appropriately licensed by the state. Where necessary, HSR staff would coordinate with the County Agricultural Commissioners and obtain required licenses and permits prior to herbicide application. In addition, to the extent possible, the Authority would commit to identifying, avoiding, and minimizing hazardous substances in the material selection process for construction, operations, and maintenance of the HSR system as part of a comprehensive environmental management system (HMW-IAMF#3).

The technology for the HSR system does not require large amounts of lubricants or hazardous materials for operations compared to diesel locomotive fuel tanks. TPSSs, switching stations, and substations would require maintenance activities and the storage of oil and other materials for equipment maintenance. For example, oil-filled transformers require the storage of chemicals, such as cleaning liquids and mineral oil, for proper maintenance. The majority of materials used for maintenance would be nontoxic and would be stored in covered areas.

Existing federal and state laws regulate the storage of hazardous materials, and these materials would be located in maintenance areas with secondary containment to prevent potential spills in compliance with state and federal requirements and industry standard BMPs. Site-specific practices would be described in a field manual prepared by the contractor and would help identify BMPs for site cleanliness and materials control. In addition, the Central Valley Wye alternatives would incorporate measures to minimize and avoid potential impacts of hazardous materials. The Authority would implement an environmental management system to promote the use of

nonhazardous materials to the extent possible (HMW-IAMF#3), and hazardous materials monitoring plans would reduce the potential impacts of the use and storage of hazardous materials at Central Valley Wye facilities (i.e., TPSSs), including a hazardous materials business plan and a spill prevention, control, and countermeasure plan (HMW-IAMF#4). Therefore, the design of the Central Valley Wye alternatives would limit the amount of hazardous substances used for HSR operations and would have specific cleanup protocols and trained personnel to prevent accidental spills of hazardous materials reaching surface waterbodies.

In general, these intermittent permanent impacts would be similar for all four Central Valley Wye alternatives. However, new wood utility poles would be introduced under the SR 152 (North) to Road 19 Wye Alternative for the Site 7—Le Grand Junction/Sandy Mush Road, 115 kV Tie-Line. Wood utility poles use wood preservatives to maintain the integrity of poles and prevent them from prematurely degrading as a result of fungal rot, sap stain, mold, or insects. Common among wood treatments for utility poles in the United States are the chemicals pentachlorophenol, chromated copper arsenate (CCA), and creosote. Pentachlorophenol and creosote are known carcinogens, listed on California's Proposition 65 list. Proposition 65 is the Safe Drinking Water and Toxic Enforcement Act of 1986, which requires the state to publish a list of chemicals known to cause cancer, birth defects, or other reproductive harm. All three chemicals are subject to leaching and may appear in stormwater runoff that has made contact with utility poles (U.S. Department of Health and Human Services 2001, et al. 2002; Agency for Toxic Substances and Disease Registry 2011).

Given the very low amount of rain in the region (about 12 inches per year), opportunities for leaching wood preservative chemicals into the environment are limited. Furthermore, any leaching that could occur would be located in the immediate vicinity of the wood pole and would only be expected to enter surface water during periods of heavy or extended rainfall when local ephemeral drainages are linked to other waterways. Even in these cases, degradation and dispersion of these pollutants in the environment would reduce their concentration and no water quality impacts are expected.

Taken as a whole, none of the Central Valley Wye alternatives would contribute to an intermittent permanent violation of surface water quality standards because of the incorporation of effective IAMFs to avoid and minimize impacts, though some effects would occur and would be greatest for the SR 152 (North) to Road 19 Wye Alternative because of the need to add new wood utility poles.

CEQA Conclusion

The impact under CEQA would be less than significant because coordination, an environmental management system, and a hazardous materials plan to minimize hazardous substances would be implemented during operations of the Central Valley Wye alternatives and substantial changes in surface water quality would not occur. Therefore, CEQA does not require any mitigation.

