4.9 HYDROLOGY AND WATER QUALITY

4.9.1 Introduction

This section describes the existing surface water and groundwater hydrology, use, and quality in the project area for proposed Segments 2 and 3, including alternatives. Surface water and groundwater in the project area were evaluated by reviewing maps showing the water bodies and drainages, by reviewing studies completed by and for state and local water agencies, and by obtaining information from city, regional, county, and state water agencies.

Areas of existing soil and water quality degradation were identified by searching federal and state regulatory agency databases that track sites with known, suspected, or potential hazardous substance contamination (for example, underground storage tanks or landfills). For sites that were identified in these databases, local regulatory agencies were contacted and files were reviewed for specific information regarding existing soil and groundwater conditions.

4.9.2 Watershed and Regulatory Issues

The proposed project and its alternatives are located in three major watersheds that drain into separate basins. Groundwater and surface water in the southern end of the project flow to the Santa Clara River Basin, while the northern end of the project drains to the Antelope Valley and Fremont Valley Basin. The Santa Clara and Antelope Valley watersheds are separated by the northwest portion of the San Gabriel Mountains, which provide a topographic and hydrologic divide. The Antelope Valley and Fremont Valley watersheds are separated by a topographic and hydrologic divide present in the Antelope Valley.

The Santa Clara River Basin is under the jurisdiction of the Los Angeles Regional Water Quality Control Board (RWQCB). The Antelope Valley and Fremont Valley Basins are under the jurisdiction of the Lahontan RWQCB. Segment 2 is located in Los Angeles County. Segment 3 and its alternatives are located partially in Los Angeles County and partially in Kern County.

4.9.2.1 Los Angeles County

Segment 2 is located in Los Angeles County, and Segment 3 and its alternatives are located within both Los Angeles County and Kern County (see Figure 4.9-1). Surface water and groundwater quality and use in Los Angeles County are under the jurisdiction of the Los Angeles County Department of Public Works (LACDPW). LACDPW operates and maintains 15 major dams and nearly 500 miles of open channel, 2,500 miles of underground storm drains, over 70,000 catch basins, about 300 debris retaining structures and 230 concrete stream bed stabilization structures, 40 pumping plants, and nearly 27 spreading grounds throughout Los Angeles County. They also monitor water quality at a network of stream stations and supply wells as well as coordinating responsibilities with 88 separate jurisdictions under the National Pollutant Discharge Elimination System (NPDES) Permit Program. Drainage and floodplain permits are required by the LADPW before constructions of certain facilities can begin. The permits require the developer to provide measures that keep peak 100-year storm flows at or below pre-development levels. The LADPW identifies flood control improvements required of new development and applies fees or conditions to ensure the improvements are built. Water quality in this area is also under the jurisdiction of the Los Angeles RWQCB.

4.9.2.2 Kern County

The proposed 500 kV T/L portion of Segment 3 between the Antelope Substation and Substation One, including Alternatives A and B, are partially located in Kern County (see Figure 4.9-1). The proposed 220 kV T/L between Substations One and Two, including T/L route Alternative C and all substation location alternatives, are located solely in Kern County. Surface water and groundwater quality and use in Kern County are under the jurisdiction of the County of Kern Engineering and Survey Service (KCESS). KCESS's authority gives them the right to make water available for any beneficial use or uses of lands or inhabitants, provide flood control, and prevent contamination of water, among others. They have the authority to maintain and monitor pollutant discharges from the County's storm water management infrastructure for the NPDES program. KCESS also reviews and inspects street, sewer, water, drainage, and grading plans for County projects and development permits and they collect floodplain mapping and hydrologic data. They are the floodplain manager for the unincorporated areas and they implement and oversee the National Flood Insurance Program. Water quality in this area is also under the jurisdiction of the RWQCB, South Lahontan Region.

