The proposed transmission line routes and the two alternative routes would lie between the Laguna Salada Fault (about 9 mi [14 km] west), the Superstition Hills Fault (about 9 mi [14 km] northeast), and the Imperial Fault (about 14 mi [23 km] east) (Figure 3.1-2). In recent history, the Imperial Fault has had the most activity. Earthquakes along this fault have produced surface rupture (i.e., breakage of the ground) along the surface trace of the fault and offsets as great as 15 ft (4.5 m) (SCEDC 2004).

3.2 WATER RESOURCES

Water resources associated with the transmission line projects include surface water, wetlands, floodplains, and groundwater.

3.2.1 Surface Water Resources

The proposed routes and the two alternative routes for the projects lie within Imperial Valley, California, and the Colorado Desert. Very high summer temperatures, low precipitation, and high evaporation rates produce an extremely arid environment. Imperial Valley, California, has an average annual rainfall of about 3 in. (8 cm) (Setmire 2000). Under these conditions, surface water is scarce. The only surface water resource that would be directly affected by the projects is the New River. Indirect impacts would affect the Salton Sea and a pilot wetland project (at Brawley) along the New River. No natural wetlands occur along the New River (Barrett 2004).

The following sections present background information on the New River, the Zaragoza Oxidation Lagoons, Salton Sea, and the Brawley wetland. This information is used in Section 4.2 to evaluate the environmental impacts of the projects to surface water resources in the United States. The Zaragoza Oxidation Lagoons, a man-made feature, are part of the plants' operating systems (as described in Chapter 2). They are discussed in this section because they are also a source of water for the New River.

3.2.1.1 New River

3.2.1.1.1 Physical Conditions. The New River originates about 15 mi (24 km) south of Mexicali, Mexico, and flows 60 mi (97 km) northward through Imperial County, California, to the Salton Sea (EPA 2003b). The channel of the New River was formed between October 1905 and February 1907, when high waters following summer flooding in the Colorado River breached a temporary diversion that had been designed to bypass a silted-up section of the

Imperial Canal (Setmire 2000; CRBRWQCB 1998a).[1] Water from the diverted Colorado River flowed for about 18 months, creating the New River and the Salton Sea. The breach created a channel that was 40 to 60 ft (12 to 18 m) deep, with a width of about 1,800 ft (549 m) (IID 2003c).

The New River flows north through Mexicali, crosses the U.S.-Mexico border at Calexico, California, and then flows northward through Imperial County to the Salton Sea (DHHS 1996; EPA 2003b). As it flows northward from Calexico, it passes through Seeley, Imperial, Brawley, and Westmorland, California (Figure 3.2-1).

In Mexico, the New River is reportedly used for bathing, drinking, household chores, and irrigation of crops (DHHS 1996). In the United States, water in the New River is used for agriculture via irrigation, and recreation. It is not used as a source of drinking water. Recreational activities include waterfowl hunting, fishing, and frog catching (DHHS 1996). Beneficial uses of the New River include freshwater replenishment; industrial surface water supply; preservation of rare, threatened species; water contact and noncontact recreation; warm freshwater habitat; and wildlife habitat (EPA 2003c).

Within the United States, the channel of the New River has a maximum width of about 3,500 ft (1,067 m) (CRBRWQCB 1998a). Recent USGS measurements at Calexico, California, indicate that the New River has a width of about 40 ft (12 m); at Westmorland, California, its width is about 95 ft (30 m) (USGS 2003a,b). The depth of the water depends on its flow. At the Calexico gage, between 1983 and 2003, the depth of water (i.e., stage) ranged from about 8 to 15 ft (2.4 to 15 m) (USGS 2003c).

The annual mean flows for the New River at USGS gages (10254970) at Calexico and Westmorland (10255550), California, are listed in Table 3.2-1 and shown in Figure 3.2-2. Between the U.S.-Mexico border and the gage near Westmorland, the New River gains in flow because of agricultural runoff and wastewater discharge. The mean flow at the Calexico gage is approximately 180,000 ac-ft/yr (7.04 m^3/s) for the period of record 1980 through 2001; the mean flow at Westmorland, California, for the same period is about 463,000 ac-ft/yr (18.10 m^3/s). As Table 3.2-1 and Figure 3.2-2 indicate, flow at these gages varies from year to

Standard Deviation

A statistical measure of spread or variability. The definition for standard deviation is the square root of the variance. In more simple terms, standard deviation is a statistic that tells you how tightly all of the various examples you are looking at are clustered around the mean (average) in a set of data. When the examples are tightly bunched together, the standard deviation is small. When the examples are spread apart, the standard deviation becomes relatively large. In the case of the New River, numerous measurements have been taken of flow rate over a one-year period. The standard deviation of these measurements was then calculated as a measure of the normal variation of flow.

[1] The Colorado River Basin Regional Water Quality Control Board (CRBRWQCB) is one of nine regional water quality boards (collectively known as the California Regional Water Quality Control Board) that regulate most of the water-related projects in California. These agencies are managed under the State Water Resources Control Board (SWRCB), located in Sacramento, California, which is part of the California EPA (Cal/EPA).

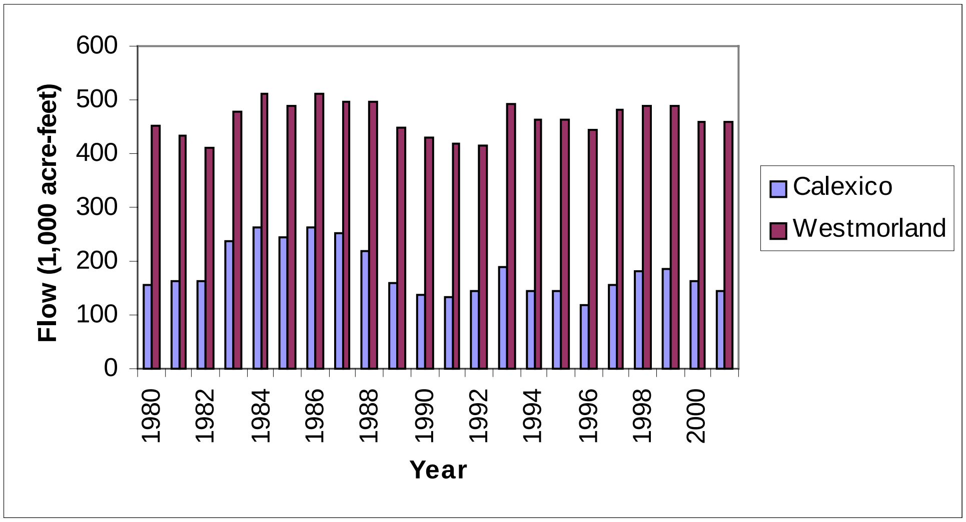

FIGURE 3.2-2 Annual Mean Flow in the New River at Calexico and Westmorland, California, 1980–2000 (Source: USGS 2003a,b)

year. The variability of the flow at Calexico, California, is about 46,000 ac-ft/yr (1.80 m^3/s); the variability at Westmorland, California, is about 31,000 ac-ft/yr (1.21 m^3/s). Minimum flows recorded for the Calexico and Westmorland gages for the period of record 1980 through 2001 were about 118,000 and 412,000 ac-ft/yr (4.62 and 16.11 m^3/s), respectively; maximum flows were about 264,000 and 513,000 ac-ft/yr (10.33 and 20.06 m^3/s), respectively (Table 3.2-1).

Figures 3.2-3 and 3.2-4 show depth/flow curves using the USGS data. These curves estimate the correlation between water depth and flow. A linear regression model was applied to the data to reduce its variability. The regression line shown in Figure 3.2-3 for the Calexico gage, along with its equation and R^2 coefficient (coefficient of determination; an R^2 value of 0.0 indicates that knowledge of variable *X* [in this case, flow] does not help in predicting value *Y* [in this case, the depth of the water]; an R^2 value of 1.0 indicates that all *Y* values are perfectly predicted from knowledge of *X*; i.e., *Y* lies on a straight line with no scatter). For a mean flow of 180,000 ac-ft/yr (7.04 m^3/s), the depth of the water in the New River at the Calexico gage calculated with the linear regression model is approximately 9.5 ft (2.9 m). For a standard deviation of 45,600 ac-ft/yr (1.78 m^3/s), the elevation of the water for a flow equal to the mean flow value minus one standard deviation 135,380 ac-ft/yr (5.30 m^3/s) would be about 9.0 ft (2.7 m), a difference of 0.5 ft (0.15 m) from calculated mean-flow conditions.