Impact HYD#11: Continuous Permanent Surface Water Quality Impacts

Operations activities associated with all of the Central Valley Wye alternatives require new electrified rail service, which could increase the amount of pollutants associated with rail operations that may already exist in the watershed, primarily in areas not parallel to the existing BNSF Railway. The HSR system is electrically powered, and the HSR trains would not introduce significant new pollutant sources or types of pollutants. In addition, the electric trains would use a regenerative braking technology.[11] Burkhardt, Rossi, and Boller (2008) estimated the composition and quantity of substances released to the environment by the Swiss Federal Railways network based on use of consumable materials (i.e., brake pads, lubricants, and herbicides). In the case of the Swiss Federal Railways, the primary substances released from braking were iron, copper, manganese, and chromium; zinc was released from galvanized poles. Most of the releases into the environment were as particulate matter, which is airborne liquid and solid particles that cause

[11] When using regenerative braking, the train converts some kinetic energy into electrical energy and feeds this energy back into the overhead contact system to be used by other trains operating close by or to be fed back into the power supply utility network.

air pollution. The use of regenerative braking technology would result in reduced physical braking and associated wear, and would thereby minimize the release of metal particles.

Because the HSR would run parallel to the existing BNSF alignment for a portion of the alignment, and potential pollutant types for the HSR are fewer than those found in existing and active non-electrified railroads, the Central Valley Wye alternatives would not introduce new types of pollutants to the San Joaquin River Basin in the areas near the existing railway. Therefore, the at-grade tracks and the elevated guideways would be minimal pollutant-generating surfaces. Additional pollutant sources, such as residual debris from track wear, also would be minimal. No new sources of pollutants from trash would be introduced by the Central Valley Wye alternatives because the right-of-way would be fenced, restricting public access and keeping out flying debris, and the HSR trains would not have operable windows allowing riders to discard trash. Therefore, the design of the Central Valley Wye alternatives would minimize potential continuous permanent sources of pollution that could result in an impact to surface water quality. As each of the Central Valley Wye alternatives have similar route lengths and braking needs, there would be no distinguishable difference in these pollution effects among the four alternatives.

CEQA Conclusion

The impact under CEQA would be less than significant because electrical power, regenerative braking technology, fencing, and inoperable windows would be implemented during operations of the Central Valley Wye alternatives and substantial changes in water quality would not occur. Therefore, CEQA does not require any mitigation.

Groundwater Quality and Volume Impacts

Impact HYD#12: Continuous Permanent Groundwater Quality and Volume Impacts

Because the HSR system is electrically powered, the track runoff from train operations would carry few pollutants. In addition, as described in Section 3.6, current water use along the Central Valley Wye alternatives' alignments would decrease because the Central Valley Wye alternatives design does not include any stations or maintenance facilities, operations would not require on-going or permanent sources of water, and the Central Valley Wye alternatives would replace agricultural uses within the permanent area of disturbance that presently pump groundwater for irrigation. Additionally, as documented in Impact HYD#5 and Impact HYD#6, groundwater recharge is anticipated to be similar to current conditions after construction. Therefore, none of the Central Valley Wye alternatives would require the use of existing groundwater or installation of new groundwater supply wells and all of the Central Valley Wye alternatives would avoid continuous permanent groundwater quality and volume impacts.

CEQA Conclusion

The impact under CEQA would be less than significant because limited amounts of pollutant-generating material would be used during operations that could degrade groundwater quality, and no groundwater sources would be required during operations. Therefore, CEQA does not require any mitigation.

Floodplain and Flood Risk Impact

Impact HYD#13: Intermittent Permanent Floodplain Impacts

The floodplain RSA includes the FEMA- and DWR-designated flood hazard areas within the potential areas of disturbance of the Central Valley Wye alternatives, as well as any areas where the Central Valley Wye alternatives could affect flood frequency, extent, and duration. As shown on Figure 3.8-3, portions of the Central Valley Wye alternatives are in an SFHA (within the 100-year floodplain) or within the 500-year floodplains. However, much of the Central Valley Wye alternatives' impact areas lie outside of the 100-year floodplain. Areas above the 500-year flood level are areas of minimal flood hazard (Zones C and X on Figure 3.8-3). In general, areas within the 500-year floodplain are considered of moderate risk or designated base floodplains of lesser hazards or shallow flooding.