4.9.2.3 Federal and State Requirements

The RWQCBs implement water quality regulations under the Federal Clear Water Act (CWA) and the State Porter-Cologne Act. The regulations require compliance with the NPDES program. Construction activities for this project require an NPDES General Construction Permit for discharges of storm water runoff associated with construction activity. A Notice of Intent (NOI) to the State Water Resources Control Board (SWRCB) to be covered by the General Permit would be required for Segments 2 and 3 prior to the initiation of construction. The General Permit requires the implementation of a Storm Water Pollution Prevention Plan (SWPPP), which must be prepared before construction begins. The SWPPP requirements include:

- Specifications for best management practices (BMPs) that would be implemented during project construction to minimize the potential for accidental releases and to minimize runoff from the construction areas, including storage and maintenance areas and building material laydown areas
- A description of a plan for communicating appropriate work practices to field workers
- A plan for monitoring, inspecting, and reporting any release of hazardous materials

During construction, the RWQCBs would oversee and inspect the project for the SWRCB.

4.9.2.3.1 <u>Section 404 Permits</u>. Waters of the United States (including wetlands) are subject to U.S. Army Corps of Engineers (Corps) jurisdiction under Section 404 of the CWA. Section 404 regulates the filling and dredging of U.S. waters. The limits of nontidal waters extend to the Ordinary High Water (OHW) line, defined as the line on the shore established by the fluctuation of water and indicated by physical characteristics such as a natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, presence of litter or debris, or other appropriate means. In general, ditches excavated on dry land that do not convey flows from historical streams are considered non-jurisdictional as determined by the Corps on a case-by-case basis. A Section 404 permit would be required for project construction activities involving excavation of, or placement of fill material into, waters of the United States. A Water Quality Certification pursuant to Section 401 of the CWA is required for Section 404 permit actions. If applicable, construction would also require a request for Water Quality Certification (or Waiver thereof) from the RWQCB.

4.9.2.3.2 <u>Streambed Alteration Agreements</u>. Sections 1600-1616 of the California Fish and Game Code stipulate that a governmental or private entity may not substantially divert or obstruct the natural flow of, or change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit debris or waste materials into such waterbodies, until a permit has been issued by the California Department of Fish and Game (CDFG) to authorize such activity.

The permit application process includes submitting a complete Lake and Streambed Alteration Program Notification Package that includes the Notification of Lake or Streambed Alteration Form (FG 2023), Project Questionnaire (FG 2024), and an appropriate processing fee based upon total project cost. The information is available on the CDFG website at http://www.dfg.ca.gov/1600/notification_pkg.html.

4.9.3 Surface Water

The proposed project area for Segments 2 and 3, including alternatives, are located in three major watersheds that drain into separate basins. Surface water in the southern end of the project area flows to the Santa Clara River Basin in the South Coast Hydrologic Region. The proposed facilities in the northern end of the project drain to the Antelope Valley and Fremont Valley Basin in the South Lahontan Hydrologic Region. The Santa Clara and Antelope Valley watersheds are separated by the northwest portion of the San Gabriel Mountains, which provide a topographic and hydrologic divide. The Antelope Valley and Fremont Valley watersheds are separated by a topographic and hydrologic divide present in Antelope Valley.

4.9.3.1 Segment 2

The Segment 2 alignment proceeds generally in a southeasterly direction from the Antelope Substation located in the western portion of the City of Lancaster. From MP 0 to approximately MP 16.5 (refer to Figure 3-2), Segment 2 crosses the surface water Antelope Valley Hydrologic Unit in the South Lahontan Hydrologic Region as defined by the Lahontan RWQCB (2002). From MP 16.5 to its terminus at the Vincent Substation (MP 21.5), Segment 2 crosses the surface water Santa Clara Hydrologic Region as defined by the Los Angeles RWQCB.