At the Westmorland gage, shown in Figure 3.2-4, the depth of the water ranges from about 4.6 to 7.4 ft (1.4 to 2.3 m) for a flow that ranged from about 260,600 to 680,500 ac-ft/yr (10.19 to 26.61 m^3/s) over the period of record 1993 through 2003 (USGS 2003d). Because the depth/flow data have short-scale variability, similar to that observed in the data for the Calexico depth/flow data, a linear regression model was again applied. Figure 3.2-4 shows the regression line for the model, its equation, and R^2 value. For a mean flow of 463,340 ac-ft/yr (18.12 m^2/s), the depth of the water calculated, using the linear regression model of the data, is about 6.0 ft

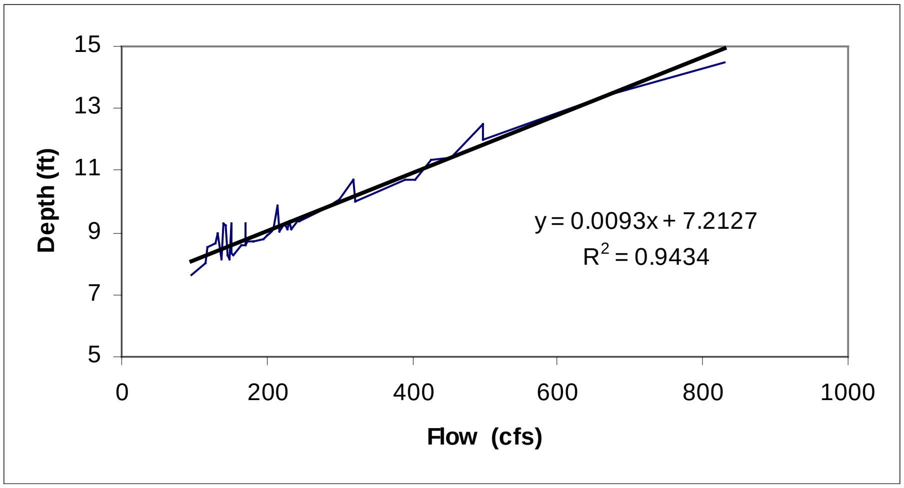

FIGURE 3.2-3 Depth/Flow Relationship for the Calexico Gage

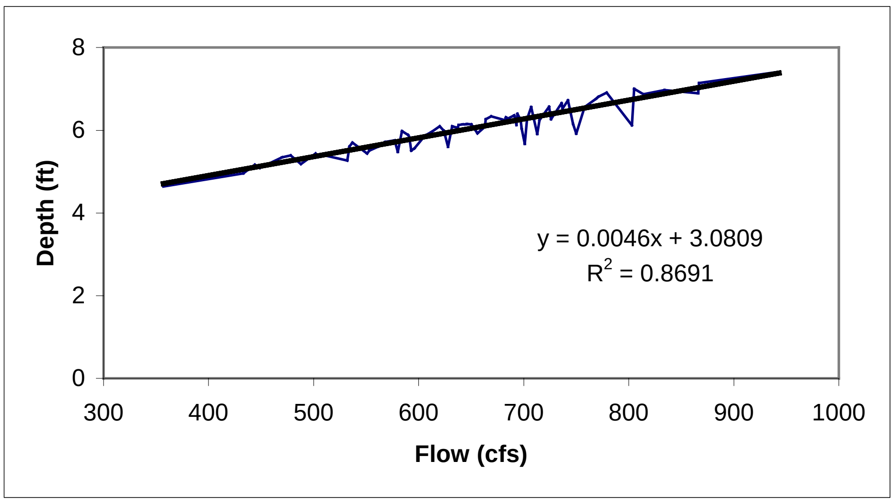

FIGURE 3.2-4 Depth/Flow Relationship for the Westmorland Gage on the New River (to convert ft^3/s to m^3/s, multiply by 0.02832)

(1.8 m). For a standard deviation of 31,130 ac-ft/yr (1.22 m^3/s), the depth of the water for a flow equal to the mean value minus one standard deviation calculated with the linear regression model is about 5.8 ft (1.8 m), a difference of 0.2 ft (0.1 m) from mean-flow conditions.

3.2.1.1.2 Water Quality. Water quality in the New River is, in general, poor. Pollution sources include agricultural drainage (both tailwater [i.e., surface water that drains from the low end of an irrigated field when the amount of water added to the field exceeds the infiltration capacity of the soil] and tilewater [i.e., subsurface water that drains via tiles from an irrigated field]); industrial and residential wastewater from Mexicali, Mexico, and the Imperial Valley in

California; and runoff from confined animal feeding operations and industrial and household “dumps” along the river.

Tiles

Man-made subsurface drains remove excess water from soil, usually through a network of perforated tubes installed 2 to 4 ft (0.6 to 1.2 m) below the soil surface. These tubes are commonly called “tiles” because they were originally made from short lengths of clay pipes.

Maquiladoras are sources of New River pollution in Mexicali (Pauw 2003). A maquiladora is a Mexican corporation that operates under a maquila (Mexican In-Bond) program approved by the Mexican Secretariat of Commerce and Industrial Development (Baz 2003). Many of these industries discharge untreated wastewater into rivers daily (American Rivers 2003). Additional pollution from south of the U.S.-Mexico border comes from the operation of two wastewater treatment lagoon systems in two water treatment districts (Mexicali I and II) in the Mexicali metropolitan area (Figure 3.2-5). These systems are organically and hydraulically overloaded because of large local municipal sewage flows. Because of the lack of treatment capacity and an inadequate and aging collection system, Mexicali discharges 5 million to 20 million gal/d (18.9 million to 79.7 million L/d) of untreated municipal wastewater into the New River (CRBRWQCB 2004b).

In the United States, the New River receives urban runoff, agricultural runoff, treated industrial wastes, and treated, disinfected, and nondisinfected domestic wastes from the Imperial Valley (University of California 2003). It also receives about 8,000 ac-ft (9.9 million m^3) of treated wastewater per year from eight National Pollutant Discharge Elimination System (NPDES) Imperial Valley wastewater treatment facilities. Of these facilities, three discharge disinfected effluent (approximately 4,100 ac-ft [5.1 million m^3]), and five discharge about 3,800 ac-ft (4.7 million m^3) of nondisinfected effluent (Cal/EPA 2003).

Environmental sampling of the New River has been performed at the U.S.-Mexico border since 1969; additional sampling has been performed between the U.S.-Mexico border and the Salton Sea. Many agencies, including the USGS, the California Regional Water Quality Control Board, the California State Water Resource Control Board, and the California Department of Fish and Game, have sampled water from the New River.

Contaminants of concern detected in water samples from the New River at the U.S.-Mexico border that exceeded comparison values set by the Agency for Toxic Substances and Disease Registry include pathogens (e.g., fecal coliform bacteria, fecal streptococci, *E. coli* bacteria, and enterococci bacteria), metals (e.g., lead, arsenic, cadmium, thallium, antimony, boron, and manganese), pesticides (e.g., aldrin, chlordane, dichlorodiphenyldichloroethane [DDD], 4,4’-DDD, dichlorodiphenyldichloroethylene [DDE], dichlorodiphenyltrichloroethane [DDT], and heptachlor epoxide), and volatile organic compounds (VOC) (e.g., tetrachloro-ethylene [TCE], methylene chloride, and *n*-nitrodiphenylamine) (DHHS 1996).

For the present study, water quality parameters of interest include salinity, selenium, total phosphorus, biochemical oxygen demand (BOD), chemical oxygen demand (COD), and total

