Volume I

ORANGE COUNTY WATER DISTRICT APPLICATION TO APPROPRIATE SANTA ANA RIVER WATER

Recirculated Draft Program Environmental Impact Report
SCH # 2002081024

Prepared for:
Orange County Water District

March 2006

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EXECUTIVE SUMMARY

Introduction

The Orange County Water District (OCWD or District) was created by the California Legislature in 1933, and empowered to manage and protect Orange County's groundwater basin. In order to carry out this mandate, OCWD has implemented a range of projects to capture available Santa Ana River flows, maximize the beneficial use of Orange County's groundwater basin and protect it from overdraft, seawater intrusion and contamination. Each project initiated after 1971 has been reviewed pursuant to the California Environmental Quality Act (CEQA). CEQA documentation concerning diversion and recharge operations is summarized in Appendix C. New and future projects are reviewed in this Recirculated Draft Program Environmental Impact Report (PEIR).

In implementing its mandate, OCWD has relied upon water rights which are reflected in a 1969 Judgment and Court Order. The State Water Resources Control Board ("SWRCB") has indicated that it does not recognize water rights conferred by court proceedings such as those leading to the 1969 Judgment, and recommended that OCWD file an Application to Appropriate the water which it currently diverts, as well as all water it plans to divert in the future.

OCWD has done so, and its application reflects its intent to adhere to the rights and responsibilities set forth in the 1969 Judgment, while complying with its legislative mandate. Santa Ana River flows reaching Prado Basin have increased dramatically since 1969, and OCWD's application and this PEIR pertain to projects to maximize the beneficial uses of such flows. OCWD does not seek to compel the continued flow of such additional waters, but to the extent that such water does reach Prado Basin, OCWD plans to implement projects to put that additional water to beneficial use as part of its management and protection of the Orange County groundwater basin.

This PEIR has been prepared pursuant to CEQA to assess potential environmental effects of the District's SAR diversions along with associated facilities for water storage and recharge. OCWD is the lead agency and will approve the future water diversion program outlined in the application. The SWRCB is a responsible agency pursuant to CEQA Guidelines section 15096 and will use this PEIR to evaluate effects of issuing a permit to divert water from the SAR.

The Draft PEIR for this project was originally circulated for public review from May 28 to July 16, 2004. In response to the comments received on the Draft PEIR the District has developed and incorporated substantial additional information and reorganized the PEIR. A description of new information added follows. The District is recirculating the Draft PEIR to allow for public and agency review and comment on the expanded analysis.

Project Background

The District was formed in 1933 by a special act of the State Legislature [Water Code App § 40-1 et seq.]. It has authority for managing and protecting the Orange County groundwater basin. The District encompasses over 229,000 acres of the lower watershed of the SAR below Prado Dam. Currently, the District maintains approximately 1,000 acres of riverbed and off-stream recharge basins, with a combined recharge capacity of approximately 264,000 acre-feet per year (afy).

The District's original water rights to the lower SAR were acquired from two irrigation districts with rights established in the 1870s, entitling each district to half of the normal surface flow of the SAR below the present location of Prado Dam. In 1969, litigation was resolved between the District and upstream water districts including San Bernardino Valley Municipal Water District (Muni), Inland Empire Utilities Agency (IEUA) (formerly Chino Basin Municipal Water District), and the Western Municipal Water District (Western). The 1969 Stipulated Judgment established the Santa Ana River Watermaster and a physical solution to maximize beneficial uses of the river. The judgment provided to the District a minimum guaranteed base flow of 42,000 acre-feet per year (afy) plus all storm flows reaching Prado Basin. Although the 1969 Stipulated Judgment provided a court-ordered physical solution between upstream and downstream parties, it did not allocate water rights within the watershed in a manner currently recognized by the SWRCB. The District submitted an Application to the SWRCB Division of Water Rights in November 1992 for the purpose of formalizing rights to the water reaching Prado Basin. A Supplement to the Application was submitted in August 1998 at the request of SWRCB.

Proposed Project

The District has filed an Application to the SWRCB to appropriate water from the SAR. The District requests a permit that recognizes its current water rights and diversion practices as well as appropriation of the river's increasing flow at Prado Dam that would otherwise reach the Pacific Ocean. The District has diverted a maximum of 237,000 af of native SAR water in a single water year.[1] It is anticipated that future base flow and storm flow in the SAR below Prado Dam will increase due to urbanization in the upper SAR watershed. The District wants to finalize with the SWRCB the right to capture whatever level of additional base and storm flow may reach Prado Basin in the future up to 505,000 afy.

District operations would remain similar to existing conditions along the river channel between Imperial Highway and State Route 22 (SR-22). Virtually all base flow released through Prado Dam during non-storm periods would be diverted for groundwater recharge as is currently the case. Downstream of the SR-22 overpass, peak storm flows would continue to reach the ocean. The District's proposed project would utilize existing diversion and recharge facilities as well as proposed near-term and long-term facilities for additional storage and recharge. No new diversion structures would be installed within the river downstream of Prado Dam to accommodate the proposed near-term facilities, although new points of diversion within Prado Basin would be necessary to implement the long-term projects.

[1] 1992/1993 and 1994/1995water years.

The District has identified a suite of projects to increase recharge and storage capacity for both the near term and the long term, including new and expanded recharge basins and potential surface water reservoirs. **Table ES-1** lists these projects.

TABLE ES-1
NEAR-TERM AND LONG-TERM PROJECTS

		Recharge (Diversion) Capacity (AF/Y)	Storage Capacity (AF) *	CEQA Coverage
	Near-Term Projects			
1	La Jolla Recharge Basin	9,000		EIR to be published in 2006
2	Mira Loma Recharge Basin	10,000		IS to be published in 2006
3	Santiago Creek Expanded Recharge	3,000		Covered in this EIR
4	Anaheim Lake Expanded Recharge	2,000		Covered in this EIR
	Basin Cleaning Vehicles [1] [BCV]			Cat Ex. Adopted May 2003
5	Anaheim Lake	18,000		
6	Kraemer Basin	18,000		
7	Miller Basin **	7,000		
8	Weir Pond #3 **	8,000		
9	Five Coves **	8,000		
10	Prado Dam (Conservation elev. = 508) [2]		10,000	Draft EIS for elevation 505 published July 2004. EIR for elevation 505 to be published in 2006.
	Subtotal	**97,000**[4]	**10,000**	
	Long-Term Projects			
11	Prado Dam (Conservation elev. = 514) [2]		23,600	Program-level review of additional long-term recharge basins and storage facilities provided in this PEIR. Additional project-level CEQA to be provided in future as appropriate.
12	Fletcher Recharge Basin	1,000		
13	Additional Recharge Basins [3]	77,000		
	Basin Cleaning Vehicle			
14	Burris Pit	15,000		
15	Bond Pit	10,000		
16	Subsurface Collection/ Recharge System (SCARS) – Multiple Sites	10,000		
17	Deep Basin Filtration Recharge – 3 sites	25,000		
18	Recharge Galleries – 2 sites	20,000		
19	Gypsum Canyon Reservoir [2]		30,000	
20	Aliso Canyon Reservoir [2]		30,000	
	Subtotal	**158,000**	**83,600**	
	Existing Facilities When Application Submitted	250,000		
	Total	**505,000**	**93,600**	

1 Deep Basin continuous cleaning device will increase percolation rates.
2 Storm flows captured for later release to the SAR for diversion downstream at recharge facilities when capacity becomes available.
3 150 acres total – multiple sites.
4 Includes 14,000 af attributed to Santiago Creek Replenishment and River View Recharge Basin projects that have been implemented since the application was submitted.
* Denotes size of reservoir. Reservoirs may be filled and drained multiple times per year.
** OCWD has completed separate CEQA review and these projects are in development.

SOURCE: Orange County Water District.

Need for the Project

The District's existing and planned diversions are crucial in order to carry out the District's legislative mission to manage the Orange County groundwater basin as the major municipal water source for the region. The Orange County Water District Act of 1933 gives OCWD the powers to manage the Orange County groundwater basin including replenishing, regulating, and protecting groundwater supplies. This includes powers to appropriate and acquire water and water rights, to conserve water and to regulate groundwater production to protect the basin.[2]

Northern Orange County is a densely populated urban area that receives an average of 13 inches of precipitation annually. Water demand within the service area far exceeds the supply from its rainfall and is expected to increase about 14 percent from 500,000 afy in 2000 to 570,000 afy in 2025.[3] The annual yield of the Orange County groundwater basin varies from year to year, currently providing approximately 67 percent (330,000 afy) of the total water demand within the District's service area. Native SAR water diverted to recharge the groundwater basin provides approximately 55 percent (184,000 afy) of the basin's annual recharge.

Currently, local water retailers must augment groundwater production with imported supplies from the Metropolitan Water District of Southern California (Metropolitan or MWD) to meet total water demand within the District's boundaries. Capturing the increased flow in the SAR to support beneficial uses of the Orange County groundwater basin would reduce dependence on imported supplies to meet future demand.

To manage the annual amount of groundwater pumping by retail agencies within the service area, the District uses its statutory authority to establish a basin production percentage (BPP) each year. Groundwater production below the BPP is assessed the replenishment assessment (RA), which is established annually by the District. Groundwater production above the BPP is assessed the basin equity assessment (BEA) in addition to the RA. The BEA acts as a financial disincentive to pump above the BPP, which is established to achieve basin management objectives including optimizing sustainable basin yield and reducing accumulated overdraft. OCWD uses the BEA revenue to purchase imported water during times of surplus to replenish the basin. Three such basin storage withdrawal and replenishment cycles have occurred in the Orange County groundwater basin since 1970.

With urbanization in the upper watershed, flow in the SAR has increased and is projected to continue to increase as further development occurs. **Figure ES-1** illustrates the increase in river flows as recorded at Prado Dam since 1970. Capturing these increased river flows will reduce the demand for imported water in urbanized Orange County.

OCWD Watershed Stewardship

OCWD is a leading resource manager and environmental steward within the Prado Basin and the greater Santa Ana River watershed. OCWD is a founding member of the Santa Ana Watershed Association of Resource Conservation Districts (SAWA) and of the Santa Ana Watershed Project

2 OCWD Act, Section 2.6.
3 MWDOC, Retail Demand Projection with 2004 Data, Producers Model (based on a survey of retail producers from 2004).

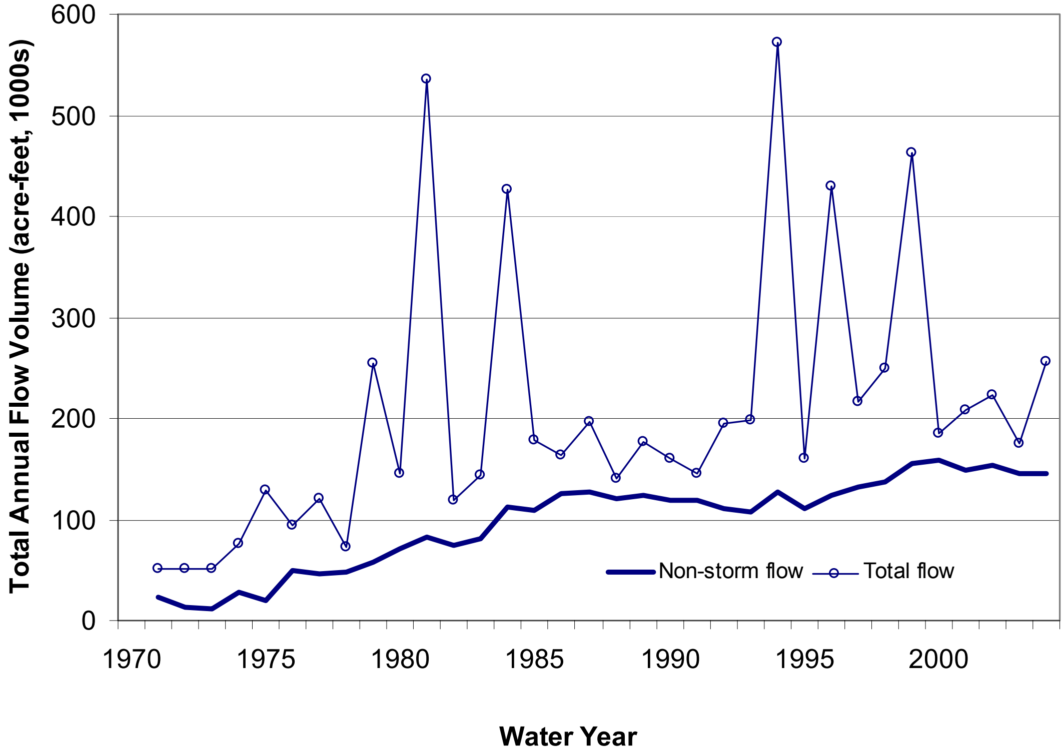


Figure ES-1 Increasing Trends in SAR Total and Non-storm Flows Since 1970

Authority (SAWPA). Both organizations were established to enhance Santa Ana River watershed resource management. Through SAWPA, the District has instigated numerous projects to protect the natural resources in the SAR watershed including the following:

- Least Bell's Vireo Management Program
- Santa Ana Sucker Conservation Program
- Arundo Removal Program in Santiago Creek and along portions of the SAR
- Groundwater desalting within the Chino Basin and Arlington sub-basin

The District owns 2,150 acres behind Prado Dam in Riverside County. Within this area, the District operates and maintains approximately 465 acres of constructed wetlands. The wetlands reduce nitrogen levels in SAR water, and they also provide habitat value. The District manages extensive habitat and species restoration programs within Prado Basin, cooperating with the U.S. Fish and Wildlife Service to expand the population of threatened least Bell's vireo, a small song bird, and to enhance habitat for the southwestern willow flycatcher and Santa Ana sucker.

The District has set aside more than 250 acres within the Prado Basin as protective habitat for the vireo and has funded more than $1 million for a vireo monitoring program. The program includes restoration of habitat and the trapping of cowbirds that colonize vireo nests. The habitat conservation program has been extremely successful, becoming the largest nesting area for the vireo in the State and a key feature in the recovery of the species. In addition, the District has been a key partner in providing funding and support for Santa Ana sucker research and protection programs within the greater Santa Ana watershed.

The District has also contributed $2 million to the USFWS for removal of Arundo, an invasive exotic plant that consumes large amounts of water and out-competes native plants that are beneficial to wildlife. It is estimated that by 2025, an annual minimum of 36,000 af of additional water will be available in the Santa Ana River as a result of removing Arundo. These and other environmental projects maintained by the District provide benefits to the environment and are also beneficial to the District's water conservation programs.

Project Objectives

The District's goal in securing rights from SWRCB to existing and increased SAR water is to ensure maximum use of local water supplies to meet the water demands of the region. The increased diversions and the proposed recharge and storage facilities provide an opportunity for the District to achieve its following project objectives:

- Protect beneficial uses of the Orange County groundwater basin;
- Improve the reliability of local groundwater supply to serve local water demands;
- Ensure sustainable water supplies during drought periods;
- Increase the sustainable yield of the Orange County groundwater basin in a cost effective manner to maximize the use of local water supplies to serve local water demands;
- Reduce dependence on imported water; and
- Increase operational flexibility by increasing both recharge capacity and recharge location options to better manage groundwater basin conditions. Summary of Revisions to the Original PEIR.

Summary of Revisions to the Original PEIR

Comments received on the original Draft PEIR requested that additional information be added to the document to support the conclusions regarding some of the impacts of the project. Major revisions to the PEIR are listed below:

- Inclusion of a new Chapter 2 – Project Overview
- Revised Chapter 4.2 – Santa Ana River Hydrology and Water Resources
- Revised Chapter 4.3 – Biological Resources
- Inclusion of a new Chapter 5 – Program-Level Environmental Analysis of Future Facilities
- Revised Chapter 7 – Cumulative Analysis
- Revised Chapter 8 – Alternatives
- New and Revised Appendices

The scope and content of the revisions made to each of these sections are described in detail in Section 1.5 of the Introduction Chapter.

Scope of Analysis

The PEIR evaluates the potential effects of increasing SAR diversions by the District, of construction and operation of additional recharge and storage facilities to accommodate increasing SAR diversions, and of increasing the District's groundwater recharge efforts. The increased diversions are evaluated at a project level. Two near-term facilities projects are also provided project-level analysis in this PEIR: the Anaheim Lake Expansion and the Santiago Creek Expanded Recharge. The other near-term projects and each of the long-term projects are reviewed in this PEIR at a program level of detail, consistent with the conceptual nature of the siting, design, and operational descriptions for such potential facilities. The projects are evaluated as separate categories: surface recharge facilities, sub-surface recharge facilities, and surface storage facilities. Each of the individual future projects not evaluated at project level in this PEIR will be required to undergo additional CEQA review prior to approval and implementation.

Project Alternatives

The District's preferred alternative is the proposed project described in detail in Chapter 3 of this document. Chapter 8 describes three other alternative projects and evaluates their ability to avoid identified impacts and meet project objectives:

- No Project Alternative
- Near-Term Facilities Only Alternative
- No Surface Water Storage Reservoirs Alternative

No Project Alternative: The No Project Alternative reflects the existing condition. The existing maximum recharge capacity is approximately 264,000 afy, which includes two facilities implemented since the application was submitted (Santiago Creek Replenishment and River View Recharge projects). No new projects would be constructed to increase this recharge capacity.

Near-Term Facilities Only Alternative: The Near-Term Facilities Only Alternative assumes that each of the near-term facilities would be constructed, but the long-term facilities would be abandoned. This would increase the District's recharge capacity by 97,000 afy to approximately 347,000 afy.

No Surface Water Storage Reservoirs Alternative: The No Storage Reservoirs Alternative assumes that the off-river storm water storage reservoirs listed in the Application (Aliso Canyon and Gypsum Canyon) would not be constructed. Under this alternative, each of the near-term projects and the long-term recharge projects would remain under consideration. Without storm water storage reservoirs, diverting and recharging 505,000 afy would not be possible. For planning purposes, this analysis assumes that the maximum recharge capacity without off-river storage facilities would be reduced to approximately 445,000 afy. This is approximately 60,000 afy less than the preferred project. Additional analysis would be required to assess the District's actual recharge capacity without the use of off-river storm water storage reservoirs.

Environmentally Superior Alternative

CEQA requires that an EIR identify the environmentally superior alternative of a project. Each of the alternatives evaluated in this PEIR would present environmental tradeoffs based on construction and other impacts associated with recharge and storage facilities. The proposed project would provide for the maximum use of SAR water to meet local water demand and would be the most favorable to protection of groundwater resources since up to 505,000 af could be recharged in one wet year. Maximizing use of SAR water minimizes the impacts associated with providing new facilities and technologies to import, desalinate, or reclaim water to meet local demand. However, construction of facilities to recharge the additional water would present impacts to other environmental resources as discussed above. As shown in Chapter 5 of this document, potential impacts of constructing the off-river storage reservoirs could be significant. In contrast, impacts associated with constructing recharge facilities would be minimal. Both the Near-Term Facilities Only Alternative and the No Storage Reservoirs Alternative would avoid the significant impacts associated with off-river storage reservoirs while providing additional recharge capacity. Of these two alternatives, the No Storage Reservoirs Alternative would provide substantially greater recharge capacity with minimal impact while avoiding the significant impacts associated with constructing off-river storage projects. Based on this analysis, the No Storage Reservoirs Alternative is the environmentally superior alternative.

Environmental Impacts

Chapters 4 and 5 of this PEIR consider the environmental impacts of the proposed project as required by CEQA. **Table ES-2** summarizes impacts to environmental resources identified in this PEIR.

TABLE ES-2
SUMMARY OF PROJECT IMPACTS

		Future Projects		Specific Projects	
	SAR Water Diversion	Recharge Basins	Storage Reservoirs	Anaheim Lake Expansion	Santiago Creek Expansion
Hydrology	LS	LS/M	LS/M	LS/M	LS/M
Biology	NI	LS/M	PS	LS/M	NI
Land Use/Recreation	NI	LS/M	PS	LS	LS
Aesthetics	NI	LS/M	PS	LS	LS
Air Quality	NI	PS	PS	LS	LS
Cultural Resources	NI	LS/M	LS/M	LS/M	LS/M
Geology	NI	LS/M	PS	NI	LS
Hazards	NI	LS/M	LS/M	NI	LS
Noise	NI	LS/M	PS	LS	LS
Traffic	NI	LS/M	LS/M	LS	LS

PS= Potentially Significant Unavoidable
LS/M = Less than Significant with Incorporation of Mitigation
LS = Less than Significant
NI = No Adverse Impact

No significant and unavoidable impacts would result from the increased diversions or for implementation of the Anaheim Lake Expanded Recharge project or the Santiago Creek Expanded Recharge. Mitigation measures have been identified that would reduce potentially significant impacts to less than significant levels for these projects.

At a program-level of review, the PEIR concludes that construction and operation of future projects could result in significant and unavoidable impacts. Future project-level impact analysis would be required to determine methods of avoiding or minimizing these potentially significant effects.