4.9.3.1.1 South Lahontan Region Surface Water – Antelope Valley Hydrologic Unit. The major portions of the proposed 500 kV T/Ls and other project facilities for Segment 2 are located in the South Lahontan Hydrologic Region/Antelope Valley Hydrologic Unit (Figure 4.9-1). This Unit receives runoff from Big Rock and Little Rock Creeks from the San Gabriel Mountains and from Oak Creek and Cottonwood Creek in the Tehachapi Mountains. This area receives average annual rainfall ranging from 4.04 to 6.89 inches per year based on LACDPW rain gauge data. Segment 2 traverses several intermittent and ephemeral streams that generally infiltrate all of their runoff into alluvial fans at their canyon outlets. In extreme storm events, the streams eventually convey storm runoff to Rosamond Lake located northeast of the City of Lancaster within the boundaries of Edwards Air Force Base. Rosamond Lake is generally dry much of the year. When inundated, the streams and lake provide recharge to the underlying groundwater basin. The area is subject to high-intensity thunderstorms and intense general rains in the summer, fall, and winter.

Segment 2 crossed the California Aqueduct at MP 4.5. The East Branch of the California Aqueduct alignment along the northeastern margin of the San Gabriel Mountains delivers State Water Project water to the Antelope Valley-East Kern Water Agency (AVEK) and to the Mojave Water Agency further east. AVEK is a State Water Contractor and has received water from the aqueduct since 1972 for delivery to 22 water purveyors for agricultural, municipal, and industrial use. AVEK's maximum allocation is 141,400 acre-feet per year. In 1995 and 1996 they received approximately 49,000 and 58,000 acre-feet of water, respectively (Woodward-Clyde, 1997). Currently, AVEK's water customers are using about 75,000 acre-feet per year (Kern County, 2003a), which corresponds to an average flow rate in the aqueduct of about 103.5 cubic feet per second (cfs).

4.9.3.1.2 South Coast Region Surface Water – Santa Clara Hydrologic Unit. The small portion of Segment 2 located in the South Coast Region is in the upper Santa Clara River Basin in the Santa Clara Hydrologic Unit (Figure 4.9-1). Based on data obtained from the LACDPW, the project area in the headwaters of the Santa Clara River Basin has an average annual precipitation of 9.63 inches. Most of the precipitation occurs during the wet season extending from November through April.

The Santa Clara River watershed is approximately 1,630 square miles within Los Angeles and Ventura counties with about 40 percent of the watershed in Los Angeles County. The watershed extends from the San Gabriel Mountains to its outlet in the Pacific Ocean in Ventura County. Approximately 90 percent of the watershed consists of rugged mountains of up to 8,800 feet in elevation; the remainder consists of valley floor and coastal plain (AMEC Environmental, 2003). Portions of the upper Santa Clara River are perennial due to baseflow occurring from groundwater.

4.9.3.2 Segment 3 and Alternatives – South Lahontan Region Surface Water

The Segment 3 alignment and its alternatives proceed northerly from the Antelope Substation located in the western portion of the City of Lancaster into Los Angeles and Kern counties. From the Antelope Substation to all three proposed Substation 1, 1A, and 1B sites, the T/L routes are located in the surface water Antelope Valley Hydrologic Unit in the South Lahontan Hydrologic Region as defined by the Lahontan RWQCB (2002) (Figure 4.9-1). The Proposed 220 kV Substation One to Substation Two route and the Alternative C route are located in the Antelope Valley Hydrologic Unit from the Substation One location to mile 31.5 and mile 7.3, respectively. The remaining portions of the proposed T/Ls and project facilities are located in the East Tehachapi Hydrologic Area tributary to the Fremont Valley Hydrologic Unit (Figure 4.9-1).

4.9.3.2.1 Antelope Valley Hydrologic Unit. The Antelope Valley Hydrologic Unit has been discussed above in Section 4.9.3.1.1. In addition, the westernmost portions of the Hydrologic Unit receive average annual rainfall amounts ranging from 10 to 14 inches (DWR, 2003). The largest floods recorded were those of 1932, 1938, and 1945. The 1932 and 1945 storms occurred as convective storms in late summer, while the 1938 event occurred in the winter as a series of high-intensity, long-duration storms. One of the largest intermittent streams crossed by the project, Oak Creek, has a drainage area of 15.8 square miles (KCPD, 1986). The Kern County Water Agency reports that peak flows of 1,740 cfs occurred in Oak Creek during the winter of 1972, and a peak flow of 750 cfs occurred in the winter of 1978. The highest flow reported during the months of June through October from 1959 to 1984 was 235 cfs in the summer of 1972.