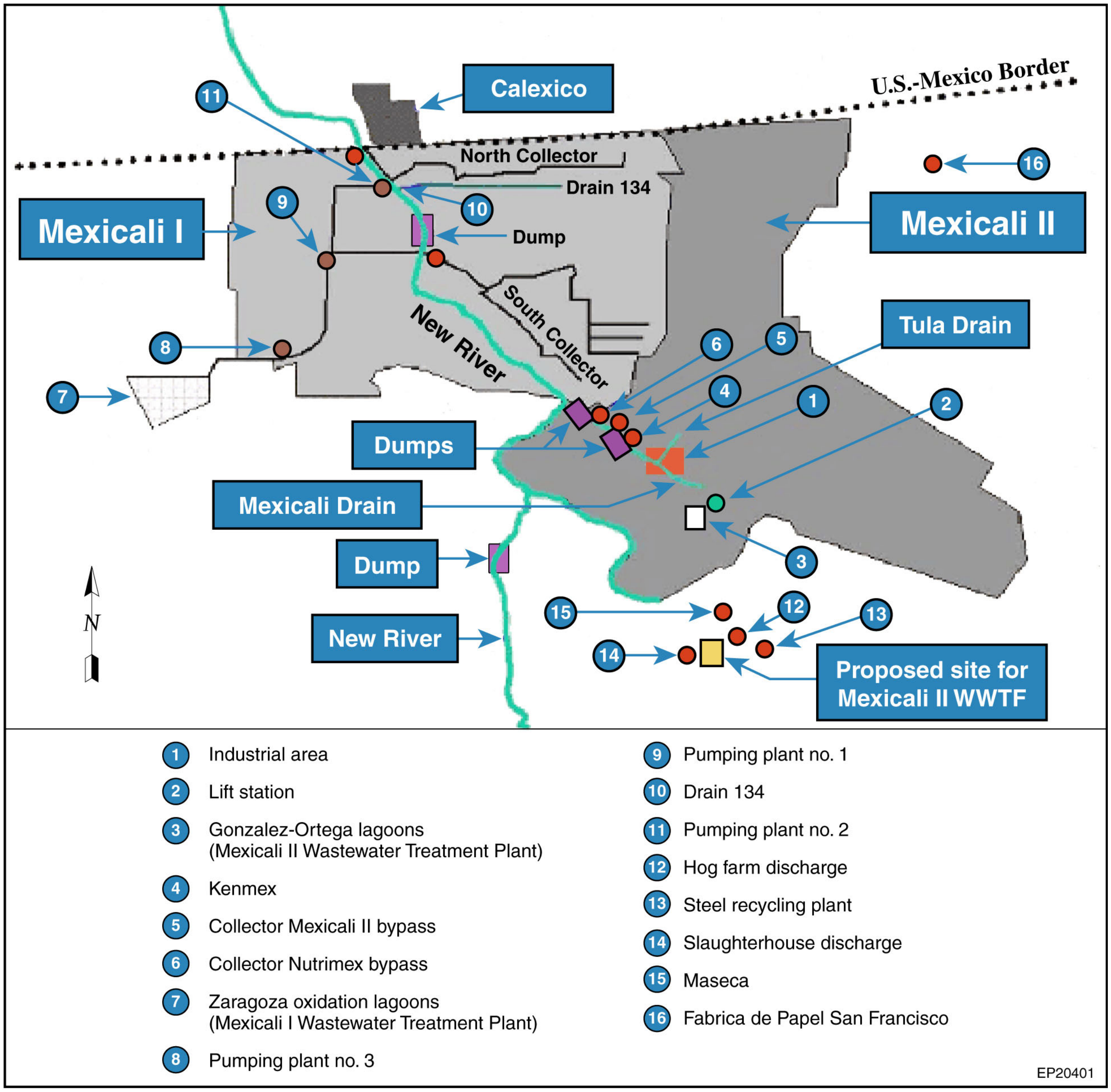

FIGURE 3.2-5 The New River in Mexicali, Mexico (Source: CRBRWQCB 2004c)

suspended solids (TSS). These parameters are of interest because operation of the power plants could increase the salinity and the selenium concentration in the New River and decrease the concentrations of the other constituents because of water treatment (Section 4.2).

Salinity. Salinity is a measure of the number of grams of material (salts) dissolved in a number of grams of water. Salinity is often referred to as total dissolved solids (TDS) and is usually expressed in units of milligrams of dissolved salts per unit volume of water (mg/L).[2]

2 One milligram (mg) is equal to 0.001 g; one microgram (µg) is equal to 0.000001 g.

Because 1 L of water weighs 1,000 g, 1 mg/L is the same as one part per million (ppm). Important salts associated with the New River include chloride, sodium, magnesium, calcium, carbonate, bicarbonate, nitrate, and sulfate (University of California 2003). The primary source of salts in waters is from chemical weathering of earth materials, such as rocks and soils. Other sources of salts include salt flushing (passing clean irrigation water through soil to reduce its salt content), chemical fertilizers, animal wastes, sewage sludges and effluents, and oil- and gas-field brines (University of California 2003).

From January 1997 through April 2003, the Colorado River Basin Regional Water Control Board collected samples of river water at the Calexico gage at the U.S.-Mexico border (CRBRWQCB 2003b). Monthly measurements of the TDS concentration for the New River water at the Calexico gage at the U.S.-Mexico border are shown in Figure 3.2-6. The mean TDS concentration for the period of record is about 2,620 mg/L. This value is less than the 4,000 mg/L upper bound for Colorado River basin water quality objectives (SWRCB 2003). The variability of the TDS concentration is about 315 mg/L. Most of this salinity is derived between Mexicali and the U.S.-Mexico border. As a point of reference, the mean salinity of the Colorado River, the primary source of water in the New River, is about 650 to 700 mg/L (University of California 2003).

Selenium. Selenium is an essential nutrient for humans and animals. When consumed in amounts greater than the amounts needed for good nutrition, selenium can be toxic. Selenium is naturally occurring in the environment and is usually found in a compound form. Plants can readily take up selenium compounds from water and concentrate them. This effect is particularly important for fish and birds that eat fish.

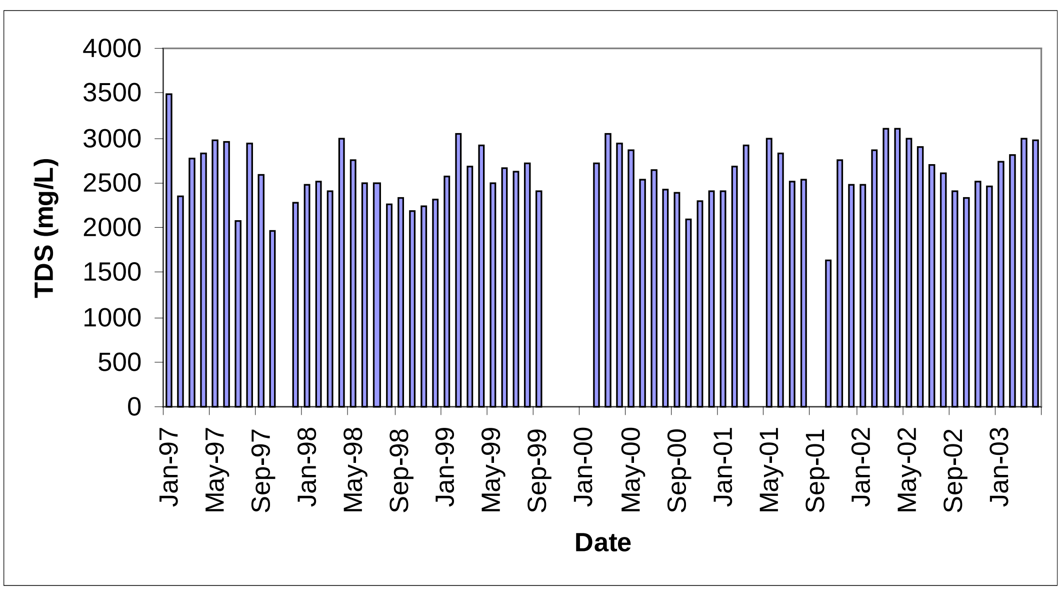

FIGURE 3.2-6 Total Dissolved Solids (mg/L) Concentration at the Calexico Gage on the New River (Source: CRBRWQCB 2003a)

Selenium measurements have been made for a number of years at the U.S.-Mexico border. Table 3.2-2 lists the values recorded for the past 6 years (1997 through 2003) by the Colorado River Basin Regional Water Quality Control Board. As indicated in Table 3.2-2, selenium was not detected (the reporting limit was 0.005 ppm; 1 ppm = 1 mg/L). In 2002, regular monthly detections occurred. These detections may have occurred either because smaller detection limits were used during sample analysis, or the method of reporting the results changed (E.S. Babcock and Sons, Inc., Laboratory replaced Department of Health Services - Southern California Laboratory for analytical work for most of the water sampling analysis during 2002). The average concentration for selenium was about 0.021 mg/L. The standard deviation of sample concentrations was also about 0.021 mg/L, indicating variability in the dataset.

The U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) for selenium is 0.05 mg/L or 50 μg/L (EPA 1996). Thus, the average value of the selenium concentration for the New River at the U.S.-Mexico border is less than the MCL for this contaminant.

Maximum Contaminant Level

The U.S. Environmental Protection Agency (EPA) has determined maximum contaminant levels (MCLs) that are allowable in water systems. MCLs have been determined for a wide range of pollutants ranging from metals to volatile organic compounds. Complete lists of pollutants and their MCLs are published by the EPA.

TABLE 3.2-2 Selenium Concentrations (μg/L) in New River Water at the U.S.-Mexico Border

	1997	1998	1999	2000	2001	2002[b]	2003
January	ND[a]	ND	ND	ND	ND	ND	ND
February	ND	ND	ND	ND	ND	11	ND
March	ND	30	ND	ND	ND	22	ND
April	ND	ND	ND	ND	ND	9.2	ND
May	ND	ND	ND	ND	ND	20	NA[c]
June	21	ND	ND	ND	ND	14	NA
July	ND	ND	ND	ND	ND	7.3	NA
August	ND	ND	ND	ND	ND	13	NA
September	37	ND	ND	ND	NA	72	NA
October	ND	ND	ND	ND	ND	ND	NA
November	ND	ND	ND	ND	ND	ND	NA
December	ND	ND	ND	ND	ND	ND	NA

[a] ND = nondetect; reporting limit = 5 μg/L.

[b] Detection limits in 2002 were 5 μg/L (0.005 mg/L).

[c] NA = not available.

Source: CRBRWQCB (2003a).

TSS, BOD, COD, and Phosphorus. In addition to salinity and selenium, other important water quality parameters for the New River are TSS, BOD, COD, and total phosphorus. Excess sediment in the water column (i.e., TSS) and in bottom deposits threatens many aquatic and terrestrial organisms that use New River habitat. BOD and COD deplete the quantity of oxygen available in the water. TSS, BOD, and COD concentrations, reported in mg/L, for 1997 through April 2003 are shown in Figures 3.2-7 through 3.2-9, respectively. Yearly averages and total yearly loads for these parameters are given in Table 3.2-3 and shown in Figure 3.2-10. These calculations use average quantities for the flow in the river and the average annual pollutant concentrations. For the period of record, TSS and BOD appear to have remained about constant. COD appears to be increasing with time. This type of increase is probably the result of additional industrial discharge to the river.

