3.11 HYDROLOGY AND WATER QUALITY

3.11.1 Introduction

This section addresses the hydrology and water quality of the Salton Sea, the New River, the Alamo River, and groundwater underlying the Salton Sea Basin. Water quality impacts on biological resources are discussed in Section 3.4, Biological Resources. Impacts on fugitive dust emissions resulting from changes in the water surface elevation of the Sea are discussed in Section 3.3, Air Quality. The study area for hydrology and water quality is the Salton Sea watershed, shown on Figure 3.11-1.

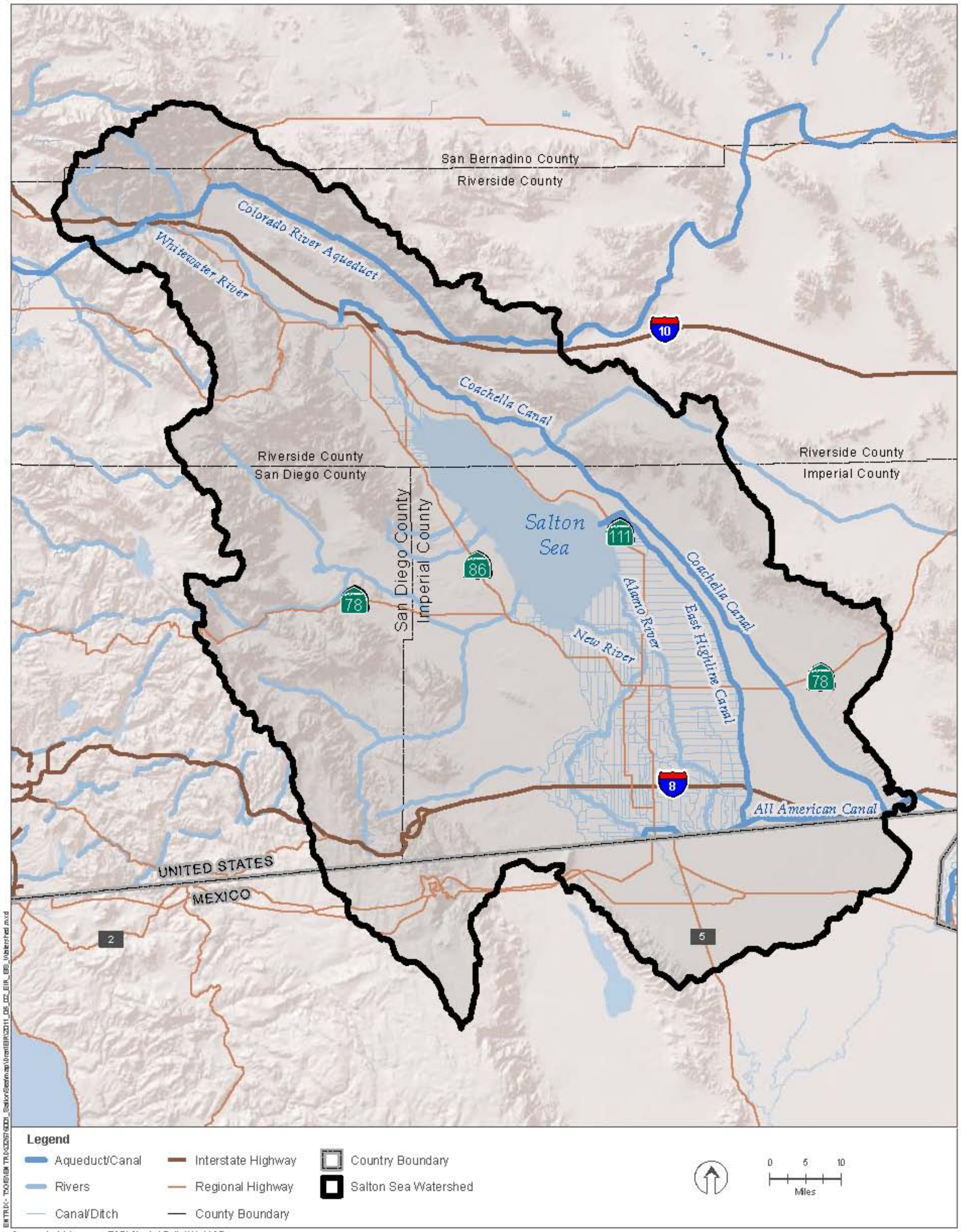
Table 3.11-1 summarizes the impacts of the six Project alternatives on hydrology and water quality, compared to both the existing conditions and the No Action Alternative.

Table 3.11-1 Summary of Impacts on Hydrology and Water Quality

Impact	Basis of Comparison	Project Alternative						Mitigation Measures
		1	2	3	4	5	6	
Impact HYD-1: Project implementation would cause a reduction in the Salton Sea's water surface elevation.	Existing Condition	L	L	L	L	L	L	None required
	No Action	L	L	L	L	L	L	None required
Impact HYD-2: Project implementation would increase the Salton Sea's salinity.	Existing Condition	L	L	L	L	L	L	None required
	No Action	L	L	L	L	L	L	None required
Impact HYD-3: Project operations would cause changes in Salton Sea water quality but would not violate established standards.	Existing Condition	L	L	L	L	L	L	None required
	No Action	L	L	L	L	L	L	None required
Impact HYD-4: Construction of the SCH ponds would temporarily degrade water quality at the Salton Sea.	Existing Condition	L	L	L	L	L	L	None required
	No Action	L	L	L	L	L	L	None required
Impact HYD-5: Berm failure could increase erosion and sedimentation of the adjacent river and the Salton Sea.	Existing Condition	L	L	L	L	L	L	None required
	No Action	L	L	L	L	L	L	None required

Note:

O = No Impact
L = Less-than-Significant Impact
S = Significant Impact, but Mitigable to Less than Significant
U = Significant Unavoidable Impact
B = Beneficial Impact



Source: Aerial Imagery: ESRI Shaded Relief World 2D

Figure 3.11-1 Salton Sea Contributing Watershed

3.11.2 Regulatory Requirements

3.11.2.1 Water Rights

Individuals and agencies in the Salton Sea Basin hold seven individual water rights permits for diversion from Salton Sea tributaries. Imperial Irrigation District (IID) has water rights on the Colorado River for delivery of water through the All American Canal. Metropolitan Water District of Southern California has submitted a water right application to divert agricultural return flows from the New and Alamo rivers. The return flows are a result of the application of Colorado River water to irrigated lands in IID's service area. The New River water right application seeks 700 cfs up to a maximum of 433,400 afy. The Alamo River water right application is for a diversion of 800 cubic feet per second (cfs) up to 475,000 acre-feet per year (afy). To date, Metropolitan Water District of Southern California has not prepared the required environmental document for these water rights permits and so the California State Water Resources Control Board (SWRCB) has not acted upon these permits.

3.11.2.2 Salton Sea and Agricultural Drainage

The Salton Sea receives runoff from several small tributaries, in addition to the Whitewater, New, and Alamo rivers. Flows from the three rivers are largely the result of agricultural return flows. The application of irrigation water introduces salts to the land, which are leached through the soil and collected in subsurface drains located 4 to 6 feet below the surface. This water is then conveyed to surface drains connected directly to the Salton Sea, or to the New or Alamo rivers and then to the Sea.

The California Legislature in 1968 passed Assembly Bill 461 that reserves the Salton Sea for collection of agricultural drainage flows, seepage, and other flows.

3.11.2.3 Federal Water Quality Regulations

Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act)

The Federal Water Pollution Control Act Amendments of 1972, also known as the Clean Water Act, established the institutional structure for the United States Environmental Protection Agency (USEPA) to regulate discharges of pollutants into the Waters of the United States, establish water quality standards, conduct planning studies, and provide funding for specific grant projects. Congress has amended the Clean Water Act several times since 1972. USEPA has provided most states with the authority to administer many of the Clean Water Act's provisions. In California, the SWRCB has been designated by USEPA along with the nine Regional Water Quality Control Boards (RWQCB) to develop and enforce water quality objectives and implementation plans, as described below under Section 3.11.2.4, State Surface Water and Water Quality Regulations. The Colorado River Basin RWQCB (CRBRWQCB) is the lead water quality management agency in the study area (California Department of Water Resources [DWR] and California Department of Fish and Game [DFG] 2007).

Clean Water Act section 401 requires that Federally authorized discharges into Waters of the United States not violate state water quality standards. Clean Water Act section 402 authorizes states to issue National Pollutant Discharge Elimination System (NPDES) permits for discharges to surface water both from point sources and many nonpoint sources in stormwater. Compliance is required for all discharges into Waters of the United States, or for construction projects that would disturb 1 acre or more. The CRBRWQCB administers the NPDES permit program in the study area, except on Tribal lands (DWR and DFG 2007).

Clean Water Act section 404 requires that an entity obtain permits before discharging dredge or fill material into navigable waters, their tributaries, and associated wetlands. Activities regulated by section

404 permits include, but are not limited to, dredging, bridge construction, flood control actions, and some fishing operations (DWR and DFG 2007).

Under Clean Water Act section 303(d), states, territories, and authorized Indian tribes submit lists to the USEPA describing water bodies for which existing pollution controls are insufficient to attain or maintain water quality standards. Impaired water bodies must be ranked based upon the severity of the pollution and the beneficial uses of such waters. After submitting the list of impaired waters, also referred to as a 303(d) list, states must develop a plan, called the Total Maximum Daily Load (TMDL) plan, to limit excess pollution loading to the waterbody. A TMDL represents the greatest pollutant load that a waterbody can assimilate and continue to meet water quality standards and designated beneficial uses. Generally, TMDLs are adopted for specific pollutants throughout the water body (DWR and DFG 2007).

The California Environmental Protection Agency, SWRCB, and CRBRWQCB have identified water bodies within the Salton Sea watershed that do not comply with applicable water quality standards. The Salton Sea and all of the principal inflow sources are listed as impaired water bodies (DWR and DFG 2007).

A number of TMDLs have been adopted for the Salton Sea watershed and approved by the SWRCB and USEPA. They include sedimentation/siltation TMDLs for the New and Alamo rivers, organic enrichment/low dissolved oxygen, pathogen, and trash TMDLs for the New River, and a selenium TMDL for the Imperial Valley Drains (CRBRWQCB 2010a). Other TMDLs are in the development and review processes, as shown in Table 3.11-2.

Table 3.11-2 Impaired Water Bodies within the Salton Sea Watershed

Water Body	Pollutant/Stressor
New River	Chlordane, Chlorpyrifos, Copper, DDT, Diazinon, Dieldrin, Hexachlorobenzene, Mercury, Nutrients[1], Organic Enrichment/Low Dissolved Oxygen, PCBs, Pathogens, Sedimentation/Siltation[2], Selenium, Toxaphene, Toxicity, Trash, Zinc
Alamo River	Chlordane, Chlorpyrifos, Dichlorodiphenyltrichloroethane (DDT), Diazinon, Dieldrin, Endosulfan, Enterococcus, Escherichia coli (E.coli), Mercury, Polychlorinated biphenyls (PCBs), Sedimentation/Siltation2, Selenium, Toxaphene
Imperial Valley Drains	Chlordane, DDT, Dieldrin, Endosulfan, PCBs, Sedimentation/Siltation2, Selenium, Toxaphene
Salton Sea	Arsenic, Chlorpyrifos, DDT, Enterococcus, Nutrients, Salinity[3], Selenium

Notes:

[1] CRBRWQCB (2010a) proposes to establish a TMDL in cooperation with USEPA and Mexico.

[2] Sedimentation/Siltation TMDL for Alamo River (CRBRQCB 2002a), New River (CRBRWQCB 2002b) and Imperial Valley Drains (CRBRWQCB 2005)

[3] TMDL development will not be effective in addressing this problem, which will require an engineering solution with Federal, local, and state cooperation (CRBRWQCB 2010a).

3.11.2.4 State Surface Water and Water Quality Regulations

California Fish and Game Code section 1602 requires an entity to consult with DFG prior to diverting, obstructing, or changing natural flow of a bed, channel, or bank of a river, stream, or lake; or using materials from the streambed; or disposing of materials in a river, stream, or lake. If the action would adversely affect fish and wildlife resources, DFG would require a Lake and Streambed Alteration Agreement.

DWR's Division of Safety of Dams (DSOD), which operates under California Water Code Division 3, reviews plans and specifications for the construction of new dams or for the enlargement, alteration, repair, or removal of existing dams. DSOD must grant written approval before construction can proceed on any new dam (assuming it falls within DSOD's jurisdiction). The berms proposed for the Species Conservation Habitat (SCH) Project would be constructed using local materials and impound water that is no more than 6 feet from the water surface to the berm's downstream toe. This design consideration places the berms outside the DSOD's jurisdiction (personal communication, D. Gutierrez 2011).

Porter-Cologne Act

The Porter-Cologne Act modified the California Water Code to establish the responsibilities and authorities of the SWRCB and nine RWQCBs. The SWRCB formulates and adopts state policy for water quality control. The RWQCBs develop water quality objectives and Basin Plans that identify beneficial uses of water, establish water quality objectives (limits or levels of water constituents based on Federal and state laws), and define implementation programs to meet water quality objectives (DWR and DFG 2007).

Colorado River Basin Regional Water Quality Control Board Water Quality Control Plan

The CRBRWQCB Water Quality Control Plan establishes water quality criteria and guidelines that protect human and aquatic life uses of the Lower Colorado River geographic subregion. Specifically, the Water Quality Control Plan designates beneficial uses for surface water and groundwater, establishes narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses, conforms to California's antidegradation policy, describes implementation programs to protect the beneficial uses, and defines required monitoring activities to evaluate the effectiveness of the Water Quality Control Plan (DWR and DFG 2007).

Additionally, the Water Quality Control Plan (CRBRWQCB 2006) incorporates, by reference, all applicable SWRCB and CRBRWQCB plans and policies.

Beneficial uses designated for the New and Alamo rivers in the Project area and the Salton Sea are summarized in Table 3.11-3.

Table 3.11-3 Designated Beneficial Uses for Surface Waters in the SCH Project Area

Beneficial Use	Description	Surface Water		
		New River	Alamo River	Salton Sea
Aquaculture (AQUA)	Uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.			X
Freshwater Replenishment (FRSH)	Uses of water for natural or artificial maintenance of surface water quantity or quality.	X	X	
Industrial Service Supply (IND)	Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.	P		P

Table 3.11-3 Designated Beneficial Uses for Surface Waters in the SCH Project Area

Beneficial Use	Description	Surface Water		
		New River	Alamo River	Salton Sea
Water Contact Recreation (REC-I)	Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, and use of natural hot springs.	X[1]	X[2]	X
Noncontact Recreation (REC-II)	Uses of water for recreational activities involving proximity to water, but not normally involving contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.	X	X	X
Warm Freshwater Habitat (WARM)	Uses of water that support warmwater ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	X	X	X
Wildlife Habitat (WILD)	Uses of water that support terrestrial ecosystems including, but not limited to, the preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.	X	X	X
Hydropower Generation (POW)	Uses of water for hydropower generation.		P	
Preservation of Rare, Threatened, or Endangered Species (RARE)	Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or Federal law as rare, threatened, or endangered.	X[3]	X[3]	X[3]

Notes:

1 Although some fishing occurs in the downstream reaches, the presently contaminated water in the river makes it unfit for any recreational use. An advisory has been issued by Imperial County Health Department warning against the consumption of any fish caught from the river and the river has been posted with advisories against any body contact with the water.

2 The only REC I usage that is known to occur is from infrequent fishing activity.

3 Rare, endangered, or threatened wildlife exists in or utilizes some of these waterway(s). If the RARE beneficial use may be affected by a water quality control decision, responsibility for substantiation of the existence of rare, endangered, or threatened species on a case-by-case basis is upon DFG on its own initiative and/or at the request of the CRBRWQCB; and such substantiation must be provided within a reasonable time frame as approved by the CRBRWQCB.

X = existing use; P = potential use

Source: CRBRWQCB 2006

3.11.2.5 Surface Water Hydrology

Salton Sea

The Salton Sea is located in the Salton Trough, a northern extension of the Colorado River Delta. The Sea's bottom elevation is about 278 feet below msl, and the water surface elevation on October 1, 2010 (the start of the 2011 water year), was -231.87 feet msl (United States Geological Survey [USGS] 2010).

The Sea's total volume is approximately 7.2 million acre-feet (af), with a current maximum depth of 46 feet. With about 350 square miles of surface area, the Salton Sea is the largest waterbody in California. It measures about 35 miles along a northwest/southeast axis by about 15 miles at its widest point. The total shoreline measures about 120 miles (DWR and DFG 2007).

The Salton Sea is a terminal water body that receives water from the New, Alamo, and Whitewater rivers, along with numerous small streams, precipitation, and groundwater. The only outflow from the Sea is through evaporation and seepage. Formed in 1905–1907 from Colorado River flood flows, the Salton Sea is supported primarily by agricultural return flows. These return flows have decreased in recent time, largely because of water transfers from the Imperial Valley and the resulting water conservation measures. Recent Salton Sea elevations show the elevation peak around May 1995 and a decreasing trend to the end of the 2010 water year (Figure 3.11-2). Inflow to the Sea from the Imperial Valley is projected to continue to decline from the current annual average of 1,029,620 afy to 723,940 afy (with adjustment for the Quantification Settlement Agreement [QSA]) by 2020 (DWR and DFG 2007). The combined inflow from the Imperial Valley and Mexico to the Salton Sea represents about 86.3 percent of the total inflow to the Sea. The Coachella Valley accounts for 8.5 percent of the total inflow to the Sea. The total salt loading to the Sea from these sources is 92.6 and 5.8 percent, respectively (DWR and DFG 2007). The relative magnitude of the annual flow to the Sea from the three major tributaries is shown on Figure 3.11-3.