4.9.3.2.2 Fremont Valley Hydrologic Unit. The Fremont Valley Hydrologic Unit (HU) identified in the Lahontan RWQCB Basin Plan overlies the Fremont Valley groundwater basin. The HU receives runoff from Lone Tree Canyon, Cache Creek, and adjacent ridges. Surface water drains toward generally dry Koehn Lake located about 20 miles northeast of the Community of Mojave. However, surface drainage in the watershed overlying the most southwestern part of the Fremont Valley drains southward toward the community of Rosamond. One of the largest streams in the HU is Cache Creek, with a drainage area of 96.5 square miles and which has an estimated peak flow of 34,400 cfs for a 100-year event (KCPD, 1986). The Kern County Water Agency reports that peak flows of 2,100 cfs occurred during the summer of 1972 and winter of 1978, and a peak flow of 2,245 cfs occurred in the winter of 1983.

The portion of the project area in the Fremont HU is in the East Tehachapi Hydrologic Area (HA). This HA overlies the Tehachapi Valley East groundwater basin, which is separated by an alluvial high topographic boundary from the Tehachapi Valley West groundwater basin that is part of the San Joaquin Hydrologic Region. Surface water east of the divide either ponds in Proctor Dry Lake or flows eastward down Cache Creek toward the Fremont Valley. Water ponds in Proctor Dry Lake due to a slight surface drainage divide between the lake and Cache Creek. Normally dry during the summer, Proctor Lake is one of the lowest points in the Tehachapi Valley and receives a significant portion of the winter runoff.

4.9.3.3 FEMA 100-Year Floodplain Boundaries

The Federal Emergency Management Agency (FEMA) has estimated areas subject to flooding in the project areas in the Fremont Valley and Antelope Valley Hydrologic Units as shown on Figure 4.9-2. FEMA's Flood Insurance Rate Maps (FIRMs) define the predicted boundaries of 100-year (Zone A) floods. Many of the areas of potential flooding shown on the map were not delineated through detailed hydrologic and hydraulic analyses and, therefore, have approximate limits. Although the proposed T/Ls cross 100-year floodplain areas, the proposed and alternative substation locations are not located within 100-year floodplain areas.

The abrupt discontinuity in the 100-year floodplain zone at the Kern-Los Angeles County boundary is not a result of detailed hydraulic studies, based on information provided by the Kern County Department of Engineering and Survey Services (Farr, 2004). This boundary was based on approximate hydrologic information for Kern County developed by the Corps during the 1980s. However, a detailed study that would refine the boundaries to reflect updated peak flows and realistic flow patterns was never performed, so the boundaries have never been revised.

4.9.3.4 Dam Failure Inundation Area

To help local jurisdictions develop evacuation plans for areas below dams, the State Office of Emergency Services (OES) and the Department of Water Resources (DWR) require dam owners to evaluate areas of potential inundation in the event of dam failures and estimate when floodwaters would arrive at downstream locations. Projected inundation limits are approximate and assume severe hypothetical failures, thus showing a conservative estimate of potential flooding in the improbable occurrence of failure and resulting flooding. There are no dams that would inundate the proposed Segments 2 and 3 facilities in the event of a dam failure.

4.9.4 South Lahontan Hydrologic Region Groundwater

As depicted on Figure 4.9-1, most of the Segment 2 proposed and alternative routes occur in the Antelope Valley Groundwater Basin. The southern terminus of Segment 2 crosses a groundwater subbasin that is located in the South Coast Hydrologic Region, but is hydrologically connected to the Antelope Valley Groundwater Basin even though surface water runoff flows to the Santa Clara River. The proposed Segment 3 project and its alternatives are located in two major groundwater basins, the Antelope Valley and Fremont Valley Groundwater Basins (Figure 4.9-1). The proposed and Alternative C 220 kV T/L routes also enters the Tehachapi Valley East Groundwater Basin (Figure 4.9-1).