Total Suspended Solids

Total suspended solids (TSS) is the concentration of TSS in a water system. Suspended solids increase the turbidity of the water, degrade its quality, and impact the following beneficial uses: warm freshwater habitat, wildlife habitat, preservation of rare, endangered and threatened species, freshwater replenishment, and both contact and non-contact recreation. A Total Maximum Daily Load (TMDL) for New River suspended solids has an ultimate maximum TSS goal of 200 mg/L.

Biochemical Oxygen Demand

The biochemical oxygen demand (BOD) is a measure of the amount of oxygen consumed by microorganisms decomposing organic matter in stream water. A higher BOD value indicates a smaller amount of dissolved oxygen in rivers and streams that is available to higher forms of aquatic life.

Chemical Oxygen Demand

The chemical oxygen demand (COD) measures the total amount of oxidizable (biodegradable and nonbiodegradable) compounds in natural and wastewaters in terms of the equivalent amount of oxygen required to oxidize them. In a natural setting, oxygen depletion results from metabolic processes and contributes to the process of eutrification.

The concentration of total phosphorus in water in the New River is a concern because it is an important biological nutrient for the river, and it is a limiting nutrient for the Salton Sea (Section 3.2.1.3). Excess phosphorus leads to eutrophication of the waterbody. Figure 3.2-11 shows the concentration of total phosphorus at the Calexico, California, gage from 1997 through 2003. Figure 3.2-12 shows the annual total quantity of phosphorus transported by the New River for 1997 through 2001. The total quantity of phosphorus transported past the Calexico gage has been fairly constant and averages about 450 tons/yr (402 t/yr). The average total phosphorus concentration for 1997 through 2003 is about 2.0 mg/L (ppb). Phosphorus has no Safe Drinking Water Act guidelines, MCL, or secondary MCL (SMCL) (EPA 1996). However, to prevent eutrophication, the EPA recommends that phosphates should not exceed 0.025 mg/L in lakes, 0.05 mg/L where streams enter lakes, and 0.1 mg/L in streams that do not flow into lakes (University of California, Davis 2003). To prevent excessive plant growth that becomes a nuisance or adversely affects beneficial uses of the water, a 0.1-mg/L total phosphorus guideline has often been applied (e.g., CRBRWQCB 2003d). The average total phosphorus concentration at the Calexico gage exceeds all of these recommended values.

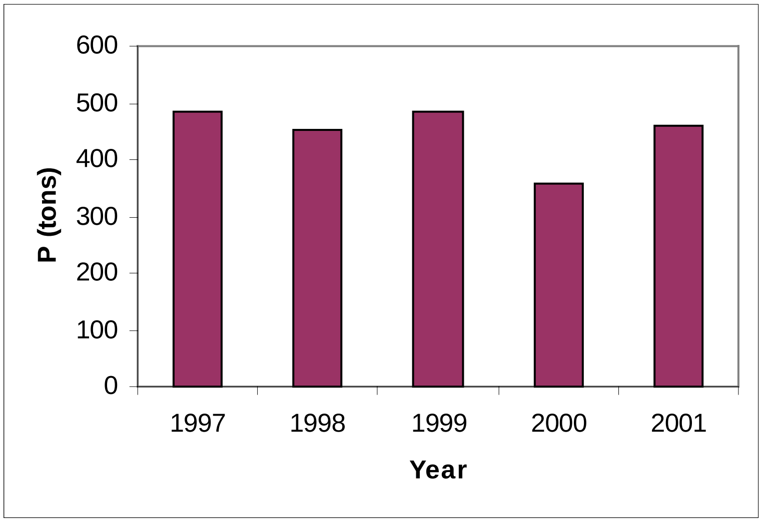

FIGURE 3.2-12 Annual Total Quantity of Phosphorus at the Calexico Gage on the New River at the U.S.-Mexico Border (Source: CRBRWQCB 2003a)

Dissolved Oxygen. The quantity of dissolved oxygen (DO) in the river increases with distance from the U.S.-Mexico border due to reaeration and self-purification. In summer, depressed oxygen levels extend 26 mi (42 km) downstream of the U.S.-Mexico border (i.e., north toward the Salton Sea), making water quality too poor to support a diverse fish population (Setmire 1984).

Temperature. The average temperature of water discharged from the TDM power plant for the period June through November 2004 was 79.2°F (26.2°C) (Henao 2004). The range of temperatures was 66.0 to 94.5°F (18.9 to 34.7°C). Water temperatures in effluent from the Zaragoza Oxidation Lagoons averaged 70.7°F (21.5°C) for the period August 2000 through June 2004 (Kasper 2003). The range of effluent temperature was 49.1 to 89.6°F (9.5 to 32°C). The water temperature in the New River at the Calexico gage has not been recorded regularly since 1981 (USGS 2003c). Between September 26 and September 30, 1977, the water temperature at the Calexico gage was 76.1°F (24.5°C) (Setmire 1984).

Phosphorus

Phosphorus is one of the key elements needed for plant and animal growth. Phosphates, PO_4^{-2}, are formed from elemental phosphorus and oxygen. Phosphates occur in three forms: orthophosphates, produced from natural processes and found in sewage; polyphosphates, found in detergents; and organically bound phosphate, produced from organic pesticides. The sum of all phosphorus-containing compounds is referred to as total phosphorus. Excess phosphorus can lead to eutrophication.

Eutrophication

Eutrophication is a process whereby water bodies, such as lakes, estuaries, or slow-moving streams and rivers, receive excess nutrients (phosphorus and nitrogen) that stimulate excessive plant growth (algae, periphyton-attached algae, and nuisance plants). This enhanced plant growth, often called an algal bloom, reduces dissolved oxygen in the water when dead plant material decomposes and can cause other organisms, such as fish, to die. If the quantity of total phosphorus or nitrogen exceeds the other, the nutrient with the lesser concentration controls the degree of eutrophication and is called limiting.

3.2.1.1.3 Water Quality Guidance for the New River. In evaluating impacts of operations of the proposed projects, pre- and post-operation water quality concentrations are compared with each other and with existing guidance (Section 4.2). The following section discusses applicable regulations, standards, and guidelines for salinity, selenium, TSS, BOD, COD, and phosphorus for the New River. These are in the forms of total maximum daily loads (TMDLs), EPA MCLs, EPA SMCLs, Salton Sea water quality objectives, and Colorado River Basin water quality objectives.

> **Dissolved Oxygen**
>
> Dissolved oxygen (DO) is the concentration of dissolved oxygen in a water system; it serves as an indicator of the existing water quality. DO is important to fish and other organisms living in the water and sediments. Low levels of DO indicate an impaired system. A draft Total Maximum Daily Load (TMDL) for the New River establishes a minimum DO of 5.0 mg/L.

> **Water Quality: Load vs. Concentration**
>
> The concentration of a material is the mass of the material per unit volume of water. Load is the quantity of material passing a given point in a specified period of time (usually one year). If the concentration of a material remains constant over a one-year time period, its annual load is given as the product of its concentration, flow, and a time of one year.

Section 303(d)(a)(1) of the CWA requires state agencies (in this case, the Colorado River Basin Regional Water Quality Control Board) to identify the region's waters that do not comply with water quality standards applicable to such waters; rank the impaired waterbodies taking into account, among other criteria, the severity of the pollution and the uses made of such waters; and establish TMDLs for those pollutants causing the impairments (SWRCB 2003). As used here, load is the weight per unit of time of a substance passing a point. A TMDL is the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards and ensure that impaired waters attain their beneficial use. For assessments, a TMDL is the sum of the individual waste load allocations for point sources of pollution, the load allocations for nonpoint pollution sources, and the contribution from background sources of pollution.

In 1998, the Colorado River Basin Regional Water Quality Control Board, adopted Resolution 98006, which placed the New River on its list of impaired waters. Impairment of the New River was associated with sedimentation/siltation (including TSS and turbidity), pesticides, bacteria, nutrients, and VOC (SWRCB 2003).

The Colorado River Basin Regional Water Quality Control Board submitted a sedimentation/siltation TMDL to the EPA in May 2002 (CRBRWQCB 2002c); the EPA approved it in March 2003. Similarly, a New River pathogens TMDL for fecal coliform bacteria, *E. coli*, and enterococci bacteria was submitted to the EPA in March 2002 and approved in August 2002 (CRBRWQCB 2004b). TMDLs for the New River for DO, BOD, and COD have been drafted by the Colorado River Basin Regional Water Quality Control Board and are currently under review (CRBRWQCB 2004c). Concentrations of DO, BOD, and COD violate numeric standards in the Water Quality Control Plan for the Colorado River Basin (Basin Plan) and narrative standards in Minute No. 264 of the Mexican-American Water Treaty (CRBRWQCB 2004c). This TMDL would set a minimum DO concentration of 5.0 mg/L for the river and limit the BOD and COD releases to the river. Additional TMDL numeric targets for bacteria, nutrients, pesticides, and VOC are under development (EPA 2003a).

Selenium was not included in the EPA list of anticipated TMDLs for the New River; however, it is being considered as part of a Federal TMDL for the Colorado River Watershed. The EPA has established that the drinking water MCL is 0.005 mg/L (CRBRWQCB 2002c; EPA 1996). Salton Sea objectives that apply to selenium for the New River, as a tributary to the Salton Sea, include: a four-day average value of selenium that shall not exceed 0.005 mg/L, and a one-hour average value of selenium that shall not exceed 0.02 mg/L (CRBRWQCB 2002d).