Wastewater discharges enter the Salton Sea from numerous municipal wastewater systems in the Imperial and Coachella valleys. The wastewater effluent is discharged to the New River, Alamo River, or Coachella Valley Stormwater Channel, and eventually flows to the Sea. In the future, the wastewater effluent is expected to decline as more water is recycled and overall municipal wastewater flows decrease because of water conservation measures.

New River

The New River originates in the Mexicali Valley of northern Mexico and terminates where it flows into the Salton Sea. It receives runoff from several sources, primarily agricultural drainage conveyed to the river by subsurface drains, as well as wastewater treatment plant flows. The New River watershed is predominantly at or below sea level. Rainfall in the Imperial Valley is less than 2 inches annually, but the New River receives up to 10 inches each year in the southwestern portion of the watershed located in northern Mexico (Hely and Peck 1964).

The New River flow is measured at a gage near Westmorland (USGS gage #10255550) and at the international boundary with Mexico (USGS gage #10254970). The annual flow (based on water year) for water years 1944–2010 at the Westmorland gage has ranged from 360,459 af to 536,100 af, with an average of 443,272 af (Figure 3.11-4). Both IID and USGS measured the New River flow independently prior to March 2005. Since that time, both agencies have cooperatively collected streamflow data for the river. Daily flow data at the USGS stream flow gage near Westmorland indicate that the flows from 1944 to date show a median flow for each month that ranges from 521 cfs (December) to 732 cfs (April). The 90 percentile flow (90 percent of all flows are greater) is 423 cfs (December) while the minimum 10 percentile flow (only 10 percent of flow is greater) is 848 cfs (April) (Table 3.11-4 and Figure 3.11-4). The range in any month between the 10 and 90 percentile ranges from 200 cfs to 240 cfs. The USGS rates the measurement capability of stream gages on a system that ranges from "Poor" to "Good" that relates to the accuracy of the streamflow measurements. The Westmorland gage provides data rated "Good" for 74 percent of its history.

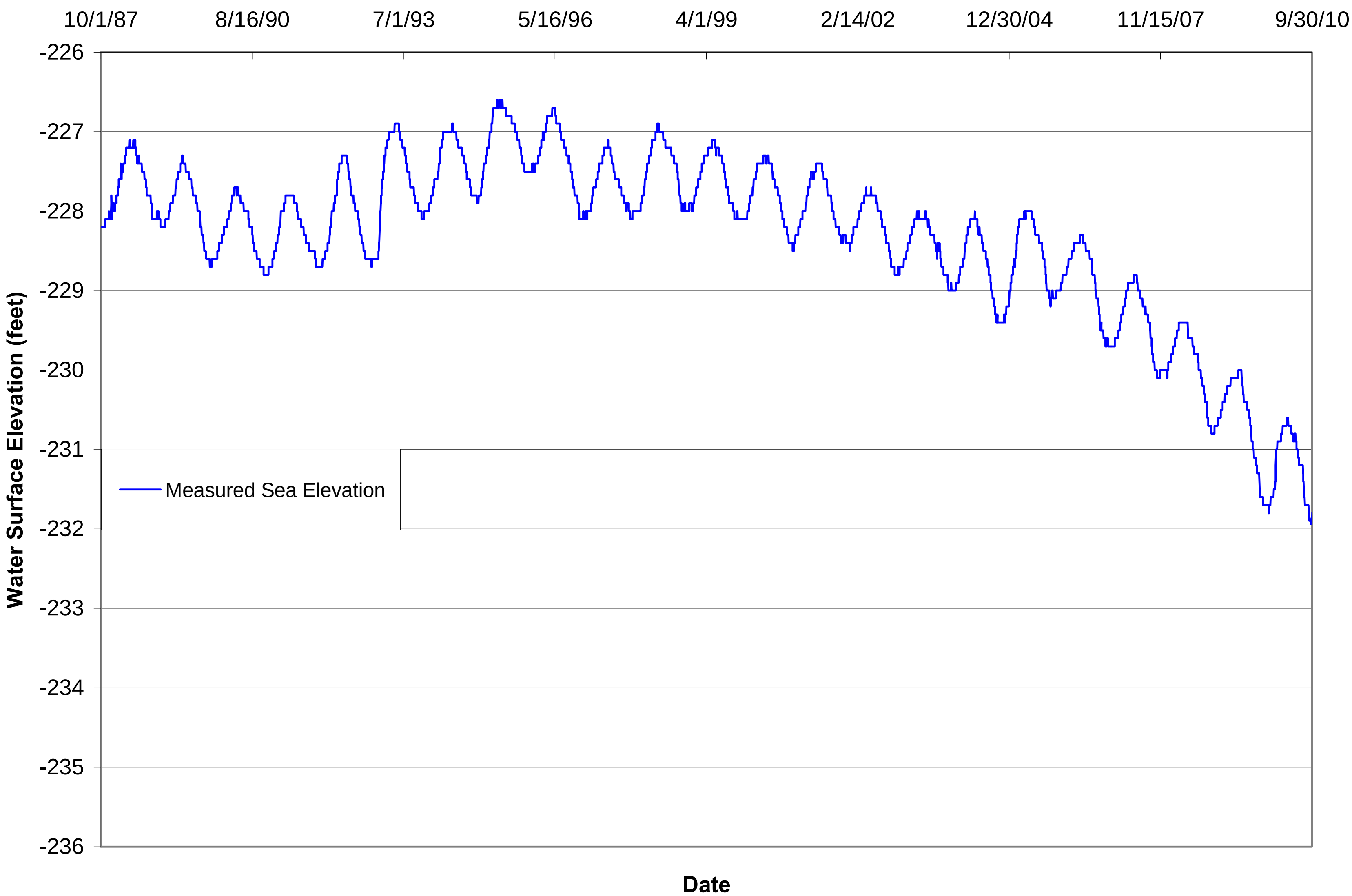


Figure 3.11-2 Salton Sea Water Surface Elevation

Source: USGS data for Station #10254005 Salton Sea near Westmorland

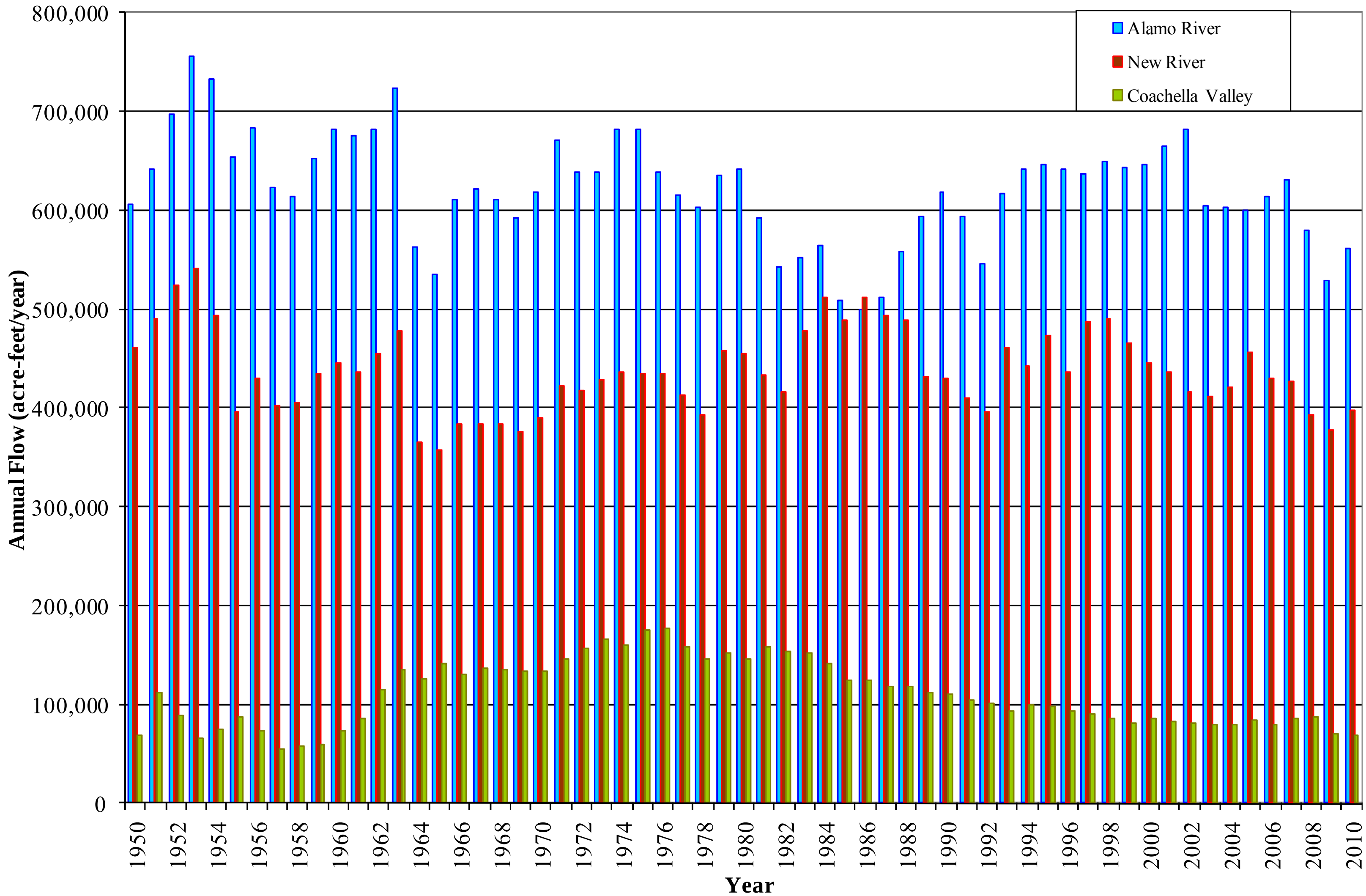


Figure 3.11-3 Annual Flow for the Primary Watercourses Tributary to the Salton Sea

Source: USGS gage #10255550, USGS gage #10254, USGS gage #10259540, CVWD Data

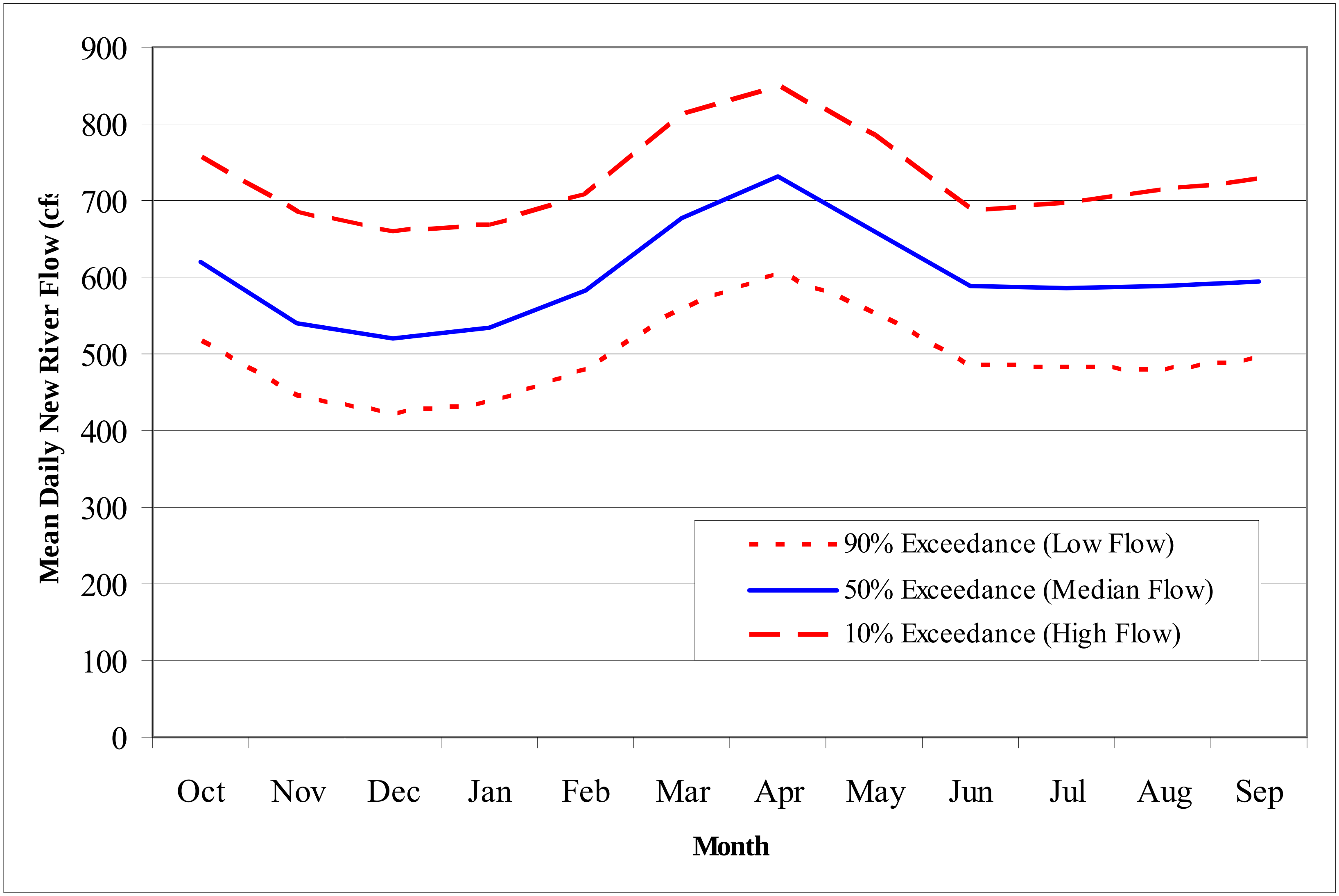


Figure 3.11-4 New River Exceedance Plot of Average Daily Flows

Alamo River

The Alamo River also originates in the Mexicali Valley and flows north to the Salton Sea. Runoff from the Chocolate Mountains to the southeast contributes to the Alamo River through numerous watercourses that eventually are picked up in agricultural drains within IID's service area. Along its course, the river picks up stormwater, municipal wastewater, and agricultural return flows. During dry periods, the river flow is composed almost entirely of agricultural return flow (drainwater). The elevation of this basin is primarily at or below sea level, with a mean annual precipitation less than 2 inches near the Salton Sea.

The flow of the Alamo River into the Salton Sea is measured at the USGS stream flow gage near Niland (USGS gage #10254730) and upstream near Calipatria (USGS gage #10254670). Prior to October 1, 2004, IID and USGS independently collected Alamo River flow data. While the measurements were similar, differences often occurred in the measured value (DWR and DFG 2007). Currently, the flow data are cooperatively collected at Niland and only one dataset is used. The Niland gage provides measurements rated "Good" for 93 percent of its history, while the Calipatria gage provides measurements rated "Good" for 65 percent of its history.

The USGS data at Niland indicate that the annual flow for water years 1960–2010 ranged from 492,315 af to 717,375 af, with an average of 612,274 af (Figure 3.11-5). Median monthly flows ranged from 630 cfs in January to 1,100 cfs in April. January and February typically experience the lowest daily flow and April experiences the highest (Table 3.11-4). Variation of flow within a month occurs in response to irrigation practices as well as occasional storm events. For December/January, the minimum flow month, 90 percent of the flows are greater than 443 cfs (the "90 percentile" value). During April, the high flow month, 10 percent of the daily flows exceed 1,240 cfs (the "10 percentile" value). For any given month, the historic record suggests that the variation between the 10 percent and 90 percent exceedance flow ranges from 300-400 cfs (Figure 3.11-5).

Agricultural Drains/Natural Watercourses

IID is the agricultural water purveyor in the Imperial Valley, providing water from the Colorado River through the All American Canal. IID receives and delivers about 90 percent of the 3.2 million af of irrigation water delivered from the Colorado River (Lawrence Livermore National Laboratory [LLNL] 2008). IID also provides a network of drainage channels that receive water from on-farm subsurface drainage systems (Figure 3.11-6). This drainage water is then conveyed to the New River, Alamo River, or directly to the Salton Sea. Agricultural drainage from the Imperial Valley to the Sea comprises about 10 percent of total Imperial Valley contribution to the Sea's inflow, which is estimated at 93,848 afy (DWR and DFG 2007).

Several natural watercourses terminate at the Salton Sea, including in the Project area. Several watercourses begin southwest of the New River, cross under State Route 86 and the Westside Canal before entering the Salton Sea. These watercourses typically convey runoff only during large rainfall events. These storms produce high peak flow and short duration floods. The runoff west of State Route 86 is collected with levees near the highway and directed under the highway and the canal. Runoff is then conveyed in natural and constructed channels to the Salton Sea. To the southeast, several watercourses cross the Coachella Canal and Highline Canal and enter IID's drainage system. Flow records are not available for these natural watercourses, but the flows are irregular, only responding to large thundershower events.