There is a discrepancy in the boundary between the Fremont Valley and Antelope Valley groundwater basins. Although the GIS map obtained from DWR shows the boundary to the be located to the Northeast of the City of Mojave, DWR's Updated Bulletin 118 (2003) describes the boundary as located "…at a groundwater divide approximated by a southeastward-trending line from the mouth of Oak Creek through Middle Butte to exposed bedrock near Gen Hill." Based on this description, the proposed T/Ls and substations northeast of Oak Creek are located in the Fremont Valley Groundwater Basin. For this report, it is assumed that these facilities are located in the Fremont Valley Groundwater Basin.

4.9.4.1 Segment 2 – Antelope Valley Groundwater Basin

As depicted by the colored area on Figure 4.9-1, the major portion of Segment 2 is located in the Antelope Valley Groundwater Basin in the South Lahontan Hydrologic Region as defined by DWR (Bulletin 118, 2003). The non-colored areas along the T/L route coincide with the Portal Ridge and the Sierra Pelona geologic formations where no groundwater basins are indicated. The Antelope Valley Basin is the principal water basin for southeastern Kern

County and the portion of Los Angeles County in the vicinity of the City of Lancaster. The surface area of the basin is approximately 1,580 square miles extending across Kern, Los Angeles, and San Bernardino counties. This basin is bounded to the northwest by the Garlock fault zone and on the southwest by the San Andreas fault zone. The eastern boundary is a surface and groundwater drainage divide, and to the north is the Fremont Valley Groundwater Basin.

The primary water-bearing materials are the Pleistocene and Holocene age unconsolidated alluvial and lacustrine deposits. An upper aquifer is generally unconfined and supplies most of the groundwater for the valley, while a lower aquifer is generally confined. Wells typically have moderate to high yields (DWR, 2003). The Antelope Valley groundwater basin receives recharge from Big Rock and Little Rock creeks from the San Gabriel Mountains and from Oak Creek and Cottonwood Creek in the Tehachapi Mountains.

Hydrographs of wells located in the vicinity of Soledad Mountain near the Fremont Valley/Antelope Valley basin boundary show that the unconfined groundwater table has been decreasing steadily from 1981 through 1997 at a rate of 0.25 to 0.50 feet per year (KCPD, 1997).

4.9.4.2 Segment 3 and Alternatives – Groundwater

4.9.4.2.1 Antelope Valley Groundwater Basin. The Segment 3 proposed and alternative T/L routes are within the Antelope Valley Groundwater Basin (Figure 4.9-1). The Antelope Valley Groundwater Basin has been described above in Section 4.9.4.1.

4.9.4.2.2 Fremont Valley Groundwater Basin. The Substation One to Substation Two Alternative C 220 kV route intercepts the westernmost extent of the Fremont Valley Groundwater Basin in the vicinity of Cameron Canyon (Figure 4.9-1). The Fremont Valley Groundwater Basin underlies Fremont Valley in eastern Kern County and northwestern San Bernardino County. The basin is bounded by impermeable crystalline rocks to the north, west, and east, and by the Antelope Valley Groundwater Basin groundwater divide to the south. The basin has a surface area of approximately 523 square miles and an estimated storage capacity of 4,800,000 acre-feet, and receives recharge from Lone Tree Canyon, Cache Creek, and other adjacent intermittent streams that drain toward Koehn Lake, which is generally dry. Average annual groundwater recharge to the basin has been estimated as 18,000 acre-feet per year (Kern County, 1997).

The most important water-bearing deposit is Quaternary alluvium up to about 1,190 feet thick along the margin of the basin. Groundwater in the alluvium is generally unconfined, although locally confined conditions occur near Koehn Lake due to the thick layers of lacustrine silt and clay found there. Average well yield is about 530 gallons per minute (gpm) with a maximum yield of 2,580 gpm (DWR, 2003). Well hydrographs indicate that historic declines have largely stopped, with declines of only about 5 to 6 feet in the period from 1980 through 1999.