Project-level and program-level impacts and mitigation measures identified in Chapter 4 are listed in the following tables:

Table ES-3: Impacts of Proposed Santa Ana River Diversions (Project-Level)

Table ES-4: Impacts of Proposed Anaheim Lake Expansion Project (Project-Level)

Table ES-5: Impacts of Proposed Santiago Creek Expanded Recharge Project (Project-Level)

Table ES-6: Impacts of Proposed Future Surface Recharge Basins (Program-Level)

Table ES-7: Impacts of Proposed Future Enhancement of Existing Recharge Systems (Program-Level)

Table ES-8: Impacts of Proposed Future Subsurface Recharge Systems (Program-Level)

Table ES-9: Impacts of Proposed Future Storage Reservoirs (Program-Level)

TABLE ES-3
SANTA ANA RIVER DIVERSIONS
PROJECT LEVEL SUMMARY OF IMPACTS AND MITIGATIONS

Impact	Significance
4.2. Hydrology and Water Resources	
Impact HYDRO-1: Diversion of SAR water would reduce the volume of water that would otherwise reach the ocean. This would be a less than significant impact.	Less than significant.
4.3. Biological Resources	
No impacts to biological resources would occur from existing or proposed diversions. No mitigation measures would be necessary.	No Impact
4.4. Land Use and Recreation	
No impacts to land uses would occur from existing or proposed diversions. No mitigation measures would be necessary.	No Impact
4.5. Aesthetics	
No impacts to local aesthetics or character would occur from existing or proposed diversions. No mitigation measures would be necessary.	No Impact
4.6. Air Quality	
No additional air emissions would result from existing or proposed diversions. No mitigation measures would be necessary.	No Impact
4.7. Cultural Resources	
No impacts to cultural resources would occur from existing or proposed diversions. No mitigation measures would be necessary.	No Impact
4.8. Geology and Soils	
No geologic hazards would occur from existing or proposed diversions. No mitigation measures would be necessary.	No Impact
4.9. Hazards and Hazardous Materials	
No hazards would occur from existing or proposed diversions. No mitigation measures would be necessary.	No Impact
4.10. Noise	
The increased diversions would not increase noise emissions. No mitigation measures would be necessary.	No Impact
4.11. Traffic	
The existing or proposed diversions would not increase or impact local traffic or transportation infrastructure. No mitigation measures would be necessary.	No Impact
7.4 Cumulative Impacts	
Impact C-1: OCWD diversions would contribute to the cumulative diversions within the SAR watershed which would result in a reduction of the amount of water that would otherwise reach the ocean. This would be considered a less than significant impact.	Less than significant.

TABLE ES-4

ANAHEIM LAKE EXPANSION PROJECT

PROJECT LEVEL SUMMARY OF IMPACTS AND MITIGATIONS

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
4.2. Hydrology and Water Resources		
HYDRO-2: Construction activities associated with Anaheim Lake Expanded Recharge could temporarily add sediment and pollutants to urban runoff and storm water runoff.	M-HYDRO-1: The District will prepare and implement a Storm Water Pollution Prevention Plan as required for coverage under the statewide National Pollutant Discharge Elimination System construction permit. At a minimum, specific measures should include the following: • Stockpiles of loose material shall be covered to prevent wind and water erosion and runoff diverted away from exposed soil. • Concrete wash water will be collected and disposed of in the sanitary sewer. • Fuel storage shall be within secondary containment.	Less than significant.
4.3. Biological Resources		
BIO-1: Implementation of the proposed project at Anaheim Lake could result in impacts to nesting cormorants, herons, egrets, raptors and other birds protected by the Migratory Bird Treaty Act.	M-BIO-1: The identified nesting trees will be removed outside the March 1 – July 31 breeding period. OCWD shall conduct pre-construction surveys for nesting birds within 30 days prior to removing the trees. The results of the surveys shall be forwarded to the USFWS and CDFG. If birds are found to be nesting in the trees to be removed during the survey, the tree removal will be delayed until the nests are no longer in use. M-BIO-2: OCWD shall construct artificial nesting platforms, to replace the number of active nests present during the breeding season before the trees on the island are removed. See Payne and Copes (1990) for successful platform design. M-BIO-3: OCWD will consult with CDFG prior to removing nesting trees to determine what additional measures, if any, will be required to offset project impacts to the cormorant rookery.	Less than significant.
4.4. Land Use and Recreation		
LU-1: The Anaheim Lake Expanded Recharge project could temporarily reduce the availability of recreational resources.	None required.	Less than significant.
4.5. Aesthetics		
AES-1: Construction of the Anaheim Lake Expanded Recharge project would pose temporary aesthetics impacts.	None required.	Less than significant.

TABLE ES-4

ANAHEIM LAKE EXPANSION PROJECT

PROJECT LEVEL SUMMARY OF IMPACTS AND MITIGATIONS (CONT.)

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
4.6. Air Quality		
AIR-1: Construction activities would emit criteria pollutants.	None required.	Less than significant.
4.7. Cultural Resources		
CULT-1: Implementation of the Anaheim Lake Expanded Recharge project could affect unknown, potentially significant prehistoric and historic resources.	M-CULT-1: Pursuant to CEQA Guidelines 15064.5 (f), “provisions for historical or unique archaeological resources accidentally discovered during construction” will be instituted. In the event that any prehistoric or historic subsurface cultural resources are discovered during ground disturbing activities, all work within 50 feet of the resources shall be halted and the District shall consult with a qualified archaeologist or paleontologist to assess the significance of the find. If any find is determined to be significant, representatives of the District and the qualified archaeologist and/or paleontologist would meet to determine the appropriate course of action. All significant cultural materials recovered shall be subject to scientific analysis, professional museum curation, and a report prepared by the qualified archaeologist according to current professional standards.	Less than significant.
4.8. Geology and Soils		
No impacts.	None required.	No impact.
4.9. Hazards and Hazardous Materials		
No impacts.	None required.	No impact.
4.10. Noise		
NOISE-1: Implementation of the Anaheim Lake Expanded Recharge project would temporarily increase noise in local areas.	None required.	Less than significant.
7.6 Cumulative Impacts		
CM-4: Construction and operation of Anaheim Lake Expanded Recharge projects would not contribute significantly to cumulative environmental impacts.	None required.	Less than significant.

TABLE ES-5

SANTIAGO CREEK EXPANDED RECHARGE PROJECT

PROJECT LEVEL SUMMARY OF IMPACTS AND MITIGATIONS

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
4.2. Hydrology and Water Resources		
HYDRO-3: Construction activities associated with Santiago Creek Expanded Recharge temporarily could add sediment and pollutants to urban runoff and storm water runoff.	M-HYDRO-2: The District will prepare and implement a Storm Water Pollution Prevention Plan as required for coverage under the statewide National Pollutant Discharge Elimination System construction permit. At a minimum, specific measures should include the following: • Stockpiles of loose material shall be covered to prevent wind and water erosion and runoff diverted away from exposed soil. • Concrete wash water will be collected and disposed of in the sanitary sewer. • Fuel storage shall be within secondary containment • Construction debris including broken concrete will be removed from the creek. • Construction activities in the creek will not occur during the rainy season.	Less than significant.
HYDRO-4: Increased recharge within Santiago Creek could transport contamination from surface soils in the area into the groundwater. Nearby production wells could be affected.	M-HYDRO-3: Prior to implementing the project, the District will conduct a Phase I Site Assessment for hazardous waste and soil contamination for the portion of the Santiago Creek between Hart Park and the SAR. The District will comply with recommendations contained in the Site Assessment to avoid transporting contamination. M-HYDRO-4: If the Site Assessment identifies the potential for contaminated soils to be transported by the project, the District will either redesign the project to avoid this area or remediate the contamination prior to implementation of the project such that no adjacent properties or the groundwater basin would be adversely affected. M-HYDRO-5: The District will notify the owners of active production wells within 500 feet of the lower reach of Santiago Creek between Hart Park and the SAR of the District's intent to recharge groundwater within Santiago Creek. In coordination with these well owners, the District will develop and implement a groundwater monitoring plan similar to the existing plan for the upper reach of the creek that will provide early detection of potential changes to groundwater chemistry resulting from the project. If the monitoring plan identifies adverse effects to water chemistry, the recharge operations causing the effect will cease. The results from periodic groundwater monitoring will be submitted to the RWQCB. M-HYDRO-6: If adverse effects to groundwater quality caused by the recharge project are identified during groundwater monitoring, recharge operations will cease until the condition is resolved.	Less than significant.

TABLE ES-5
SANTIAGO CREEK EXPANDED RECHARGE PROJECT
PROJECT LEVEL SUMMARY OF IMPACTS AND MITIGATIONS (CONT.)

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
4.3. Biological Resources		
BIO-2: Implementation of the Santiago Creek Expanded Recharge project would occur within the creek bed subject to USACE, RWQCB, and CDFG jurisdiction.	M-BIO-4: Prior to construction within Santiago Creek, the District shall obtain a permit from the USACE pursuant to Section 404 of the CWA. The final permit shall be submitted to the SARWQCB in application for certification pursuant to Section 401 of the CWA. M-BIO-5: Prior to construction within Santiago Creek, the District shall obtain a Streambed Alteration Agreement from CDFG pursuant to Section 1600 et seq. of the California Fish and Game Code. M-BIO-6: Prior to construction within Santiago Creek, the District shall consult with CDFG to determine any additional notifications or measures required to offset project impacts.	Beneficial.
BIO-3: Increasing the flow in Lower Santiago Creek from 15 cfs to 30 cfs could affect existing vegetation and encourage riparian habitat.	None required.	Beneficial.
4.4. Land Use and Recreation		
LU-2: The Santiago Creek Expanded Recharge project could conflict with an applicable habitat conservation plan or NCCP.	None required.	Less than significant.
LU-3: The proposed Santiago Creek Expanded Recharge project could temporarily reduce the availability of recreational resources.	None required.	Less than significant.
4.5. Aesthetics		
AES-2: Construction at Santiago Creek would pose temporary aesthetic impacts.	None required.	Less than significant.
4.6. Air Quality		
AIR-2: Construction activities would emit criteria pollutants.	None required.	Less than significant.
4.7. Cultural Resources		
CULT-2: Implementation of the Santiago Creek Expanded Recharge project could affect unknown, potentially significant prehistoric and historic resources.	M-CULT-2: Prior to excavation, a qualified architectural historian shall conduct a survey of the Hart Park construction area. The historian shall determine the potential significance of the Hart Park parking area. The historian shall prepare a report identifying the significance and recommending measures to minimize the potential impact. Measures may include minimizing the construction	Less than significant.

TABLE ES-5
SANTIAGO CREEK EXPANDED RECHARGE PROJECT
PROJECT LEVEL SUMMARY OF IMPACTS AND MITIGATIONS (CONT.)

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
	area to avoid construction impacts to side walls and access routes. M-CULT-3: Pursuant to CEQA Guidelines 15064.5 (f), "provisions for historical or unique archaeological resources accidentally discovered during construction" will be curated. In the event that any prehistoric or historic subsurface cultural resources are discovered during ground disturbing activities, all work within 50 feet of the resources shall be halted and the District shall consult with a qualified archaeologist or paleontologist to assess the significance of the find. If any find is determined to be significant, representatives of the District and the qualified archaeologist and/or paleontologist would meet to determine the appropriate course of action. All significant cultural materials recovered shall be subject to scientific analysis, professional museum curation, and a report prepared by the qualified archaeologist according to current professional standards.	
4.8. Geology and Soils		
GEO-1: The Santiago Creek Expanded Recharge Project would be subject to geologic hazards including unstable soils and seismic hazards such as surface rupture, ground shaking, landslides, and liquefaction.	None required.	Less than significant.
GEO-2: The Santiago Creek Expanded Recharge Project would occur within an area that has been identified as a mineral resource zone for aggregate material.	None required.	Less than significant.
4.9. Hazards and Hazardous Materials		
HAZ-1: The Santiago Creek Expanded Recharge project could encounter soil during excavation that has been exposed to contamination.	See M-Hydro-3 and M-Hydro-4.	Less than significant.
HAZ-2: Construction activities within Santiago Creek could result in spilling hazardous materials into the creek.	M-HAZ-1: No refueling of heavy equipment shall be conducted within the creek bed. M-HAZ-2: Drip pans shall be placed under heavy equipment within the creek bed when not in operation.	Less than significant.
4.10. Noise		
NOISE-2: Implementation of the Santiago Creek Expanded Recharge project would temporarily increase noise in local areas.	M-NOISE-1: Prior to construction activities in Hart Park, notices will be sent to neighboring residences within a 1,000 foot radius of the construction area providing the planned construction schedule and including a contact number.	Less than significant.

TABLE ES-5
SANTIAGO CREEK EXPANDED RECHARGE PROJECT
PROJECT LEVEL SUMMARY OF IMPACTS AND MITIGATIONS (CONT.)

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
4.11. Traffic		
TR-2: Construction activities for the Santiago Creek Expanded Recharge project could impact traffic flow and parking in Hart Park.	M-TR-1: Prior to construction, the District shall obtain an encroachment permit from the City of Orange. The encroachment permit will include a traffic control plan that will provide for temporary parking during construction.	Less than significant.
7.6 Cumulative Impacts		
C-4: Construction and operation of Santiago Creek Expanded Recharge would not contribute significantly to cumulative environmental impacts.	None Required.	Less than significant.

TABLE ES-6
FUTURE PROJECTS – SURFACE RECHARGE BASINS
PROGRAM LEVEL SUMMARY OF IMPACTS AND MITIGATIONS

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
5.2.1. Hydrology		
Future surface recharge projects could result in significant impacts to storm water quality.	RB-HYDRO-1: The District will prepare and implement Storm Water Pollution Prevention Plans as required for coverage under the statewide National Pollutant Discharge Elimination System construction permit.	Less than significant.
	RB-HYDRO-2: The District will design facilities to be consistent with Orange County's storm water quality requirements.	
Future surface recharge projects could result in significant impacts to groundwater quality.	RB-HYDRO-3: Prior to implementation of new recharge facilities, the District shall conduct groundwater modeling to evaluate the ability of the groundwater basin to accommodate the additional water at the specific recharge location. If modeling concludes that the basin can not accommodate the additional recharge, no recharge basins will be constructed in that area.	Less than significant.

TABLE ES-6
FUTURE PROJECTS – SURFACE RECHARGE BASINS
PROGRAM LEVEL SUMMARY OF IMPACTS AND MITIGATIONS (CONT.)

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
	RB-HYDRO-4**:** The District shall continue to coordinate with the Department of Health Services and local water producers to effectively manage and maintain high water quality. The District shall continue water quality monitoring of recharge water to assess the potential for affecting groundwater quality. The District shall submit water quality monitoring results to the Department of Health Services. If monitoring identifies water quality concerns, OCWD shall coordinate with the Department of Health Services to develop and implement necessary water quality protection measures. RB-HYDRO-5**:** Prior to implementation of new recharge facilities, the District shall conduct Phase I site assessments for each potential recharge basin prior to approval to assess potential for soil contamination to exist on site or in neighboring areas that could be affected by the project. If contaminated soils are identified the District will implement measures to prevent adversely affecting groundwater.	
5.2.2. Biological Resources		
Future surface recharge projects could result in significant impacts to biological resources.	RB-BIO-1: The District will consult with resource agencies including the USFWS, CDFG, the USACE, and the RWQCB to obtain necessary permits prior to implementation of projects that could result in disturbance to biological resources. RB-BIO-2: The District shall implement a pre-construction mitigation strategy first to identify sensitive habitats, plants, and wildlife species, and then to avoid impacts if possible. If avoidance is not possible, the District shall minimize the impact and compensate in accordance with permitting requirements. This general mitigation strategy is summarized below. • **Determine if sensitive habitats or species are present:** The District will retain qualified biologists to survey the project site for sensitive habitats, plants, and wildlife species. • **Avoid loss of sensitive habitats and species:** The District will avoid disturbing sensitive biological resources, if possible. During project planning and siting, alternative locations or project configurations would be evaluated. • **Minimize loss of sensitive habitats and species:** If avoidance is not possible, the District will limit construction activities in and around sensitive habitats and species to the minimum area necessary. • **Compensate for unavoidable loss of sensitive habitats and species:** If avoidance is not possible, the District will compensate for the unavoidable losses in coordination with the USFWS and CDFG. Compensation for sensitive habitats and special-status	Less than significant.

TABLE ES-6

FUTURE PROJECTS – SURFACE RECHARGE BASINS

PROGRAM LEVEL SUMMARY OF IMPACTS AND MITIGATIONS (CONT.)

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
	plant communities could involve either purchasing property with similar habitat or plant communities and providing for their protection and management for wildlife value in perpetuity, or enhancing sensitive habitat and plant communities within existing conservation areas.	
5.2.3. Land Use and Recreation		
Future surface recharge projects could conflict with existing land use designations and temporarily impact the availability of recreational resources.	RB-LU-1: The District shall conduct siting studies to determine the most suitable locations to place facilities. Siting studies shall consider existing and planned land uses in the vicinity of the project. Projects will be located in areas with suitable neighboring land uses wherever feasible. RB-LU-2: If sensitive land uses cannot be avoided, buffer zones, access controls, and visual screens will be implemented to minimize impacts wherever feasible. RB-LU-3: The District shall identify locations for project facilities that minimize impacts to recreational facilities. RB-LU-4: For projects located near recreational areas, the District shall coordinate with the applicable recreation or park agency to identify ways to minimize impacts of project construction on recreational activities. Measures may include but are not limited to: • Posting of signage indicating dates during which use of recreational areas would be restricted due to construction; • Placement of fencing to isolate construction areas and allow continued use of other areas of recreational parks and facilities; and • Timing of construction activities to avoid peak recreational use seasons.	Less than significant.
5.2.4. Aesthetics		
Future surface recharge projects could result in significant impacts to local aesthetic character.	RB-AES-1: The District shall design facilities to be consistent with local policies and programs to protect scenic values and to avoid visual intrusions. RB-AES-2: The District shall incorporate landscaping plans into final designs of project facilities to mask views of new structures.	Less than significant.
5.2.5. Air Quality		
Construction of future surface recharge projects could result in significant air quality impacts.	RB-AIR-1: The District shall establish best management practices (BMPs) to reduce air emissions from construction projects. BMPs may include measures such as restricting hours of use of construction equipment, minimizing idling, using fuel additives or alternatives in	Potentially significant and unavoidable.

TABLE ES-6

FUTURE PROJECTS – SURFACE RECHARGE BASINS

PROGRAM LEVEL SUMMARY OF IMPACTS AND MITIGATIONS (CONT.)

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
	construction equipment, and implementing dust control plans. RB-AIR-2: The District shall require contractors to comply with its BMPs and with SCAQMD emissions regulations.	
5.2.6. Cultural Resources		
Construction of future surface recharge projects could result in significant impacts to cultural resources.	RB-CULT-1: The District shall conduct archaeological and paleontological resource evaluations before and during construction activities as appropriate to minimize impacts to cultural resources.	Less than significant.
5.2.7. Geology and Soils		
Future surface recharge projects could be subject to geologic hazards.	RB-GEO-1: The District shall prepare site-specific, design-level geotechnical investigations for each site prior to the commencement of construction. Each investigation shall include an analysis of expected geologic hazards at the site and recommended measures to avoid the hazards. The investigations will include assessing liquefaction hazards to neighboring structures. The District shall include recommended measures necessary to avoid geologic hazards in design specifications..	Less than significant.
5.2.8. Hazards and Hazardous Materials		
Future surface recharge projects could be subject to hazards such as surface and subsurface soil contamination.	See RB-Hydro-5. RB-HAZ-1: Excavated materials containing hazardous waste shall be disposed of in accordance with applicable hazardous waste transportation and disposal regulations by the District within 90 days of excavation.	Less than significant.
5.2.9. Noise		
Construction of future surface recharge projects could result in significant noise impacts.	RB-NOISE-1: The District will require contractors to comply with local noise ordinances. RB-NOISE-2: The District shall implement procedures to reduce noise generation from project construction activities. Typical noise control procedures could include the following: • Require construction contractors to comply with the construction hours and days limitations established in local noise ordinances. Night-time construction would require approval from local jurisdictions. • Require all construction contractors to locate fixed construction equipment (e.g., compressors and generators) as far as possible from noise-sensitive receptors.	Less than significant.

TABLE ES-6
FUTURE PROJECTS – SURFACE RECHARGE BASINS
PROGRAM LEVEL SUMMARY OF IMPACTS AND MITIGATIONS (CONT.)