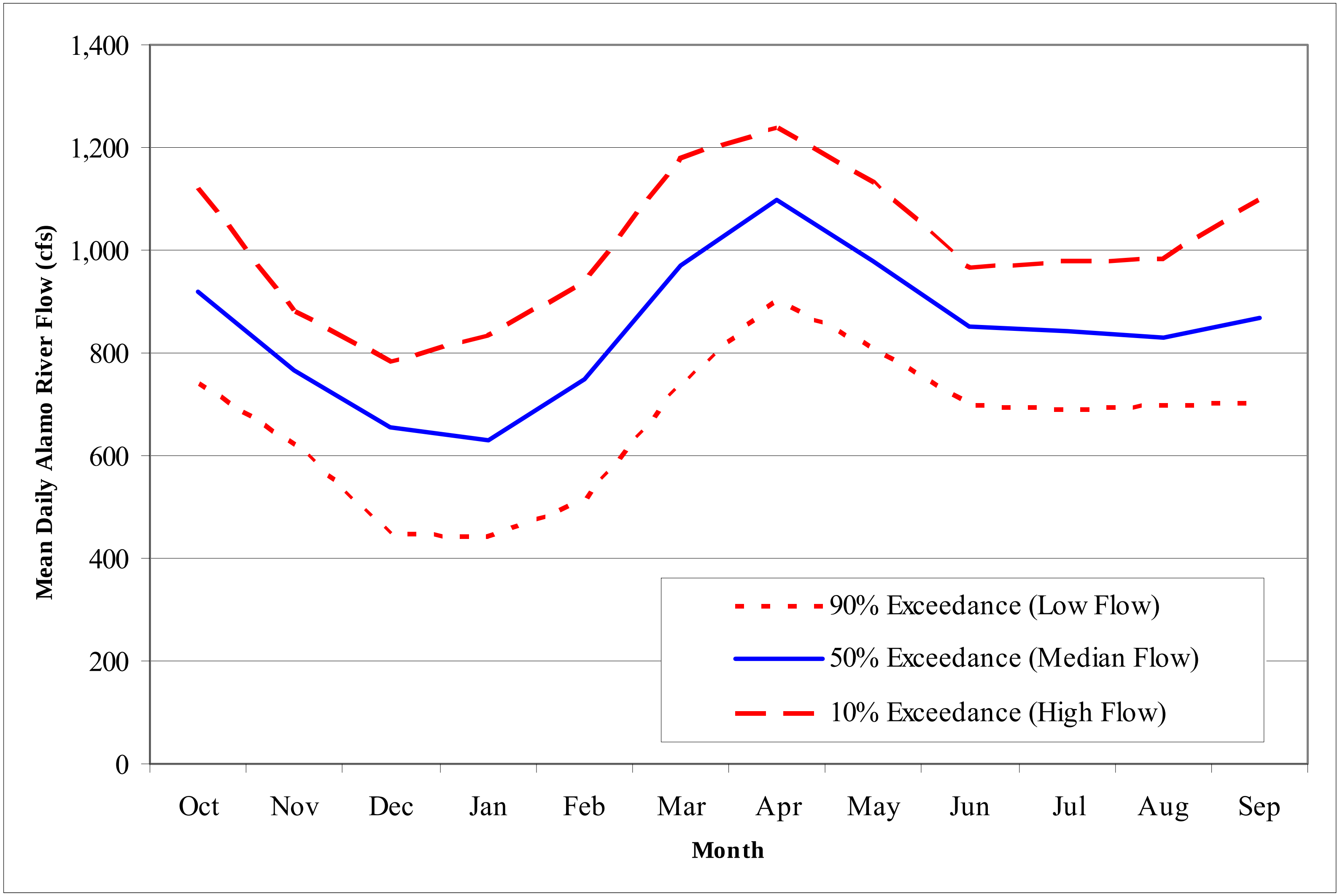


Figure 3.11-5 Alamo River Exceedance Plot of Average Daily Flows

Table 3.11-4 Statistical Representation of Mean Daily Stream Flow

	New River (cfs)			Alamo River (cfs)		
Month	90%	Median	10%	90%	Median	10%
October	517	620	756	740	919	1,120
November	445	540	687	619	766	882
December	423	521	661	447	655	783
January	436	535	669	443	630	833
February	481	582	708	512	748	935
March	559	678	811	735	969	1,180
April	607	732	848	904	1,100	1,240
May	554	659	786	809	979	1,130
June	487	589	688	696	849	966
July	483	586	698	690	842	979
August	481	590	714	700	829	983
September	494	594	729	704	870	1,100

Source: USGS 2010

Flooding

The Project area has been defined by the Federal Emergency Management Agency (FEMA) as a special flood hazard area. The New and Alamo rivers, along with the land between both rivers within 4.5 miles of the Salton Sea, are listed as Zone A.

The Zone A delineation refers to flood boundaries that are set using approximate methods (an estimation of the flood boundary) rather than a detailed hydraulic model. Therefore, the depth of flooding is not presented on the flood maps but is assumed to be less than 1 foot (typically how Zone A is represented). The area where the proposed SCH ponds would be located is shown on the flood map as within the Sea's inundation area. That is, it is not in the flood hazard area because it is part of the Sea.

3.11.2.6 Surface Water Quality

Sediment

Sediment loading to the Salton Sea comes from the New, Alamo, and Whitewater rivers, numerous natural watercourses that flow into the Sea, and also the individual drains and canals that directly enter the Sea. Total suspended solids, a measure of the sediment load, has been measured in both the New and Alamo rivers. These data indicate that the average total suspended solids for the New River is 217 milligrams per liter (mg/L) and 261 mg/L for the Alamo River. Assuming an average annual flow for the New River of 845 cfs and 612 cfs for Alamo River, then the annual sediment loading to the Sea is 132,000 and 232,600 tons/year for the New and Alamo rivers, respectively.

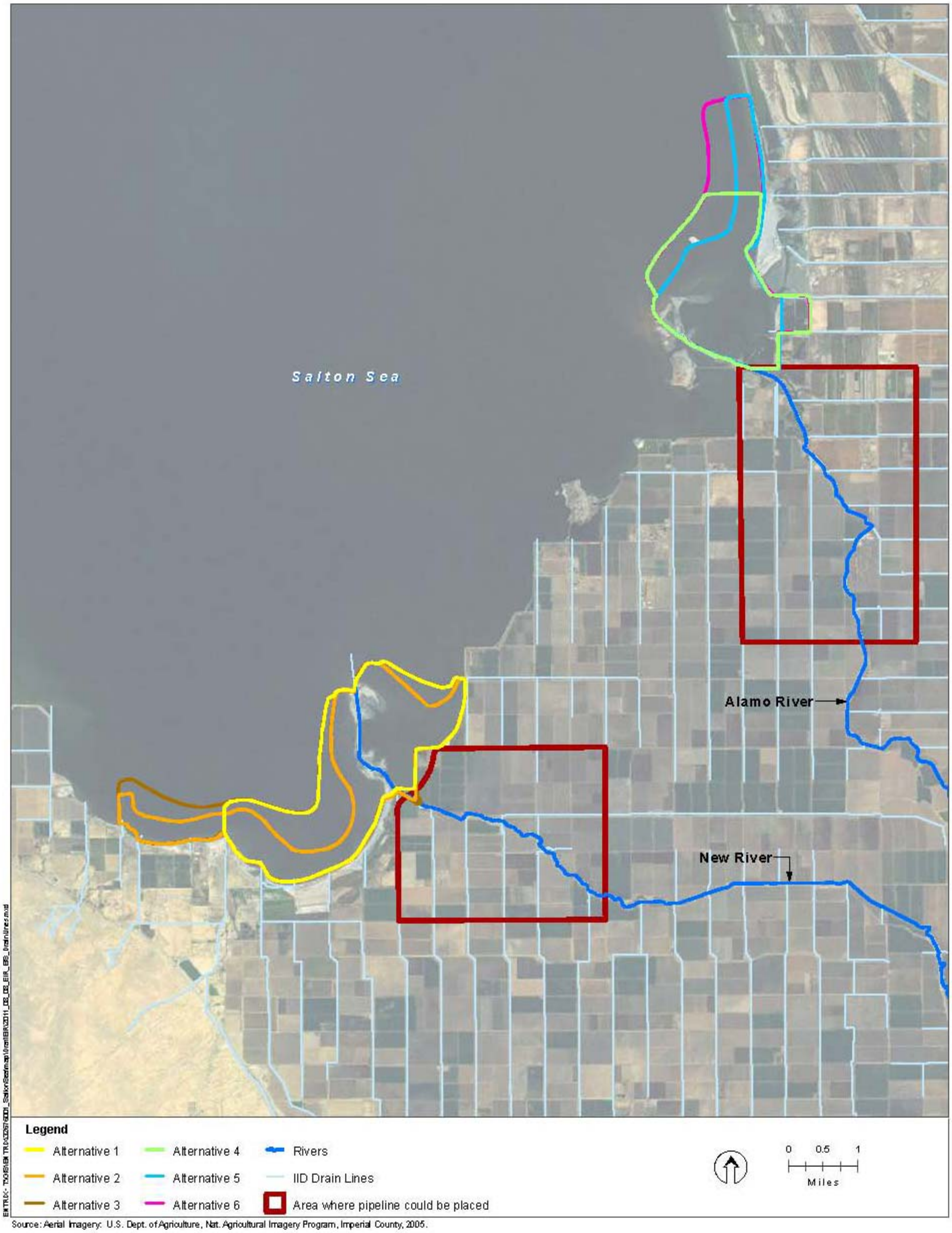


Figure 3.11-6 Imperial Irrigation District Service Area and Agricultural Drain Network

Constituents Included in the Water Quality Control Plan (Surface Water Quality Objectives)

The CRBRWQCB Water Quality Control Plan (2006) provides general surface water quality objectives for surface waters of the Colorado River Basin Region. These water quality objectives are compared below, by constituent of concern, to seasonal water quality data collected by the Bureau of Reclamation (Reclamation) in the Salton Sea and its tributaries in 2004–2010 (C. Holdren, Reclamation, unpublished data) (Table 3.11-5).

Table 3.11-5 Comparison of Water Quality Objectives with Current Conditions (2004-2010 Mean Annual)

		Current Conditions			
Constituent	Objective	Salton Sea	New River	Alamo River	Whitewater River
Suspended solids (mg/L)		39	217	261	56
Total dissolved solids (Salinity) (mg/L or ppt)	35 ppt (Sea) 4 ppt (Rivers)	51,829 mg/L 52 ppt in 2010	2,636 mg/L 2.6 ppt	1,987 mg/L 2.0 ppt	1,132 mg/L 1.1 ppt
Nitrate and nitrites (NO^3/NO^2) (µg/L)		209	4,142	5,862	12,846
Ammonia (NH^3) (µg/L)		1,157	1,750	1,347	1,019
Total phosphorus (µg/L)	35 (Sea)	103	976	624	1,419
Orthophosphate (µg/L)		42	536	306	992
Selenium (µg/L)	5	1.34	3.18	5.39	2.00
Dissolved oxygen range (mg/L)	5	—	3.2 – 11.5	5.0 – 12.5	3.8 – 10.4

Source: C. Holdren, Reclamation, unpublished data
Note: Objectives from CRBRWQCB Basin Plan 2006

Salinity

The CRBRWQCB's (2006) water quality objective for total dissolved solids (salinity) at the Salton Sea is to stabilize salinity at 35,000 mg/L or 35 parts per thousand [ppt]. Average salinity in the Sea in 2010 was 51,829 mg/L (approximately 52 ppt) (C. Holdren, Reclamation, unpublished data) (Table 3.11-5). Since 2004, average salinity in the Sea has increased by approximately 13.1 percent. Lower salinity conditions frequently occur near the tributaries and near the Sea's shoreline due to dilution by inflows. Higher salinity generally occurs in the Sea's center. The primary source of salts in the Sea's watershed is from imported Colorado River water. These salts are applied to fields with irrigation water and are carried off by tailwater or tilewater into surface drains. The Imperial Valley contributes a greater salt load to the Sea than does the Coachella Valley (DWR and DFG 2007).

The New, Alamo, and Whitewater rivers have average salinity concentrations of 2,636, 1,987, and 1,132 mg/L respectively (C. Holdren, Reclamation, unpublished data). Since 2004, average salinity in the New River has increased by approximately 23.6 percent, and average salinity in the Alamo River has increased by approximately 15.8 percent. Although salinities are increasing in both the New and Alamo rivers, salinities are still below the CRBRWQCB's (2006) water quality objective of 4,000 mg/L for total dissolved solids (salinity). In general, the New River has slightly higher salinity than the Alamo River.

Selenium

Selenium is present in the water, sediment, and biota around the Salton Sea. Selenium bioaccumulation in biota is discussed further in Section 3.4, Biological Resources. Most of the selenium entering the Salton Sea originally comes from the upper Colorado River in water used to irrigate agriculture in the Imperial and Coachella valleys. Selenium becomes concentrated by agricultural usage and is discharged from subsurface tile drains into surface drains that flow into the Sea either directly or via tributaries (Saiki et al. 2010). Selenium concentrations in agricultural drains vary widely (0.790–79.1 micrograms/liter [µg/L]), averaging 4.18 µg/L in selected IID drains monitored in 2005–2009 (Saiki et al. 2010). Total selenium concentrations in the rivers averaged 2.0 µg/L in Whitewater, 3.2 µg/L in New, and 5.4 µg/L in Alamo in 2004–2010 (C. Holdren, Reclamation, unpublished data) (Table 3.11-5). Future scenarios modeled in the PEIR suggested that selenium in New and Alamo rivers would not exceed 10 µg/L by 2075 (DFG and DWR 2007).

Selenium enters the Salton Sea as highly soluble salt (primarily as selenate and selenite) and accumulates in the anoxic sediments on the Salton Sea floor (DWR and DFG 2007). Waterborne concentrations are rapidly reduced to less than 2 µg/L as selenium assimilates into biota and settles as part of the organically rich sediments. The anoxic nature of the Sea sediments is important in trapping the selenium in insoluble, non-bioavailable forms of selenite, elemental selenium, and selenide. The CRBRWQCB's (2006) water quality objective for selenium is 5 µg/L (4-day average).

Selenium concentrations in sediment were measured in 2010 at proposed Project sites adjacent to the mouths of the New and Alamo rivers. Mean selenium concentrations were 1.1 milligrams per kilogram (mg/kg) (range 0.54–2.3 mg/kg). The majority of sediment samples (63 percent) was less than 1 mg/kg of selenium and would be considered "low risk." The remaining 37 percent of the samples were between 1 and 4 mg/kg (only two samples exceeded 2.5 mg/kg) and were considered in the "level of concern" category. No sample exceeded the "toxicity threshold" value of 4 mg/kg (Amrhein and Smith 2011).

Oxidized selenium is present in the exposed playa sediments, and rewetting the sediments could result in a "flush" of selenium released into the pond water (DWR and DFG 2007; Amrhein et al. 2011). An experiment measured water-soluble selenium released from wetted sediment samples taken from the SCH Project area and incubated up to 235 days with low-salinity water (2 ppt and 13.7 ppt) (Amrhein et al. 2011; see also Appendix I**,** Selenium Management Strategies). Sediment selenium concentrations were positively related to organic carbon, but the oxidation rates and amount released into water did not appear affected by carbon content, salinity, location, or depth of sample core. Rather, the release of selenium appeared controlled by the amount of oxidizable iron present in sediments. If iron was present, the oxidized selenium adsorbed onto the iron and remained in the sediment, and less selenium would dissolve into pond water.

Temperature

The CRBRWQCB's (2006) water quality objective for temperature is that the receiving water's temperature should not be altered by waste discharges unless demonstrated that the temperature alteration does not adversely affect the receiving water's designated beneficial use. Water temperature was monitored at three sampling sites toward deep areas of the Sea in 1999 (Holdren and Montaño 2002, as cited in DWR and DFG 2007) and 2004–2010 (C. Holdren, Reclamation, unpublished data). The Sea's water surface temperatures ranged from a low of 12.8 degrees Celsius (˚C) (55.1 degrees Fahrenheit [˚F]) in February 2009 to a high of 36.5˚C 97.7˚F) (C. Holdren, Reclamation, unpublished data). The Salton

Sea is a polymictic lake (a lake having no stable thermal stratification), which can stratify and mix many times during the year.

In the rivers, water surface temperature was measured quarterly from 2004–2010. Temperatures were lowest in February 2009 (New River 11.7˚C [53.1˚F], Alamo River 11.5˚C [52.7˚F]) and highest in July 2006 (New River 31.1˚C [88.0˚F], Alamo River 31.9˚C [89.4˚F]) (C. Holdren, Reclamation, unpublished data). In general, the New River has slightly higher temperatures than the Alamo River.

Dissolved Oxygen

Dissolved oxygen is of particular concern at the Salton Sea because it is essential to support survival of fish and other aquatic organisms. Surface water (technically referred to as the epilimnion or epilimnetic water) is often supersaturated with respect to dissolved oxygen for several months during daylight hours, while water at the Sea's bottom near the Seabed (also referred to as the hypolimnion or hypolimnetic water) is virtually devoid of dissolved oxygen (Holdren and Montaño 2002, as cited in DWR and DFG 2007; Anderson and Amrhein 2003, as cited in DWR and DFG 2007). Dissolved oxygen supersaturation is often caused by photosynthetic production of oxygen during the daytime. Dissolved oxygen concentrations are a function of the geometry of the water body, wind fields, algal production, and biological and chemical oxygen demand in the water body. Frequently the geometry of a large water body is described in relation to depth and fetch. The fetch is a measure of the water surface area where the wind continues at a constant direction and speed (DWR and DFG 2007).