As with selenium, no TMDLs have been established for salinity or total phosphorus for the New River. However, a 4,000-mg/L upper-bound salinity value for Colorado River Basin water quality objectives has been established (SWRCB 2003).

3.2.1.2 Zaragoza Oxidation Lagoons

The Zaragoza Oxidation Lagoons, described in Chapter 2 (see also Figure 2.2-17), are located in the northwest section of Mexicali, Mexico, and are used to treat wastewater from the Mexicali I district, which has a population of about 500,000 people. The treatment plant has a total design capacity of 22.4 million gal/d (84.8 million L/d). Because of a smaller than anticipated BOD load, the plant has an existing capacity of about 27.4 million gal/d (103.7 million L/d). The current flows entering the headworks of the treatment plant are at about full capacity (27.4 million gal/d [103.7 million L/d]) (EPA 2003b).

The average flow of water discharged from the Zaragoza Oxidation Lagoons to the discharge canals and subsequently to the New River is about 33,200 ac-ft/yr (1.30 m^3/s), which exceeds the full-capacity of the lagoons (30,694 ac-ft/yr or 1.20 m^3/s) (Henao 2004). This value is about 20% of the average flow in the New River at the Calexico gage. Water released from the Zaragoza lagoons is untreated or partially treated sewage water. Concentrations for TDS, TSS, BOD, COD, selenium, and total phosphorus for influent and effluent at the lagoons are provided in Table 3.2-4. The concentration ranges for these parameters (i.e., high versus low) tend to be large.

3.2.1.3 Salton Sea

3.2.1.3.1 Physical Conditions. The Salton Sea is situated in the Salton Trough near the Gulf of California in Riverside and Imperial Counties, California. The Salton Sea is located about 35 mi (56 km) north of the border between Mexico and the United States and about 90 mi (145 km) east of San Diego. In the geological past, the Sea was part of the Gulf of California; it is now separated from the Gulf by a delta created by the Colorado River. The Colorado River has flowed north across this delta forming large, temporary lakes about every 400 or 500 years (Laflin 1995). From 1824 until 1904, the Colorado River flowed into the Salton Basin many times (Salton Sea Authority 2003a), including 1840, 1849, 1852, 1859, 1867, and 1891 (Krantz 2002). The temporary lakes formed by the floodwaters dried up when the Colorado

River again flowed south to the Gulf. The last large lake that formed was ancient Lake Cahuilla; it covered about 2,100 mi^2 (5,440 km^2). Evidence of an ancient shoreline suggests that Lake Cahuilla occupied the basin until about 300 years ago (BOR 2003a).

TABLE 3.2-4 Influent and Effluent Concentrations for the Zaragoza Oxidation Lagoons (2000–2003)

Parameter	Average	Low	High
Influent (mg/L)			
TDS	1,147	816	1,404
TSS	192	42	772
BOD	217	67	386
COD	528	335	836
Selenium[a]	0.001[b]	ND[c]	0.0021
Total phosphorus[a]	4.5	ND	9.5
Effluent (mg/L)			
TDS	1,170	944	1,872
TSS	59	14	132
BOD	44	4	99
COD	162	110	210
Selenium[a]	0.0011[b]	ND	0.0026
Total phosphorus[a]	4.3	0.10	8.2

[a] Source: Kasper (2003).

[b] Value represents an average of results with detectable levels of selenium.

[c] ND = not detected.

The Salton Sea was formed between 1905 and 1907 when floodwaters in the Colorado River breached a temporary diversion of a silted-up section of the Imperial Canal and flowed into the Salton Trough rather than to the Gulf. Flooded areas in 1905 through 1908 are shown in Figure 3.2-13. The Salton Basin, below an elevation of −226 ft (−67 m) MSL, was designated as an agricultural sump in 1928 under Executive Order of Withdrawal (Public Water Reserve No. 114, California No. 26) (CRBRWQCB 2003b) to receive agricultural drainage water. When formed, the Sea had an elevation of −195 ft (−59 m) MSL, with a surface area of about 520 mi^2 (1,347 km^2) (Ponce et al. 2003). The surface of the Sea began to drop until the 1930s, when agricultural drainage inflows from the nearby developing Imperial and Coachella Valleys sustained the Sea's level (BOR 1999). From the 1930s to the 1960s, the level of the Sea increased slowly (Figure 3.2-14). Since 1980, the level of the Sea has been fairly constant, with a balance between inflow and evaporation.

Currently, the Salton Sea is about 35 mi (56 km) long and from 9 to 15 mi (14 and 24 km) wide. It covers about 360 mi^2 (932 km^2) and has about 105 mi (169 km) of shoreline (IID 2003c). The saline lake lies within a closed basin (Salton Sink, also known as the Salton Basin) and has no outlets. Its surface is about −227 ft (−69 m) MSL. At its deepest, the Sea has a depth of about 50 ft (15 m) (about −278 ft [−85 m] MSL); its average depth is about 30 ft (9 m) (−258 ft [−79 m] MSL) (Ponce et al. 2003). With a volume of about 7.53 million ac-ft (9.3×10^9 m^3), it is the largest inland body of water in California. The northern portion of the Sea is referred to as the North Basin; the southern portion is referred to as the South Basin.

The principal resource values of the Salton Sea are based on its recreational and wildlife uses and support of agricultural activities in the Coachella and Imperial Valleys. Recreational uses include fishing, boating, swimming, camping, sightseeing, and birding. Wildlife uses include aquatic habitat for organisms (e.g., microorganisms, plants, invertebrates, and fish) and terrestrial habitat, primarily for waterfowl. The Sea is host to state park and recreation areas and State and Federal wildlife refugees. For example, the Sonny Bono Salton Sea National Wildlife

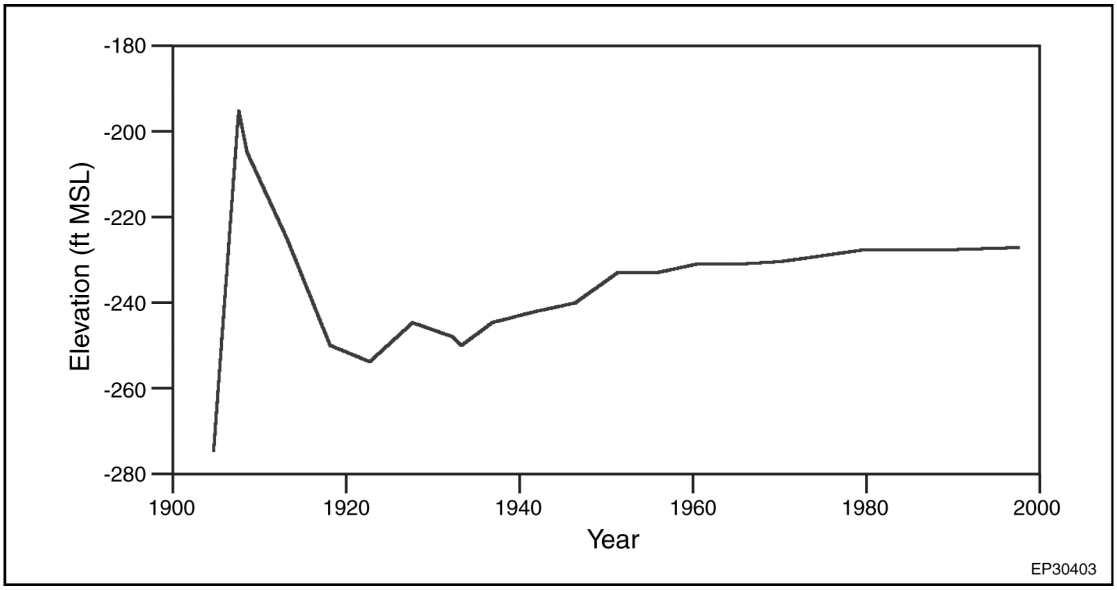

FIGURE 3.2-14 Elevation of the Salton Sea from 1905 to 2001 (Source: adapted from BOR 2001)

Refuge (formerly Salton Sea National Wildlife Refuge), located on the southern end of the Salton Sea, includes 35,484 acres (14,360 ha) of salt marsh and open water, as well as 2,000 acres (809 ha) of agricultural fields and freshwater marsh (USFWS 2003a).

The Salton Sea provides agricultural support in the Coachella and Imperial Valleys primarily by serving as a drainage basin for agricultural runoff. In addition, the Sea assists with flood control in upstream communities by serving as a repository for stormwater runoff. The bed and surrounding area of the Salton Sea are relatively flat. Small changes in the volume of the Sea make large differences in the Sea's area (Figure 3.2-15) and volume (Figure 3.2-16). A decrease of 1 ft (0.30 m) in depth, for an initial elevation of –227 ft (–69 m) MSL, would produce a surface area change of approximately 2,140 acres (about 866 ha) (Weghorst 2001) and a decrease of about 233,000 ac-ft (2.9×10^8 m^3) of water.