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
	• Equipment used in the construction of individual projects and management actions shall be muffled and maintained in good operating condition. Internal combustion engine-driven equipment shall be fitted with intake and exhaust mufflers that are in good condition. • Additional noise attenuating measures include changing the location of stationary construction equipment and/or staging areas; notifying adjacent residences and nearby sensitive receptors in advance of construction work; shutting off idling equipment; rescheduling construction activities; requiring on-going construction noise monitoring to assure adherence to City/County construction equipment standards; and/or installing temporary barriers around stationary construction noise sources.	
5.2.10. Traffic		
Construction of future surface recharge projects could result in significant impacts to local traffic.	RB-TR-1: The District will consult with local jurisdictions and Caltrans when considering future projects to develop measures to minimize impacts to traffic from construction activities. The District will implement these measures wherever feasible. RB-TR-2: The District shall obtain encroachment permits from local jurisdictions and Caltrans prior to construction when construction would result in work within roadway easements or would require lane closures. RB-TR-3: The District shall minimize heavy-duty truck traffic associated with soil hauling and deliveries during peak traffic periods.	Less than significant.
7.5 Cumulative Impacts		
C-2: Construction activities could contribute temporarily to cumulatively significant environmental impacts to air quality.	See RB-Air-1 and RB-Air-2	Potentially significant and unavoidable.

TABLE ES-7

FUTURE PROJECTS – ENHANCEMENT OF EXISTING RECHARGE SYSTEMS

PROGRAM LEVEL SUMMARY OF IMPACTS AND MITIGATIONS

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
No impacts to environmental resources would result from the use of Basin Cleaning Vehicles.	None required.	No impact.

TABLE ES-8

FUTURE PROJECTS – SUBSURFACE RECHARGE SYSTEMS

PROGRAM LEVEL SUMMARY OF IMPACTS AND MITIGATIONS

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
5.4.1. Hydrology		
Future subsurface recharge projects could result in significant impacts to storm water quality during construction activities.	See RB-HYDRO-1 and RB-HYDRO-2.	Less then significant.
Future subsurface recharge projects could result in significant impacts to groundwater quality.	See RB-HYDRO-3, RB-HYDRO-4, RB-HYDRO-5, and RB-HYDRO-6.	Less then significant.
5.4.2. Biological Resources		
Future subsurface recharge projects could result in significant impacts to biological resources.	See RB-BIO-1 and RB-BIO-2.	Less than significant.
5.4.3. Land Use and Recreation		
Future subsurface recharge projects could temporarily impact the availability of recreational resources.	See RB-LU-1, RB-LU-3, and RB-LU-4.	Less than significant.

TABLE ES-8
FUTURE PROJECTS – SUBSURFACE RECHARGE SYSTEMS
PROGRAM LEVEL SUMMARY OF IMPACTS AND MITIGATIONS (CONT.)

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
5.4.5. Air Quality		
Construction of future subsurface recharge projects could result in significant air quality impacts.	See RB-AIR-1 and RB-AIR-2.	Potentially significant and unavoidable.
5.4.6. Cultural Resources		
Construction of future subsurface recharge projects could result in significant impacts to cultural resources.	See RB-CULT-1.	Less than significant.
5.4.7. Geology And Soils		
Future subsurface recharge projects could be subject to geologic hazards.	See RB-GEO-1.	Less than significant.
5.4.8. Hazards And Hazardous Materials		
Future subsurface recharge projects could be subject to hazards such as surface and subsurface soil contamination.	See RB-HYDRO-5 and RB-HAZ-1.	Less than significant.
5.4.9. Noise		
Construction of future subsurface recharge projects could result in significant noise impacts.	See RB-NOISE-1 and RB-NOISE-2.	Less than significant.
5.4.10. Traffic		
Construction of future subsurface recharge projects could result in significant impacts to local traffic.	See RB-TR-1, RB-TR-2, and RB-TR-3.	Less than significant.
7.5 Cumulative Impacts		
C-2: Construction of recharge facilities could contribute temporarily to cumulatively significant environmental impacts to air quality and noise.	See RB-AIR-1, RB-AIR-2, RB-NOISE-1, and RB-NOISE-2	Potentially significant and unavoidable.

TABLE ES-9

FUTURE PROJECTS – STORAGE RESERVOIRS

PROGRAM LEVEL SUMMARY OF IMPACTS AND MITIGATIONS

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
5.5.1. Hydrology		
Construction of off-river storage reservoirs could significantly impact storm water runoff quality.	See RB-HYDRO-1 and RB-HYDRO-2.	Less then significant.
Future storage reservoir projects could reduce storm water volumes reaching the ocean.	None required.	Less than significant
5.5.2. Biological Resources		
Future storage reservoir projects could result in significant impacts to biological resources, including habitat for sensitive species.	See RB-BIO-1 and RB-BIO-2.	Potentially significant and unavoidable.
5.5.3. Land Use and Recreation		
Future storage reservoir projects could conflict with existing land use designations and habitat conservation plans, and could impact the availability of recreational resources.	See RB-LU-1 through RB-LU-4.	Potentially significant and unavoidable.
5.5.4. Aesthetics		
Future storage reservoir projects could have a significant impact on scenic vistas and aesthetic resources.	See RB-AES-1 and RB-AES-2.	Potentially significant and unavoidable.
5.5.5. Air Quality		
Construction of storage reservoir projects could result in significant air quality impacts.	See RB-AIR-1 and RB-AIR-2.	Potentially significant and unavoidable.
5.5.6. Cultural Resources		
Construction of storage reservoir projects could result in significant impacts to cultural resources.	See RB-CULT-1.	Less than significant.
5.5.7. Geology and Soils		
Future storage reservoir projects could be subject to geologic hazards.	See RB-GEO-1.	Potentially significant and unavoidable.

TABLE ES-9

FUTURE PROJECTS – STORAGE RESERVOIRS

PROGRAM LEVEL SUMMARY OF IMPACTS AND MITIGATIONS (CONT.)

Impact	Mitigation Measure(s)	Level of Significance After Mitigation
5.5.8. Hazards and Hazardous Materials		
Future storage reservoir project sites could contain potentially hazardous materials.	See RB-HAZ-1.	Less than significant.
5.5.9. Noise		
Construction and operation of future storage reservoir projects could result in significant noise impacts.	See RB-NOISE-1 and RB-NOISE-2.	Potentially significant and unavoidable.
5.5.10. Traffic		
Construction of storage reservoir projects could result in significant impacts to local traffic and require the construction of new roads.	See RB-TR-1 through RB-TR-3.	Less than significant.
7.5 Cumulative Impacts		
C-3: Construction of off-river storage facilities within open space could contribute to cumulatively significant impacts to air quality, noise, and traffic. Operations could add to cumulatively significant impacts to aesthetics, biological resources, and land use.	See RB-Air-1, RB-Air-2, RB-Noise-1, RB-Noise-2, RB-TR-1, RB-TR-2, and RB-TR-3.	Potentially significant and unavoidable.

CHAPTER 1
Introduction

The Orange County Water District (OCWD or District) was created by the California Legislature in 1933, and empowered to manage and protect Orange County's groundwater basin. In order to carry out this mandate, OCWD has implemented a range of projects to capture available Santa Ana River flows, maximize the beneficial use of Orange County's groundwater basin and protect it from overdraft, seawater intrusion and contamination. Each projects initiated after 1971 has been reviewed pursuant to the California Environmental Quality Act ("CEQA"). CEQA documentation concerning diversion and recharge operations is summarized in Appendix C. New and future projects are reviewed in this Draft Program Environmental Impact Report (PEIR).

In implementing its mandate, OCWD has relied upon water rights which are reflected in a 1969 Judgment and Court Order. The State Water Resources Control Board ("SWRCB") has indicated that it does not recognize water rights conferred by court proceedings such as those leading to the 1969 Judgment, and recommended that OCWD file an Application to Appropriate the water which it currently diverts, as well as all water it plans to divert in the future.

OCWD has done so, and its application reflects its intent to adhere to the rights and responsibilities set forth in the 1969 Judgment, while complying with its legislative mandate. Santa Ana River flows reaching Prado Basin have increased dramatically since 1969, and OCWD's application and this PEIR pertain to projects to maximize the beneficial uses of such flows. OCWD does not seek to compel the flow of such additional waters, but to the extent that such water does reach Prado Basin, OCWD plans to implement projects to put that additional water to beneficial use as part of its management and protection of the Orange County groundwater basin.

This PEIR has been prepared pursuant to CEQA to assess potential environmental effects of the District's SAR diversions along with associated facilities for water storage and recharge. The PEIR provides an overview of the District's diversion and recharge operations and provides a program-level impact analysis for the recharge program. Two specific recharge projects (the Anaheim Lake Expansion project and the Santiago Creek Expanded Recharge project) are given project-level assessment. OCWD is the lead agency and will approve the future water diversion program outlined in the application. The SWRCB is a responsible agency pursuant to CEQA Guidelines section 15096 and will use this PEIR to evaluate effects of issuing a permit to divert water from the SAR.

The Draft PEIR for this project was originally circulated for public review from May 28 to July 16, 2004. In response to the comments received on the Draft PEIR the District has developed and incorporated substantial additional information and reorganized the PEIR. A description of new information added follows. The District is recirculating the Draft PEIR to allow for public and agency review and comment on the expanded analysis. (Section 1.5 lists the major revisions to the document.)

1.1 Project Background

District Overview

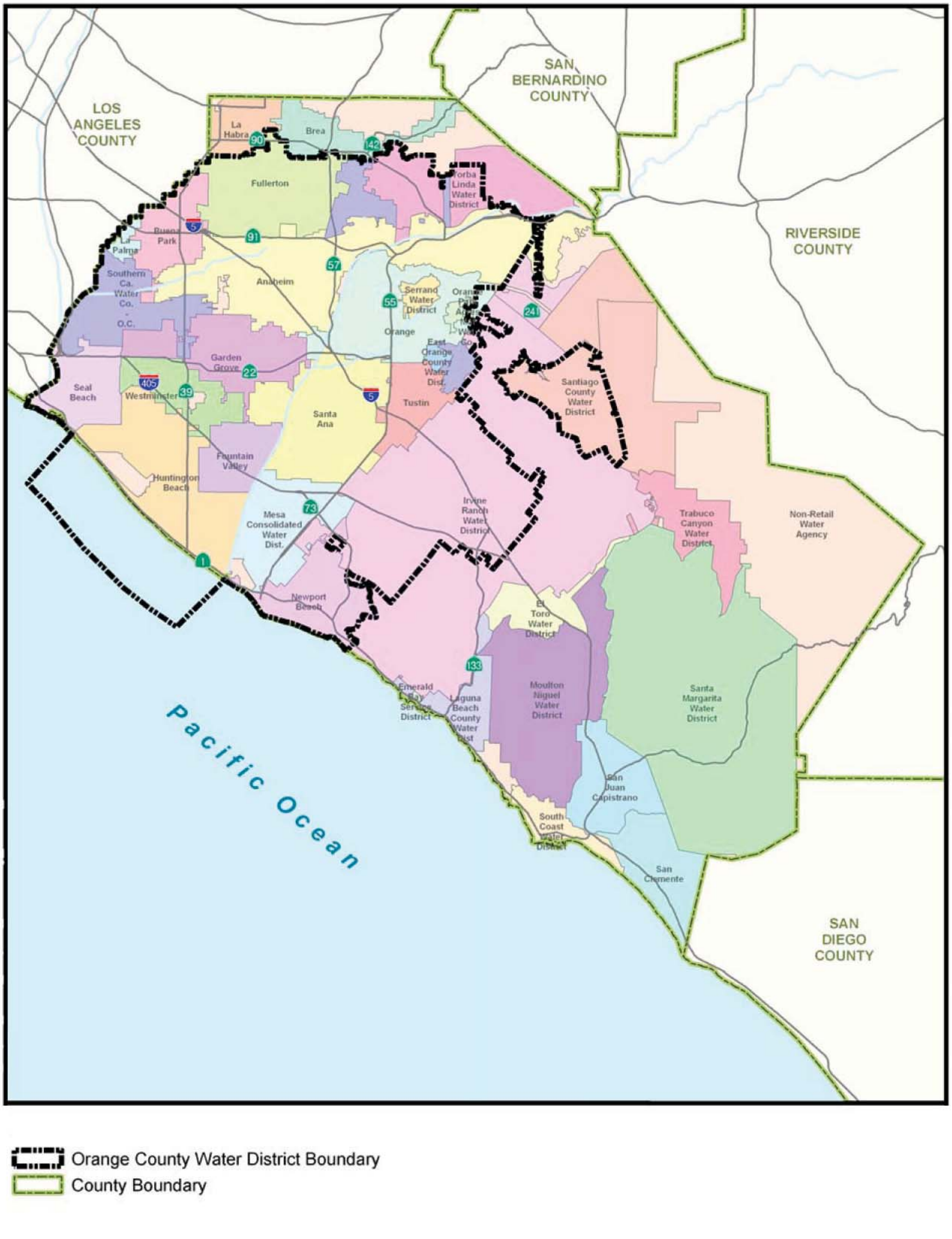
The District encompasses over 229,000 acres of the lower watershed of the SAR below Prado Dam. Currently, the District maintains approximately 1,000 acres of riverbed and off-stream recharge basins, with a combined recharge capacity of approximately 264,000 acre-feet per year (afy). Each of the existing recharge facilities currently in operation have been assessed individually pursuant to CEQA requirements, with the exception of the two recharge basins (Anaheim Lake and Warner Basin) that were in operation prior to 1970 when CEQA was enacted.

The District has been diverting water from the SAR for groundwater recharge since its formation in 1933. The amount of water diverted and recharged varies year-to-year depending on rainfall in the watershed. In the 2003/04 year, approximately 184,000 af were diverted. OCWD has diverted up to a maximum of 237,000 af in one year (1994/95) of native SAR water.[1] (See Chapter 2, Section 2.3 for continued discussion of existing diversions.) The District proposes to increase SAR diversion over current levels as flows in the river increase over time due to upstream urbanization. The District's water rights application to the SWRCB requests the right to divert up to a maximum of 505,000 afy. The District requests a permit that recognizes its current water rights and diversion practices as well as appropriates additional flow for diversion. To make use of the increased SAR diversion, the District's project would utilize existing diversion and recharge facilities as well as proposed near-term and long-term facilities for diversion, storage, and recharge. The District has identified a menu of potential projects to increase recharge and storage capacity for both the near-term and the long-term, including new and expanded recharge basins and potential surface water reservoirs.

The primary source of water for groundwater recharge is the SAR. The District supplements river flows with imported water that it purchases for additional groundwater recharge. Currently, there are approximately 1,000 acres of riverbed and off-stream basins that the District utilizes for groundwater recharge. **Figure 1-1** identifies the District's boundaries and major water retail agencies. **Table 1-1** lists major water retailers and groundwater producing agencies within the OCWD service area.

Water Rights

The District's original water rights to the lower SAR were acquired from two irrigation districts with rights established in the 1870s, entitling each district to half of the normal surface flow of the SAR below the present location of Prado Dam. The District thereby acquired pre-1914 rights to divert the surface flow of the SAR once it reaches Prado Reservoir. The District has since acquired further rights via salvage and has invested in water supply infrastructure in reliance on those and other rights.



SOURCE: OCWD

OCWD . 202291

Figure 1-1
Retail Water Agencies in Orange County

TABLE 1-1
MAJOR WATER RETAIL AGENCIES WITHIN OCWD

City of Anaheim	City of Newport Beach
City of Buena Park	City of Orange
East Orange County Water District	Orange Park Acres Mutual Water Company
City of Fountain Valley	City of Santa Ana
City of Fullerton	Santiago County Water District
City of Garden Grove	City of Seal Beach
City of Huntington Beach	Serrano Water District
Irvine Ranch Water District	Southern California Water Company
City of La Palma	City of Tustin
Mesa Consolidated Water District	City of Westminster
City of Yorba Linda	

SOURCE: Orange County Water District

Application to Appropriate

In 1969, watershed-wide litigation was resolved between the District and upstream water districts reporting the interests upstream of Prado Dam including San Bernardino Valley Municipal Water District (Muni), Inland Empire Utilities Agency (IEUA) (formerly Chino Basin Municipal Water District), and the Western Municipal Water District (Western). The 1969 Stipulated Judgment established the Santa Ana River Watermaster and a physical solution to maximize beneficial uses of the river. The judgment provided to the District a minimum guaranteed base flow of 42,000 acre-feet per year (afy) plus all storm flows reaching Prado Basin. Although the 1969 Stipulated Judgment provided a court-ordered physical solution between upstream and downstream parties, it did not formalize water rights within the watershed in a manner currently recognized by the SWRCB. In 1989, the SAR was included in the SWRCB's Declaration of Fully Appropriated Streams (Order WR 89-25), concluding that no unappropriated water was available. However, increased urbanization and other activity in the upper watershed have resulted in greater runoff reaching Prado Dam. On the recommendation of the SWRCB, the District submitted an Application to the SWRCB Division of Water Rights in November 1992 for the purpose of confirming existing rights and establishing rights to the increased volumes of water reaching Prado Dam. A Supplement to the Application was submitted in August 1998 at the request of SWRCB.

A Supplement to the Application was submitted in August 1998 at the request of SWRCB. The Supplement summarized hydrologic information demonstrating that current and projected flows in the lower reach of the SAR watershed have changed due to upstream urbanization and increased wastewater effluent from upstream sanitation districts. The Application and Supplement are available at OCWD for public review.[2]

[2] Contact Craig Miller: 714-378-3225, Orange County Water District, 10500 Ellis Avenue, Fountain Valley, CA 92728-8300.

The Supplement included a list of projects the District would be considering to make beneficial use of the increased river flows. The near-term projects would provide an additional 97,000 afy of recharge capacity. The District included a list of projects that could be implemented in the long-term. These long-term projects would provide up to 158,000 afy of additional recharge capacity, for a total of 505,000 afy of recharge capacity and 162,000 af of surface storage capacity.

In 1999 at the SWRCB's direction, the District submitted to the SWRCB a Petition for Revision of the Declaration of Fully Appropriated Streams. Subsequently, SWRCB issued Order WR 2000-12 amending the Declaration of Fully Appropriated Streams and Directing the Division of Water Rights to proceed with processing the District's Application as well as other water rights applications for the SAR.

Pursuant to SWRCB's request, the District initiated the CEQA EIR process as Lead Agency. It published a Notice of Preparation (NOP) for a PEIR to assess potential impacts of the application on August 2, 2002. A public hearing was held on August 15, 2002. **Appendix A** includes a copy of the NOP. **Appendix B** provides the written responses received during the 30-day NOP public review period and the oral responses received at the public hearing.

1.2 Need for the Project

The District's existing and planned diversions are crucial in order to carry out the District's legislative mission to manage the Orange County groundwater basin as the major municipal water source for the region. Northern Orange County is a densely populated urban area that receives an average of 13 inches of precipitation annually. Water demand within the service area is expected to increase about 14 percent from 500,000 afy in 2000 to 570,000 afy in 2025[3]. The annual yield of the Orange County groundwater basin varies from year to year, currently providing approximately 67 percent of the total water demand within the District's service area.

Notwithstanding current and proposed conservation programs, local water retailers must augment groundwater production by importing water from Metropolitan to meet total water demand within the District's boundaries. Capturing the increased flow in the SAR to support beneficial uses of the Orange County groundwater basin would help reduce dependence on imported supplies. Each of the recharge basins and storage reservoirs listed in the Application would assist in achieving this goal.

To manage the annual amount of groundwater pumping within the service area, the District uses its statutory authority by establishing a basin production percentage (BPP) each year. Groundwater production below the BPP is assessed the replenishment assessment (RA), which is established annually by the District. Groundwater production above the BPP is assessed the basin equity assessment (BEA) in addition to the RA. The BEA acts as a financial disincentive to pump above the BPP, which is established to achieve basin management objectives including optimizing sustainable basin yield and reducing accumulated overdraft. OCWD uses the BEA revenue to purchase imported water during times of surplus to replenish the basin. Three such basin storage withdrawal and replenishment cycles have occurred in the Orange County groundwater basin since 1970.

[3] MWDOC, Retail Demand Projection with 2004 Data, Producers Model (based on a survey of retail producers from 2004).

With urbanization in the upper watershed, flow in the SAR has increased and is projected to continue to increase as further development occurs. Increased urbanization causes increased runoff, and increased municipal water use in the upper watershed will increase treated wastewater discharges into the river, even after planned recycling projects. **Figure 1-2** illustrates the increasing trend in both total and non-storm flow volumes in the SAR at Prado Dam since 1970.[4] Twice since 1980, the total flow has exceeded 505,000 afy, which is the volume of water requested in the District's Application. It is likely that flow reaching Prado Dam will increase in the future, providing essential water supply for the county. **Figure 1-3** is a flow chart showing how increased urbanization in the upper watershed increases water supply in the lower watershed.