Operations activities associated with each of the Central Valley Wye alternatives would require periodic in-water bridge maintenance activities; however, operations of the Central Valley Wye

alternatives would occur in different parts of the 100-year floodplain (Figure 3.8-3). These activities could require the temporary placement of vehicles and other equipment such as scaffolding for maintenance of bridge and aerial structures; however, it would not typically require excavation, cut-and-fill construction, or obstruction within the floodway and on levees adjacent to a regulated stream during the flood season (wet season). In addition, consistent with typical SWPPP requirements, during maintenance activities, the person or persons responsible for water quality monitoring or the stormwater monitoring plan, usually a qualified stormwater practitioner, would monitor weather conditions for heavy storms (and potential flood flows) such that the maintenance crew would be able to relocate construction equipment, which could impede flows and increase flood risks, to minimize the potential flood risk (HYD-IAMF#3). The Central Valley Wye alternatives design includes standards (HYD-IAMF#2) where possible to minimize flow disturbance, and these structures would be temporary and would cause intermittent obstructions to surface flows. Therefore, the design of the Central Valley Wye alternatives would avoid any impacts of operations on floodplains and flood risk and there would be no discernable difference among the alternatives.

CEQA Conclusion

The impact under CEQA would be less than significant because flood planning and protection measures and stormwater management, which would avoid impeding or redirecting flood flows, would be implemented during operations of the Central Valley Wye alternatives. Therefore, CEQA does not require any mitigation.

Impact HYD#14 Continuous Permanent Exposure to Flood Hazards from Seismic Events

Operations activities associated with the Central Valley Wye alternatives would occur in areas that could be flooded from the failure of levees or dams. Levees conveying water for agricultural uses are prevalent throughout the floodplain RSA. Furthermore, the Central Valley Wye alternatives occur along the western portion of the Sierra Nevada, which is the site of many large dams that impound the waters of most of the west-flowing rivers that flow to the Central Valley to provide water for irrigation, drinking, recreation, and flood control. The potential for flooding from seismic events is the same for all of the Central Valley Wye alternatives. As discussed in Section 3.9, failure of Buchanan Dam, Hidden Dam, Friant Dam, or Pine Flat Dam from seismic events could result in inundation of portions of the right-of-way for all of the Central Valley Wye alternatives. Section 3.9 evaluates the risk of water inundation resulting from the failure of dams and seismic hazards at dams but excludes the evaluation of potential safety and security risks.

The Central Valley Wye alternatives design includes measures to allow the HSR system to safely remain operational during flood events (HYD-IAMF#2), except in cases where there is risk to life or safety, or damage to infrastructure. The contractor would prepare a flood protection plan for Authority review and approval that includes design standards that would minimize the effects on floodplains and floodways. The design of the Central Valley Wye alternatives would also include fire and life safety programs to require fire and life safety and security during operations and address the safety of passengers and employees during emergency response events, such as flooding (SS-IAMF#2). These fire and life safety programs would be coordinated with local emergency response organizations to provide them with an understanding of the HSR system, facilities, and operations, and to obtain their input for modifications to emergency response operations and facilities.

The Central Valley Wye alternatives also incorporate requirements for the contractor to conduct a preliminary hazards analysis during design and construction to determine and address facility hazards and vulnerabilities, thereby preventing impacts, such as risks of flooding, which may occur during operations (SS-IAMF#3). The Authority would implement the recommendations contained in the preliminary hazards analysis. With incorporation of these measures into the design of the Central Valley Wye alternatives, it is not anticipated that there would be any special safety or security risk for the HSR related to levee or dam failure and there would be no impact under any of the alternatives.