Inflow to the Salton Sea comes from the Alamo River, New River, Whitewater River, IID agricultural drains, Salt Creek, San Felipe Creek, groundwater, precipitation, and overland flow. For the period of record 1950 through 1999, the mean inflow to the Salton Sea was approximately 1.34 million ac-ft/yr (52.4 m^3/s) (Weghorst 2001). As shown in Figure 3.2-17, annual inflow to the Salton Sea is variable. The standard deviation of the inflow is about 78,750 ac-ft/yr (3.1 m^3/s) for the period 1950 through 1999 (Weghorst 2001). Assuming an initial elevation of –227 ft (–69 m) MSL, the variation in Salton Sea inflow would produce a change of depth of about 6 in. (15 cm) (about 1.7% of the Sea's average depth), with a surface area change of about 1,100 acres (445 ha) (about 0.5% of the existing surface area) (Weghorst 2001). About 6% of the inflow to the Salton Sea is natural flow; the rest of the inflow is return flow from irrigation and municipal wastewater (Setmire 2000). Most of the agricultural

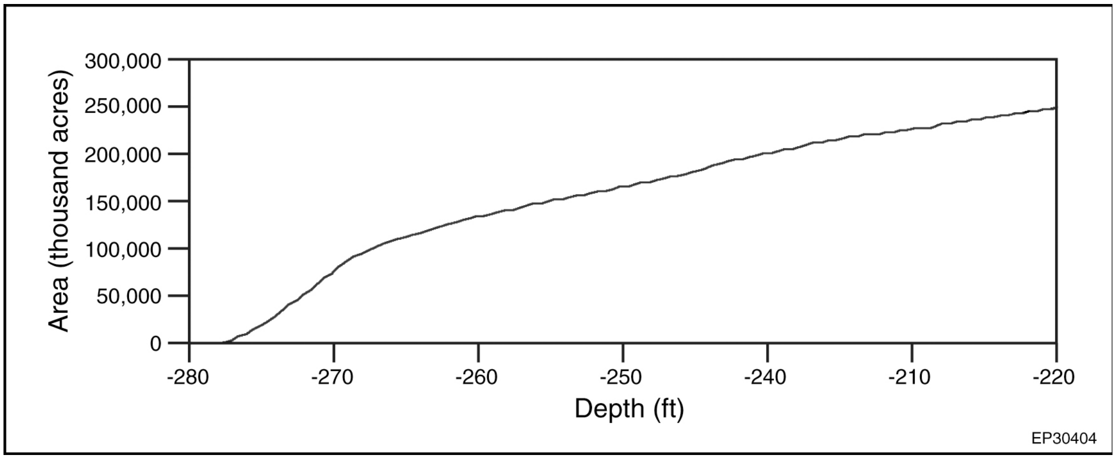

FIGURE 3.2-15 Depth/Area Relationship for the Salton Sea (Source: Weghorst 2001)

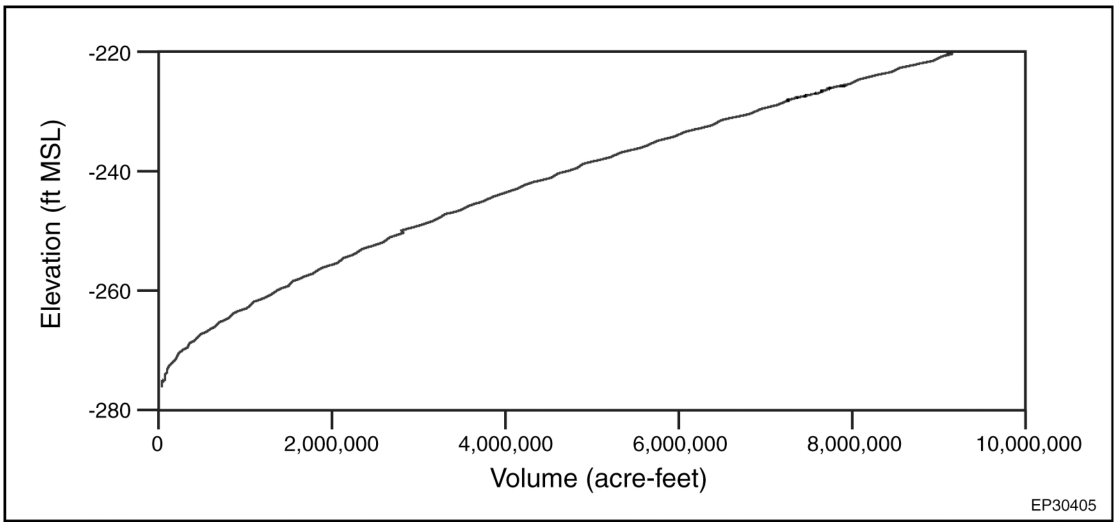

FIGURE 3.2-16 Volume/Depth Relationship for the Salton Sea (Source: Weghorst 2001)

water used in the watershed is derived from the Colorado River. About two-thirds of the water used for agriculture is consumed or lost to evaporation; about one-third of the water applied to fields eventually reaches the Salton Sea (Cohen et al. 1999). The residence time of agricultural water in the soil is about 6 years (BOR 2001). Colorado River water is delivered to the Coachella and Imperial Valleys via the All American and Coachella Canals. Inflow from the New River south of the U.S.-Mexico border accounts for about 14% of the total inflow to the Salton Sea, while the flow at Westmorland accounts for about 36% of the Sea's total inflow.

Because the Salton Sea is situated in a closed basin, water flows into it but does not leave, except by evaporation. The evaporation rate is about 6 ft/yr (2 m/yr) (Ponce et al. 2003). With time, evaporation reduced the elevation of the water in the Sea to its current value of approximately –227 ft (–69 m) MSL. The Salton Sea is in a near state of equilibrium, with inflow water roughly equaling the water lost to evaporation (BOR 1999).

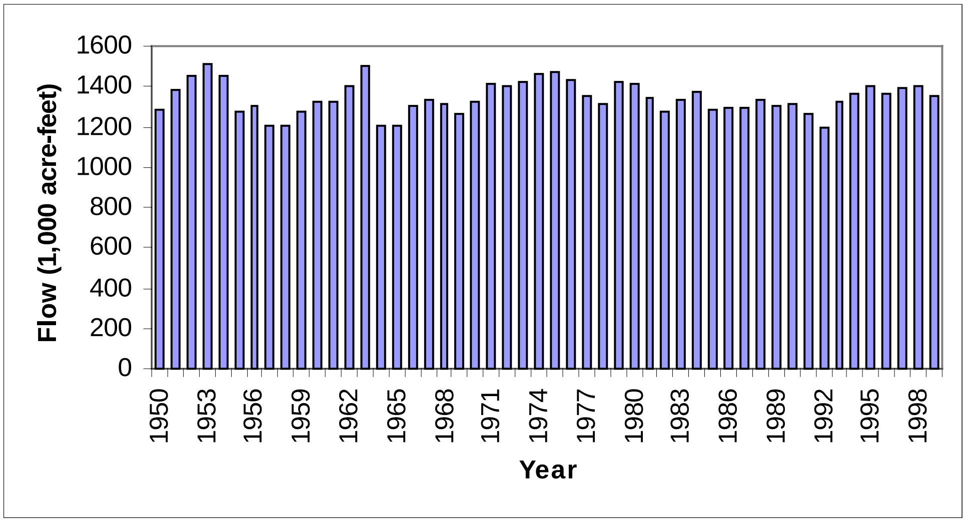

FIGURE 3.2-17 Inflow Volume to the Salton Sea (Source: Weghorst 2001)

3.2.1.3.2 Water Quality. As mentioned previously, the Colorado River Basin Regional Water Quality Control Board adopted Resolution 98006 during its January 1998 public meeting, which updated the list of impaired waterbodies for the region. The updated list included the New River, the Alamo River, and the Salton Sea. Impairment of the Salton Sea was associated with salt, selenium, and nutrients (SWRCB 2003; CRBRWQCB 2003c).

Water that flows into the Salton Sea contains dissolved salts. Figure 3.2-18 shows the total salt load into the Sea as a function of time for the period 1950 through 1999 (Weghorst 2001). The mean total load of dissolved salts entering the Salton Sea was about 4.6 million tons/yr (4.2 million t/yr). As indicated in Figure 3.2-18, the total load of salts per year varied considerably with time. The standard deviation of the annual salt load is about 640,000 tons (580,598 t). Figure 3.2-19 shows the TDS load entering the Salton Sea for the same period of record (TDS was calculated by dividing the total salt load by the annual volume of inflow water). The mean TDS for the inflow water was about 2,525 mg/L; the standard deviation of the inflow TDS was about 340 mg/L. Because the Sea is in a closed basin, incoming water evaporates, leaving behind the dissolved salts, thereby increasing the salinity of the Sea. Not all salts in the incoming water to the Salton Sea increase its salinity; some of the salts (particularly calcium salts as carbonate and sulfate, i.e., calcite and gypsum, respectively) precipitate (BOR 2001). Weghorst (2001) estimated that about one-third of the annual salt discharged to the Sea would precipitate. Other estimates range from 0.77 million to 1.32 million tons (0.7 million to 1.2 million t) of salt precipitated annually (BOR 2001).