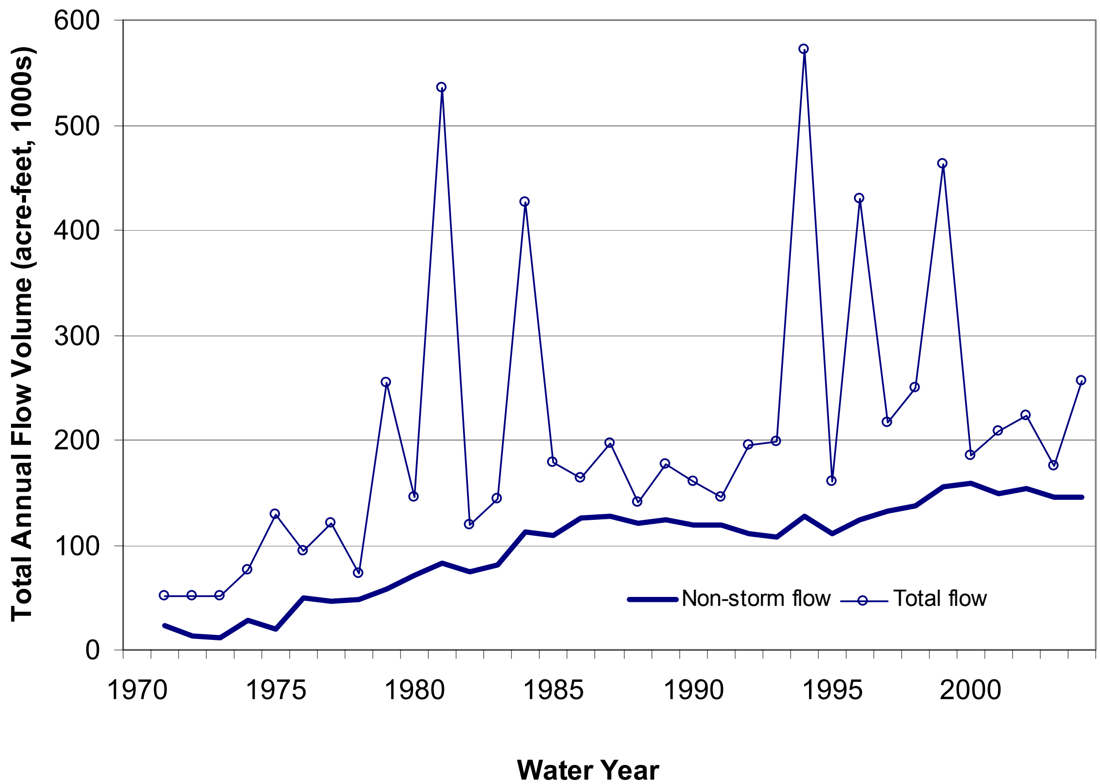


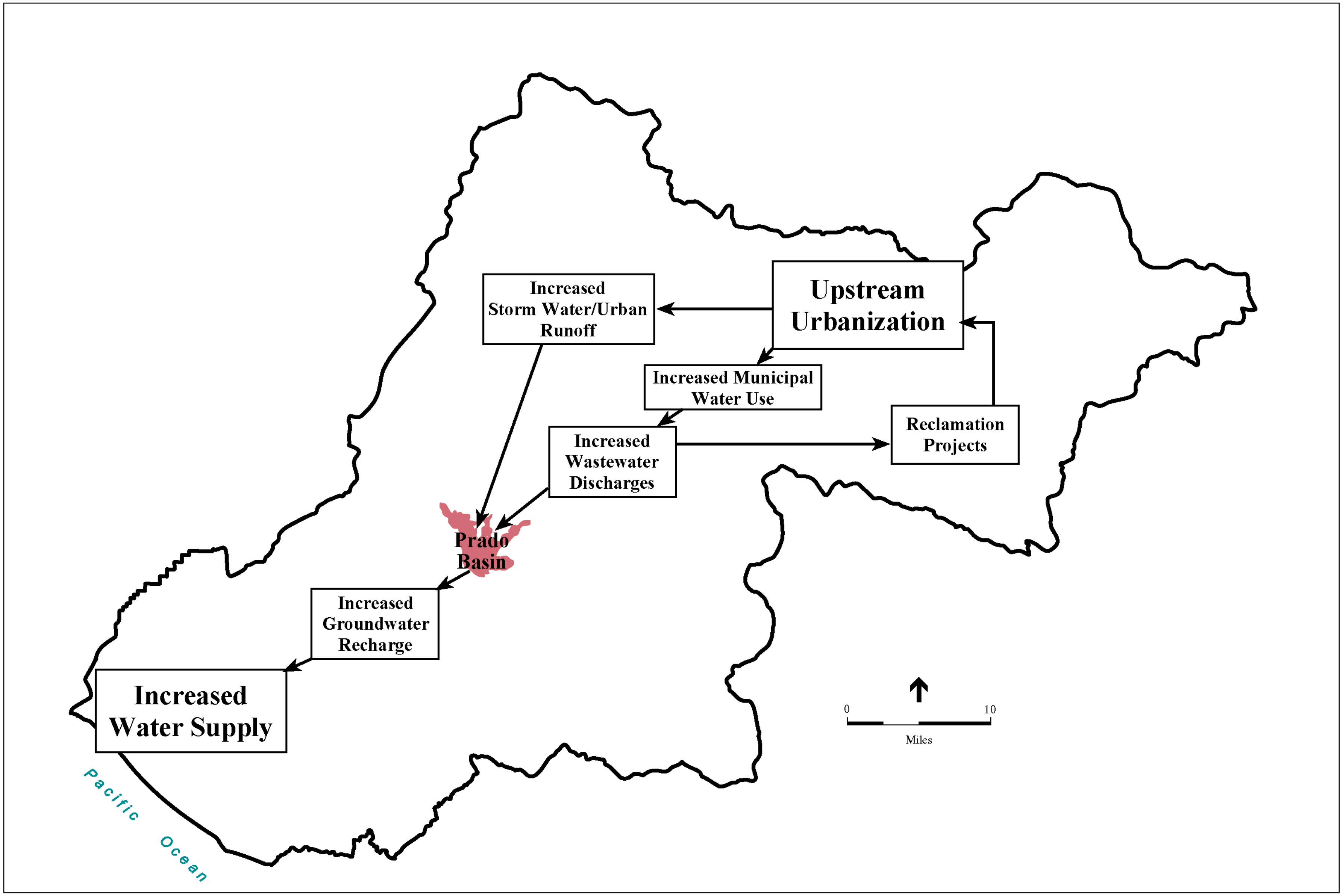
Figure 1-2 Increasing Trends in SAR Total and Non-Storm Flows at Prado Dam Since 1970

1.3 Project Objectives

The District's goal in securing rights from SWRCB to existing and increased SAR water is to ensure maximum use of local water supplies to meet the groundwater demands of the region. The increased diversions and proposed recharge and storage projects provide an opportunity for the District to achieve its following project objectives:

- Protect beneficial uses of the Orange County groundwater basin

4 SAR Watermaster, 2003.



SOURCE: ESA, 2005

OCWD . 202291

Figure 1-3
Water Supply Flow Chart

- Improve the reliability of local groundwater supply to serve local water demands
- Ensure sustainable water supplies during drought periods
- Increase the sustainable yield of the Orange County groundwater basin in a cost effective manner to maximize the use of local water supplies to serve local water demands
- Reduce dependence on imported water
- Increase operational flexibility by increasing both recharge capacity and recharge location options to better manage groundwater basin conditions.

The Orange County Water District Act of 1933 gives OCWD the powers to manage the Orange County groundwater basin, including replenishing, regulating, and protecting groundwater supplies. This includes powers to appropriate and acquire water rights, to conserve water and to regulate groundwater production to protect the basin.[5]

The Application to Appropriate SAR water was submitted to the SWRCB to confirm and secure the District's rights to the 42,000 afy base flow plus any additional storm flows reaching Prado Dam in conformance with the 1969 Stipulated Judgment. The Application also was submitted to establish the rights to base and storm flows in excess of the 42,000 afy, to a maximum of 505,000 afy, that reach the Prado Dam conservation pool. The District is not requesting any mandate of releases to create flows beyond those granted in the 1969 Stipulated Judgment, but does want a right to capture more of the SAR flow that does reach Prado Dam each year. Increasing flows are part of an existing condition on the river in evidence over the past twenty years and are projected to continue in the future. As flows in the SAR reaching Prado Dam continue to increase, the District wishes to obtain the rights and build the facilities necessary so that it may continue to capture and beneficially use all the base flow and a portion of the storm flow reaching this point to make maximum use of this local water supply. Each of the proposed recharge basins and storage reservoirs would assist in achieving this goal.

1.4 Reason for Recirculation

CEQA Guidelines Section 15088.5 provides direction on when to re-circulate an EIR. Re-circulation is necessary when significant new information becomes available before an EIR has been certified. Although the new information that has been identified has not significantly altered the conclusions of the impact analysis contained in the original PEIR, this recirculated PEIR provides a substantial volume of additional information and analysis.

1.5 Previously Submitted Comments

Comments received on the original PEIR are not reproduced in this recirculated PEIR, nor have individual responses been prepared for each comment received. This recirculated PEIR has been prepared to include information that sufficiently addresses concerns raised in comments received on the original Draft PEIR. Pursuant to Section 15088.5(f)(1) of the CEQA Guidelines, when an EIR is recirculated in its entirety, the lead agency may require that reviewers submit new

[5] OCWD Act, Section 2.6.

comments. OCWD is requesting that anyone wishing to comment on the project submit a new set of comments reflecting this recirculated PEIR. The Final PEIR will provide responses to comments received on the recirculated PEIR only.

1.6 Summary of Revisions to the Original PEIR

Comments received on the original Draft PEIR requested that additional information be added to the document to support the conclusions regarding some of the impacts of the project. CEQA Guidelines Section 15088.5(g) requires that a recirculated EIR summarize the revisions made to the original EIR. The substantial revisions to the PEIR are listed below:

- Inclusion of a new Chapter 2 – Project Overview: Comments on the original Draft PEIR requested that the baseline for analysis be shifted from 2002 existing conditions to 1970 or earlier. This recirculated PEIR does provide environmental analysis for all projects back to 1970, but maintains 2002 as the formal baseline for the following reasons: 1) CEQA Guidelines Section 15125(a) provides that the baseline condition, against which impacts are assessed, is represented by physical conditions at the time the Notice of Preparation is published, which is August 2002 for this project (see Appendix A); 2) OCWD facilities on the SAR constructed after 1970 have been fully evaluated pursuant to CEQA and impacts have been mitigated (see new **Appendix C**); and 3) historical records indicate that the lower SAR below 17th Street has been dry during summer months since at least the mid-1800s.

  - Chapter 2 has been added to summarize the historical CEQA analysis of existing facilities back to 1970. The chapter describes the historical hydrology of the SAR from the early 1800s to the present, and summarizes the history of water resources development on the river, including flood control improvements and water conservation. Chapter 2 describes the existing condition of the river and lists the environmental assessments prepared by OCWD for the existing recharge facilities. These assessments are appended in Appendix M

- Revised Chapter 4.2 – Santa Ana River Hydrology and Water Resources: Comments to the original Draft PEIR included concerns that creating or allowing additional "bypass" flows may be desirable to support downstream beneficial uses and that the availability of water in the SAR needs documentation. 1) This chapter has been expanded to include historical SAR flow data from the U.S. Geological Survey (USGS) that pre-dates the formation of OCWD. The data show that the existing hydrologic cycles of the river are similar to historical conditions and that provisions for new bypass flows would not be beneficial. 2) An assessment of the availability of unappropriated water for which the District is requesting rights has been added. Chapter 4.2 presents recent flow data and future flow projections upstream of the District's operations area to illustrate that 505,000 afy is and will continue to be available for diversion by OCWD in the foreseeable future. This analysis is supported with data compiled in **Appendix D** (described below).

- Revised Chapter 4.3 – Biological Resources: Comments to the original Draft PEIR requested additional information about the historical biological condition of the lower SAR and the current status of threatened and endangered species, such as the Santa Ana sucker (*Catostomus santaanae*). Comments expressed concerns that increased diversions could affect biological resources in the river. In response, this chapter contains an expanded description of past and present biological resources in the lower SAR, including fisheries, sensitive species, and critical habitat designations in the watershed. An evaluation of the desirability of creating "bypass" flows below OCWD's Main River System and the potential for suitable aquatic habitat to exist downstream for fish and wildlife also has been added. Appendices C, E, F, and K have been added to summarize previous environmental evaluations of biological resources in the river conducted for recharge and flood control projects (see below). In addition, in response to comments about the cormorant rookery at Anaheim Lake, new information from a follow-up site survey has been included.

- Inclusion of new Chapter 5 – Program-Level Environmental Analysis of Future Facilities: Comments to the original Draft PEIR suggested there was not sufficient information about future long-term projects to adequately identify impacts at the programmatic level. In response, new Chapter 5 provides more detailed programmatic analyses of the environmental impacts of the District's proposed future long-term projects.

- Revised Chapter 7 – Cumulative Analysis: Comments to the original Draft PEIR requested a more thorough analysis of the effects of cumulative diversions on future water availability in the lower SAR, after considering existing and pending upstream water rights and diversions and seasonal variation in precipitation. This chapter provides an expanded cumulative assessment of water availability at the District's Main River System given expected future watershed conditions, projected SAR flow, and planned diversions in the upper and lower watershed. This analysis has been developed in conjunction with upstream water agencies. **Appendix J** includes a summary of cumulative impacts identified by other applicants.

- Revised Chapter 8 – Alternatives: Comments to the original Draft PEIR suggested a greater range of alternatives and impacts should be presented. In response, two new alternatives have been evaluated in Chapter 8: the Near-Term Facilities Only Alternative and the No Storage Reservoirs Alternative.

- Revised Appendix G – Air Emissions Worksheets: In response to comments received on the original Draft PEIR, the air emissions calculations have been revised with updated emissions factors.

Eight new appendices have been added containing supplementary information or analyses related to issues raised on the original Draft PEIR. The PEIR has a total of 12 appendices organized in three volumes. Nine appendices (A – J) are included in Volume I along with the Recirculated Draft PEIR document, including six new ones. Only the new appendices (C, D, E, F, I, and J) are described below.

- **Appendix C**: Existing OCWD diversion and recharge facilities have been fully evaluated and mitigated pursuant to CEQA. This new Appendix C contains a summary of these previous environmental assessments, including the EIS/EIRs for the Prado Dam Water Control Manual and conservation pool operation. Copies of all CEQA documents for OCWD facilities are included in Volume III, Appendix M.
- **Appendix D**: To support the District's application to appropriate water from the SAR, this new Appendix D contains a technical assessment of future water availability in the river. The assessment is based on flow projections made by USACE and the multi-agency Santa Ana Watershed Project Authority (SAWPA), and considers the impacts of future cumulative watershed conditions on flow volumes reaching Prado Dam. This assessment includes the effects of urbanization, planned upstream diversions, and recycling projects and is also used to support the evaluation of cumulative project impacts in Chapter 7. The assessment concludes that 505,000 afy and will continue to be available below Prado Dam in the foreseeable future.
- **Appendix E**: Comments to the original Draft PEIR requested further documentation of the status of threatened and endangered fishes in the lower SAR and the possible benefit of bypass flows to aquatic habitat and species below the District's Main River System. This new Appendix E contains a technical memorandum by fisheries experts, Thomas Haglund, Ph.D. and Jonathan Baskin, Ph.D., that describes the existing conditions of the endangered Santa Ana sucker in the lower SAR. The memorandum supports the conclusions of Chapter 4.3 that

suckers are rare below Prado Dam and that sucker populations would not benefit from creation of "bypass" flows.

- **Appendix F**: This new appendix reviews the history of USACE flood control projects in the lower SAR, specifically the SAR Mainstem Project. Each NEPA/CEQA environmental assessment for the Mainstem Project is summarized, including the mitigation measures being implemented for impacts to habitat and sensitive species in the watershed. Copies of the USACE documents are available in full at the USACE offices in Los Angeles (911 Wilshire Blvd., Los Angeles, CA 90053-2325 Phone: 213-452-3967). OCWD participates in and supports some of the mitigation commitments for the flood control projects as a local sponsor of the USACE's Water Control Manual for Prado Dam.
- **Appendix I**: This new appendix contains CEQA Initial Studies for the District's two near-term projects: Anaheim Lake Expanded Recharge and Santiago Creek Expanded Recharge Projects.
- **Appendix J**: This new appendix reproduces an exhibit prepared by OCWD, San Bernardino Valley Municipal Water District and Western Municipal Water District that summarizes the cumulative impacts of planned water diversion projects throughout the SAR watershed. The exhibit is a summary table that breaks down the SAR into four segments and lists the cumulative impact conclusions for each segment as determined by four agencies: SBVMWD, WMWD, IEUA, and OCWD.

Volume II contains two new technical appendices (K and L) for Hydrology Resources and Biological Resources, respectively. Documents included in Volume II contain information about existing and future conditions in the lower SAR watershed and previous mitigation commitments by OCWD and USACE. This information is included in support of the information summarized in the previous appendices. Volume II is available for review from OCWD upon request.[6] Both volumes are available on OCWD's website: www.ocwd.com.

- **Appendix K**: This new appendix contains copies of reports by USACE and SAWPA that include each entity's estimate of future flows in the SAR. These projections are the basis for the assessment of water availability in Appendix D.
- **Appendix L**: This new appendix, which supports Chapter 4.3, contains copies of documents that describe the biological conditions in the lower SAR watershed, such as the status of plants, wildlife, fishes, sensitive species, and critical habitat designations. Also included are documents that explain some of the District's mitigation conservation programs (e.g., Arundo Removal) and U.S. Fish and Wildlife Service (USFWS) Biological Opinions for USACE flood control projects. The required mitigation measures in the Biological Opinions have been implemented by USACE and/or OCWD to compensate for flood control projects and activities both upstream and downstream of OCWD's Main River System.

Volume III contains one appendix (M) that compiles all of the prior environmental assessments prepared pursuant to CEQA for OCWD's diversion and recharge facilities on the SAR. PEIR Volume III is available for review on OCWD's web site (www.ocwd.com) and from OCWD upon request.[7]

- **Appendix M**: This new appendix contains copies of all environmental review documents for OCWD facilities and operations on the SAR. This record supports the determination of the

6 Contact Craig Miller: 714-378-3225, Orange County Water District, 10500 Ellis Avenue, Fountain Valley, CA 92728-8300.

7 *Ibid.*

2002 baseline for the District's proposed project, given prior evaluation of recharge facilities and activities pursuant to CEQA.

1.7 Scope of EIR Analysis

The PEIR provides impact analysis for three distinct components of the project:

1. Increased SAR diversions (Chapter 4)
2. Two near-term facilities projects: the Anaheim Lake Expansion and the Santiago Creek Expanded Recharge (Chapter 4)
3. Construction and operation of future recharge and storage facilities to accommodate increased SAR diversions (Chapter 5)

The OCWD diversions and two near-term projects are evaluated at a project level of detail in Chapter 4. Future projects are reviewed in this PEIR in Chapter 5 at a program level of detail, consistent with the conceptual nature of the siting, design, and operational descriptions for such potential facilities. OCWD will conduct additional, project-level CEQA review of these future projects.

Several of the near-term facilities identified in the water rights application previously have undergone separate analysis pursuant to CEQA. OCWD has been the lead agency for each of these CEQA compliance efforts. Appendix C summarizes the results of these previous CEQA analyses.

1.8 Known Areas of Controversy

CEQA Guidelines require EIRs to summarize controversial issues associated with the proposed project (15123(2)). Two chief areas of concern have developed from the District's proposed appropriation of additional SAR water. First, concerns have been raised about the effects of the District's existing and proposed river diversions and recharge operations on in-stream resources in the SAR and the possible beneficial effects of unappropriated waters left in river downstream of the District's recharge operations. This PEIR evaluates these potential effects in Chapters 4.2 Hydrology and 4.3 Biological Resources. Second, agencies upstream on the upper SAR responsible for water supply and/or wastewater management have expressed concern about the effects of OCWD's proposed water rights application on their water rights and water management operations and have requested confirmation that OCWD's request conforms with the Stipulated Judgment. This PEIR acknowledges the application does not guarantee additional flows beyond those identified in the 1969 Stipulated Judgment. Each protest to OCWD's application on this issue has been or is expected to be resolved.

1.9 Organization and Contents of this PEIR

This PEIR is organized into 11 Chapters as follows:

- Chapter 1 – Introduction: outlines the scope of the document, the need for the project, and project background. This chapter clarifies which activities are covered in this PEIR at a project-level of review or a program-level of review.

- <u>Chapter 2 – Historical Overview of the Lower Santa Ana River</u>: describes the history of the development of the river with flood control and water supply infrastructure, describes existing diversion and recharge facilities, and provides an overview of past environmental evaluations conducted for each of the improvements.

- <u>Chapter 3 – Project Description:</u> describes each element of the District's proposed expanded SAR diversion and groundwater recharge program that is evaluated in the PEIR.

- <u>Chapter 4 – Project-Level Environmental Analysis of SAR Appropriation, Anaheim Lake Expansion, and Santiago Creek Expansion</u>: provides impact assessment on environmental resources pursuant to CEQA requirements for increasing SAR diversions and construction and operation of Anaheim Lake Expansion and Santiago Creek Expansion projects.

- <u>Chapter 5 – Program-Level Environmental Analysis of Future Facilities</u>: provides a programmatic analysis of future storage and recharge facility projects proposed either for the near-term or for the long-term.