Thermal stratification leads to accumulation of chemically reduced compounds in the hypolimnion. The anaerobic microbial and decomposition of organic matter in an anoxic hypolimnion produce hydrogen sulfide and ammonia, constituents that are toxic to most aquatic life. When wind action mixes hypolimnetic and surface waters and breaks down stratification, these toxic components are distributed throughout the water column and deplete dissolved oxygen. These mixing events have been linked with massive fish kills (Schladow 2004, as cited in DWR and DFG 2007), although fish kills are observed during all seasons, including some that result from low water temperatures.

A dissolved oxygen concentration of about 4 to 5 mg/L is generally considered necessary for most aquatic species. Tilapia can tolerate infrequent very low dissolved oxygen concentrations, generally less than 2 mg/L (FAO 1986, as cited in DWR and DFG 2007) and briefly 1 mg/L (personal communication, K. Fitzsimmons 2010). The CRBRWQCB's (2006) water quality objective for dissolved oxygen of all designated "warm freshwater habitat (WARM)" surface waters (see Table 3.11-3) within the Colorado River Basin states that dissolved oxygen should not be reduced below the minimum level of 5 mg/L. In addition, the CRBRWQCB's (2010b) TMDL for dissolved oxygen in the New River is 5 mg/L.

Vertical profiles of dissolved oxygen were measured in the Salton Sea 1999 (Holdren and Montaño 2002, as cited in DWR and DFG 2007) and 2004–2010 (C. Holdren, Reclamation, unpublished data). Dissolved oxygen ranged from 20.6 mg/L and greater than 370 percent saturation in the surface water to zero in the bottom water. A period of severe dissolved oxygen depletion during August and September 1999 (0.21 mg/L as surface dissolved oxygen on September 8, 1999) coincided with extensive fish kills (Holdren and Montaño 2002, as cited in DWR and DFG 2007).

In the New River, dissolved oxygen ranged from 11.5 mg/L in November 2008 to a low of 3.2 mg/L in July 2006 (C. Holdren, Reclamation, unpublished data). In the Alamo River, dissolved oxygen ranged from 12.5 mg/L in November 2008 to a low of 5.0 mg/L in May 2007 (C. Holdren, Reclamation, unpublished data). In general, the Alamo River has slightly higher dissolved oxygen concentrations than the New River.

Nutrient

The Salton Sea is a eutrophic to hypereutrophic water body characterized by high nutrient concentrations, high algal biomass as demonstrated by high chlorophyll a concentrations, high fish productivity, low clarity, frequent very low dissolved oxygen concentrations, massive fish kills, and noxious odors (Setmire 2000, as cited in DWR and DFG 2007). The eutrophic conditions appear to be controlled (i.e., limited) by phosphorus. In addition, nutrients can stimulate the overproduction of algae, which can lead to low dissolved oxygen and the production of hydrogen sulfide (DWR and DFG 2007).

Phosphorus

Phosphorus is an essential nutrient for plant and algal growth. Setmire et al. (2001, as cited in DWR and DFG 2007) identified phosphorus as the limiting nutrient at the Salton Sea, and others (Holdren and Montaño 2002, as cited in DWR and DFG 2007; Schladow 2004, as cited in DWR and DFG 2007) have supported this conclusion. Phosphorus is present in water bodies in many forms, including soluble and particulate organic phosphates from algae and other organisms, inorganic particulate phosphorus, polyphosphates, and soluble orthophosphates. Soluble orthophosphate is assimilated by phytoplankton and therefore is an important indicator of productivity and quality. Total phosphorus is another indicator of the maximum level of productivity of a water body (DWR and DFG 2007). Eutrophic lakes are typically associated with total phosphorus concentrations of 16-386 μg/L, which is very productive for warm water fisheries.

In the Salton Sea, levels of soluble orthophosphates during 2004-2010 were lowest during the spring and summer months and highest during the winter months, correlating with typical seasonal algal growth patterns. Total phosphorus concentrations were lowest in the spring and summer months and highest in the fall and winter months, with peak concentrations as high as 756 μg/L (C. Holdren, Reclamation, unpublished data). The Sea's concentration of phosphorus was nearly the same in 1968/69 as in 1999 despite a 100 percent increase in external phosphorus loading (Setmire et al. 2001, as cited in DWR and DFG 2007), which indicates an effective phosphorus removal mechanism in the Salton Sea. Annual average total phosphorus concentration for 2004-2010 was 103 μg/L (C. Holdren, Reclamation, unpublished data), which exceeds the draft TMDL target of 35 μg/L (CRBRWQCB 2006).

In the rivers during 2004-2010, average levels of soluble orthophosphates were 75 percent greater in the New River compared to the Alamo River (536 μg/L and 306 μg/L, respectively) (Table 3.11-5) (C. Holdren, Reclamation, unpublished data). Similar to the Salton Sea, during the summer months levels of soluble orthophosphates and total phosphorus were lowest. Total phosphorus concentrations are highest during the fall months at the New River and during the winter months at the Alamo River. Average annual concentrations of total phosphorus were approximately 56 percent greater in the New River compared to the Alamo River (976 μg/L and 624 μg/L, respectively) (C. Holdren, Reclamation, unpublished data). Nutrient concentrations have not decreased recently, despite TMDLs for total suspended solids and phosphorus or changes in agricultural practices (personal communication, C. Holdren Reclamation, 2010).

Nitrogen

Nitrogen is present in water bodies in several forms. Ammonia is the form most readily utilized by phytoplankton, and is typically found in water with low oxygen concentrations. Bacteria can break ammonia down to form nitrite, which, in turn, is converted to nitrate. Nitrate is commonly found in surface water. Nitrogen in the inflows to the Salton Sea is primarily in nitrate-nitrite form. Nitrate-nitrite levels in the rivers were approximately 20-30 times greater than in the Sea (Table 3.11-5) (C. Holdren, Reclamation, unpublished data).

Most of the nitrogen in the Salton Sea consists of ammonia and organic nitrogen. High levels of ammonia indicate frequent reducing conditions in the Sea, and contribute to anoxia and fish kills. The annual mean concentration of ammonia for 2004–2010 was 1,157 µg/L in the Sea, 1,750 µg/L in New River, and 1,347 µg/L in Alamo River (Table 3.11-5) (C. Holdren, Reclamation, unpublished data). Concentrations in the New River are approximately 30 percent greater than in the Alamo River (C. Holdren, Reclamation, unpublished data).

Pesticides and Contaminants

A large percentage of the water the Salton Sea receives is from agricultural runoff, which contains numerous pesticides and heavy metals at levels that can be toxic to aquatic organisms (de Vlaming et al. 2004 and Phillips et al. 2007, as cited in Wang et al. 2011). Concentrations of pesticides in sediments and water correlate with their seasonal usage in the adjacent agricultural areas (LeBlanc and Kuivila 2008, as cited in Wang et al. 2011). Concentrations were highest near the shoreline and mouth of inflowing rivers, but levels dropped below detection off shore.

In 2010, levels of chlorinated insecticides and pyrethroids were measured in water of the New and Alamo rivers and in the bed sediments at potential SCH pond sites (Wang et al. 2011**;** see also Appendix J, Summary of Special Studies). In the water (four samples per river), most organochlorine pesticides were < 1.5 nanograms per liter (ng/L) or were not detected. Chlorpyrifos was the most frequently detected, but only one sample at the New River (80 ng/L) exceeded the DFG Hazardous Assessment Criteria (14 ng/L 4-day average) (Siepmann and Finlayson 2000, as cited in CRBRWQCB 2008). Of pyrethroids, permethrin (3.3-7.5 ng/L) was the most commonly detected, and fenpropathrin (New River, 11.6 ng/L) was detected once at elevated levels.

Sediment concentrations of pesticides were also measured in 2010 at exposed playa and submerged sites (Wang et al. 2011). Samples were taken at three depths (0-5 centimeters [cm], 5-15 cm, and 15-30 cm deep) in order to discriminate potential differences in deposition of legacy (i.e., organochlorines) and current-use pesticides. Total sediment pesticide concentrations detected ranged from 0.2 to 120 nanograms per gram [ng/g]. Sediment pesticide concentrations, particularly organochlorines, were greatest at the mouth of both the New and Alamo rivers. Dichlorodiphenyltrichloroethane (DDT) and its metabolites were detected in all samples, and dichlorodiphenyldichloroethylene (DDE) was the predominant pesticide residue. In general, the concentrations of organochlorine pesticides were higher in the 5–30 cm depth interval than in the 0–5 cm depth interval (more recent deposition). This correlation equates with the banning of most organochlorine pesticides, including DDT, in the United States in the 1970s. Mean DDE concentrations in at New River were 1.14 to 6.52 ng/g at the surface (0 to 5 cm deep) and 0.89 to 9.10 ng/g subsurface (5 to 15 cm and 15 to 30 cm deep). Mean DDE concentrations in sediments at Alamo River were 13.41 to 13.66 ng/g at the surface (0 to 5 cm deep) and 9.16 to 25.02 ng/g subsurface (5 to 15 cm and 15 to 30 cm deep) (Table 3.11-6). Organochlorine pesticide concentrations showed a pattern of decreasing concentration with distance from the river mouths. The highest DDE concentrations were documented in East New and immediately adjacent to the Alamo River mouth in Morton Bay (Wang et al. 2011). Lower concentrations of DDE were documented at the Mid New River and Alamo River-Davis Road sites (Wang et al. 2011). The lowest DDE concentrations were documented at the Far West New River sites (Wang et al. 2011).

Table 3.11-6 DDE Concentrations in Sediment at SCH Project Area (ng/g)

Location	Surface Mean (# samples)	Surface Maximum	Subsurface Mean (# samples)	Subsurface Maximum
New River - East	6.52 (11)	23.71	9.10 (21)	41.16
New River - Middle	2.78 (15)	7.99	5.44 (29)	33.51
New River - Far West	1.14 (6)	2.90	0.89 (13)	2.41
Alamo River - Morton Bay	13.66 (11)	32.41	25.02 (19)	102.60
Alamo River - North (Davis Road)	13.41 (7)	34.40	9.16 (14)	38.26

Source: Calculated from raw data in Wang et al. 2011. Surface (0-5 cm deep) and Subsurface (5-15 cm and 15-30 cm deep). Nondetect values were defined as 0.01 ng/g for purpose of calculating means. Samples were pooled for air-exposed and submerged sites within each location.

The frequency of surface sediment samples exceeding a sediment guideline of 31.3 ng/g total DDE (Probable Effects Concentration [PEC], MacDonald et al. 2000, as cited in CRBRWQCB 2008) was 18 percent at Alamo River-Morton Bay (32.41 ng/g maximum); 14 percent at Alamo River-Davis Road (34.40 ng/g maximum); and none at New River sites. The frequency of subsurface samples exceeding the PEC was 37 percent at Alamo River-Morton Bay (102.60 ng/g maximum); 7 percent at Alamo River-Davis Road (38.26 ng/g maximum); and 10 percent at New River East (41.16 ng/g maximum); 3 percent at New River Middle (33.51 ng/g maximum); and none at New River West. Further analysis of potential biological impacts to biota utilizing the SCH ponds is provided in Section 3.4.4. Mean DDE sediment concentrations (0-5 cm deep) were measured at nearby sites by USGS in 2006-2008 (Miles et al. 2009). For comparison, 0-5 cm depth were 4-48 ng/g at the Reclamation/USGS Saline Habitat Ponds, 41-56 ng/g in Alamo River, 15-41 ng/g in the Salton Sea near Alamo River, 60-98 ng/g at the Freshwater Marsh near Morton Bay, and 2-6 ng/g at the D-Pond on the Sonny Bono Salton Sea National Wildlife Refuge (NWR) (Miles et al. 2009). With the exception of the D-Pond, these concentrations are similar or higher than the levels measured at the Salton Sea SCH alternative sites.

Chlordane (organochlorine, < 1.2 ng/g New River, < 3 ng/g Alamo River) and bifenthrin (pyrethroid, < 0.5 ng/g New River, < 1.9 ng/g Alamo River) were also detected, but at lower levels than DDE. Other pesticides were infrequently detected (Wang et al. 2011).

3.11.2.7 Groundwater Hydrology and Quality

Groundwater is present throughout the Salton Sea Basin and is extracted for consumptive use. The sources of groundwater include:

- Percolation of ancient seawater associated with the Gulf of California when the Gulf extended north into the Salton Trough;
- Direct infiltration from the Colorado, New, and Alamo rivers, both currently and previously when these rivers discharged to the Salton Trough;
- Deep percolation of applied agricultural irrigation water;
- Leakage from the numerous unlined irrigation canals;

- Percolation of precipitation over the basin proper, including the mountains that comprise part of the watershed; and
- Direct groundwater recharge and recovery projects such as projects currently operating in the Coachella Valley (LLNL 2008).

The Project area is part of the Imperial Valley Groundwater Basin. Previous studies (LLNL 2008) have found that production of groundwater in the central portion of the Imperial Valley is limited because of the low permeability of the aquifer and also poor groundwater quality. The low permeability is a consequence of the deposition of former lakebed sediments that comprise the Imperial Valley soils. Some of these sediments have low transmissivity and, therefore, do not produce significant amounts of groundwater. The groundwater is characterized as occurring in a shallow system (ground surface to 2,000 feet deep) and a deeper system (extending to bedrock). The shallow system in the Imperial Valley Groundwater Basin consists of low permeability lake deposits from 0-80 feet, a low-permeability aquitard from 60-450 feet, and alluvium down to about 1,500 feet (LLNL 2008). Well production data are limited for the Imperial Valley aquifer, but available data suggest the wells in the central portion of the aquifer (closest to the Project area) have the following characteristics:

- Production rates of less than 100 gallons per minute (0.2 cfs);
- Salinity generally ranged between 1,000 and 2,000 mg/L to as high as 15,700 mg/L; and
- Hydraulic conductivity of 0.6 foot/day (LLNL 2008).

Although groundwater in the central Imperial Valley aquifer is saline, this source is not a replacement for the Salton Sea as a source of saline water for the Project (the salinity is less than the lowest pond salinity proposed). At this time, it appears that groundwater is not a suitable replacement supply for the river water used in the Project because of inadequate yield of the shallow groundwater. This source may have a use in augmenting the river supply, especially if saline groundwater is used. However, insufficient data exist regarding this supply including depth to groundwater, yield, salinity, subsidence, and location of cost-effective production wells, to carry this supply forward in the Project. This supply can be reevaluated at a later time if additional data are available.

3.11.3 Impacts and Mitigation Measures

3.11.3.1 Impact Analysis Methodology

The impact assessment of the Project's hydrologic and water quality effects was performed by superimposing the proposed Project actions on the hydrologic record of the New and Alamo rivers, with consideration of the aspects of the Project design that are intended to avoid impacts. The presence of the IID drains and local groundwater conditions were also considered in the analysis. Water quality modeling was also used to examine the hydrologic operations with a range of residence times and salinities (as produced by blending river and saline water), and to evaluate potential water quality outcomes in the ponds (seasonal and vertical profiles of dissolved oxygen and temperature) (B. Barry and M. Anderson, University of California Riverside, unpublished data).

Several Project features are common to all alternatives. The common features with specific hydrologic/hydraulic importance are outlined below:

- **Berms for Natural Watercourses**. The berms for all alternatives would be constructed to avoid the large natural watercourses that enter the Project site west of the New River and east of the Alamo River. Large flows in these watercourses would continue to flow to the Salton Sea without interruption by SCH facilities.

- **Interception Ditch**. The interception ditch would be sized to accommodate the anticipated flows in the IID drains that the interception ditch intersects (Figure 3.11-6). The interception ditch capacity would be based on monitored drainflow on data collected by IID for the drains. The invert of the interception ditch would be set to avoid creating a backwater condition in the drains and allow continuity between the drains for pupfish.
- **Water Diversion.** The total diversion to the SCH ponds from the river and the Sea would vary by alternative and by the final operations (Table 3.11-7). Factors such as time of year, pond size and depth, residence time in the ponds, and salinity would influence the diversion from the river and the Sea. For the maximum SCH pond size (Alternative 3), assuming a salinity of 20 ppt and a 2-week residence time, the average total diversion would be up to 474 cfs, with 313 cfs from the New River and 162 cfs from the Sea. In the peak evaporation period (June), the total diversion would be 494 cfs, with 333 cfs from the New River and 161 cfs from the Sea. The diverted water would cycle through the SCH ponds with a 2- to 32-week residence time before it was returned to the Sea. During the holding time, the only loss of water would be to evaporation.
- **Gravity River Diversion**. The river gravity diversion would be located upstream (between 2 and 4 miles) of the Project area at a location that provides sufficient head to facilitate flow by gravity and enables necessary easements to be negotiated with landowners. This is a feature common to Alternatives 1 and 4.
- **Pumped River Diversion**. The pumped diversion would be located adjacent to the SCH ponds. This is a feature common to Alternatives 2, 3, 5, and 6.
- **River Diversion Structures**. The structures needed to divert water by gravity or pumping would be constructed by notching the banks of the river to set the structures into the bank rather than allowing them to project into the river. This notching would help avoid debris fouling and maintain the river cross section that is used by floodwater. Because the river is incised relative to surrounding ground (up to 15 feet in some areas), this action would not involve altering a levee, but rather excavating into native ground to create the notch. Putting the facilities into a notch in the bank would require the use of sheet pile during construction to separate the river from the work area. Its use has the benefit of being able to dry out the work area and avoid discharge of sediment from the construction area into the river. The completed diversion area will be lined with riprap or other suitable material to stabilize the bank and prevent erosion near the diversion.
- **SCH Outflow Structure**. Each SCH pond would have an independent outlet to the Salton Sea. Water would be released to the Sea through the pond outlet based on the residence time and the time to drain a pond, if needed.
- **Emergency Outflow Structure**. Each pond also would have an emergency outflow structure (usually combined with the outflow structure that would allow the release of water during an emergency). The structure would be a weir that water would flow over and through the outlet in an emergency. The structure would not require human intervention to operate. The outlet pipe and weir would be sized based on a 100-year, 24-hour rainfall falling on the SCH ponds (2.74 inches of rain) and also an extreme event, such as the rainfall associated with the hurricane that dropped 4.84 inches of rain in 2 days in 1977.