In 1907, shortly after the Salton Sea was formed, its salinity was about 3,500 mg/L. Currently, it is about 44,000 mg/L (BOR 2003a) (Figure 3.2-20), approximately 25% saltier than ocean water. In 1998, the Colorado River Basin Regional Water Quality Control Board, in accordance with Section 303(d) of the CWA, listed the Salton Sea as impaired in its Water Quality Assessment because the salinity of the Sea exceeded the Regional Board's water quality

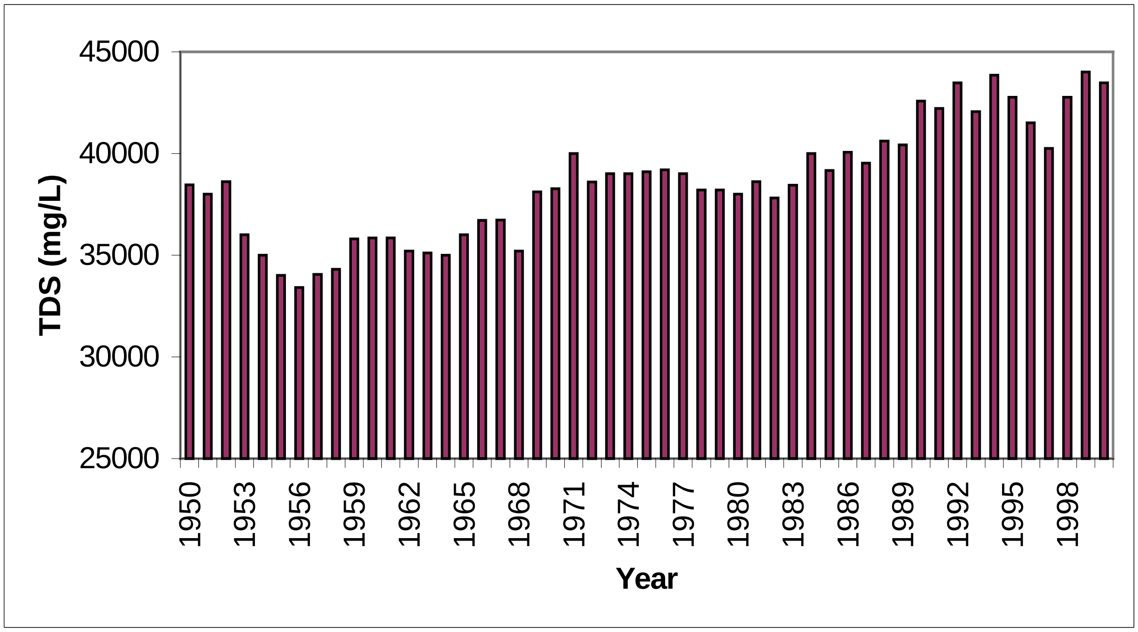

FIGURE 3.2-20 Salton Sea Total Dissolved Solids (Source: Weghorst 2001)

objective of reducing the salinity level to 35,000 mg/L, "unless it can be demonstrated that a different level of salinity is optimal for the sustenance of the Sea's wild and aquatic life" (CRBRWQCB 1991). The actual salinity of the Sea is uncertain because of measurement precision (on the order of 1% for conductance measurements), the location of the measurement (there is an approximate difference of 3% between the center of the north and south sub-basins of the Sea), a difference of about 1% between measurements taken at the Sea surface and measurements taken near its bottom, density variations in the Sea's water (a range of 1.028 to 1.032 g/cm^3), and temperature (BOR 2001). The uncertainty of the Sea's salinity is estimated to be about 5% of its actual value, or about 2,200 mg/L (BOR 2001).

The rate of increase of salinity in the Salton Sea has had a wide range of values reported in the literature. Between 1980 and 1995, the rate was approximately 430 mg/L/yr. At this rate, the Salton Sea would reach a value of 60,000 mg/L within about 37 years from its current salinity level. Because of toxicity, salinity values in excess of 60,000 mg/L would kill fish populations in the Sea (BOR 2003a). The rate of salinity increase for the Sea is highly uncertain. Estimates range from 0.4 to 1% per year (about 175 to 440 mg/L/yr) (BOR 1998a). For these rates of increasing salinity, the Salton Sea would reach a salinity of 60,000 mg/L after about 90 and 36 years, respectively.

Selenium. Although the potential loss of fish and other organisms that depend on the Salton Sea is closely related to salinity issues and high concentrations of nutrients, there are also significant water quality concerns related to selenium (CRBRWQCB 1991). Selenium is derived from irrigation water passing through clayey soils. The selenium concentration in Salton Sea water is very low, about 0.001 mg/L. This concentration is much less than the MCL for selenium in drinking water 0.05 mg/L (EPA 1996); however, concentrations in the Sea's sediment and biota are at levels of concern (Salton Sea Authority 1997). Most of the selenium in sediment occurs at the north end of the Sea (Redlands Institute 2002). The dissolved selenium in the Sea can be taken up and concentrated in tissues of small organisms in the Sea. Selenium can be further concentrated (biomagnified) by larger organisms from eating the smaller ones (CRBRWQCB 1991). At greatest risk are the larger fish-eating (piscivorous) birds, such as the double-crested cormorant, great blue heron, and the cattle egret, which have fairly long food chains. Other birds, such as the black-necked stilt, American coot, eared grebe, northern shoveler, and the ruddy duck also have elevated selenium concentrations in tissues, livers, and/or eggs. Concentrations in these birds, however, are lower because of shorter food chains (BOR 1998b).

Phosphorus. In addition to salinity and selenium, the Salton Sea is highly eutrophic (i.e., its waters are rich in dissolved nutrients, photosynthetically productive, and often deficient in oxygen during warm weather). Eutrophication of the Salton Sea is caused by the inflow of agricultural drainage and municipal effluent containing high levels of nutrients, especially nitrogen and phosphorus (EPA 2003c). High nutrient levels in the Sea promote algal blooms. Algal respiration and the decomposition of dead algae consume large quantities of oxygen, decrease concentrations of DO in the Sea, and kill fish by suffocation due to a lack of oxygen (Pacific Institute 2001). Fish kills then release algal nutrients back to the Sea, thus promoting additional algae growth.

Recent studies indicate that the ratio of nitrogen to phosphorus in the Sea exceeds 25. Because there is much more nitrogen than phosphorus in the Sea, phosphorus is the limiting nutrient for eutrophication. In 1999, the average mass of phosphorus in the Salton Sea was about 1,389 lb (630,000 kg) (Setmire 2000), with phosphorus loading coming primarily from external sources (New River, Alamo River, White Water River, and agricultural drains). Most of the nutrient load is supplied by the rivers. In 1999, the following phosphorus loads occurred: Alamo River – 1.3 million lb (0.574 million kg); New River – 1.5 million lb (0.669 million kg); and White Water River – 120,000 lb (0.053 million kg) (Setmire 2000). The nitrogen to phosphorus ratios for surface water (epilimnion) reached 192:1; hypolimnion ratios (bottom of the Sea) were even higher (430:1).

For samples collected during 1999 from three sites in the Salton Sea, total phosphorus concentrations in water ranged from less than 0.005 to 0.222 mg/L, with a median value of 0.071 mg/L in surface waters, and a median value of 0.059 mg/L near the bottom. These values exceed the phosphorus concentration of 0.025 mg/L recommended to prevent eutrophication in lakes (University of California, Davis 2003). These values have remained about the same over the past 25 years, indicating that there are processes occurring in the Sea that control (i.e., buffer) the phosphorus concentration against variations in influx concentrations.

Because phosphorus is a limiting nutrient for eutrophication, the degree of eutrophication of the Sea could be most easily reduced by decreasing the amount of phosphorus that enters it from its tributaries. A similar-sized reduction in the quantity of nitrogen entering the system would not affect the system as much because nitrogen is so plentiful. Although reducing the phosphorus load to the Salton Sea would improve its condition, a 50 to 80% reduction in load would be required to achieve a marked decrease in eutrophication (Setmire 2000).

3.2.1.3.3 Salton Sea Water Quality Guidelines. TMDLs have been proposed for the Salton Sea in order to improve its water quality. In July 2003, the EPA gave final approval to California's 2002 Section 303(d) List of Water Quality Limited Segments, which identified the Salton Sea as an impaired watershed because of selenium, salt, and nutrients. At the present time, a TMDL is being developed for nutrients (CRBRWQCB 2004d). A TMDL program will begin for selenium in 2005, with a target completion date of 2010 (CRBRWQCB 1998b). The State of California has determined that an engineered solution for salinity will be more effective than the development of a TMDL (CRBRWQCB 2003b).

3.2.1.3.4 Salton Sea Restoration. The Salton Sea Authority was established in 1993 to direct and coordinate actions to improve water quality, stabilize water elevation, and enhance recreational and economic development of the Salton Sea and other beneficial uses (EPA 2003c). The Salton Sea Authority is composed of Riverside and Imperial Counties, the IID, and the Coachella Valley Water District. The Torres Martinez Desert Cahuilla Indians and a host of Federal and State agencies are exofficio members of the Authority (Codekas 1998).