- <u>Chapter 6 – Growth Inducement Potential and Secondary Effects of Growth</u>: describes the role of OCWD and its groundwater management efforts in supporting water supply for the urban areas within the District's service area. It reviews the relationship between the District's groundwater management program and water supply planning and management efforts of the water agencies within Orange County and reviews the projected increases in population and water supply demand. It reviews the land use plans of the communities within the District service area and findings of the CEQA review of the General Plans regarding the potential secondary effects of approved and planned land uses.

- <u>Chapter 7 – Cumulative Effects</u>: provides an analysis of potential cumulative affects posed by the project in conjunction with other projects affecting either the SAR or the regional groundwater resources.

- <u>Chapter 8 – Alternatives</u>: provides a description and analysis of alternatives to the project that, in accordance with CEQA, could avoid or mitigate the potential significant environmental effects of the project while still meeting the basic project objectives. Alternatives are discussed in comparison to the proposed project. This chapter also evaluates the No Project Alternative as required by CEQA.

- <u>Chapter 9 – PEIR Preparers</u>: lists District and consultant staff members that contributed to report preparation.

- <u>Chapter 10 – References</u>: provides a bibliography of the references noted throughout the PEIR.

- <u>Chapter 11 – Acronyms</u>: lists the acronyms used in the document.

CHAPTER 2

Historical Overview and Current Condition of the Lower Santa Ana River

This Chapter provides an historical overview of the Santa Ana River, a summary of flood control improvements made on the river, a summary of existing OCWD facilities and operations, and a summary of environmental evaluations conducted for each improvement.

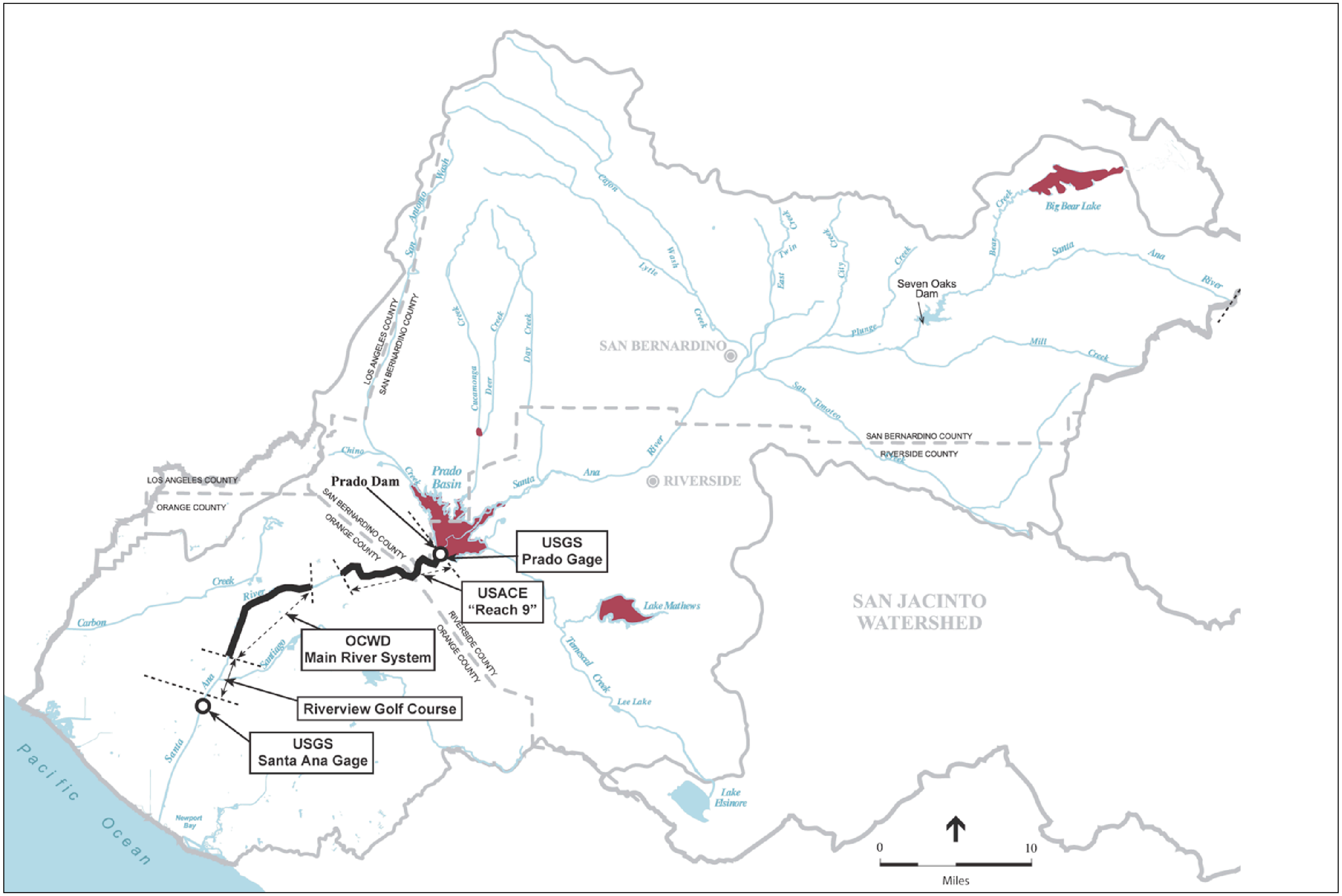
2.1 Historical Setting

Geographical Overview

The SAR is the largest river system in coastal Southern California, originating in the San Bernardino Mountains and encompassing 2,450 square miles in San Bernardino, Riverside and Orange Counties. The upper and lower watersheds are divided at Prado Dam located just east of the Santa Ana Mountains. Below the dam, the river channel passes through the mountains into Orange County and ultimately reaches the Pacific Ocean between the cities of Newport Beach and Huntington Beach. Approximately 200 square miles of the watershed is located downstream of Prado Dam within Orange County. **Figure 2-1** provides an overview of the watershed, demarcating the location of the OCWD Main River System.

The upper watershed consists of the southern slopes of the San Bernardino Mountains and eastern portions of the San Gabriel Mountains that flow into the Chino Basin. The mountain areas are primarily National Forest land with small urban areas and mountain roads. The portion of the upper watershed south of the mountains is highly urbanized, including the cities of Ontario, San Bernardino, and Riverside. Major regional highways traverse the watershed, and major industrial facilities have operated in San Bernardino County, historically serving the mining, aviation, and military industries. In addition, the lower Chino Basin, to the south of the urban areas, has supported major agricultural activities, including the highest concentration of dairies in the nation.

Most of the river's tributary streams are ephemeral, responding to precipitation occurring almost exclusively in the winter months. However, under existing conditions, urban runoff and wastewater treatment plant effluent provide a perennial base flow in the river. Major tributaries include the San Antonio Creek, Chino Creek, San Timoteo Creek, Temescal Creek, Cucamonga Creek, Lytle Creek, and Bear Creek as shown on Figure 2-1. Bear Creek connects Big Bear Lake with the SAR. San Antonio Creek flows from Mount Baldy in the San Gabriel Mountains through Pomona then to Chino Creek, which flows to the Prado Basin. The Prado Basin constitutes a potential inundation area behind Prado Dam but is not a full reservoir. The



SOURCE: SARWQCB Basic Plain, 1995

OCWD . 202291

Figure 2-1
Santa Ana River Watershed

inundation area consists of seasonal wetlands, constructed treatment wetlands, open space, and other land uses. Finally, the San Jacinto sub-watershed drains the southern slope of the San Jacinto Mountains, feeding Lake Elsinore. Lake Elsinore only occasionally overflows to Temescal Creek leading to the SAR.

Downstream of Prado Dam the SAR crosses into Orange County and traverses the Santa Ana Mountains. The lower SAR, between Prado Dam and the Pacific Ocean, has been improved largely by the USACE in the interest of flood control. Just below Prado Dam, in the area described by the USACE as Reach 9, the river supports riparian habitats leading into the urbanized coastal areas. At Weir Canyon, the channelized section of the river begins, and at Imperial Highway, the District's diversion and recharge operations begin. The District's Main River System provides substantial recharge capacity in the soft bottom channel from Imperial Highway to the State Route 22, Garden Grove Freeway (SR-22) overpass, approximately 8 miles downstream from Imperial Highway. No diversions of SAR water for beneficial uses occur downstream of the District's Main River System. From SR-22 to 17th Street in Santa Ana, the Riverview golf course occupies the river channel. Santiago Creek merges with the SAR within the golf course property. Below 17th Street, the Orange County Flood Control District (OCFCD) and the USACE have converted the river into a concrete channel to provide flood protection to the urbanized coast. From 17th Street in Santa Ana south to Adams Avenue in Costa Mesa the channel has a concrete bottom, and from Adams Avenue to the coast the channel has a soft bottom. The ocean encroaches upstream within the concrete-lined channel approximately ½ mile at high tide. **Figures 2-2** through **2-5** provide aerial view of the river in its current condition from Prado Dam to the ocean.

Brief History of Water Utilization on the Santa Ana River

Water resources development in the SAR watershed has centered around three general themes: water utilization/conservation, flood control, and urbanization. Though irrigation diversions had occurred in the SAR basin as early as 1810[1], a notable increase in demand did not occur until the middle part of the 1800s. Prior to the mid-1800s, the SAR basin was inhabited by Mexican settlers who were principally focused on raising livestock (cattle, horses, sheep, etc.) and typically irrigated small plots of land.

The breakup of the Mexican settlements (ranchos) through sales to new American settlers, who were rapidly migrating to California following its acquisition by the United States in 1848, marked the beginning of significant increases in water use and widespread irrigation. One of the most notable of these early settlements, in terms of irrigation and water-use, was founded by Mormons who had migrated from Salt Lake City into the upper Santa Ana Valley near what is today San Bernardino.[2] In the lower Santa Ana Valley, a colony which would eventually become the City of Anaheim was founded around this same time period, obtaining water from the SAR as it flowed through Santa Ana Canyon. The canal which served this settlement was later incorporated into the Anaheim Union Water Company. Increased irrigation demands marked a shift in the hydrologic regime of the SAR. The Santa Ana River had been a perennial stream,

1 Scott, 1977.

2 DWR, 1959; OCWD, 2003.

From Adams Avenue to the coast, the channel has a soft bottom.

SOURCE: OCWD and ESA, 2005

OCWD . 202291

Figure 2-2
Adams Avenue to the Coast

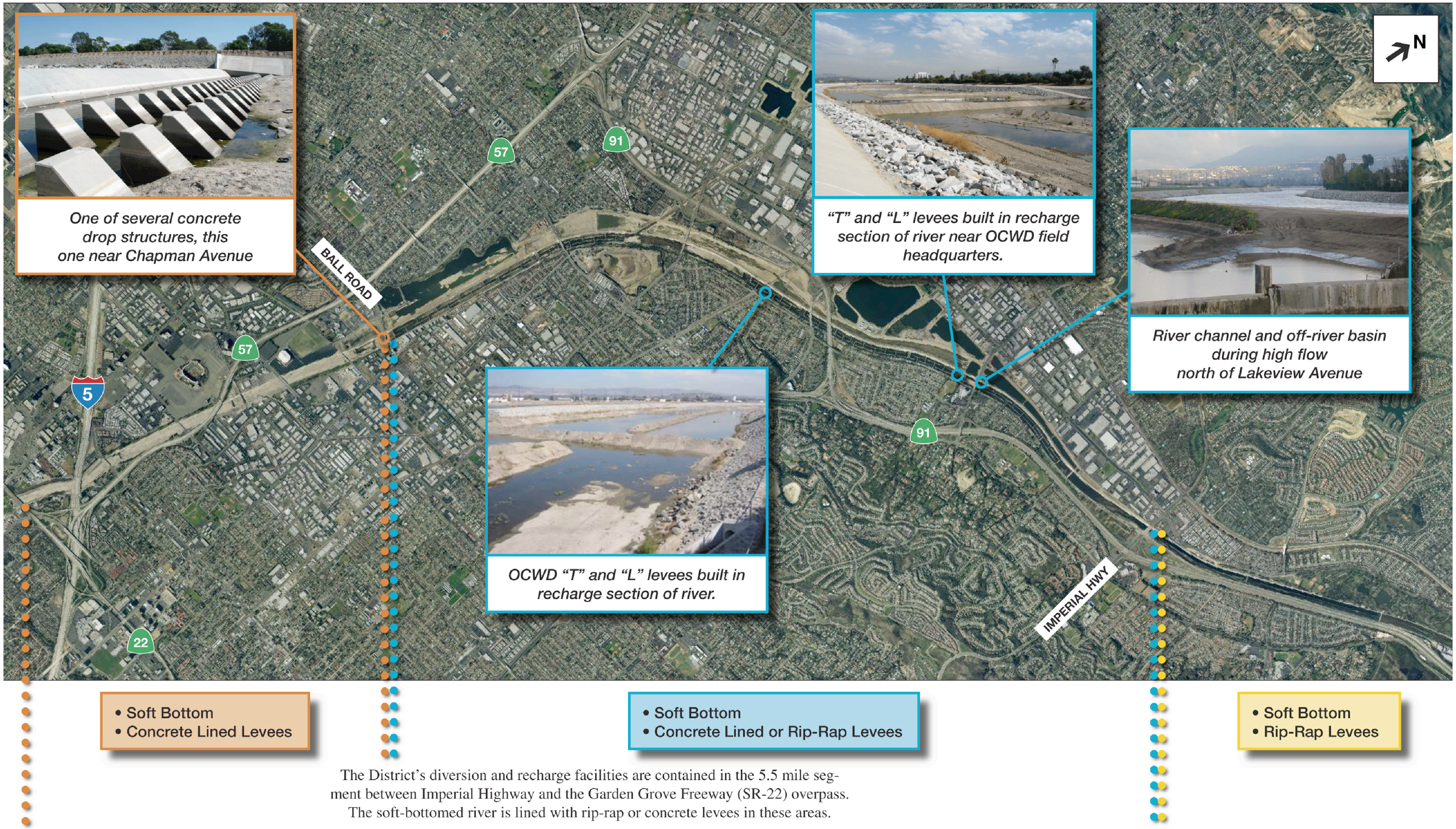
South of 17th Street in Santa Ana to above Adams Avenue in Costa Mesa, the river is a concrete lined channel with sloping concrete side levees and a concrete bottom

From SR-22 to 17th Street in Santa Ana, the Riverview Golf Course occupies the river channel landscaped with manicured turf grass and exotic trees.

SOURCE: OCWD and ESA, 2005

OCWD . 202291

Figure 2-3
South of 17th Street to SR-22 in Santa Ana

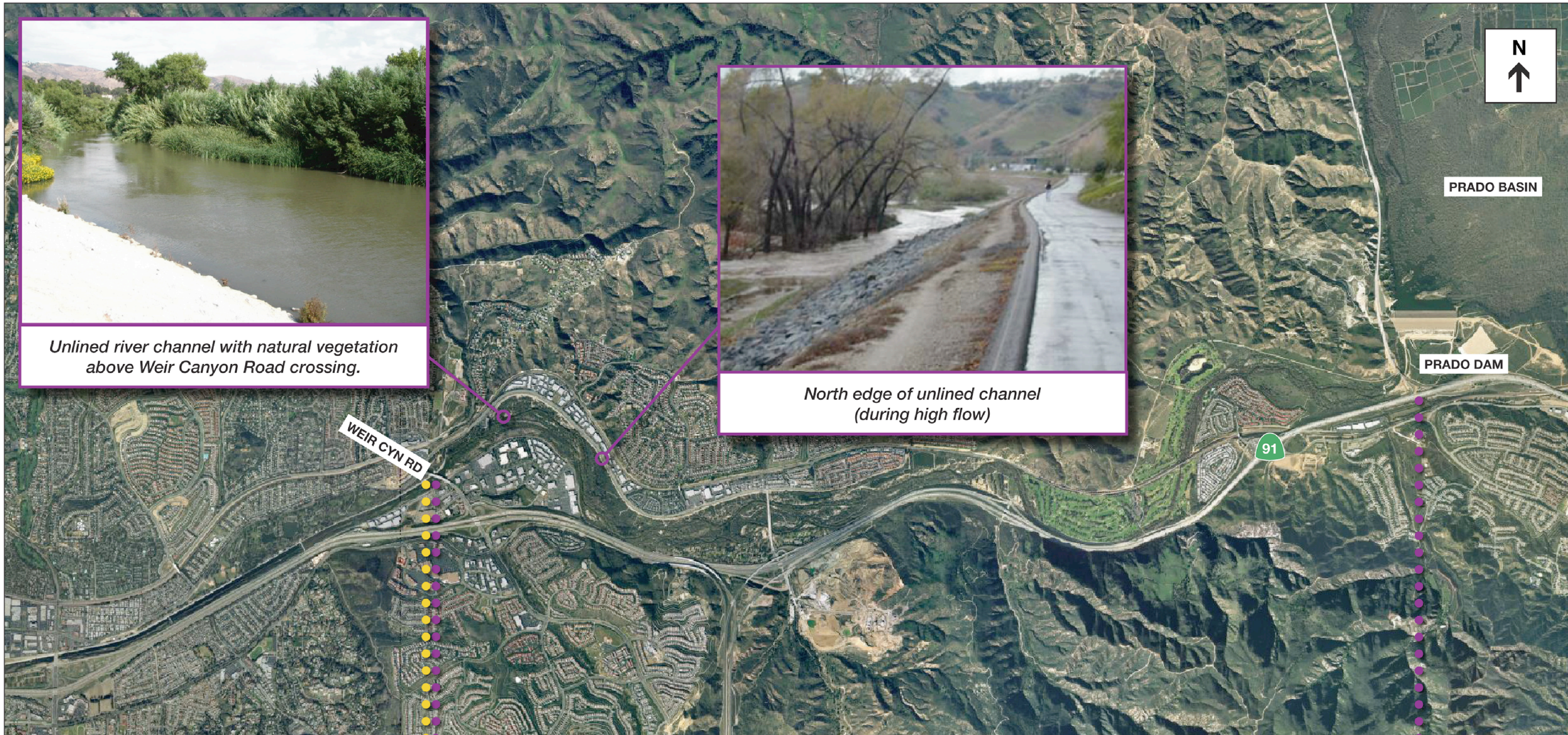


The District’s diversion and recharge facilities are contained in the 5.5 mile segment between Imperial Highway and the Garden Grove Freeway (SR-22) overpass. The soft-bottomed river is lined with rip-rap or concrete levees in these areas.

SOURCE: OCWD and ESA, 2005

OCWD . 202291

Figure 2-4
The District’s Division and Recharge Facilities and a Portion of Reach 8



- Channelized
- Soft Bottom
- Rip-Rap levees

In Reach 8, the soft-bottomed river is channelized and lined with rip-rap.

- Soft Bottom
- Wide Channel
- Riparian Habitat

Downstream of Prado Dam the SAR crosses into Orange County and traverses the Santa Ana Mountains. Reach 9 consists of a wide soft bottomed flood plain.

SOURCE: OCWD and ESA, 2005

OCWD . 202291

Figure 2-5
Reach 8 and Reach 9

except in years of extreme drought, from its source in the mountains nearly to the Pacific Ocean. With the great increase in population and the accompanying use of water for irrigation, the river was no longer a perennial stream, and it was necessary to supplement the surface-water supply with ground water.[3]

In the 1870s, following the discovery that the environment of the SAR basin favored the growth of citrus trees, a significant shift in the principal agricultural crops of the basin took place. Grain and fruit crops were replaced by citrus groves (mostly oranges). Furthermore, completion of the first transcontinental railroad later in that decade provided SAR basin farmers more ready access to expanded markets. As a result, the rapid expansion of water intensive citrus farming accelerated water supply developments in the later part of the century. This time period saw the completion of the first large-scale water conservation project, Bear Valley Dam, completed in 1884 and subsequently modified and enlarged in 1911.[4]

In the 1890s, utilization of ground waters by pumping commenced.[5] This practice provided an even more efficient means for expanding the irrigated areas of the SAR basin. However, as ground water levels began to decline, it became apparent that some method of enhancing recharge to these depleted ground water basins was needed. Spreading water on alluvial fan areas in the SAR basin to recharge the groundwater basin was first practiced as early as the late 1890s. This practice became increasingly widespread following the turn of the century.

In 1931, amid growing concern over depleted water levels in wells, property owners in the San Bernadino Valley petitioned to form a public water conservation district in order to provide both an organization and financial means to determine the proper course of action.[6] After approval through an election, the first meeting of the San Bernadino Valley Water Conservation District (SBVWCD) took place in January of 1932. Along with other water resource management activities, the SBVWCD also began to take part in the spreading of water and conservation of any runoff not necessary for irrigation.