Table 3.11-7 Estimated Annual Diversion Rates for SCH Under Differing Residence Times and Salinities[1]

				Average diversion rate (cfs) to achieve target salinity					
				20 ppt		30 ppt		40 ppt	
	Residence time (days)	Total annual diversion (af)	Average annual diversion (cfs)	Saline (cfs)	River (cfs)	Saline (cfs)	River (cfs)	Saline (cfs)	River (cfs)
Alternative 1	14	286,271	396	135	261	210	185	286	110
	28	152,459	211	67	144	105	106	142	68
	56	85,553	118	33	85	52	66	71	48
	112	52,100	72	16	56	25	47	35	37
Alternative 2	14	189,264	261	87	174	136	125	185	77
	28	102,563	142	43	99	68	74	92	50
	56	59,213	82	21	61	33	48	46	36
	112	37,538	52	10	42	16	36	22	30
Alternative 3	14	343,290	474	162	313	252	222	342	132
	28	182,873	253	80	172	125	127	171	82
	56	102,664	142	39	102	62	80	85	57
	112	62,560	86	19	67	30	56	42	45
Alternative 4	14	174,889	242	81	161	127	115	172	70
	28	94,263	130	40	90	63	67	86	45
	56	53,950	75	20	55	31	43	42	32
	112	33,794	47	9	37	15	32	21	26
Alternative 5	14	142,180	196	65	131	102	95	138	58
	28	77,275	107	32	75	51	56	69	38
	56	44,822	62	16	46	25	37	34	28
	112	28,596	39	8	32	12	27	17	23

Table 3.11-7 Estimated Annual Diversion Rates for SCH Under Differing Residence Times and Salinties[1]

	Residence time (days)	Total annual diversion (af)	Average annual diversion (cfs)	Average diversion rate (cfs) to achieve target salinity					
				20 ppt		30 ppt		40 ppt	
				Saline (cfs)	River (cfs)	Saline (cfs)	River (cfs)	Saline (cfs)	River (cfs)
Alternative 6	14	239,706	331	112	219	174	157	237	94
	28	128,602	178	55	122	87	91	118	60
	56	73,051	101	27	74	43	58	59	42
	112	45,275	63	13	49	21	42	29	34

Notes:

1. Assumes Sea salinity of 51 ppt and river salinity of 2 ppt.

Using data from the California Irrigation Management Information System database, the average annual evaporative losses for the Project conditions are estimated at an annual average of 31 cfs (3,770 acres at 71.4 inches of evaporation per year). Of the 474 cfs diverted from the river and the Sea, (for maximum pond size and 2-week residence time) approximately 443 cfs would be returned to the Sea. The evaporation loss of 31 cfs represents 5.1 and 3.7 percent of the annual average flow of the New and Alamo rivers, respectively. For the peak month, the evaporation for 3,770 acres would be 51 cfs, or about 8.3 percent and 6.0 percent of the flow in the New and Alamo rivers (Table 3.11-8 and Table 3.11-9).

The manner in which the SCH ponds could be operated would affect the total water diverted (Appendix D). The SCH ponds could be operated for constant or variable salinity, storage, and residence time. The results presented in Table 3.11-7 through Table 3.11-9 assumes that the entire SCH would be operated as one pond rather than individual pond units. However, changing the operations to allow variable salinity (e.g., high in summer and lower in winter), operating each pond to different requirements, or varying storage, would change the maximum and minimum diversion rates. The total diversion from the rivers and therefore, the total Project impact, would be controlled by Project operation. Because the SCH Project is a “proof-of-concept” design, a potential range of operations may be tried.

Based on simulations of possible Project operations, the diversion of river water to the SCH ponds would reduce the average annual flow and the peak monthly flow immediately downstream of the diversion (Table 3.11-8 and Table 3.11-9). The reduction would be present only in the portion of the river between the diversion and the Sea. The water would be returned to the Sea, less the evaporation loss that occurred while the water was in the SCH ponds. For the average annual condition, the diversion would range from 5 percent to 51 percent of the New River flow and 3 percent to 26 percent for the Alamo River, depending on the pond size, pond salinity, and residence time. For the peak evaporation month (June), the reduction downstream of the diversion would range from 7 percent to 56 percent for the New River and 4 percent to 28 percent of the Alamo River flow. The reductions in flow would be offset by the flow returned to the Sea from the ponds (Figures 3.11-7 and 3.11-8) (these figures are based on Alternative 3, which would restore the greatest amount of habitat).

The total salt loading to the Salton Sea from the rivers would only be decreased by the amount of salt that deposited (drops out of solution) in the SCH ponds. During steady-state operations (a constant salinity and storage in the SCH ponds), the salt load diverted into SCH ponds from the combined river and Sea diversions would equal the load released from the SCH ponds back to the Sea. Therefore, the SCH ponds would not act as a salt sink that reduces the salt load to the Sea. The exception would be salt that may precipitate out of solution. This amount of salt is considered too small to be a factor in the total salt balance.

3.11.3.2 Thresholds of Significance

Significance Criteria

Impacts on hydrology and water quality would be significant if the Project alternatives would:

- Reduce the flow in a river to the detriment of downstream water users;
- Raise the elevation of water in the IID drains, resulting in the backup of water into on-farm drains;
- Change the Salton Sea’s water surface elevation and salinity to an extent that the change would in itself adversely affect or preclude the uses of the Salton Sea identified in the Basin Plan;

Table 3.11-8 River Diversions as a Function of Average Annual New and Alamo River Flows

	Residence time (days)	Average annual diversion (cfs)	Percent of River Flow Diverted to Achieve Target Salinity					
			20 ppt		30 ppt		40 ppt	
			New River (%)	Alamo River (%)	New River (%)	Alamo River (%)	New River (%)	Alamo River (%)
Alternative 1	14	396	43		30		18	
	28	211	24		17		11	
	56	118	14		11		8	
	112	72	9		8		6	
Alternative 2	14	261	28		20		13	
	28	142	16		12		8	
	56	82	10		8		6	
	112	52	7		6		5	
Alternative 3	14	475	51		36		22	
	28	252	28		21		13	
	56	141	17		13		9	
	112	86	11		9		7	
Alternative 4	14	242		19		14		8
	28	130		11		8		5
	56	75		7		5		4
	112	46		4		4		3

Table 3.11-8 River Diversions as a Function of Average Annual New and Alamo River Flows

	Residence time (days)	Average annual diversion (cfs)	Percent of River Flow Diverted to Achieve Target Salinity					
			20 ppt		30 ppt		40 ppt	
			New River (%)	Alamo River (%)	New River (%)	Alamo River (%)	New River (%)	Alamo River (%)
Alternative 5	14	196		15		11		7
	28	107		9		7		4
	56	62		5		4		3
	112	40		4		3		3
Alternative 6	14	331		26		19		11
	28	177		14		11		7
	56	101		9		7		5
	112	62		6		5		4

Table 3.11-9 River Diversions as a Function of Peak New and Alamo River Flows[1]

	Residence time (days)	Peak monthly diversion (cfs)	Percent of Peak River Flow Diverted to Achieve Target Salinity					
			20 ppt		30 ppt		40 ppt	
			New River (%)	Alamo River (%)	New River (%)	Alamo River (%)	New River (%)	Alamo River (%)
Alternative 1	14	412	47		34		21	
	28	227	27		21		14	
	56	134	17		14		11	
	112	86	12		10		9	
Alternative 2	14	275	32		24		15	
	28	155	19		15		11	
	56	95	13		11		9	
	112	63	9		8		7	
Alternative 3	14	494	56		41		26	
	28	272	33		25		17	
	56	161	21		17		13	
	112	103	14		12		10	
Alternative 4	14	253		21		15		10
	28	142		12		9		7
	56	86		8		7		5
	112	57		6		5		4
Alternative 5	14	207		17		13		8
	28	118		10		8		6
	56	72		7		6		5
	112	49		5		4		4

Table 3.11-9 River Diversions as a Function of Peak New and Alamo River Flows[1]

	Residence time (days)	Peak monthly diversion (cfs)	Percent of Peak River Flow Diverted to Achieve Target Salinity					
			20 ppt		30 ppt		40 ppt	
			New River (%)	Alamo River (%)	New River (%)	Alamo River (%)	New River (%)	Alamo River (%)
Alternative 6	14	346		28		20		13
	28	193		16		13		9
	56	116		11		9		7
	112	75		7		7		6

Notes:

1. River flow for the peak diversion month (June).

- 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 water runoff, in a manner that would result in substantial erosion, siltation, or flooding;
- Substantially deplete groundwater supplies or interfere with groundwater recharge that would cause a deficit in the aquifer volume or lower the local groundwater level;
- Place structures within a 100-year flood hazard area (as mapped on a Federal Flood Hazard Boundary, Flood Insurance Rate Map, or other flood hazard delineation map) that would impede or redirect flood flows or expose people or structures to significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam;
- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- Cause inundation by seiche, tsunami, or mudflow;
- Violate any water quality standards or waste discharge requirements; or
- Substantially degrade water quality.

Application of Significance Criteria

A summary of the overall methodology used in applying the significance criteria to the Project alternatives follows:

- **Reduce the flow in a river to the detriment of downstream water users –** The Project would reduce the average annual flow in the New or Alamo rivers by up to 261 cfs immediately downstream of the diversion (assuming a 2-week residence time and 20 ppt salinity). Of this total diversion, up to 170 cfs would be returned to the Salton Sea, but at a different location than the diversion point. The reduction in flow in the river would occur from the diversion point to the outlet of the river into the Sea (about 1 mile for the pumped diversion and 3-4 miles for a gravity diversion). No downstream water rights holders would be affected by the diversion. As stated above, Metropolitan Water District of Southern California has applied for water rights on both the New and Alamo rivers, but has not advanced the claim any further than the initial application. The Salton Sea is the ultimate recipient of the water in the rivers, and the Project would only consumptively use the water lost to evaporation from the SCH ponds. The reduction in river flow due to the SCH Project would not adversely affect downstream water users, and this issue is not addressed further in this section. Impacts on biological resources from the reduction in flow are addressed in Section 3.4, Biological Resources.
- **Raise the elevation of water in the IID drains, resulting in the backup of water into on-farm drains –** The river diversion (both pumped and gravity) would be set into the river bank and would not increase the water surface elevation in the rivers; therefore, the diversion would not affect the drains that empty into the rivers. The interception ditch along the edge of the SCH ponds would be designed to avoid backing water up into the drains and so would not impair the flow of agricultural systems that empty into the drain. In addition, the SCH pond berms would terminate before intersecting an IID drain that is not handled with the interception ditch, including IID drains that receive large amounts of natural storm runoff. The presence of the water stored in the SCH ponds at an elevation of -228 feet msl would not influence the shallow groundwater conditions in the vicinity of the ponds, including to the south near agricultural lands, because the interception ditch would intercept and collect seepage from the SCH ponds that would otherwise move south toward agricultural land. The sedimentation basin would be located upstream of the SCH ponds, adjacent to the diversion structure, and would store about 6 feet of water. This water would not seep into adjacent fields or drains, however, because the bottom of the sedimentation basin would be from 15–20 feet

below the ground surface, well below the depth of the on-farm drains or IID drains (typically 4–6 feet below the ground surface). Because of these design elements, this criterion is not a Project impact and is not considered further.

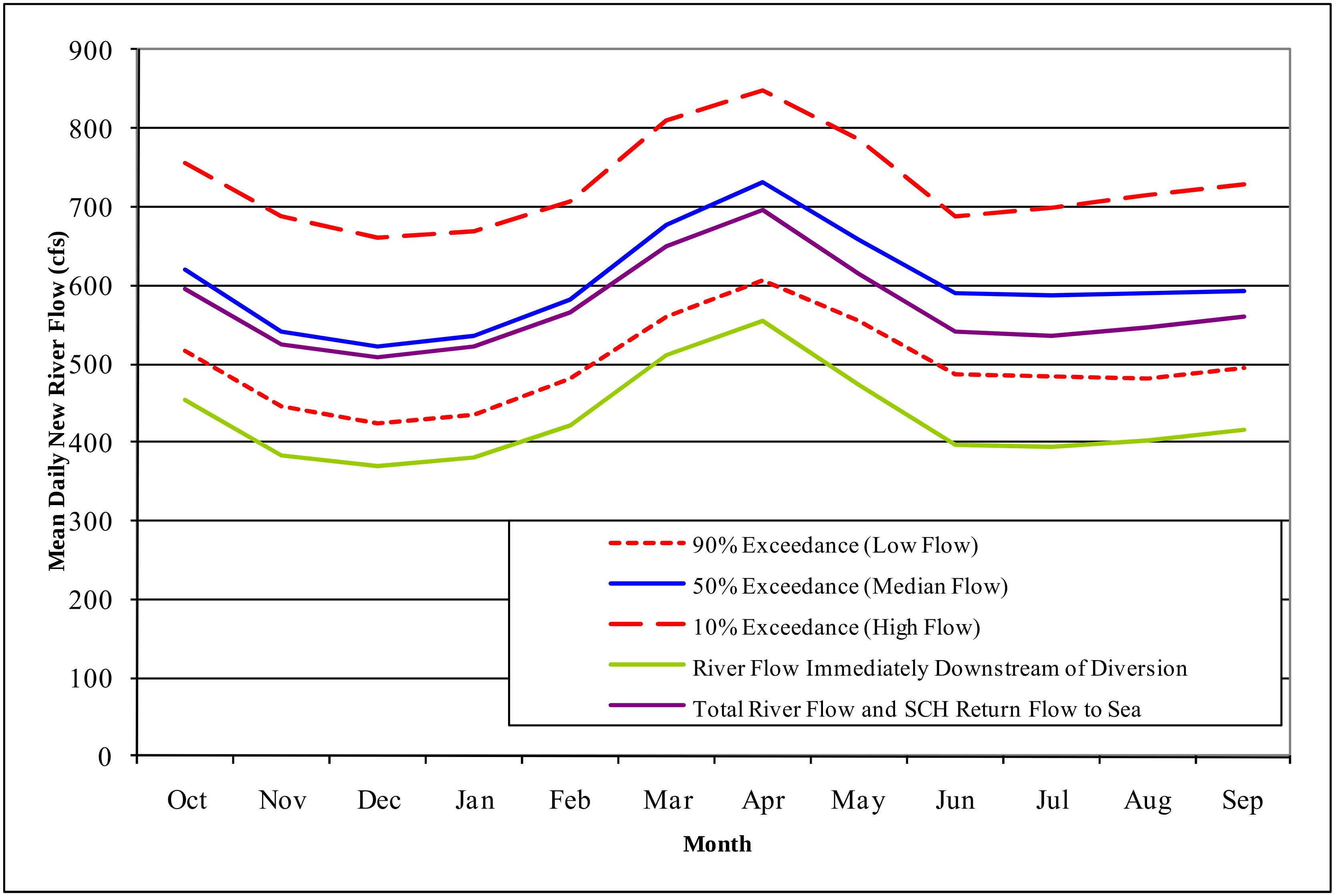
- **Substantially change the Salton Sea's water surface elevation and salinity** – The Project has the potential to affect the water surface elevation and salinity of the Sea due to the temporary detention of water in the SCH ponds. This impact is discussed below. Because the diverted water would pass through the SCH ponds, losing water only to evaporation, both water and salt would be returned to the Sea.

  Substantially alter the existing drainage pattern of the site or area in a manner that would result in substantial erosion, siltation, or flooding – The SCH ponds would be located on areas that are recently exposed (dry) playa or are currently submerged. Rainfall on the dry playa would drain to the Sea or ponds before being evaporated. Rainfall on the SCH ponds temporarily would be retained in the ponds and would not cause an increase in erosion. Therefore, changing drainage patterns on the playa is not considered further. The drainage pattern of the IID drains would be altered by the SCH Project because some of them would be intersected by the interception ditch. The interception ditch would be designed to convey the historic flow in the drains and maintain a channel elevation that is lower than the elevation of the drains to avoid backing water into the drains. The IID drains would remain in a free-flowing condition and maintain the connectivity between the drains that is currently afforded by the Sea. The interception ditch would also collect shallow groundwater that seeps from the SCH ponds. Therefore, the Project would alter the drainage pattern of the IID drains, but not substantially or in a manner that could result in substantial erosion, siltation, or flooding; therefore, this impact is not addressed further.

  Water from the New and Alamo rivers would supply the SCH ponds, but the course of the rivers would not be changed. The structures that would be used to divert water would be set into the river banks and stabilized with riprap, thus preventing erosion. Less water would be carried in the rivers after the water was diverted, thus lessening the potential for siltation, erosion, and flooding. This impact therefore, is not addressed further.