CEQA Conclusion

The impact under CEQA would be less than significant to the public and employees because the design of the Central Valley Wye alternatives include effective measures to avoid or minimize the potential for exposure of HSR passengers and employees to flooding and related risks, and new or additional exposure to flooding risks and hazards from the failure of a levee or dam would not occur. Therefore, CEQA does not require any mitigation.

3.8.7 Mitigation Measures

All construction and operations impacts would be minimized or avoided. No mitigation measures are required.

3.8.8 Impacts Summary for NEPA Comparison of Alternatives

This section summarizes the impacts of the Central Valley Wye alternatives and compares them to the anticipated impacts of the No Project Alternative. Table 3.8-13 provides a comparison of the potential impacts of each of the Central Valley Wye alternatives, summarizing the more detailed information provided in Section 3.8.6. A comparison of the impacts on hydrology and water resources of the different Central Valley Wye alternatives follows Table 3.8-13.

As discussed in Chapter 2, under the No Project Alternative, development resulting from an increasing population in Merced and Madera Counties is anticipated to continue recent development patterns, resulting in continued conversion of agricultural lands to residential and commercial land uses. This conversion of agricultural land (see Section 3.14) and construction and operation of new residential and commercial structures would modify local drainage patterns and runoff rates and could result in additional runoff entering waterways, potentially degrading stormwater quality. Planned transportation and industrial projects would also result in changes in hydrology and water quality from construction and operations activities, particularly for roadways requiring crossings of natural watercourses. Development and planned projects could place structures within the floodplains of nearby waterways and place these structures at risk of inundation, or divert flood flows such that there could be off-site flooding. Development of structures within groundwater basins would increase areas of impermeable surfaces, potentially changing runoff volumes and contributing to declines in regional groundwater levels and quality.

The Merced to Fresno Final EIR/EIS concluded that development of the HSR system would result in impacts on hydrology and water resources but that the project design elements would minimize effects during construction on drainage and stormwater runoff patterns, as well as groundwater quality, to a negligible level of intensity. The Merced to Fresno Final EIR/EIS also noted potential beneficial effects to groundwater conditions as a result of the project because permanent features of the project would convert land that is presently being irrigated using, in part, groundwater sources. Implementing the Central Valley Wye alternatives would also result in impacts on hydrology and water resources, particularly to surface water hydrology during construction activities.

The Central Valley Wye alternatives incorporate IAMFs that would minimize and avoid impacts on hydrology and water resources. These IAMFs include design features for stormwater management and flood protection, erosion and sedimentation controls, protection of groundwater quality, and waste management and materials pollution controls and are effective in minimizing impacts. However, effects during construction to surface water hydrology would still occur while projected benefits could be realized in other areas, such as through a potential reduction in regional groundwater withdrawals during operations. Overall, the four Central Valley Wye alternatives are not anticipated to result in impacts to hydrology or water resources that would require mitigation.