The OCWD was organized in 1933 with the passage of SB 1201. The mission of the new District was management and protection of the Orange County groundwater basin supply. Management of the basin was to include protection of groundwater rights and water rights on the Santa Ana River, conservation of groundwater supplies (both quantity and quality), groundwater replenishment, and conservation of flood water and storm water for beneficial use in the basin.[7]

After almost a century of predominantly agricultural land use, the time period from the mid-1940s to 1970 saw a dramatic increase in the development of urban and suburban areas in the SAR basin. The expansion of urban development into agricultural areas decreased the water demands for farming, but a more than compensating increase in water demands for municipal purposes ensued. Urbanization has also seen the paving-over of much of the valley and lowland areas of this expansive watershed.

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3 Scott, 1977.
4 DWR, 1959.
5 *Ibid.*
6 Beattie, 1951.
7 OCWD, 2003.

History of Santa Ana River Floods

The Santa Ana River has a history of significant flood events as highlighted in **Table 2-1**. The most severe flood event on record occurred in January of 1862, with flow of up to 320,000 cubic feet per second (cfs). This event foreshadowed the disastrous flood of March, 1938, which ranks second in the estimated peak discharge only to the flood of 1862. Of the peak 100,000 cfs that was recorded on the SAR near Prado (March 3, 1938), only about half made it downstream to the gaging station near Santa Ana that recorded a peak flow of 46,000 cfs that same day. The excess flow not recorded near Santa Ana had been attenuated in spreading across the coastal plain.[8] The break-out of the SAR onto the floodplain (much of which is modern-day Anaheim and Huntington Beach) is shown in two historic photographs (**Figure 2-6**).

History of Santa Ana River Flood Control Improvements

The SAR channel has been substantially modified to protect against floods, particularly in the lower watershed. Beginning in the mid-1800s river levees were constructed at key segments of the river to provide flood protection. Flood control districts were established in the mid 1800s and continued efforts to control the flow of the river through the 1930s. In 1936, the US Congress authorized the Santa Ana River Basin Federal Flood Control Project to protect a predominantly rural Orange County.[9]

Prado Dam was constructed in 1941 by the US Army Corps of Engineers (USACE) in response to the catastrophic flood of 1938. County flood control projects along the river banks in Orange County continued through the 1970s until the USACE identified flood control deficiencies throughout the length of the Santa Ana River, resulting from increased urbanization in the watershed. Urbanization of the floodplains along the coastal plain and the upper watershed exacerbated an already significant risk of flooding along the Santa Ana River system. In the upper watershed, steep slopes, shallow surface soils, impervious bedrock, and occasional loss of vegetation from fires served to compound the flooding impacts of intense rainfall. Table 2-1 summarizes the numerous flood control activities implemented over the last century and a half–mostly in the last 60 years to respond to the flood threat along the river. **Figure 2-7** provides a series of historic aerial photographs that document the progressive flood control protection infrastructure constructed over the years within the segment of the river used by OCWD to enhance groundwater recharge.

Summary of Environmental Evaluations Conducted by the USACE for Flood Control Improvements

Table 2-2 lists reports prepared by the USACE to support design and construction of flood control improvements for the Santa Ana River Mainstem Flood Control Project (SARP). The primary features of the Phase II General Design Memorandum (GDM) include the construction of Seven Oaks Dam in San Bernardino County, raising of the Prado Dam, improving the SAR concrete levees in Orange County, and conducting improvements to the Mill Creek Levee, the Oak Street Drain, and Santiago Creek.

[8] Nelson, 1982.
[9] Moore, 1996.

TABLE 2-1
SUMMARY OF MAJOR FLOOD EVENTS AND FLOOD CONTROL IMPROVEMENTS ON THE LOWER SANTA ANA RIVER

Flood Event	Flood Control Improvements	
	US Army Corps of Engineers	**Orange County Flood Control District**
1800's		
1825. Mouth of Santa Ana shifts from Los Alamitos Bay to present location northwest of Newport Beach **January 1862.** Largest flood event known. Flow up to 320,000 cfs near Agua Mansa		
1900's		
January 1916. USGS Peak flow near Prado of 45,000 cfs		
March 1938. Most damaging flood of recorded history peak flow of 100,000 cfs near Prado	**1936.** US Congress authorizes Santa Ana River Basin Federal Flood Control Project **1941.** Prado Dam Control Basin **1941.** Fullerton Flood Control Basin on East Fullerton Creek (754 acre-feet) **1948.** Lytle-Cajon flood channel and bank protection levees upstream	**1938 to 1956.** OCFCD inherits limited existing protective works: - Imperial highway to 17th Street: pipe and wire revetment - 17th Street to the ocean: levees with vegetative cover.
	1950. "Riverside Levees": levees along both banks of the Santa Ana River from La Loma Hills to beyond Mount Rubidoux **1956.** San Antonio Dam on San Antonio Creek	**1956 to early 1960's.** - Imperial highway to 17th Street: intermittent improvements - 17th Street to Garfield Ave: wire-mesh reinforced asphalt/concrete side-slopes - Garfield Ave to the ocean: rock-revetted side-slopes
January and February 1969. Peak flow entering Prado at 75,000 cfs, leaving at 5,000 cfs	**1960.** Carbon Creek flood control dam and Mill Creek levees upstream from Garnet Street **1961.** East Twin-Warm Creek flood control channel	**1964.** The Board of Supervisors commissions study of levee improvements between Imperial Highway and Katella Ave. **1969 to 1978.** - Santa Ana canyon to Garden Grove Freeway: rock-revetted side-slopes installed. - Imperial Highway to Katella Ave: Nine drop structures (of the ten recommended) and water conservation features installed. - 17th Street to Garfield Ave: asphalt side-slope replaced with concrete
February and March 1978. Peak flow of 20,000 cfs and 34,705 cfs		**1979.** - Below 17th Street: Four drop structures installed. - Garfield Ave to the ocean: reinforced concrete side-slope installed
February 1980. Peak flow of 36,000 cfs into Prado **February and March 1983.** Peak flow of 25,000 cfs into Prado	**1988 to Present.** Santa Ana Mainstream project. - ***1992*** – Mill Creek Levee - ***1994*** – Oak Street Drain - ***1998*** – San Timoteo Creek: channel improvements and sediment basins - ***1999*** – Seven Oaks Dam - ***2000*** – Lower Santa Ana: various improvements to 23 miles of channel (Weir Road to ocean)	**1980s**: On-going maintenance
February 1993. Peak flow of 25,000 cfs into Prado	**1992.** Raise Prado Dam Project: - raise existing embankment by 28.4 ft. (to 594.4 ft.) - raise spillway crest by 20 ft. (to 563 ft.) - build new outlet works on left abatement **1999.** Began Santiago Creek channel improvements	**1990s**: On-going maintenance

SOURCE: Environmental Science Associates

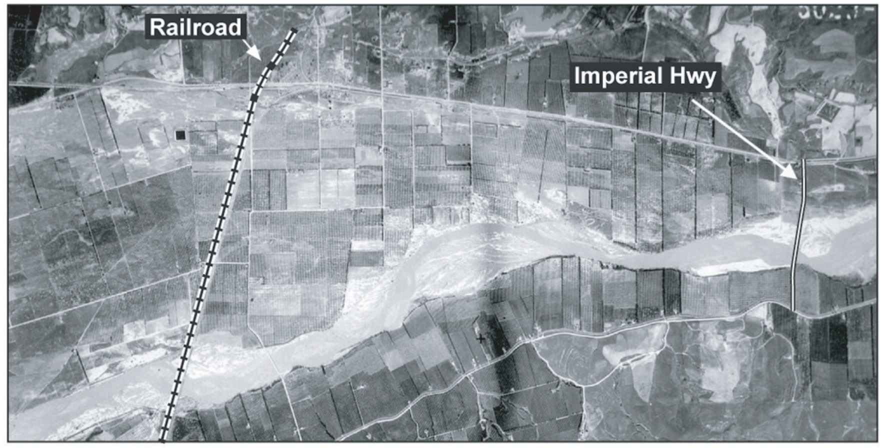
Year
1938

Year
2000

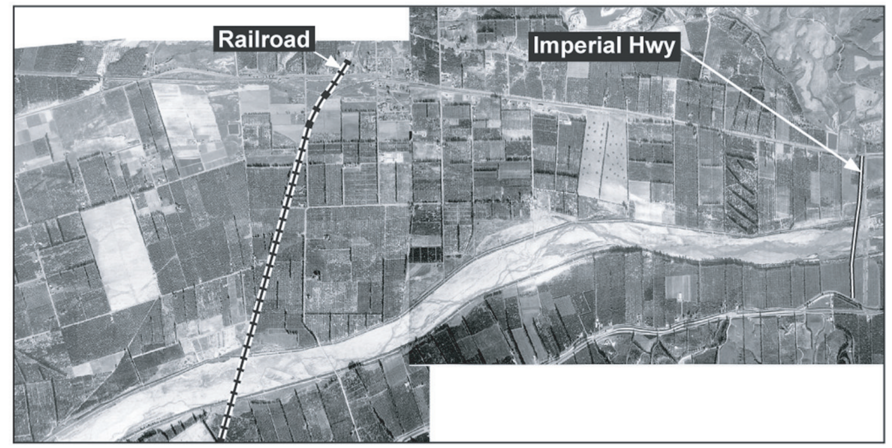
SOURCE: ESA, 2005

OCWD . 202291

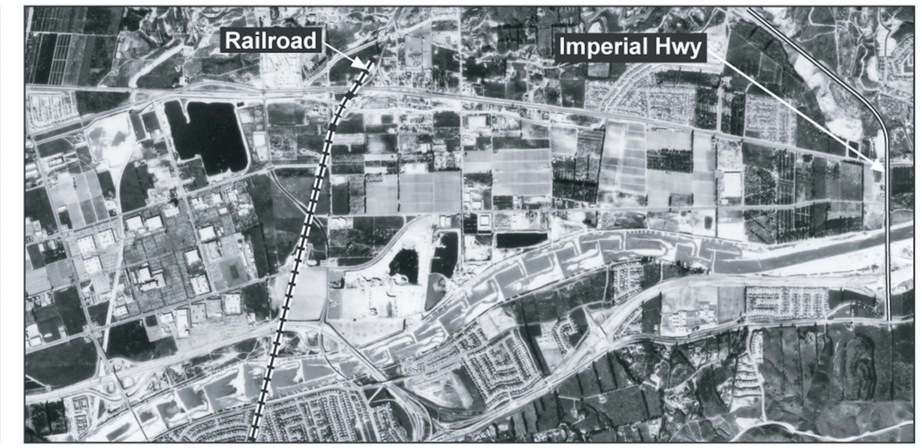
Figure 2-6
Boundary of Historic SAR in 1938 and 2000



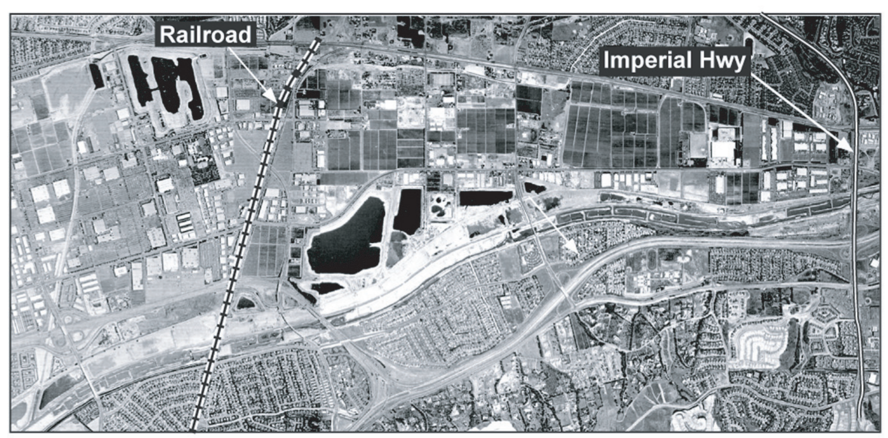
1938
No substantial side levees or in-river improvements visible.



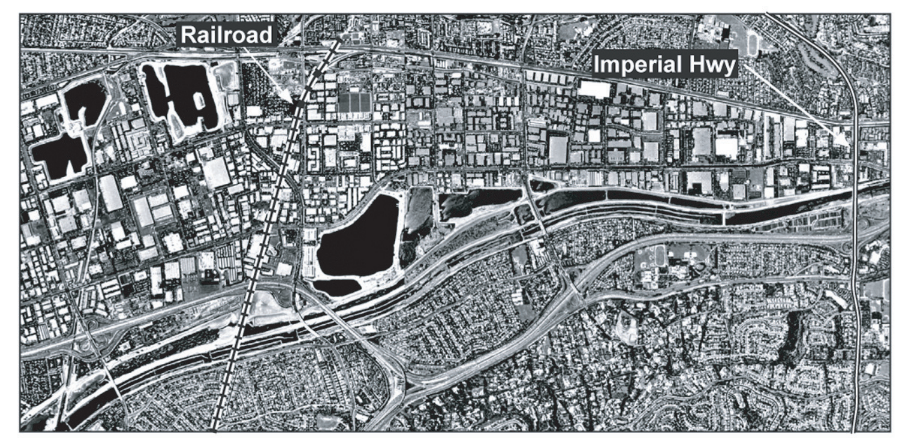
1953
Side levees visible. Some in-river grading may be occurring.



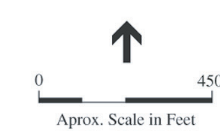
1970
Improved channel levees. In-river levees visible to slow base flow. Off-river recharge basins (Conrock Basin and Huckberry Pond) visible as either operating or in construction.



1977
Off-river recharge system paralleling main river channel is apparent. River channel is groomed with "T and L" levees. Miller Basin, Anaheim Lake, Warner Basin, Conrock Basin, Huckberry Pond are clearly visible.



2002
Similar to existing condition with in-river and off-river recharge facilities. Well defined side levees. Well defined in-river "T and L" levees.



SOURCE: Water Resources Institute at Cal State San Bernardino Data Resources Inc., 1953, 1977; Continental Aerial Inc.,1970; OCWD, 2002

Figure 2-7
Historical Aerials

TABLE 2-2
SUMMARY OF USACE REPORTS FOR THE SANTA ANA RIVER MAINSTEM PROJECT

Date	USACE Report
1977	Review Report on the Santa Ana River Mainstem and Final EIS
1980	Phase I General Design Memorandum Main Report and SEIS
1985	Supplement to Phase I GDM and SEIS for Flood Storage Alternatives to Mentone Dam
1988	Phase II General Design Memorandum Main Report and SEIS
1994	Water Control Manual for the Prado Dam and Reservoir, Santa Ana River
2001	SEIS/EIR for Prado Dam and Vicinity supplemental flood control projects including Reach 9 improvements, raising of Prado Dam, and stabilization of Norco Bluffs
2002	Addendum to the 1988 Phase II GDM, Reach 2 Channel Excavation to Design Grade, Supplemental Environmental Assessment

SOURCE: Environmental Science Associates

Most of the improvements identified in the GDM have been constructed by the USACE. In 2001, the USACE and OCFCD certified a joint Supplemental EIS/EIR evaluating the few remaining flood control projects first identified in the GDM, including the raising of Prado Dam, Reach 9 improvements, and stabilization of Norco Bluffs. Construction of these projects is underway.

In 1994, the USACE adopted the *Water Control Manual for the Prado Dam and Reservoir, Santa Ana River* that outlined operational procedures for Prado Dam. The manual included the use of Prado Dam for water conservation purposes. The dam now is operated under the procedures outlined in this manual. The USACE shares maintenance responsibilities for the flood control facilities in Orange County with the OCFCD. The USACE is conducting a river dredging project at the mouth of the SAR below Adams Avenue as part of the GDM. The OCFCD will assume full responsibility for future maintenance work including dredging and channel clearing after the official completion of the GDM Project.

Pursuant to the National Environmental Policy Act (NEPA), the USACE has evaluated environmental effects for each phase of its GDM project. In 1977, the USACE completed an EIS for the GDM that identified environmental impacts of the proposed flood control features and outlined mitigation strategies. In 1980, the USACE prepared a revised Phase I GDM and a Supplemental EIS. In 1988, the USACE certified an additional Supplemental EIS for Phase II of the GDM. **Appendix F** provides a summary of each of the GDM reports.

The 1988 Supplemental EIS prepared for the Phase II GDM identified environmental effects and mitigation strategies associated with implementation of the GDM. This included providing compensation habitat for the habitat affected by the flood control improvements in the lower SAR. A 92-acre marsh habitat was established by the USACE near the mouth of the SAR as mitigation for the effects to biological resources associated with implementing flood control improvements along the main channel of the SAR through Orange County. Appendix F provides a summary table from the EIS listing the identified impacts and mitigation measures.

2.2 Existing Condition of the Lower Santa Ana River

As explained above, downstream of Prado Dam the SAR crosses into Orange County, traverses the Santa Ana Mountains, and flows through densely urbanized Orange County to the Pacific Ocean. **Figure 2-8** identifies distinct segments of the river in this lower portion of the watershed. The following sections summarize the flood control improvements implemented by USACE and OCFCD and the natural habitats currently existing within each river segment. Figures 2-2 through 2-5 provide aerial photographs of the lower SAR segments. Impacts to the river system from the construction of flood control modifications in the lower SAR were evaluated in the USACE's Phase II GDM EIS summarized in Appendix F of this document.

Prado Dam to Imperial Highway (Reach 8 and 9). Below Prado Dam, the wide soft-bottomed channel, referred to as Reach 9 by USACE, supports significant riparian habitats. Below Reach 9, Reach 8, which stretches to Imperial Highway, is soft-bottomed and channelized for flood control with riprap levees lining the river edges.

Imperial Highway to State Route 22. From Imperial Highway to State Route 22 (SR-22), approximately 5 ½ miles downstream, the District conducts recharge operations within the soft-bottomed river channel. The river levees are constructed of either rip rap or concrete.

SR-22 to 17th Street. From SR-22 to 17th Street in Santa Ana, the Riverview Golf Course occupies the river channel. The segment is landscaped with manicured turf grass and ruderal trees on the channel bottom.

17th Street to Adams Avenue. South of 17th Street in Santa Ana down to Adams Avenue in Costa Mesa, the river channel is concrete-lined for flood control, with sloping concrete side levees and a concrete bottom.

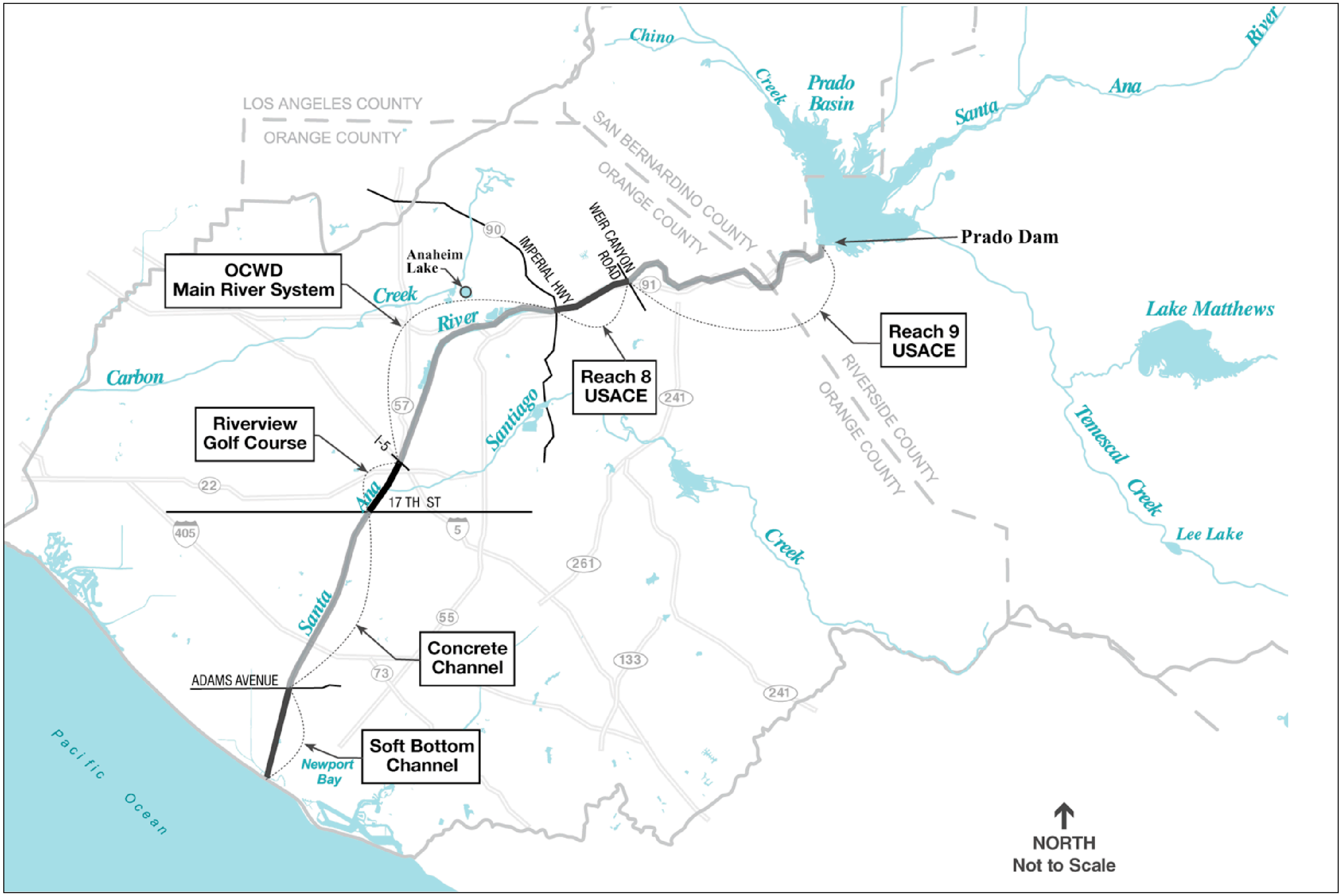
Adams Avenue to the Pacific Ocean. From Adams Avenue to the coast, the channel has vertical concrete side walls for flood control and a soft bottom. Estuary conditions within the concrete channel exist at the mouth of the river, where the ocean encroaches at high tide approximately ½ mile upstream.