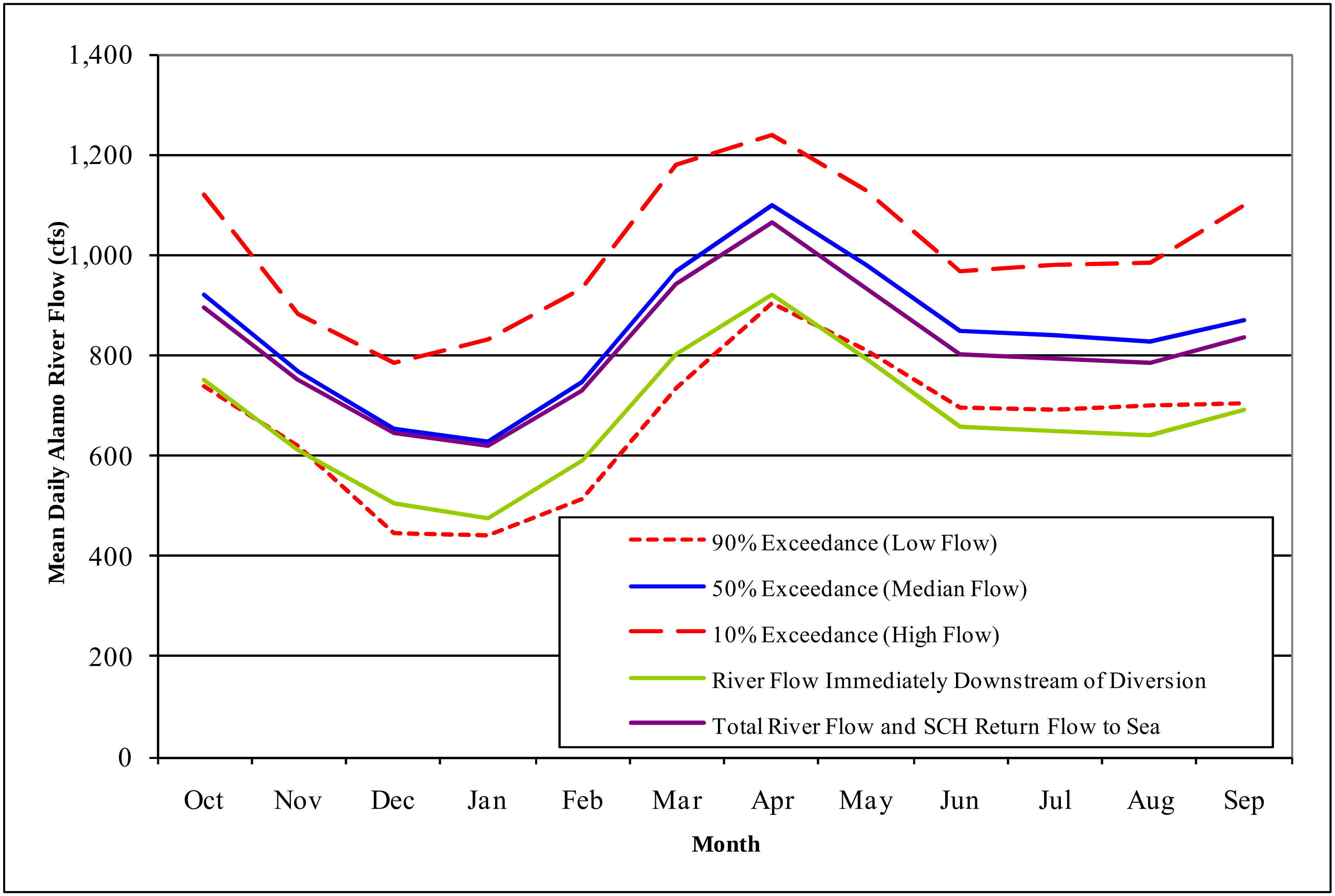
- **Substantially deplete groundwater supplies or interfere with groundwater recharge –** The local groundwater conditions reflect a shallow perched water table that receives inflows from the IID drains and applied water that is not captured in on-farm drains. The Project would store water on otherwise dry playa and, therefore, would provide seepage (additional water) to the shallow groundwater system. The interception ditch would intercept a portion of this seepage, and the remainder would flow toward the Salton Sea. This Project would not interfere or cause a deficit with groundwater resources and, therefore, is not an impact on groundwater. If future studies suggest that shallow groundwater is a potential water supply for the Project, additional environmental review will be needed before the supply can be used.

- **Place structures within a 100-year flood hazard area that would impede or redirect flood flows or expose people or structures to significant risk from floodi**ng – The proposed SCH sites would be located adjacent to Flood Zone A defined by FEMA. The diversion (both gravity and pumped) is designed to be recessed into the bank of the river so as to maintain the channel cross section and avoid collecting debris on the diversion works. In addition, the diversion would remove water from the river, thereby decreasing the flow and lowering the water surface elevation in the river at the diversion and downstream, which would reduce the risk of flooding.



Assumes 20 ppt salinity and 4-week residence time for Alternative 3

Figure 3.11-7 New River Flow Rates with Project Diversion



Assumes 20 ppt salinity and 4-week residence time for Alternative 3

Figure 3.11-8 Alamo River Flow Rates with Project Diversion

Other structures constructed under this Project include berms, which are not habitable structures as defined by FEMA. Moreover, if the berms failed, the impounded water would be released directly to the Salton Sea or onto exposed playa where it would then flow to the Sea, and their failure would not expose people to risk of injury or death. The bottom of the sedimentation basin would be from 15 to 20 feet below the ground surface and, therefore, would not pose a flood hazard.

This Project would include a trailer or similar facility that would serve as office space for the permanent employees. It would be constructed on adjacent ground above the -228-foot elevation. This facility would be in the Zone A delineated by FEMA. Any facility would be constructed in conformance with the Imperial County floodplain regulations for elevation, flood proofing, and tie-downs (for a trailer). These design features would reduce the flood potential and, therefore, by design avoid a flooding-related impact. Thus, impacts from placing structures with the floodplain are not discussed further.

- **Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff** – The drainage structures in the SCH ponds including the diversion and emergency release from the ponds is sized to accommodate the anticipated conditions at the Project site. No runoff would be generated in excess of the capacity of the drainage facilities, and this impact is not discussed further.
- **Cause inundation by seiche, tsunami, or mudflow –** The Project would not contribute to a seiche, tsunami, or mudflow. It is not located near the ocean and, therefore, would not be affected by tsunamis. It also is located in a generally level area, so mudflows are not a concern. Seiches could occur in the Salton Sea, most likely as a result of earthquakes, but they would not be caused by the Project, and this impact is not discussed further.
- **Violate any water quality standards or waste discharge requirements** – The operation of the SCH ponds to restore habitat and grow fish would not preclude the use of New and Alamo river water, nor Salton Sea water, for their designated beneficial uses as outlined in Table 3.11-3 and the CRBRWQCB Water Quality Control Plan. Therefore, this impact is not discussed further. The potential for the Project to conflict with CRBRWQCB Water Quality Control Plan surface water quality objectives is discussed below.
- **Substantially degrade water quality –** The analysis considers the potential for water quality changes caused by the Project to reduce the ability of the New and Alamo rivers to support aquatic species and recreation. This analysis also considers the potential for short-term degradation of water quality during construction, either through inadvertent releases of hazardous materials or erosion or sedimentation.

3.11.3.3 No Action Alternative

Under the No Action Alternative, the flow and salt loading to the Salton Sea will change relative to existing conditions because of changes in water use practices, as projected in the PEIR (DWR and DFG 2007). Sea salinity under No Action Alternative would be greater than under the existing conditions. Under the No Action Alternative, the Salton Sea would be sufficiently large in area and deep to maintain many of the physical and water quality characteristics of the existing conditions through 2020 (DWR and DFG 2007). Around 2020, the water column would be expected to stratify in the spring and early summer, which would allow an anoxic zone to form in the hypolimnion. The anoxic conditions and prolonged stratification would cause the production and accumulation of hydrogen sulfide and ammonia in these deeper waters. The deep waters also would be characterized by extremely low dissolved oxygen. When cooler temperatures and winds break the thermal stratification, the water column would become fully mixed. This condition would occur in late summer/early fall and would result in a serious degradation of water quality that would be toxic to aquatic life in the vicinity of this mixing event.

After 2020, the Salton Sea would become a shallower water body (DWR and DFG 2007). Less wind energy would be required to mix the water, and dissolved oxygen would extend to a larger portion of the water column in the shallower water body than under existing conditions. Therefore, the Salton Sea would be subject to greater and more frequent mixing events, less thermal stratification, and less accumulation of hydrogen sulfide and ammonia. In addition, simulations in the PEIR indicated there is considerably more orthophosphate throughout the water column in the No Action Alternative at 2040 and 2078 simulations than in the No Action Alternative at 2020 simulation. This result is influenced by the simulation's assumption that for the shallower Sea there is increased resuspension of orthophosphate from the bottom sediments and release of orthophosphate in the pore water (DWR and DFG 2007).

The large algal community would likely reduce dissolved oxygen levels. The most critical time would be in the early morning hours due to nighttime algal respiration. Model results from the PEIR indicate that early morning dissolved oxygen would be less than 2 mg/L (a value where many fish and wildlife would be stressed). However, the dissolved oxygen concentrations are anticipated to not cause long term anoxic effects in the shallow Salton Sea (DWR and DFG 2007).

Simulations in the PEIR (DWR and DFG 2007) included hydrologic conditions and future climate conditions for the 75-year PEIR study period. The hydrologic analysis was performed on an annual basis for the 2003 to 2078 period that was consistent with the implementation period for the QSA (see Section 3.11.3.1). A second hydrologic analysis was performed for the period 2018 to 2078 that represented conditions following the cessation of (c)(1) water, which is the transfer of 800,000 af of conserved water from IID to DWR (Fish and Game Code Section 2081.7(c)(1)), and conditions following the construction of major facilities under the alternatives (DWR and DFG 2007).

Inflows from Mexico simulated in the PEIR were based upon historical patterns adjusted for potential reductions in Colorado River water deliveries that would reduce agricultural return flows into the New and Alamo rivers, wastewater system improvements to the Mexicali II Service Area that would divert effluent to the Gulf of California, and recently constructed power plants that would use a portion of the New River flows for cooling water. Overall, inflows from Mexico under the No Action Alternative are expected to decrease to an average inflow of 98,000 afy for the 2003 to 2078 period, and 97,000 afy for the 2018 to 2078 period (DWR and DFG 2007).

Inflows from the Imperial Valley simulated in the PEIR also were based upon historical patterns adjusted for implementation of the QSA and IID Water Conservation and Transfer Project. Inflows from the Imperial Valley under the No Action Alternative are expected to decrease to an average inflow of 777,000 afy for the 2003 to 2078 period and 724,000 afy for the 2018 to 2078 period (DWR and DFG 2007).

Historical inflows from the Coachella Valley simulated in the PEIR also were adjusted for implementation of the QSA related projects and the Coachella Valley Water Management Plan (Coachella Valley Water District 2002, as cited in DWR and DFG 2007). Total average inflows from the Coachella Valley under the No Action Alternative are expected to increase to 126,000 afy for the 2003 to 2078 period and 138,000 afy for the 2018 to 2078 period (DWR and DFG 2007).

Inflows to the Salton Sea from local watersheds under the No Action Alternative are expected to be similar to the recent historical inflows.

The projected total average inflow to the Salton Sea under the No Action Alternative for the 2003 to 2078 period was estimated at about 965,000 afy with a minimum of 792,700 afy and a maximum of 1,303,300 afy (DWR and DFG 2007). The average inflow for 2018 to 2078 was calculated as 922,000 afy (DWR and DFG 2007).

The sequence of future climate conditions has been assumed to occur as it did in the past. Projected future 2003 to 2078 conditions for Imperial Valley and local watershed flows to the Salton Sea are based on the estimated climate conditions of the 1925 to 1999 historical sequence (primarily rainfall, evapotranspiration rates, and evaporation rates). Even if the climate is consistent with that during the historical period, the historical sequence would not reproduce identically in the future. For this reason, the inflow analysis for the No Action Alternative was developed using a statistical approach known as Monte-Carlo analysis to generate many possible future sequences (no adjustment to values, just sequence) based on the historic climate values and patterns. Using this approach, the future projections incorporate variability in climate conditions and can be viewed in a probabilistic fashion. The projected variability of total inflow to the Salton Sea could be up to 200,000 af in any one year (DWR and DFG 2007).

As water use within IID decreases, the flow in the New and Alamo rivers would be expected to decrease by approximately 305,670 afy, which would result in a declining water surface elevation in the Sea and an increasing salinity because of the concentrating effect of evaporation. Simulations in the PEIR (DWR and DFG 2007) showed water surface elevations declining and salt levels increasing under the No Action Alternative (Figure 3.11-9 and Figure 3.11-10) until 2046 when the surface elevation stabilizes at about -258.3 feet msl. The stabilized elevation would be about 6 feet lower than the 1925 elevation that the Salton Sea had declined to before rising in response to increased agricultural runoff. The simulations conducted for the PEIR suggest the current trend and show a remnant Salton Sea that would become a brine sink with salinity exceeding 100 ppt by 2024 and approximately 243 ppt by 2046 (DWR and DFG 2007).

As the Salton Sea's water surface elevation declines, the Sea's surface area will also decrease and, therefore, the total evaporation from the Sea will decrease. The water surface elevation eventually stabilizes when the water lost to evaporation equals the total inflow to the Sea. As the Sea declines, both the New and Alamo rivers will extend farther out into the Sea to reach the receding shoreline. The existing delta at both rivers will continue to form at the mouth of both rivers and be projected farther into the Sea. Finally, as the Sea elevation drops, the bed slope of the rivers at the Sea's edge will increase, leading to scour of moveable river bed sediments and possible formation of a head cut. Depending on the slope of the river projected out into the receding Sea compared to the existing channel bed slope (0.0003 foot per foot), such a head cut could migrate upstream in the existing channel, causing the water surface elevation in the river to drop. The presence of clay lenses below the channel bed may resist any head cut in the channels.

At the time of Project construction (late 2012), water quality conditions would likely be similar to those described under the Affected Environment above, with the exception of salinity, which has been steadily increasing in the Salton Sea, New River, and Alamo River since 1999. Declining inflows to the Sea in future years from various factors will result in collapse of the Sea's ecosystem due to increasing salinity and other water quality issues, such as temperature, eutrophication and related anoxia, selenium concentrations, and algal productivity. These changes reflect a substantial impact on water quality of the Salton Sea, New River, and Alamo River. Successful implementation of the TMDLs listed in Table 3.11-2 may improve water quality; however, most of the TMDLs listed have proposed completion dates of 2019 or 2021, which implies that water quality will not start improving until after those dates. By 2024, the Sea's salinity is projected to be 106 ppt (DWR and DFG 2007), which is significantly above the Water Quality Control Plan's objective of 35 ppt. Under the projected salinity trend, the Water Quality Control Plan's objective would not be met.

Compared with the existing conditions (conditions in 2010), the No Action Alternative reflects decreased water surface elevation and surface area of the Sea, and an increased salinity. The difference becomes pronounced at the end of the planning period in 2077 (Table 3.11-10).