4.9.4.2.3 Tehachapi Valley East Groundwater Basin. The proposed Substation One to Substation Two 220 kV T/L route intercepts the Tehachapi Valley East Groundwater Basin in the approximate vicinity of MP 33.0. The Alternative C 220 kV T/L route intercepts the basin boundary in the approximate vicinity of MP 8.0 (Figure 4.9-1).

The Tehachapi Valley East Groundwater Basin is a northeast-southwest-trending basin with a surface area of approximately 37 square miles. It is bounded on the north by the Sierra Nevada Mountains and on the south and east by the Tehachapi Mountains. The Tehachapi Valley East Groundwater Basin is separated by an alluvial high topographic boundary from the Tehachapi Valley West Groundwater Basin that is part of the San Joaquin Hydrologic Region. Surface drainage either ponds in Proctor Dry Lake or is drained by Cache Creek from eastward to the Fremont Valley Groundwater Basin.

This basin consists primarily of younger alluvium that extends to a depth of 750 feet. The basin is reported to have a storage capacity of 150,000 acre-feet (DWR, 2003) and a specific yield ranging from seven percent at its center to 10 percent on the alluvial fan margins. Groundwater levels dropped about 58 feet from 1951 through 1978, but have since recovered by 55 feet as of 1999 (DWR, 2003). The Tehachapi-Cummings County Water District has jurisdiction over the aquifer.

4.9.5 South Lahontan Region Surface and Groundwater Quality

4.9.5.1 Segment 2 – Surface and Groundwater Quality

Surface water beneficial uses identified within the greater Fremont Valley Hydrologic Unit include municipal and agricultural supply, groundwater recharge, water contact and non-contact recreation, warm freshwater habitat, and wildlife habitat (Lahontan RWQCB, 2002). Surface water quality data in the Antelope Valley Hydrologic Unit from a point just upstream of AVEK's first turnout on the California Aqueduct showed that TDS levels ranged from 80 to 404 milligrams per liter (mg/L) with an average of 214 mg/L over the period from January 1995 through July 1997. Arsenic averaged 2 ppm over the same period, less than the maximum contaminant level allowed in drinking water of 5 ppm.

Groundwater quality data from public supply wells in the Antelope Valley Groundwater Basin show an average total dissolved solids (TDS) content of 374 mg/L, with a range from 123 to 1,970 mg/L. The Lahontan Basin plan (Lahontan RWQCB, 2002) lists the beneficial uses for groundwater from this basin as municipal, agricultural, and industrial supply and freshwater replenishment.

4.9.5.2 Segment 3 – Surface and Groundwater Quality

4.9.5.2.1 Antelope Valley Surface and Groundwater Quality. Surface water quality for the Antelope Valley Hydrologic Unit and groundwater quality for the Antelope Valley Groundwater Basin were discussed above in Section 4.9.5.1.

4.9.5.2.2 Fremont Valley Surface and Groundwater Quality. Surface water beneficial uses identified within the greater Fremont Valley Hydrologic Unit include municipal and agricultural supply, groundwater recharge, water contact and non-contact recreation, warm freshwater habitat, and wildlife habitat (Lahontan RWQCB, 2002). TDS content in Fremont Valley groundwater averages from 350 to 1,100 mg/L, with areas of very high TDS levels near Koehn Lake. The Lahontan Basin plan (Lahontan RWQCB, 2002) lists the beneficial uses for groundwater from this basin as municipal, agricultural, and industrial supply and freshwater replenishment.

4.9.5.2.3 East Tehachapi Surface and Groundwater Quality. Surface water beneficial uses identified within the East Tehachapi HA include municipal and agricultural supply, groundwater recharge, navigation, water contact and non-contact recreation, warm freshwater habitat, and wildlife habitat (Lahontan RWQCB, 2002). TDS levels in groundwater are reported to range from 298 to 405 mg/L with an average concentration of 361 mg/L (DWR, 2003). The Lahontan Basin plan (Lahontan RWQCB, 2002) lists the beneficial uses for groundwater from this basin as municipal, agricultural, and industrial supply, and freshwater replenishment.