2.3 Existing Groundwater Recharge Facilities

The District diverts water from the Santa Ana River such that virtually all non-storm flows are captured for recharge into the groundwater basin. Providing flow regimes that optimize recharge potential is a key element of the Water Control Manual covering operation of the Prado Dam.[10] During times of low flood threat, USACE's discharges from the dam are controlled to accommodate the recharge capacity of the District's facilities downstream.

The District has invested 50 million dollars since 1989 to construct facilities for capturing river water to recharge into the groundwater basin. **Figure 2-9** illustrates the location of the District's Main River System. As shown in **Table 2-3**, existing facilities have the capacity of recharging approximately 645 cfs (250,000 afy) into the groundwater basin. This rate is an average annual rate

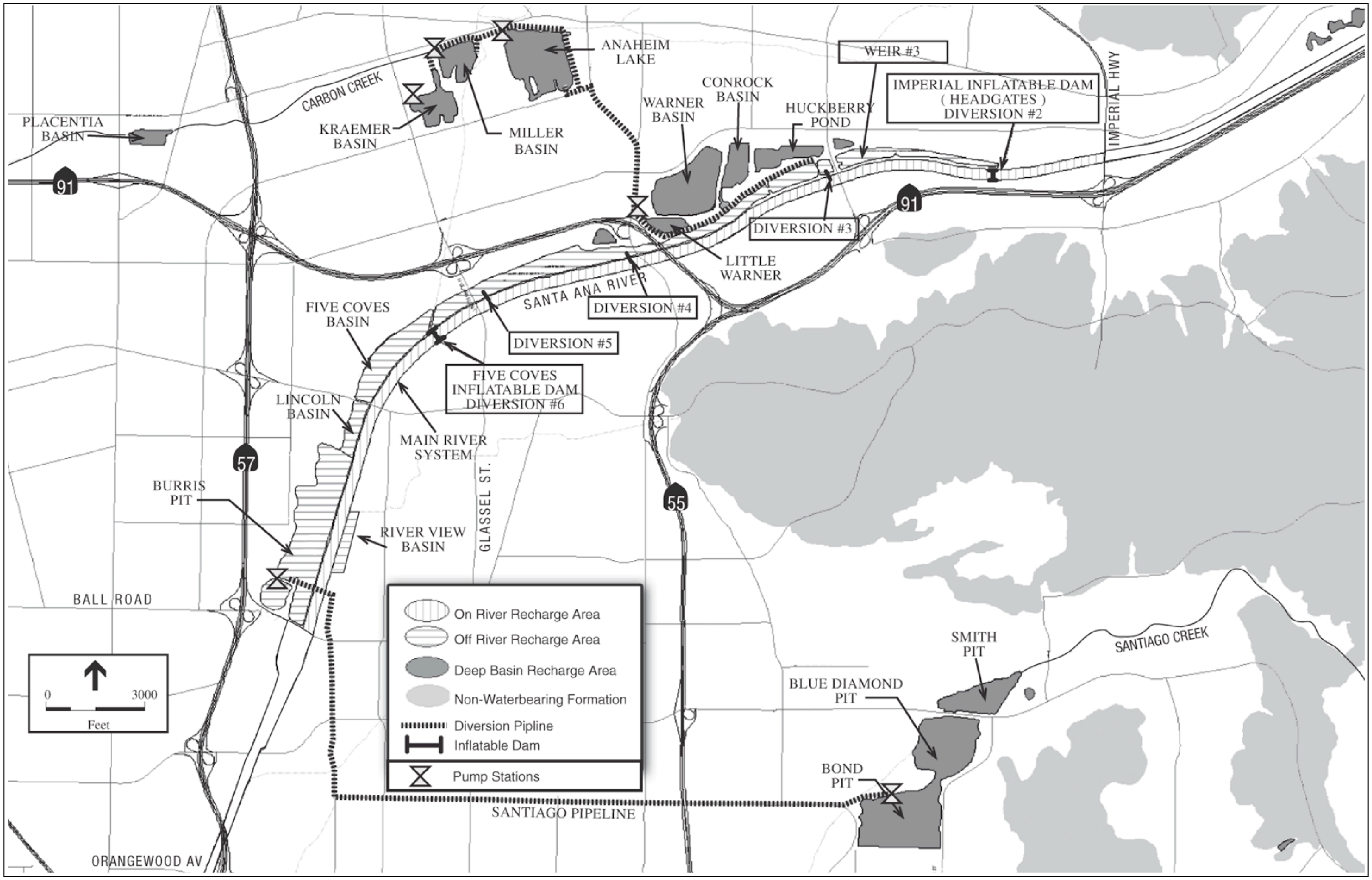
10 USACE, 1994.



SOURCE: OCWD, 2005

OCWD . 202291

Figure 2-8
Lower Santa Ana River Watershed
with Biological Study Reaches



SOURCE: OCWD, 2005

OCWD . 202291

Figure 2-9
Existing Recharge Facilities and Diversion Points

TABLE 2-3
MAXIMUM PERCOLATION RATES OF EXISTING OCWD RECHARGE FACILITIES

Existing Facilities		**Rate[1]**	
		cfs	**afy**
Main River System		100	70,400
Off River System		65	11,000
Deep Basins			
Anaheim/Kraemer System		280	91,800
Warner System		70	16,200
Burris/Santiago System		130	60,600
	Subtotal	**645**	**250,000**

1 The diversion rates shown represent an average rate accounting for time spent out of service for routine cleaning. The instantaneous diversion rate for the Deep Basins is 1,000 cfs, but this rate is sustainable for only brief periods.

SOURCE: Orange County Water District.

accounting for time spent out of service for routine cleaning needed to remove accumulated silt. **Figure 2-10** shows the annual volume recharged into the groundwater basin since 1990. As seen in this graph, the District has been nearing its existing recharge capacity in recent years. **Table 2-4** summarizes the District's recharge volumes for the 2003-04 water year.

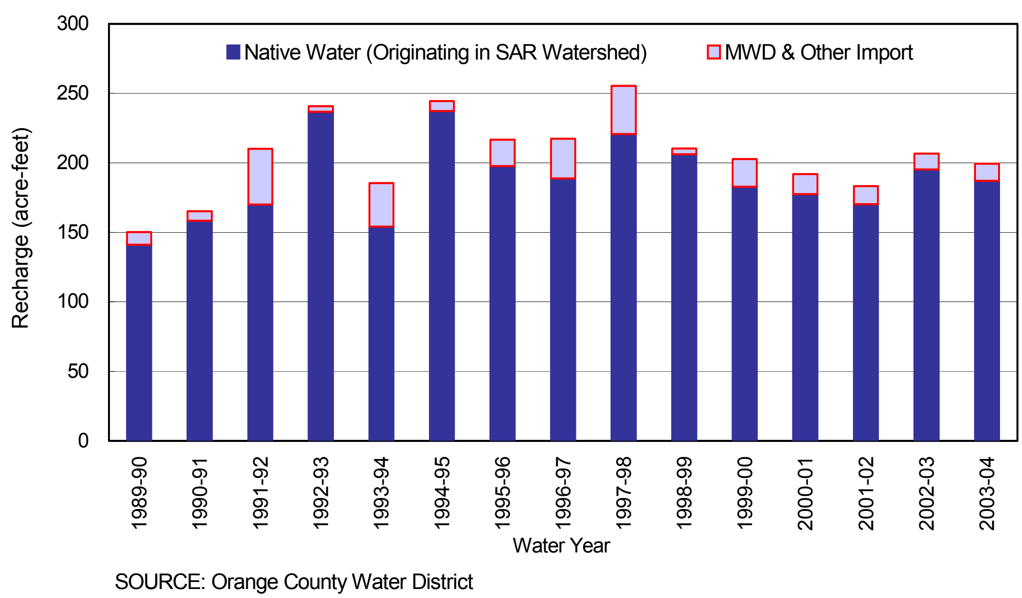


Figure 2-10 Water Recharged by OCWD, 1990-2004

Figure 2-10 distinguishes between water originating in the SAR watershed and other water. The other water includes deliveries from Metropolitan and Santiago Creek flows. The amount of native water diverted from the SAR is referred to as "water originating in the SAR watershed."

TABLE 2-4
SUMMARY OF OCWD GROUNDWATER RECHARGE FOR 2003-04 WATER YEAR

Annual Recharge	Amount (afy)
Percolation	
Native	
Santa Ana River (water originating in the SAR watershed)	184,000
Santiago Creek	1,000
Imported	23,000
Injection	12,000
Total Artificial Recharge	220,000
Incidental Recharge	60,000
In-lieu purchases	50,000
Total Groundwater Recharge	**330,000**

SOURCE: Orange County Water District, 2003-2004 Engineer's Report on Groundwater Conditions, Water Supply and Basin Utilization in the Orange County Water District. February 2005. Numbers are representative of 2003/2004 Water Year and are rounded to the nearest 1,000 afy.

Diversion Structures

The District's Application identifies a total of six existing diversion points as shown in **Table 2-5.** The first of these (River Road) is located upstream of Prado Dam and is used to feed the Prado Wetland Project, a nitrogen removal and mitigation project that is not part of the District's groundwater recharge system. After flowing through the wetland system, this water is returned to the Prado Flood Control Basin above Prado Dam. The District is proposing (as a separate project) to install an additional wetland diversion within the Prado Basin upstream of River Road to augment the wetland treatment system. This proposed diversion upstream of River Road would be similar to the existing River Road diversion, returning diverted flow back to the SAR channel upstream of the Prado Dam conservation pool.

TABLE 2-5
THE OCWD EXISTING DIVERSION POINTS

	Diversion Point	Diversion Structure	Capacity (cfs)	Diverts to
1	River Road*	Six 36-inch tubes and gates	150	Prado Wetlands above Prado Dam
2	Imperial Inflatable Dam	Inflatable Dam/Headgates	550	Off-River System Desilting basin
3	Below Lakeview	Four 30-inch tubes and valves	100	Off-River System
4	Below Tustin Avenue	Four 36-inch diameter tubes and valves	80	Off-River System
5	East of Glassell Street	Four 36-inch tubes and valves	140	Off-River System
6	Five Coves Inflatable Dam	Inflatable Dam	500	Off-River System

* Water diverted at River Road is returned to SAR channel above Prado Dam.

SOURCE: Orange County Water District.

The remaining five diversion points are located in the City of Anaheim and supply the District's recharge facilities. Figure 2-9 shows the locations of each diversion point below Prado Dam. The diversion at Imperial Inflatable Dam and the Headgate Facilities supply the Off River System and the Deep Basin System. Four additional diversion points supply the Off River System and the Burris Pit/Santiago System. These systems are described in more detail below.

The Imperial Inflatable Dam was installed in 1993. The Dam is constructed of a rubberized material that inflates to a diameter of seven feet. Once water levels behind the dam reach seven feet, the dam automatically deflates. The pooled water behind the inflated dam is diverted to the District's Headgate facilities on the north shore of the river. The Headgate Facilities consist of steel gates leading to conduits through the river levee that convey water to the uppermost desiltation basins in the Off River System. The Headgates are equipped with trash racks to prevent debris from entering the Off River System. **Figure 2-11** shows a picture of the Imperial Inflatable Dam, Headworks, and the Five Coves Inflatable Dam.

The Five Coves Inflatable Dam is the District's last diversion point on the river. When inflated, the dam diverts water to the Off River System to maximize the recharge capacity and minimize loss to the ocean. Between the two inflatable rubber dams, the District maintains three additional diversion structures consisting of gated conduits through the north river levee. River flows are diverted to the conduits by configuring soil berms in the riverbed.

The District's rate of diversion for groundwater recharge is generally limited by the flow in the river during low flow periods and by the percolation rates of the recharge basins during higher flow periods. The Headgate Facilities have a total diversion capacity of 550 cubic-feet per second (cfs). An additional 500 cfs can be diverted to the Santiago System through the downstream diversion points. As the recharge basins fill or become clogged with silt, operational diversion capacity diminishes. The inflatable dams are deflated when river flows exceed approximately 1,000-2,000 cfs, preventing diversion into the Off River System. During these periods, nearly all river flows bypass the District's diversion structures and flow to the ocean, with approximately 100-200 cfs recharging the groundwater through the river bottom.

Recharge Basins

The District currently owns and operates roughly 1,000 acres of spreading facilities located in and adjacent to the SAR and Santiago Creek. There are four major components of the spreading grounds: the Main River System, the Off-River System, the Deep Basin System, and the Burris Pit/Santiago System. **Figure 2-12** shows an aerial photograph of the recharge area, encompassing each of the District's current recharge basins. Water flows between the basins by pipeline or overflow weir by gravity, with the exception of a few lift stations and dewatering pump stations. Figure 2-5 shows the location of the pipelines and lift stations connecting the recharge basins.

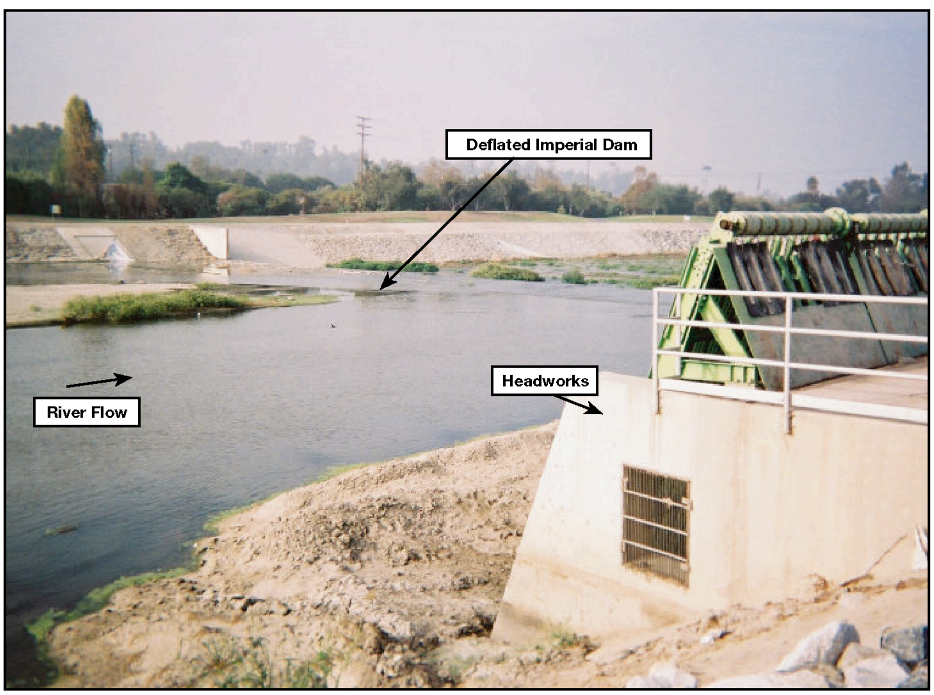
Main River System

The Main River System is comprised of approximately 245 acres of the SAR Channel from Imperial Highway to Orangewood Avenue. Water percolates through the unlined sandy river bottom. Recharge is maximized by the construction of sand levees that slow down the flow in the

SOURCE: ESA, 2005

OCWD . 202291

View of the five Coves Inflatable Dam (Looking Upstream)

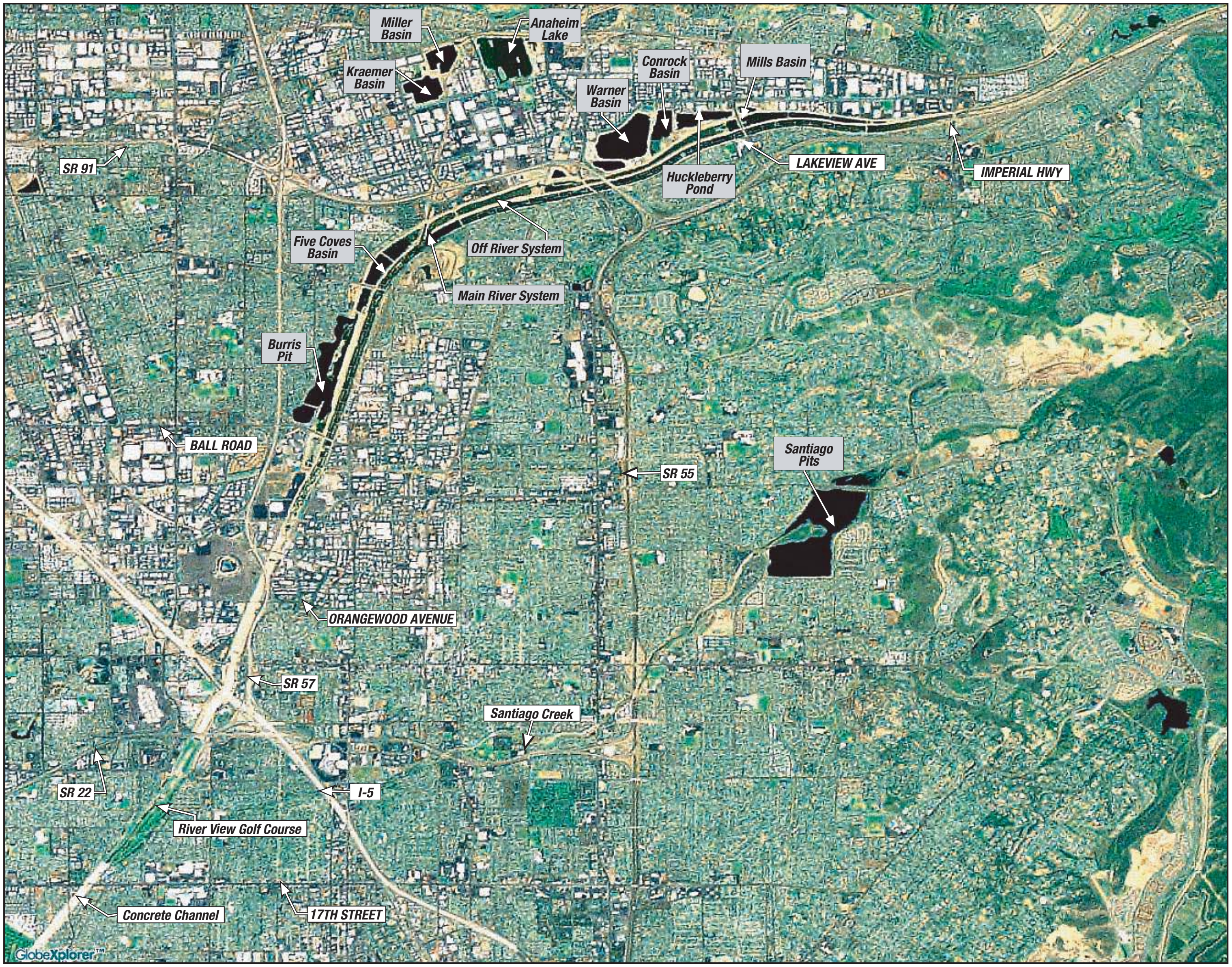


SOURCE: ESA, 2005

OCWD . 202291

Figure 2-11

View of the Headworks and Deflated Imperial Inflatable Dam



SOURCE: GlobeXplorer, 2003

OCWD . 202291

Figure 2-12
Regional Area Map

channel and increase the wetted surface area of the river bottom. The levees within the riverbed form an interlocking pattern to slow down the water flows. **Figure 2-13** shows a typical formation of in-channel levees. The levees are constructed with bulldozers, and are continuously maintained and modified as river flows and diversions fluctuate. The levees begin to erode and wash out when river flows exceed approximately 350 cfs.[11] During the winter, storm flows generally wash out the in-stream levees.

Off River System

The Off-River System is a shallow sandy bottom channel that runs parallel to the Main River System from the Imperial Inflatable Dam down to the Carbon Creek Diversion Channel. The system comprises approximately 126 acres. The first basin of this system is referred to as the desilting basin. Weir Pond #3 is the segment furthest downstream within the desilting basin. From this basin, water is transferred across Lakeview Avenue to the Off River System. The Off River System acts as the initial diversion point from which the other systems receive water. Water flowing through the system can be transferred to the Deep Basin recharge basins and to the Burris Pit/Santiago System at Carbon Creek.