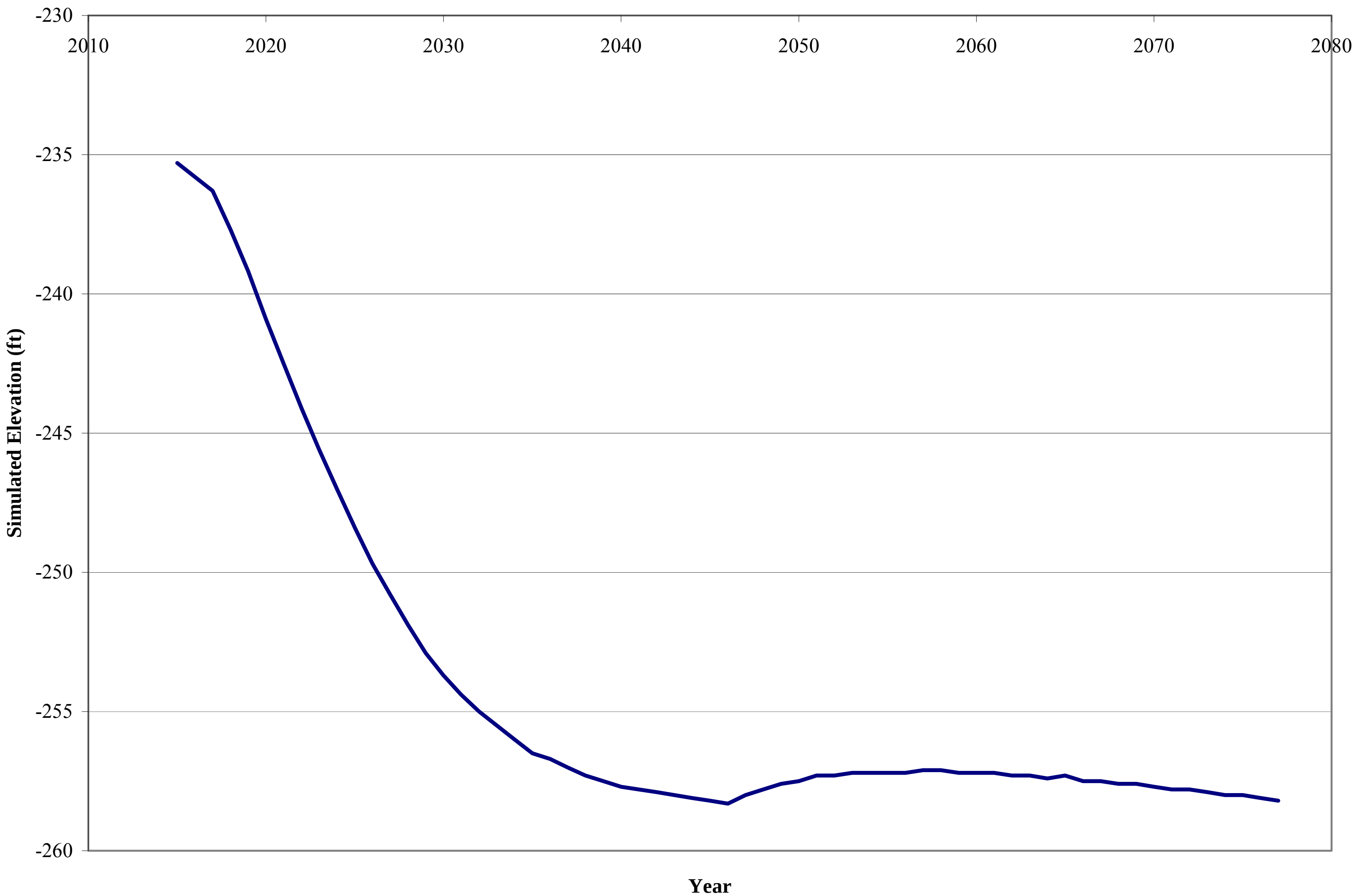


Figure 3.11-9 Simulated Salton Sea Elevation under the No Action Alternative

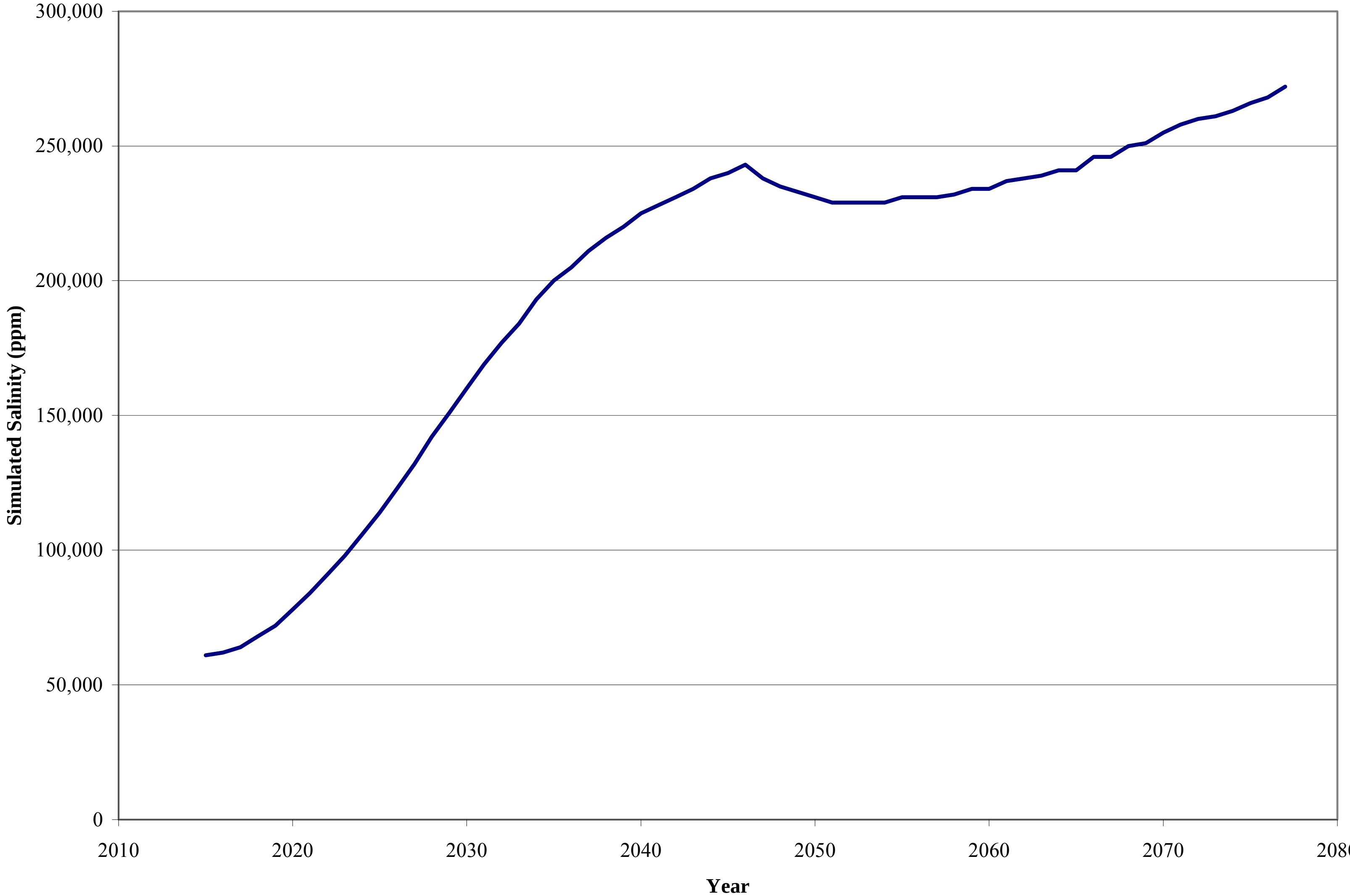


Figure 3.11-10 Simulated Salton Sea Salinity under the No Action Alternative

3.11.3.4 Alternative 1 – New River, Gravity Diversion + Cascading Ponds

Impact HYD-1: Project implementation would cause a reduction in the Salton Sea's water surface elevation (less-than-significant impact). The SCH ponds would lose about 72 inches of stored water to evaporation each year, similar to the adjacent Salton Sea. The total volume of water lost to evaporation would be equivalent to the evaporation rate multiplied by the surface area of the SCH ponds. For a surface area of the SCH ponds of 3,130 acres about 18,650 af of water would be lost from the ponds per year. In the absence of the Project, this volume of water would otherwise flow to the Sea where it would be subjected to a similar evaporation rate (but smaller because of the lake effect and the hypersaline conditions). As the Sea recedes, the surface area exposed to evaporation would decline, while the surface area of the ponds would remain constant. Thus, the difference between evaporation from the SCH ponds versus evaporation from the Sea relates to the changes in the Sea's surface area resulting from Project implementation.

From the initial Project operation in 2014 through the end of the proof-of-concept period in 2025, a total of approximately 223,770 af of water would be lost to evaporation from the SCH ponds. This loss would be partially offset by the decrease in evaporation from the Sea because the storage (and therefore the surface area of the Sea) would be less because of the SCH diversion. By 2025, the volume of water stored in the Sea would be reduced by 130,200 af compared to the No Action Alternative. The Sea's surface elevation would be about 0.8 foot lower because of the ongoing evaporation that would result from Project operations.

By 2077, the Sea's depth (water surface elevation minus the bottom elevation of the Sea) would be reduced by 4.3 percent, and its water surface elevation would be about 0.9 foot lower as a result of the SCH diversions. Table 3.11-10 compares the Salton Sea's water surface elevation, storage volume, and surface area that would occur in the absence of the Project with the Project at the onset of operations, the end of the proof-of-concept period, and the end of the Project's lifetime.

The SCH ponds would cover playa exposed under the No Action Alternative and by 2077 although Alternative 1 results in a smaller remnant Sea, the net effect of the alternative is to cover an additional 940 acres of playa.

Alternative 1 also would result in a change to the Salton Sea's water surface elevation when compared to existing conditions. Most of the change, however, would be a consequence of the changes in inflow to the Sea described above, and not related to the Project. Table 3.11-10 shows the changes from the existing conditions that occur under the No Action Alternative and a small increment associated with the Project. For example, by 2077 the water surface elevation of the Sea is expected to decline by 27.2 feet relative to existing conditions. While this is substantial change in elevation, all but 0.9 feet of the change would a result of the No Action Alternative. That is, the Sea will get smaller, shallower, and saltier regardless of whether the SCH Project is implemented or not, which expected to result in the collapse of the ecosystem. Alternative 1 would offset a portion of this lost habitat by providing new habitat that is usable by birds, fish, and other organisms. It would not, in itself, result in changes that would have an adverse effect on or preclude the beneficial uses of the Salton Sea identified in the Basin Plan. Impacts from the change in water surface elevation in the Salton Sea would be less than significant when compared to both the existing environmental setting and the No Action Alternative.

Table 3.11-10 Salton Sea Surface Elevation and Area – No Action[1] and SCH Project Alternatives

	Elevation			Storage			Area		
	2014 (ft)	2025 (ft)	2077 (ft)	2014 (af)	2025 (af)	2077 (af)	2014 (acres)	2025 (acres)	2077 (acres)
Existing[2]	-231.0	--	--	6,744,357	--	--	227,299	--	--
No Action	-234.7	-248.4	-258.2	5,867,592	3,183,010	1,648,221	219,785	169,467	141,723
Alternative 1	-234.8	-249.2	-259.1	5,848,945	3,052,854	1,528,033	219,541	166,929	139,529
Difference	-0.1	-0.8	-0.9	-18,647	-130,157	-120,188	-244	-2,538	-2,194
Alternative 2	-234.8	-249.0	-258.9	5,851,729	3,072,288	1,545,332	219,577	167,308	139,847
Difference	-0.1	-0.6	-0.7	-15,863	-110,723	-102,889	-208	-2,159	-1,875
Alternative 3	-234.8	-249.3	-259.2	5,845,137	3,026,286	1,504,769	219,493	166,413	139,097
Difference	-0.1	-0.9	-1.0	-22,455	-156,725	-143,451	-292	-3,054	-2,626
Alternative 4	-234.8	-249.1	-259.0	5,849,790	3,058,750	1,533,256	219,552	167,044	139,625
Difference	-0.1	-0.7	-0.8	-17,802	-124,260	-114,965	-233	-2,423	-2,098
Alternative 5	-234.8	-248.9	-258.8	5,855,222	3,096,671	1,567,375	219,621	167,785	140,251
Difference	-0.1	-0.5	-0.6	-12,370	-86,339	-80,846	-164	-1,682	-1,472
Alternative 6	-234.8	-249.1	-259.0	5,850,093	3,060,868	1,535,137	219,556	167,085	139,660
Difference	-0.1	-0.7	-0.8	-17,499	-122,143	-113,084	-229	-2,382	-2,063

Notes:
1. No Action modeled in PEIR, Appendix H-2, Attachment 2, Table H2-2-3 (DWR and DFG 2007)
2. Existing Conditions is represented by 2010 conditions.

Impact HYD-2: Project implementation would increase the Salton Sea's salinity (less-than-significant impact). Because the diverted water would pass through the SCH ponds, losing water only to evaporation, both water and salt would be returned to the Sea. The SCH ponds would temporarily store a volume of salt, a portion of which would be continuously released back to the Sea and a portion that would be temporarily in storage. The amount in storage is related to the SCH salinity and the volume of the ponds, and the rate that is returned to the Sea depends on the residence time (2 to 32 weeks). The salt would only be stored temporarily; thus, the SCH ponds would not be a salt sink.

Although the total salt load of the Sea would not change as a result of the Project, the volume of water in the Sea would be reduced because of the increased rate of evaporation in the SCH ponds (refer to Impact HYD-1). Therefore, for a 3,130 acre pond, the Sea's salinity would increase relative to No Action by 4.3 percent (to 118.9 ppt) by 2025 and by 7.9 percent (to 293.4 ppt) by 2077. Table 3.11-11 compares the estimated salinity of the Salton Sea that would occur in the absence of the Project and with the Project at the onset of operations, the end of the proof-of-concept period, and the end of the Project's lifetime.

Alternative 1 also would result in a change to the Salton Sea's salinity when compared to existing conditions, but as shown in Table 3.11-11, the salinity of the Sea would be changing regardless of whether the SCH Project were implemented or not. Alternative 1 would offset a portion of the habitat that will be lost as a result of the increasing salinity and would not, in itself, result in changes that would have an adverse effect on or preclude the beneficial uses of the Salton Sea identified in the Basin Plan. Impacts from the change in salinity in the Salton Sea would be less than significant when compared to both the existing environmental setting and the No Action Alternative.

Table 3.11-11 Salton Sea Salinity – No Action and SCH Project

	2014 (ppt)	2025 (ppt)	2077 (ppt)
Existing[1]	51.0	--	--
No Action	59.0	114.0	272.0
Alternative 1	59.2	118.9	293.4
Percent Change	0.3%	4.3%	7.9%
Alternative 2	59.2	118.1	290.1
Percent Change	0.3%	3.6%	6.7%
Alternative 3	59.2	119.9	297.9
Percent Change	0.4%	5.2%	9.5%
Alternative 4	59.2	118.6	292.4
Percent Change	0.3%	4.1%	7.5%
Alternative 5	59.1	117.2	286.0
Percent Change	0.2%	2.8%	5.2%
Alternative 6	59.2	118.5	292.0
Percent Change	0.3%	4.0%	7.4%

[1] Existing Conditions is represented by 2010 conditions.

This impact would be less than significant when compared to both the existing environmental setting and the No Action Alternative.

Impact HYD-3: Project operations would cause changes in Salton Sea water quality but would not violate established standards (less-than-significant impact). As discussed in Section 3.11.3.2, Regulatory Requirements, the CRBRWQCB has established general surface water quality objectives, including TMDLs, for surface waters of the Colorado River Basin region. The Project's impacts in relation to each of these objectives are discussed.

Sedimentation/Siltation. Under Alternative 1, a portion of the New River's flow would be diverted through the sedimentation basins to allow sediment to settle out prior to conveyance and delivery of water to the SCH habitat ponds. Routine operations would include the removal and disposal of the sediments collected in the sedimentation basin. The resulting discharge from the SCH ponds to the Salton Sea would have a reduced sediment load, and thus would the Project would contribute to meeting the sedimentation/siltation TMDL standard (CRBRWQCB 2002b). Therefore, the impact of the Project would be less than significant compared to existing conditions and the No Action Alternative.

Salinity. The salinity of the Salton Sea already exceeds the Basin Plan objective (it currently is approximately 51 ppt, whereas the objective is 35 ppt). As shown in Table 3.11-11, the salinity of the Sea is projected to increase regardless of whether the Project is implemented. The Project would result in an incremental increase in salinity over time, but this incremental increase would be less than significant when compared to both the existing condition and the No Action Alternative (also refer to the discussion under Impact HYD-2).

Selenium. Existing (2004-2009) mean selenium concentrations in the New River are 3.28 µg/L (C. Holdren, Reclamation, unpublished data). These concentrations have varied little over recent years, and would be expected to be similar over the next few years. Under future conditions modeled for the PEIR, selenium concentrations would increase by 2077, but would not exceed 10 µg/L (DWR and DFG 2007).

Under Alternative 1, a portion of the New River's selenium-laden flow would be diverted through the ponds before discharging to the Sea. The SCH ponds would be operated using blended inflow water with a selenium concentration between the New River (mean < 3.5 µg/L) and Salton Sea (< 2 µg/L). For 20 ppt salinity (this would be the worst-case scenario for selenium under existing conditions and near-term conditions), the inflow selenium concentration would be 2.6 µg/L (Sickman et al. 2011). Shortly after the ponds are constructed and first filled with water, selenium concentrations in the ponded water would be expected to increase due to solubilization of oxidized selenium from the rewetted playa sediments (Amrhein et al. 2011, summarized in Appendix I). Selenium concentrations in overlying water (approximately 1 meter deep) could increase by approximately 0.9 µg/L (Amrhein et al. 2011). The total load of selenium solubilized and released to the Salton Sea would depend on the amount of playa sediments exposed and oxidized (this increases each year as the Sea recedes), available iron oxides in sediments (these bind selenium and reduce the amount solubilized in water) (Amrhein et al. 2011), and the size of the ponds that would be constructed and inundated. However, this "flush" would be temporary and would likely decline over the first 1 to 2 years. This is supported by findings from the Reclamation/USGS Saline Habitat Ponds, where water selenium concentration and the frequency of elevated egg selenium concentrations declined after the first year (Miles et al. 2009). Sickman and others (2011) suggested that saline wetlands at the Salton Sea appear to develop selenium removal pathways (i.e., volatilization or sequestration) within the first 1 to 2 years after construction. Reducing water retention time and increasing flow-through of the ponds for several weeks or months following initial filling could be used to flush soluble selenium from the ponds (Amrhein et al. 2011).

If there is minimal selenium removal within the ponds, the selenium concentration of the discharge would be 2.6 µg/L under existing and expected near-term No Action conditions, and potentially elevated by approximately 0.9 µg/L during the initial wetting period. These levels would still be below the water quality objective of 5 µg/L. In the future, however, the discharge may exceed this standard, depending on the water blending ratios needed to achieve suitable salinities (Sea salinity is increasing, so would use less low-selenium Sea water) and the future selenium concentrations in the river (up to 10 µg/L possible). Nevertheless, this concentration would be lower than the concentration of New River water directly flowing to the Salton Sea.