The Salton Sea Reclamation Act of 1998 directed the Secretary of the Interior to study options for managing the salinity and elevation of the Salton Sea (EPA 2003c). The act required that certain options be analyzed and required the consideration of reduced inflows down to a level of 800,000 ac-ft (31.3 m^3/s) or less per year. In January 2000, the Salton Sea Authority and the U.S. Bureau of Reclamation (BOR) issued a draft environmental impact report (EIR)/EIS that analyzed five alternatives for restoring the Salton Sea (Salton Sea Authority and BOR 2000). The proposed restoration project was developed to comply with Federal legislation that directs the Secretary of the Interior to conduct a research project for the development of a method to reduce and control salinity, provide endangered species habitat, enhance fisheries, and protect recreational values in the area of the Salton Sea. In August 2000, the BOR and the Salton Sea Authority announced plans to revise and supplement the EIR/EIS on the basis of public comments and engineering evaluations. The supplemental review process is exploring additional restoration alternatives, including the use of large-scale solar ponds.

In April 2003, the Salton Sea Authority Board of Directors endorsed moving ahead with the "North Lake" plan to improve the Salton Sea (EPA 2003c). This plan involves creating and managing an ocean-like lake in the North Basin of the Sea by constructing a dam midway across the current Sea. Extensive shallow water habitat would be created by using stepped ponds in the South Basin of the Sea. The plan also includes desalinization of Imperial Valley rivers that flow into the Salton Sea. Desalinated water from the rivers would be sold, and the proceeds would be used to help fund improvements to the Salton Sea (Salton Sea Authority 2003b).

3.2.2 Wetlands

The BOR's Citizen Task Force has developed two pilot-project wetland areas, Imperial and Brawley, along the New River in California (Figure 3.2-1). These wetlands were designed to improve water quality and provide new wildlife habitat by reducing nutrients, pathogens, and industrial waste in the river; reduce nutrients and agricultural chemicals in the drains; and help meet the Colorado River Basin Regional Water Quality Control Board's objective to improve environmental conditions (IID 2003c). Initial construction of the wetlands began in the late spring of 2000 (Miller 2001).

The Imperial wetland site is about 1.5 mi (2.4 km) long and occupies about 68 acres (28 ha). This site receives its water from Rice Drain and is fed entirely by agricultural runoff. This wetland is designed to process about 6.9 million gal (approximately 21 ac-ft [26,000 m^3]) of water annually (Sustainable Conservation 2002). Because this wetland does not receive water from the New River, it will not be discussed further in this report.

At the 7-acre (3-ha) Brawley site, water is pumped directly from the New River to large settling ponds to settle out the heavier silts. The water then flows into a series of smaller ponds planted with native bulrushes and sedges. This wetland is designed to process approximately 2.4 million gal (approximately 7 ac-ft [8,600 m^3]) of water per year (Sustainable Conservation 2002). Passing the river water through the complex of rushes and sedges in the wetlands reduces suspended solids by as much as 97% and increases the DO content by up to 83%. Wetland-processed water leaving both sites eventually discharges to the New River (BOR 2003b).

Some concerns have been raised that the wetlands could be harmful to wildlife by increasing potential exposure to toxic constituents, such as selenium, in sediments (Sustainable Conservation 2002). Deep sediment basins have been added to the wetlands to prevent diving ducks from reaching potentially contaminated food sources on the bottom, and bypass pipelines were added to allow operators to bypass some wetland cells from operation, if needed.

If successful, the pilot wetland project will be expanded to cover most of the river bottom areas of the New and Alamo Rivers, with about 40 new sites being considered.

3.2.3 Floodplains

No perennial streams or rivers are within the area of the proposed and alternative transmission line routes. However, three defined drainages traverse the proposed routes from, generally, southwest to northeast. The northernmost and largest in area is Pinto Wash, draining toward the northeast. Pinto Wash crosses the proposed routes about 3,000 ft (914 m) south of the IV Substation, where it is more than 3,000 ft (914 m) wide (Figure 3.2-21). Another drainage is just south of State Route 98. This area includes the confluence of two streambeds, where a culvert and dam have been placed. The area directly downstream of the culvert has been heavily disturbed due to off-road vehicle traffic. The southernmost area is an extension of an unnamed intermittent drainage that rises to the southwest in Mexico and drains northeasterly. These drainages are normally dry but are probably subject to flash-flooding in occasional torrential storms that can occur in the area. Pinto Wash is the site of the only 100-year floodplain mapped in the proposed transmission line routes by the Federal Emergency Management Agency (FEMA) on Flood Insurance Rate Maps.

The proposed action might also affect the floodplain of the New River, because water that would normally flow into the New River would be diverted for plant operations. The 100-year floodplain of the New River has a narrow channel that meanders through a large, steep banked channel in the valley floor. The steep banked channel lies within a broader channel that was created in 1905 when the New River and Salton Sea were formed. Within the large channel are a series of agricultural fields, undeveloped open spaces, drains, access roads, and the Brawley Sewage Treatment Plant (DOT 2001).

3.2.4 Groundwater

The proposed routes for the transmission lines overlie the Imperial Valley Groundwater Basin in the southern part of the Colorado Desert Hydrologic Regime. The basin is bounded on the east by the Sand Hills and on the west by impermeable rocks of the Fish Creek and Coyote Mountains (Figure 3.1-1). Its discharge point is the Salton Sea. Major surface hydrologic features crossing over the groundwater basin are the New and Alamo Rivers, the three branches of the All-American Canal, and the Coachella Canal (California Department of Water Resources 2003).

Two major aquifers occur in the groundwater basin. These aquifers consist predominantly of alluvial deposits of late Tertiary and Quaternary age. The upper aquifer is about 200 ft (61 m) thick, with a maximum thickness of 450 ft (138 m). It is separated from the lower aquifer by a semipermeable aquitard that averages 60 ft (18 m) thick, with a maximum thickness of 280 ft (85 m). The lower aquifer averages 380 ft (116 m) thick, with a maximum thickness of 1,500 ft (457 m). Low-permeability lake deposits create locally confined aquifer conditions. The total storage capacity of the basin is estimated to be 14,000,000 ac-ft (California Department of Water Resources 2003).

The major source of groundwater recharge in the Imperial Valley Groundwater Basin is from irrigation return. Other recharge sources include rainfall infiltration; surface runoff, especially in the East Mesa and West Mesa where surface deposits are fairly permeable; underflow into the basin, mainly from Mexicali Valley to the south; and seepage from the New River and the All-American and Coachella Canals. Together, recharge sources contribute about 423,000 ac-ft/yr (16.5 m^3/s) from irrigation seepage, 250,000 ac-ft/yr (9.8 m^3/s) from canal seepage, and 173,000 ac-ft/yr (16.8 m^3/s) from subsurface inflow, with the New River contributing about 7,000 ac-ft/yr (6.3 m^3/s). Total discharge is about 439,500 ac-ft/yr (17.2 m^3/s) (including an average loss to streams of about 169,500 ac-ft [6.6 m^3/s]) (California Department of Water Resources 2003).

Because of its high TDS concentrations (ranging from 498 to 7,280 mg/L), a major portion of the groundwater from the Imperial Valley Groundwater Basin is considered undesirable for domestic and irrigation purposes, unless treated. Groundwater in some areas of the basin also has elevated levels of fluoride and boron (California Department of Water Resources 2003).

3.3 CLIMATE AND AIR QUALITY

This subsection describes the climate and air quality of the Imperial County region.

3.3.1 Climate

3.3.1.1 California

The State of California has a very diverse climate range, extending over four out of the six major global climate zones. A Mediterranean climate zone exists in the coastal regions, with wet winters and dry summers, and varies greatly up and down the coast. A semiarid, or steppe, climate zone encompasses much of the San Joaquin Valley and the fringes of the Mojave Desert. There is less rainfall in this zone, and temperatures are generally warmer than in the Mediterranean zone. A microthermal, or Alpine, climate zone is found in the higher elevations of the Sierra Nevada, the Modoc Plateau, and the Klamath Mountains. This mountain climate has short, cool summers and snowy winters; average temperatures in the coldest month are below freezing. A desert climate exists in the southeastern third of the state, east of the Sierra Nevada and Peninsular ranges and in the southwestern part of the San Joaquin Valley. Cut off by mountains from westerly moisture-laden Pacific storms, this leeward rain shadow region receives very little precipitation. Summer temperatures in this region are the highest in the state and can average more than 100°F (38°C). The diversity of California's climate is illustrated by a precipitation range from about 80 in. (203 cm) in the more temperate Mediterranean north coast to less than 3 in. (8 cm) in the desert region in Imperial County. The more generally prevailing winds statewide in California are incoming westerlies[3] from the Pacific Ocean. These winds are reflective of the eastern Pacific high pressure zone centered off the California coast that typically is the major influence on California's climate.

3.3.1.2 Regional

The desert region that includes Imperial County is classified under the modified Köppen Climate Classification System as arid, low-altitude desert (hot). Imperial County is in one of the hottest and driest parts of California, characterized by hot, dry summers and relatively mild winters. During the summer, the Pacific high pressure zone is well-developed to the west of California and a thermal trough overlies California's southeast desert region. The intensity and

---

[3] Wind direction is conventionally described as the direction *from* which a wind blows. Thus "westerlies" are winds that come from the west. Throughout the discussions in this EIS, a wind direction describes the direction from which a wind is blowing.