Table 3.8-13 Comparison of Central Valley Wye Alternative Impacts

Impacts	SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye
Construction				
Surface Water Hydrology Impacts				
Impact HYD#1: Temporary Changes to Drainage Patterns and Stormwater Runoff				
Effects related to total area of disturbance (acres)	3,272	4,031	2,900	3,115
Impact HYD#2: Permanent Changes to Drainage Patterns and Stormwater Runoff				
Effects related to area of permanent disturbance (acres)	2,615	2,804	2,414	2,566
Surface Water Quality Impacts				
Impact HYD#3: Temporary Surface Water Quality Impacts				
Effects related to total area of disturbance (acres)	3,272	4,031	2,900	3,115
Effects related to number of culverts and tunnels	19	20	22	16
Impact HYD#4: Permanent Surface Water Quality Impacts	No surface water quality degradation for any Central Valley Wye alternative; potential for local improvements for all Central Valley Wye alternatives			
Groundwater Impacts				
Impact HYD#5: Temporary Groundwater Quality and Volume Impacts	No anticipated groundwater impacts	Effects related to tunnel construction	No anticipated groundwater impacts	No anticipated groundwater impacts
Impact HYD#6: Permanent Groundwater Quality and Volume	Reduced groundwater use for all Central Valley Wye alternatives; no groundwater quality impacts from any Central Valley Wye alternative			
Floodplain and Flood Risk Impacts				
Impact HYD#7: Temporary Floodplain and Flood Risk Impacts	No anticipated temporary floodplain impacts or flood risks under any of the Central Valley Wye alternatives			
Impact HYD#8: Permanent Floodplain and Flood Risk Impacts				
Effects related to total acreage of development within 100-year floodplain	889	1,057	1,118	791
Operations and Maintenance				
Surface Water Hydrology Impacts				
Impact HYD#9: Intermittent Permanent Changes in Hydraulic Capacity and Connectivity	No anticipated intermittent permanent changes to hydraulic capacity and connectivity under any of the Central Valley Wye alternatives			

Impacts	SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye
Surface Water Quality Impacts				
Impact HYD#10: Intermittent Permanent Surface Water Quality Impacts	No anticipated impacts	Effects related to treated wood poles	No anticipated impacts	No anticipated impacts
Impact HYD#11: Continuous Permanent Surface Water Quality Impacts	Water pollution effects from all Central Valley Wye alternatives			
Groundwater Impacts				
Impact HYD#12: Continuous Permanent Groundwater Quality and Volume Impacts	No anticipated changes in groundwater quality or volume under any of the Central Valley Wye alternatives			
Floodplain and Flood Risk Impacts				
Impact HYD#13: Intermittent Permanent Floodplain Impacts	All of the Central Valley Wye alternatives would avoid impacts to floodplains and flood risk			
Impact HYD#14: Continuous Permanent Exposure to Flood Hazards from Seismic Events	All of the Central Valley Wye alternatives would avoid special safety or security risks associated with dam failure.			

Source: Authority, 2018

The Central Valley Wye alternatives could result in temporary and permanent construction-related impacts on hydrology and stormwater runoff patterns. These impacts are anticipated to be greatest for the alternative with the greatest area of land disturbance and topographical alteration, namely the SR 152 (North) to Road 19 Wye Alternative. Also, during construction, any of the Central Valley Wye alternatives would result in temporary effects to surface water quality. To estimate the relative impacts for each alternative, a two-part comparison was used: 1) the total area of land disturbance, and 2) the number waterbody crossings requiring a temporary diversion of water flows and/or excavation of the channel. Based on this methodology, the SR 152 (North) to Road 19 Wye Alternative would have the greatest level of impact related to the area of ground disturbance, and the Avenue 21 to Road 13 Wye alternative would have the most crossings that could cause water quality impacts.

Each of the Central Valley Wye alternatives cross multiple areas of FEMA-designated 100-year floodplain and, while no large-scale impacts are expected with the inclusion of IAMFs in the design, permanent impacts would occur. The types of impacts among alternatives are the same, and the magnitude of impacts would be greatest for the Avenue 21 to Road 13 Wye Alternative because it would require the largest area of development (1,118 acres) on floodplains within 100-year FEMA flood zones compared to the SR 152 (North) to Road 11 Wye Alternative, which would develop 29 percent less floodplain area (791 acres).