In conclusion, there would likely be an increase in total selenium load reaching the Sea compared to the existing conditions and No Action Alternative. This increase, however, would be temporary and the relative magnitude of selenium load compared to the amount present in river-source water would likely not be significant. The selenium discharged to the Sea would be diluted and assimilated, given the Sea's much greater volume and its assimilative capacity in its anoxic sediments, and therefore Alternative 1 would not appreciably affect the Sea's selenium loading or waterborne concentrations. Therefore, the impact would be less than significant when compared to the existing environmental setting and the No Action Alternative.

Dissolved Oxygen. Operation of the SCH ponds under Alternative 1 would use nutrient-rich New River water blended with Salton Sea water. Water quality modeling (B. Barry and M. Anderson, University of California Riverside, unpublished data) indicates that the ponds would sustain high primary productivity, with phytoplankton blooms in March–May and October. This high primary productivity would result in periods of anoxia both daily (near dawn due to respiration of all organisms present) and seasonally (especially in spring and fall). SCH pond water discharged to the Salton Sea during these anoxic periods would have lower levels of dissolved oxygen, potentially lower than the CRBRWQCB (2006) water quality objective of 5 mg/L, but this would be offset by aeration that would occur as it cascades from the outfall structure. Furthermore, this lowering of dissolved oxygen would have only a localized effect that would be quickly dissipated in the larger Sea, assisted by wave action. Therefore, the effect would be less than significant compared to the existing conditions and the No Action Alternative.

Nutrients. Operation of the SCH ponds under Alternative 1 would include the blending of New River water and Salton Sea water. Total phosphorus concentration in the SCH pond water would be greater than in the Salton Sea (> 122 µg/L), but less than in the New River (< 1,031 µg/L). The concentration of total phosphorus in SCH pond water discharged into the Salton Sea would exceed the draft numeric target of 35 µg/L (0.035 mg/L), but this exceedance already occurs for river water discharging directly to the Sea. Any potential effect would be localized and temporary because the pond discharge would be rapidly dissipated in the considerably larger volume of the Sea. Therefore, when compared to both the existing environmental setting and the No Action Alternative, outflow of water that is high in phosphorus concentrations from the SCH ponds to the Salton Sea would have a less-than-significant impact.

Impact HYD-4: Construction of the SCH ponds would degrade water quality at the Salton Sea (less-than-significant impact). Project construction would last approximately 2 years, during which time sediment and other constituent loads might be increased into the Salton Sea and New River. Construction would temporarily increase suspended sediment and nutrient cycling in waters near active construction. Resuspended bottom sediments would allow release previously deposited water-soluble contaminants and nutrients. Release of phosphorus would temporarily stimulate local algae production and reduce water quality conditions. With regard to pesticides, disturbance of bottom sediments in those areas where berm construction and grading of swales would occur would redistribute buried DDT residues to the surface and release pyrethroid pesticides into the water column, particularly at East New River. Pyrethroid pesticides (Fojut and Young 2011), as well as DDT and residues, are highly hydrophobic, however, and would likely remain bound to disturbed sediments that would remain in the ponds and berms. In addition, potential inadvertent releases of hazardous materials into nearby waters during construction would temporarily degrade water quality at the Salton Sea. Generally, these potential impacts would be short-term and limited to the duration of construction.

The Project would include an Erosion and Sediment Control Plan and a Stormwater Pollution and Prevention Plan for construction and maintenance activities. These plans would address the potential for erosion and incorporate appropriate protections into the design. Although DDT residues could remain in the surface sediments beyond the 2-year construction period, concentrations would likely be similar to elevated concentrations already present in several other nearby habitats. Resuspension and redistribution of almost exclusively sediment-bound pyrethroids would unlikely increase pyrethroid toxicity over existing levels, based on ongoing input of pyrethroids from agricultural drainage and pesticide concentrations currently measured in waters entering the Salton Sea. Therefore, the effect would be less than significant compared to the existing conditions and the No Action Alternative.

Impact HYD-5: Berm failure could increase erosion and sedimentation of the adjacent river and the Salton Sea (less-than-significant impact). The SCH ponds would have both interior and exterior berms. There would be a potential for berm failure to occur as a result of a seismic event, seiche, flood event, or other similar factor. The volume of sediment would be about the size of the eroded portion of the berm. If an interior berm failed, sediment would enter the SCH ponds and would not affect other water bodies. If an exterior berm failed, this failure would not affect nearby canals or drains because the berms would be downgradient, and any water released from the ponds would flow away from them, toward the Salton Sea. Impacts on the Salton Sea would be short-term, lasting only for several days. If a large-scale berm failure occurred, water would be released through the breach and would either enter the Sea directly (in the near-term) or would be released onto the exposed playa (in the future). If a smaller breach occurred, the ponds would be drained both through the breach and through the release of water through the control valve. This release also would occur over several days. Sediment released into the Sea would settle near the ponds and would not have a substantial effect on water quality. Impacts on the New River would occur only if a berm failed in the immediate vicinity of the river. This type of failure is unlikely because of the elevation of the existing ground is above -228 feet, but should this occur, the sediment would temporarily degrade water quality of a short segment of the river, and the sediment would flow to the Sea. The berms would be repaired promptly, and impacts would be less than significant when compared to both the existing environmental setting and the No Action Alternative.

3.11.3.5 Alternative 2 – New River, Pumped Diversion

Impact HYD-1: Project implementation would cause a reduction in the Salton Sea's water surface elevation (less-than-significant impact). The discussion under Alternative 1 is generally applicable to this alternative. For a surface area of the SCH ponds of 2,670 acres about 15,860 af of water would be lost from the ponds per year. In the absence of the Project, this volume of water would otherwise flow to the Sea where it would be subjected to a similar evaporation rate.

From the initial Project operation in 2014 through the end of the proof-of-concept period in 2025, a total of approximately 190,350 af of water would be lost to evaporation from the SCH ponds. This loss would be partially offset by the decrease in evaporation from the Sea because the storage (and therefore the surface area of the Sea) would be less because of the SCH diversion. By 2025, the volume of water stored in the Sea would be reduced by 110,700 af compared to the No Action Alternative. The Sea's surface elevation would be about 0.6 foot lower because of the ongoing evaporation that would result from Project operations.

By 2077, the Sea's depth would be reduced by 3.7 percent, and its water surface elevation would be about 0.7 foot lower as a result of the SCH diversions (Table 3.11-10).

The SCH ponds would cover playa exposed under the No Action Alternative and by 2077 although Alternative 2 results in a smaller remnant Sea, the net effect of the alternative is to cover an additional 790 acres of playa.

Impact HYD-2: Project implementation would increase the Salton Sea's salinity (less-than-significant impact). The discussion under Alternative 1 is generally applicable to this alternative. Although the total salt load of the Sea would not change as a result of the Project, the volume of water in the Sea would be reduced because of the increased rate of evaporation in the SCH ponds (refer to Impact HYD-1). Therefore, for a 2,670 acre pond, the Sea's salinity would increase relative to No Action by 3.6 percent (to 118.1 ppt) by 2025 and by 6.7 percent (to 290.1 ppt) by 2077 (Table 3.11-11). This impact would be less than significant when compared to both the existing environmental setting and the No Action Alternative.

Impact HYD-3: Project operations would cause changes in Salton Sea water quality but would not violate established standards (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

Impact HYD-4: Construction of the SCH ponds would temporarily degrade water quality at the Salton Sea (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

Impact HYD-5: Berm failure could increase erosion and sedimentation of the adjacent river and the Salton Sea (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

3.11.3.6 Alternative 3 – New River, Pumped Diversion + Cascading Ponds

Impact HYD-1: Project implementation would cause a reduction in the Salton Sea's water surface elevation (less-than-significant impact). The discussion under Alternative 1 is generally applicable to this alternative. For a surface area of the SCH ponds of 3,770 acres about 22,460 af of water would be lost from the ponds per year. In the absence of the Project, this volume of water would otherwise flow to the Sea where it would be subjected to a similar evaporation rate.

From the initial Project operation in 2014 through the end of the proof-of-concept period in 2025, a total of approximately 269,460 af of water would be lost to evaporation from the SCH ponds. This loss would be partially offset by the decrease in evaporation from the Sea because the storage (and therefore the surface area of the Sea) would be less because of the SCH diversion. By 2025, the volume of water stored in the Sea would be reduced by 156,700 af compared to the No Action Alternative. The Sea's surface elevation would be about 0.9 feet lower because of the ongoing evaporation that would result from Project operations.

By 2077, the Sea's depth would be reduced by 5.1 percent, and its water surface elevation would be about 1.0 foot lower as a result of the SCH diversions (Table 3.11-10).

The SCH ponds would cover playa exposed under the No Action Alternative and by 2077 although Alternative 3 results in a smaller remnant Sea, the net effect of the alternative is to cover an additional 1150 acres of playa.

Impact HYD-2: Project implementation would increase the Salton Sea's salinity (less-than-significant impact). The discussion under Alternative 1 is generally applicable to this alternative. Although the total salt load of the Sea would not change as a result of the Project, the volume of water in the Sea would be reduced because of the increased rate of evaporation in the SCH ponds (refer to Impact HYD-1). Therefore, for a 3,770-acre pond, the Sea's salinity would increase relative to No Action by 5.2 percent (to 119.9 ppt) by 2025 and by 9.5 percent (to 297.9 ppt) by 2077 (Table 3.11-11). This impact would be less than significant when compared to both the existing environmental setting and the No Action Alternative.

Impact HYD-3: Project operations would cause changes in Salton Sea water quality but would not violate established standards (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

Impact HYD-4: Construction of the SCH ponds would temporarily degrade water quality at the Salton Sea (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

Impact HYD-5: Berm failure could increase erosion and sedimentation of the adjacent river and the Salton Sea (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

3.11.3.7 Alternative 4 – Alamo River, Gravity Diversion + Cascading Pond

Impact HYD-1: Project implementation would cause a reduction in the Salton Sea's water surface elevation (less-than-significant impact). The discussion under Alternative 1 is generally applicable to this alternative. For a surface area of the SCH ponds of 2,290 acres about 13,640 af of water would be lost from the ponds per year. In the absence of the Project, this volume of water would otherwise flow to the Sea where it would be subjected to a similar evaporation rate.

From the initial Project operation in 2014 through the end of the proof-of-concept period in 2025, a total of approximately 163,650 af of water would be lost to evaporation from the SCH ponds. This loss would be partially offset by the decrease in evaporation from the Sea because the storage (and therefore the surface area of the Sea) would be less because of the SCH diversion. By 2025, the volume of water stored in the Sea would be reduced by 124,260 af compared to the No Action Alternative. The Sea's surface elevation would be about 0.7 foot lower because of the ongoing evaporation that would result from Project operations.

By 2077, the Sea's depth would be reduced by 4.1 percent, and its water surface elevation would be about 0.8 foot lower as a result of the SCH diversions (Table 3.11-10).

The SCH ponds would cover playa exposed under the No Action Alternative and by 2077 although Alternative 4 results in a smaller remnant Sea, the net effect of the alternative is to cover an additional 194 acres of playa.

Impact HYD-2: Project implementation would increase the Salton Sea's salinity (less-than-significant impact). The discussion under Alternative 1 is generally applicable to this alternative. Although the total salt load of the Sea would not change as a result of the Project, the volume of water in the Sea would be reduced because of the increased rate of evaporation in the SCH ponds (refer to Impact HYD-1). Therefore, for a 2,290 acre pond, the Sea's salinity would increase relative to No Action by 4.1 percent (to 118.6 ppt) by 2025 and by 7.5 percent (to 292.4 ppt) by 2077 (Table 3.11-11). This impact would be less than significant when compared to both the existing environmental setting and the No Action Alternative.

Impact HYD-3: Project operations would cause changes in Salton Sea water quality but would not violate established standards (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative, with the exception that Alamo River water would be used in the SCH ponds instead of New River water. The Alamo River currently has higher total selenium (current mean 5.39 µg/L) and lower total phosphorus concentrations (681 µg/L) than the New River. For ponds managed at 20 ppt salinity, the inflow selenium concentration would be 4.0 µg/L (Sickman et al. 2011). If there is minimal selenium removal within the ponds, the selenium concentration of the discharge would be 4.0 µg/L under existing and expected near-term No Action conditions, potentially temporarily elevated by approximately 0.9 µg/L due to selenium solubilization from the oxidized sediments following the initial wetting period. These concentrations exceed levels in the Salton Sea, but discharge of SCH pond water would be dissipated and diluted in the Sea's greater volume. Therefore, the water quality impact on the Sea would be less than significant when compared to the existing environmental setting and the No Action Alternative.

Impact HYD-4: Construction of the SCH ponds would temporarily degrade water quality at the Salton Sea (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

Impact HYD-5: Berm failure could increase erosion and sedimentation of the adjacent river and the Salton Sea (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

3.11.3.8 Alternative 5 – Alamo River, Pumped Diversion

Impact HYD-1: Project implementation would cause a reduction in the Salton Sea's water surface elevation (less-than-significant impact). The discussion under Alternative 1 is generally applicable to this alternative. For a surface area of the SCH ponds of 2,080 acres about 12,370 af of water would be lost from the ponds per year. In the absence of the Project, this volume of water would otherwise flow to the Sea where it would be subjected to a similar evaporation rate.

From the initial Project operation in 2014 through the end of the proof-of-concept period in 2025, a total of approximately 148,440 af of water would be lost to evaporation from the SCH ponds. This loss would be partially offset by the decrease in evaporation from the Sea because the storage (and therefore the surface area of the Sea) would be less because of the SCH diversion. By 2025, the volume of water stored in the Sea would be reduced by 86,300 af compared to the No Action Alternative. The Sea's surface elevation would be about 0.5 foot lower because of the ongoing evaporation that would result from Project operations.

By 2077, the Sea's depth would be reduced by 2.9 percent, and its water surface elevation would be about 0.6 foot lower as a result of the SCH diversions (Table 3.11-10).

The SCH ponds would cover playa exposed under the No Action Alternative and by 2077 although Alternative 5 results in a smaller remnant Sea, the net effect of the alternative is to cover an additional 600 acres of playa.

Impact HYD-2: Project implementation would increase the Salton Sea's salinity (less-than-significant impact). The discussion under Alternative 1 is generally applicable to this alternative. Although the total salt load of the Sea would not change as a result of the Project, the volume of water in the Sea would be reduced because of the increased rate of evaporation in the SCH ponds (refer to Impact HYD-1). Therefore, for a 2,080 acre pond, the Sea's salinity would increase relative to No Action by 2.8 percent (to 117.5 ppt) by 2025 and by 5.1 percent (to 286.0 ppt) by 2077 (Table 3.11-11). This impact would be less than significant when compared to both the existing environmental setting and the No Action Alternative.

Impact HYD-3: Project operations would cause changes in Salton Sea water quality but would not violate established standards (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative, with the exception that Alamo River water would be used in the SCH pondwater instead of New River water.

Impact HYD-4: Construction of the SCH ponds would temporarily degrade water quality at the Salton Sea (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

Impact HYD-5: Berm failure could increase erosion and sedimentation of the adjacent river and the Salton Sea (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

3.11.3.9 Alternative 6 – Alamo River, Pumped Diversion + Cascading Ponds

Impact HYD-1: Project implementation would cause a reduction in the Salton Sea's water surface elevation (less-than-significant impact). The discussion under Alternative 1 is generally applicable to this alternative. For a surface area of the SCH ponds of 2,940 acres about 17,500 af of water would be lost from the ponds per year. In the absence of the Project, this volume of water would otherwise flow to the Sea where it would be subjected to a similar evaporation rate.

From the initial Project operation in 2014 through the end of the proof-of-concept period in 2025, a total of approximately 209,990 af of water would be lost to evaporation from the SCH ponds. This loss would be partially offset by the decrease in evaporation from the Sea because the storage (and therefore the surface area of the Sea) would be less because of the SCH diversion. By 2025, the volume of water stored in the Sea would be reduced by 122,143 af. The Sea's surface elevation would be about 0.7 foot lower because of the ongoing evaporation that would result from Project operations.

By 2077, the Sea's depth would be reduced by 4.0 percent, and its water surface elevation would be about 0.8 feet lower as a result of the SCH diversions (Table 3.11-10).

The SCH ponds would cover playa exposed under the No Action Alternative and by 2077 although Alternative 6 results in a smaller remnant Sea, the net effect of the alternative is to cover an additional 880 acres of playa.

Impact HYD-2: Project implementation would increase the Salton Sea's salinity (less-than-significant impact). The discussion under Alternative 1 is generally applicable to this alternative. Although the total salt load of the Sea would not change as a result of the Project, the volume of water in the Sea would be reduced because of the increased rate of evaporation in the SCH ponds (refer to Impact HYD-1). Therefore, for a 2,940 acre pond, the Sea's salinity would increase relative to No Action by 4.0 percent (to 118.5 ppt) by 2025 and by 7.4 percent (to 292.0 ppt) by 2077 (Table 3.11-11). This impact would be less than significant when compared to both the existing environmental setting and the No Action Alternative.

Impact HYD-3: Project operations would cause changes in Salton Sea water quality but would not violate established standards (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative, with the exception that Alamo River water would be used in the SCH pondwater instead of New River water.

Impact HYD-4: Construction of the SCH ponds would temporarily degrade water quality at the Salton Sea (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

Impact HYD-5: Berm failure could increase erosion and sedimentation of the adjacent river and the Salton Sea (less-than-significant impact). The discussion under Alternative 1 is applicable to this alternative.

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