Effects related to groundwater quality and volume, and temporary floodplain and flood risk impacts, would be the same under all of the Central Valley Wye alternatives. Water use from groundwater sources is expected to be less than what is presently used in agricultural practices in the area following construction of any of the Central Valley Wye alternatives, and post-construction groundwater recharge is anticipated to be comparable to current recharge rates. Construction of the tunnel under the SR 152 (North) to Road 19 Wye Alternative would potentially result in the need to pump and discharge groundwater, as the water levels in groundwater basins that underlie the Central Valley Wye alternatives' project footprints are lower than the anticipated depth of excavation in all other areas. IAMFs would minimize impacts if groundwater is encountered during construction under any of the alternatives. Therefore, temporary and permanent impacts on groundwater quality and volume related to the construction of the Central

Valley Wye alternatives are not expected, but the temporary pumping and discharge of groundwater is possible under the SR 152 (North) to Road 19 Wye Alternative.

With incorporation of IAMFs, there are no impacts anticipated during operations of the Central Valley Wye alternatives. Maintenance and inspection activities would avoid disruptions to hydraulic capacity and connectivity of natural waterbodies, and would not impact floodplains flows. The Central Valley Wye alternatives would not require groundwater use for any of the alignments when the HSR system is operational; therefore, there would be no impacts on groundwater quality or volumes. There is no special risk of safety hazards during flood and seismic events because the Central Valley Wye alternatives include IAMFs and design standards that require a high level of seismic safety and flood protection as well as life safety measures.

Operations of the Central Valley Wye alternatives could result in an intermittent degradation of water quality as a result of pollutant emissions associated with train braking, as well as from chemicals used during maintenance, such as herbicides and pesticides used for vegetation control. These water quality effects would be the same under any of the alternatives, with the exception of a potential increase in water quality degradation associated with treatment chemicals in wood utility poles under the SR 152 (North) to Road 19 Wye Alternative for the Site 7—Le Grand Junction/Sandy Mush Road, 115 kV Tie-Line.

3.8.9 CEQA Significance Conclusions

Table 3.8-14 provides a summary of the CEQA determination of significance for all construction and operations impacts discussed in Section 3.8.6.3. The CEQA level of significance before and after mitigation for each impact in this table is the same for all Central Valley Wye alternatives.

Table 3.8-14 CEQA Significance Conclusions for Hydrology and Water Resources for the Central Valley Wye Alternatives

Impacts	CEQA Level of Significance before Mitigation	Mitigation Measure	CEQA Level of Significance after Mitigation
Construction			
Surface Water Hydrology Impacts			
Impact HYD#1: Temporary Changes to Drainage Patterns and Stormwater Runoff	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Impact HYD#2: Permanent Changes to Drainage Patterns and Stormwater Runoff	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Surface Water Quality Impacts			
Impact HYD#3: Temporary Surface Water Quality Impacts	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Impact HYD#4: Permanent Surface Water Quality Impacts	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Groundwater Quality and Volume Impacts			
Impact HYD#5: Temporary Groundwater Quality and Volume Impacts	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Impact HYD#6: Permanent Groundwater Quality and Volume Impacts	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Floodplain and Flood Risk Impacts			
Impact HYD#7: Temporary Changes to Floodplain Flows	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Impact HYD#8: Permanent Changes to Floodplain Flows	Less than significant for all alternatives	No mitigation measures are required	Not applicable

Impacts	CEQA Level of Significance before Mitigation	Mitigation Measure	CEQA Level of Significance after Mitigation
Operations			
Surface Water Hydrology Impacts			
Impact HYD#9: Intermittent Permanent Changes in Hydraulic Capacity and Connectivity	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Surface Water Quality Impacts			
Impact HYD#10: Intermittent Permanent Surface Water Quality Impacts	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Impact HYD#11: Continuous Permanent Surface Water Quality Impacts	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Groundwater Quality and Volume Impacts			
Impact HYD#12: Continuous Permanent Groundwater Quality and Volume Impacts	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Floodplain and Flood Risk Impacts			
Impact HYD#13: Intermittent Permanent Floodplain Impacts	Less than significant for all alternatives	No mitigation measures are required	Not applicable
Impact HYD#14: Continuous Permanent Exposure to Flood Hazards from Seismic Events	Less than significant for all alternatives	No mitigation measures are required	Not applicable

Source: Authority, 2018