The Burris Pit/Santiago System

The Burris Pit/Santiago System consists of 373 acres of shallow and deep recharge basins beginning at the confluence of the SAR and the Carbon Creek Channel and ending at the Santiago Basins in Orange. The system is comprised of four basins along the SAR (Upper Five Coves, Lower Five Coves, Lincoln, and Burris Pit), the Santiago Pits, and Santiago Creek. The basins along the river are shallow basins, similar to and connected with the Off River System. The Santiago Pits and Creek are located approximately five miles east of the river in the city of Orange and are fed by the Santiago Pipeline from Burris Pit as shown in Figure 2-8. The Santiago Pits (Bond Pit, Blue Diamond Pit, and Smith Pit) are steep-walled pits, up to 136 feet deep, created by former gravel mining operations. The three pits encompass a total of 187 acres. In addition, up to 15 cfs of water can be released into Santiago Creek for recharge into the groundwater basin from the creek bed. The creek provides recharge capacity from the Santiago Pits to Hart Park in the City of Orange.

The Deep Basin System

The Deep Basin System consists of the Warner Basin System, Anaheim Lake, Miller Basin, and Kraemer Basin. The system comprises approximately 280 acres. Water is diverted from the Off River System just south of Lakeview Avenue to Huckleberry pond which flows to Conrock Basin and Warner Basin. The Anaheim Lake basin is fed from a pipeline that connects to the Off River System as shown in Figure 2-9. The basins range in depth from 10 to 60 feet with natural sandy areas of sidewalls and bottoms that allow for infiltration. Anaheim Lake and Warner Basin periodically are stocked with fish and open to the public for recreational fishing.

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[11] OCWD, 1999.

SOURCE: ESA, 2005

OCWD . 202291

View of OCWD “T” and “L” Levees near Highway 91 Overpass

SOURCE: ESA, 2005

OCWD . 202291

Figure 2-13

View of Concrete-Lined Channel near Interstate 405 Overpass

Main River System Maintenance Activities

The District operates the recharge and diversion facilities within the Main River System throughout the year. The District's in-channel activities occur from Imperial Highway to the Highway 22 overpass. Heavy equipment operates continuously within the river channel constructing in-channel levees and clearing the river side walls of debris and vegetation. The equipment is also used to maintain the access roads running along either side of the channel.

Prado Basin Activities

The District owns 2,150 acres behind Prado Dam in Riverside County. Within this area, the District operates and maintains approximately 465 acres of constructed wetlands. The wetlands reduce nitrogen levels in SAR water. Approximately 50 percent of the SAR flow is diverted to these wetlands which outflows to Chino Creek and then to the SAR channel still within the Prado Basin upstream of Prado Dam. The wetlands consist of a system of 50 shallow ponds that remove approximately 20 tons of nitrate a month.

The wetlands also provide a substantial habitat benefit to endangered species such as the least Bell's vireo and the southwestern flycatcher. OCWD has set aside more than 250 acres within the Prado Basin as protective habitat for the vireo and has funded more than $1 million for a vireo monitoring program. The program includes restoration of habitat and the trapping of cowbirds that colonize vireo nests.

OCWD has also contributed $2 million to the USFWS for removal of the invasive plant species, Arundo donax (Arundo), along the river and within tributaries such as Santiago Creek. Arundo is a major threat to the ecosystem of not only Prado Basin but the entire SAR watershed. Its removal reduces water losses along the river and enhances habitat value for native species.

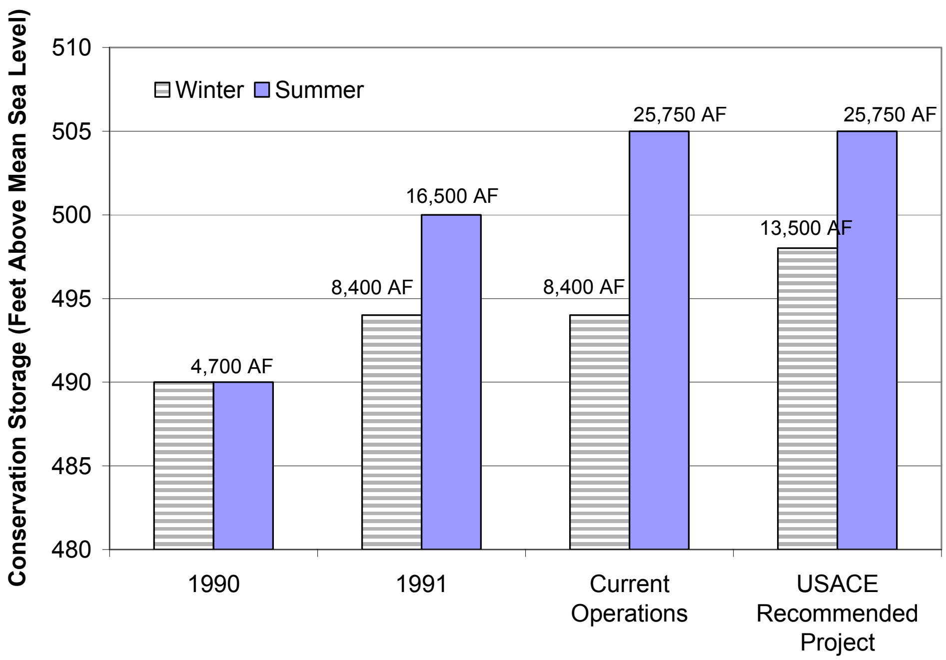
The District has developed operational guidelines incorporating the recommendations of the last 15 years of research to maximize the treatment potential of the Prado Wetlands. The research was also utilized as a design aid for the recent wetlands reconstruction, which will increase capacity and efficiency to effectively treat increasing future SAR flows.

Operation of Prado Dam for Water Conservation

Prado Dam was constructed by the USACE in 1941 for flood control purposes. Subsequently, the SARP was developed by the USACE to provide protection against a 190-year flood in the Santa Ana River watershed. Phase I and Phase II of the SARP were authorized by the U.S. Congress under the Water Resources Development Act (PL 94-587) in 1980 and 1986, respectively (see Appendix F). In 1992, the USACE certified an Environmental Impact Statement (EIS) evaluating operational changes that would allow the dam to be used for conservation purposes as well. These changes went into effect in 1994 with the adoption of the *Water Control Manual for the Prado Dam and Reservoir, Santa Ana River*. The 1994 Water Control Manual allows water to be stored in the conservation pool behind the dam for slow release to avoid exceeding OCWD's groundwater recharge capacity when this can be done consistent with flood control objectives.

During water conservation periods, the USACE operates the dam to minimize the amount of water bypassing the OCWD operations and reaching the ocean.[12]

The current operations allow for a maximum conservation pool elevation during the winter months of 494 feet asl.[13] From March to September, the conservation pool maximum elevation is raised to 505 feet asl. The USACE and OCWD are in the process of preparing an EIS/EIR assessing the potential impacts of raising the conservation pool elevation during the summer and winter months to provide greater water conservation capacity. The Draft EIS/EIR considers raising the conservation pool as high as 508 feet asl during both summer and winter seasons; however, the recommended plan is to raise the pool to 498 feet asl during the winter and maintain the pool at its current level of 505 feet asl during the summer.[14] **Figure 2-14** summarizes the maximum conservation pool elevations allowed by the USACE since 1990, the corresponding increase in storage capacity, and future proposed values.



SOURCE: USACE, 2004.

Figure 2-14 Historical and Proposed Maximum Conservation Storage Elevations Allowed Behind Prado Dam

The 1992 EIS identified specific measures to mitigate impacts caused by the creation of the conservation pool and the operation of the Prado Dam to minimize flows reaching the ocean. Many of these commitments were implemented and funded by OCWD, acting as a local responsible agency. In 1995, an agreement between the District, the U.S. Fish and Wildlife Service (USFWS), and the USACE was signed allowing the Prado Dam conservation pool to

12 The *Water Control Manual, Prado Dam and Santa Ana River, California* was completed in 1994.
13 USACE, 2004.
14 *Ibid*.

reach an elevation of 505 feet above sea level (asl) and assigning responsibility to OCWD to implement mitigation for habitat restoration.

Since 1995, OCWD has assumed a leadership role in resource management within the Prado Basin and the greater SAR watershed. OCWD is a founding member of the Santa Ana Watershed Association of Resource Conservation Districts (SAWA) and of the Santa Ana Watershed Project Authority (SAWPA). Both organizations are mandated to enhance SAR watershed resource management. Projects funded and implemented through these organizations include removal of invasive species (i.e., *Arundo donax*) and habitat restoration for endangered species including the least Bell's vireo and southwestern flycatcher. The numerous projects implemented by OCWD at a cost of over $10 million far exceed the mitigation commitments outlined in the 1992 EIS.

2.4 Summary of CEQA Documents Adopted for Existing OCWD Facilities

Each of the existing recharge facilities currently in operation have been assessed individually pursuant to CEQA requirements, with the exception of the two recharge basins (Anaheim Lake and Warner Basin) that were in operation prior to 1970 when CEQA was enacted. **Table 2-6** lists the completed CEQA documentation for existing OCWD SAR water recharge facilities. **Appendix M** provides copies of each of the CEQA documents listed in the table. These previous environmental evaluations comprise OCWD's historical impact analysis and mitigation measures. **Appendix C** provides brief summaries of impacts and mitigation measures established in each document.

TABLE 2-6
SUMMARY OF OCWD FACILITY CEQA DOCUMENTATION

Property, Facility, or Project	CEQA document	CEQA Date
Anaheim Lake	NA (Acquired in 1957 prior to CEQA)	
Warner Basin	NA (Acquired in 1966 prior to CEQA)	
Mainstem Santa Ana River in-stream levees and spreading operations	Santa Ana River between Ball Road and Imperial Highway, EIR	1972
Kraemer Basin	Draft EIR for OCWD's Proposed Acquisition of Land for Development of Additional Off-channel Water Spreading Grounds, Draft EIR	1975
Burris Pit	Burris Pit Water Conservation Facility FEIR	1976
Bond, Blue Diamond, Smith Pits	Santiago Creek Replenishment Program Pump Station and Pipeline, Initial Study/Traffic Study	1986
In-stream inflatable rubber dam and diversion structures	Negative Declaration	1991
Operation of Prado Dam for water conservation	Prado Dam Operation for Water Conservation, Final Report and EIS	1992
Santiago Creek Recharge Turnout	Negative Declaration	2000
River Trails (River View) Recharge Basin	Mitigated Negative Declaration	2000
Santiago Pits Pump Station	Negative Declaration	2002
Operation of Prado Dam to increase water conservation	Prado Basin Water Conservation Feasibility Study, Main Report and Draft EIS/EIR	2004

NA = Not Applicable.

SOURCE: OCWD, Environmental Science Associates.

CHAPTER 3
Project Description

This Chapter provides a description of the near-term and long-term projects proposed to accommodate the volume of water requested in the water rights application.

3.1 SAR Water Appropriation/Increasing SAR Diversion

The District has filed an Application to the SWRCB to appropriate water from the SAR. The District requests a permit that recognizes its current water rights and diversion practices as well as appropriation of the river's increasing flow at Prado Dam that would otherwise reach the Pacific Ocean. The District currently has the capacity to divert up to 264,000 afy from the SAR. Approximately this amount has been diverted in three previous years (1993, 1995, and 1998). In the 2003/04 water year, OCWD diverted approximately 184,000 afy of native water from the SAR.[1] It is anticipated that future base flow and storm flow in the SAR below Prado Dam will increase due to urbanization in the upper SAR watershed. The District wants to formalize with the SWRCB the right to capture whatever level of additional base and storm flow may reach Prado Basin in the future, up to 505,000 afy.

District operations would remain similar to existing conditions between Imperial Dam and SR-22. No new diversion structures would be installed within the river downstream of Prado Dam to accommodate the proposed near-term facilities. New points of diversion would be necessary to implement the long-term projects. However, the diversion capacity of the existing in-river facilities appears to be adequate to accommodate the projected increased base flow. The inflatable dams would be used to divert water to the Off-River System as under current conditions.

In-stream activities within the Main River System would be similar to existing conditions, where two or three bulldozers operate within the river channel to create temporary levees and remove vegetation. The in-stream vegetation removal activities are required for flood control purposes as well as for groundwater recharge efficiency.

Below SR-22 to the ocean, where only occasional storm flows reach the ocean and no other diversions occur, no changes from existing conditions would occur as a result of the project. For the near future, the USACE will operate Prado Dam according to the 1994 Water Control Manual, minimizing periods of flow in excess of the District's diversion and recharge capacity. The USACE's river management procedure effectively minimizes flow below SR-22.

[1] 2003/2004 water year.

The Application describes the existing facilities used by the District to capture and beneficially use Santa Ana River water. The Application also includes a list of projects proposed by the District to reasonably accommodate the projected increased river flows in the near term and long term. Some of the near-term projects have received CEQA review and already are being implemented. The additional recharge capacity of the proposed near-term projects will assist the District in increasing diversion efficiency and minimizing losses to the ocean as base flows in the river increase. The following sections describe the proposed projects.

3.2 Proposed Additional Recharge and Storage Facilities

The District is proposing to increase recharge capacity in the near-term through the development of several new recharge basins and the rehabilitation or expansion of existing recharge facilities. Development of the new recharge basins would require acquiring and clearing property, constructing the recharge basins, and installing a conveyance system from the District's existing system. Construction of the recharge basins would consist primarily of excavation and establishing engineered berms. The conveyance system may include pump stations and pipelines installed underground through city streets, an existing storm flow channel.

Table 3-1 summarizes the proposed future facilities to provide up to an additional 255,000 afy of diversion capacity, such that in combination with existing facilities, the District can accommodate up to 505,000 afy. The near-term projects include the implementation of recharge basin cleaning devices, the construction of additional recharge facilities, the expansion of several existing facilities, and modifying Prado Dam to increase the conservation pool.

TABLE 3-1
NEAR-TERM AND LONG-TERM PROJECTS

		Recharge (Diversion) Capacity (AF/Y)	Storage Capacity (AF) *	CEQA Coverage
	Near-Term Projects			
1	La Jolla Recharge Basin	9,000		EIR to be published in 2006
2	Mira Loma Recharge Basin	10,000		IS to be published in 2006
3	Santiago Creek Expanded Recharge	3,000		Covered in this EIR
4	Anaheim Lake Expanded Recharge	2,000		Covered in this EIR
	Basin Cleaning Vehicles [1] [BCV]			Cat Ex. Adopted May 2003
5	Anaheim Lake	18,000		
6	Kraemer Basin	18,000		
7	Miller Basin **	7,000		
8	Weir Pond #3 **	8,000		
9	Five Coves **	8,000		
10	Prado Dam (Conservation elev. = 508) [2]		10,000	Draft EIS for elevation of 505 feet published July 2004. EIR to be completed in 2006
	Subtotal	**97,000**[4]	**10,000**	

TABLE 3-1
NEAR-TERM AND LONG-TERM PROJECTS (CONT.)

		Recharge (Diversion) Capacity (AF/Y)	Storage Capacity (AF) *	CEQA Coverage
	Long-Term Projects			
11	Prado Dam (Conservation elev. = 514) [2]		23,600	Program-level review of additional long-term recharge basins and storage facilities provided in this PEIR. Additional project-level CEQA to be provided in future as appropriate.
12	Fletcher Recharge Basin	1,000		
13	Additional Recharge Basins [3]	77,000		
	Basin Cleaning Vehicle			
14	Burris Pit	15,000		
15	Bond Pit	10,000		
16	Subsurface Collection/ Recharge System (SCARS) – Multiple Sites	10,000		
17	Deep Basin Filtration Recharge – 3 sites	25,000		
18	Recharge Galleries – 2 sites	20,000		
19	Gypsum Canyon Reservoir [2]		30,000	
20	Aliso Canyon Reservoir [2]		30,000	
	Subtotal	**158,000**	**83,600**	
	Existing Facilities When Application Submitted	250,000		
	Total	**505,000**	**93,600**	

1 Deep Basin continuous cleaning device will increase percolation rates.
2 Storm flows captured for later release to the SAR for diversion downstream at recharge facilities when capacity becomes available.
3 150 acres total – multiple sites
4 Includes 14,000 af attributed to Santiago Creek Replenishment and River View Recharge Basin projects that have been implemented since the application was submitted.
* Denotes size of reservoir. Reservoirs may be filled and drained multiple times per year.
** OCWD has completed separate CEQA review and these projects are in development.

SOURCE: Orange County Water District

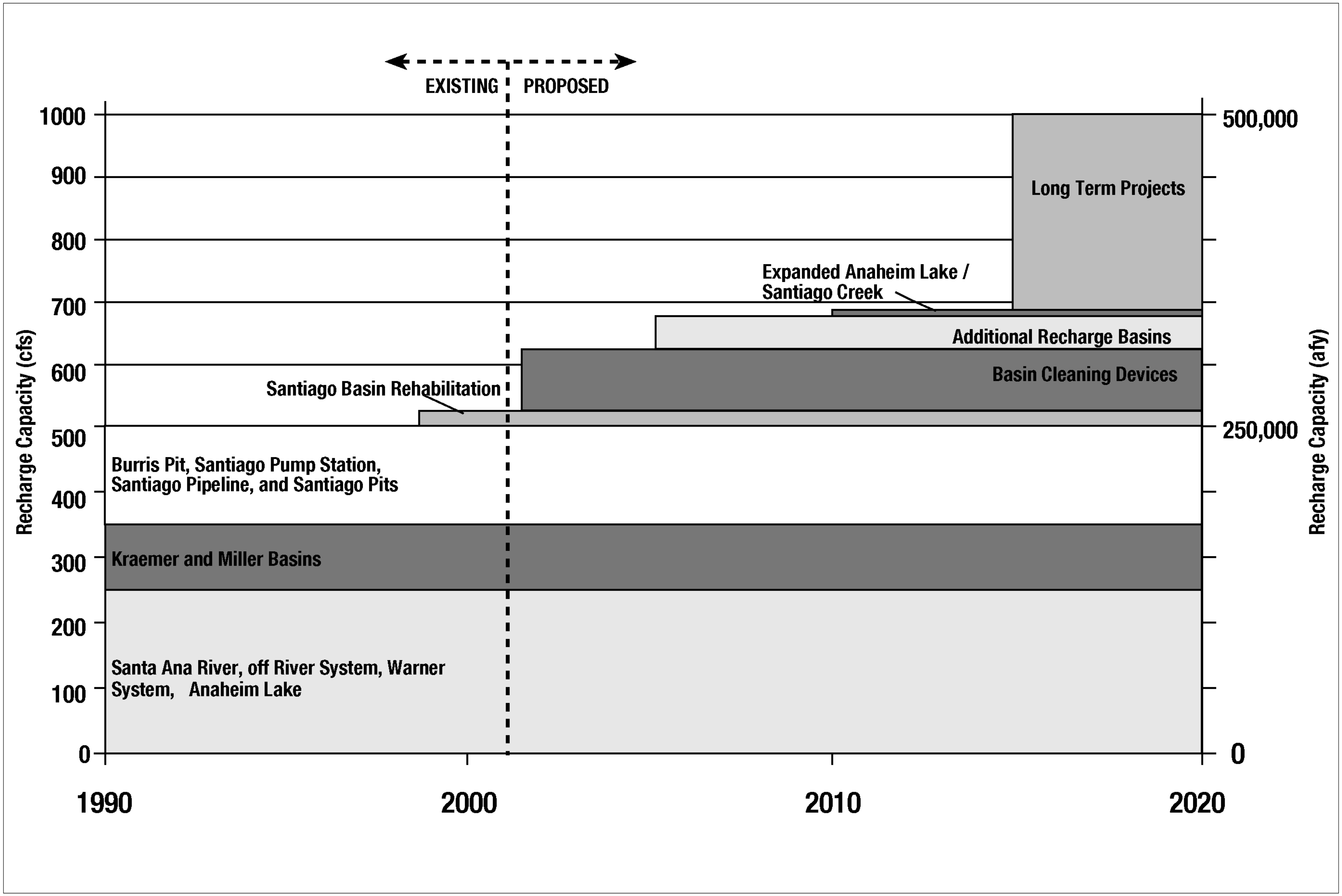
As shown on Table 3-1, near-term projects would provide up to 97,000 afy of additional diversion capacity directly to groundwater recharge facilities and up to 12,000 af of surface water storage.

Long-term projects under consideration include raising the conservation pool at Prado Dam an additional six feet to an elevation of 514 feet asl, constructing more recharge facilities, and providing for off-river storage in reservoirs. The District may not implement all of the potential long-term projects listed on Table 3-1. **Figure 3-1** shows how the near-term projects will increase recharge capacity. **Figure 3-2** shows the location of proposed near-term and long-term facility projects.

Proposed Near-Term Recharge Facility Projects

La Jolla Recharge Basin

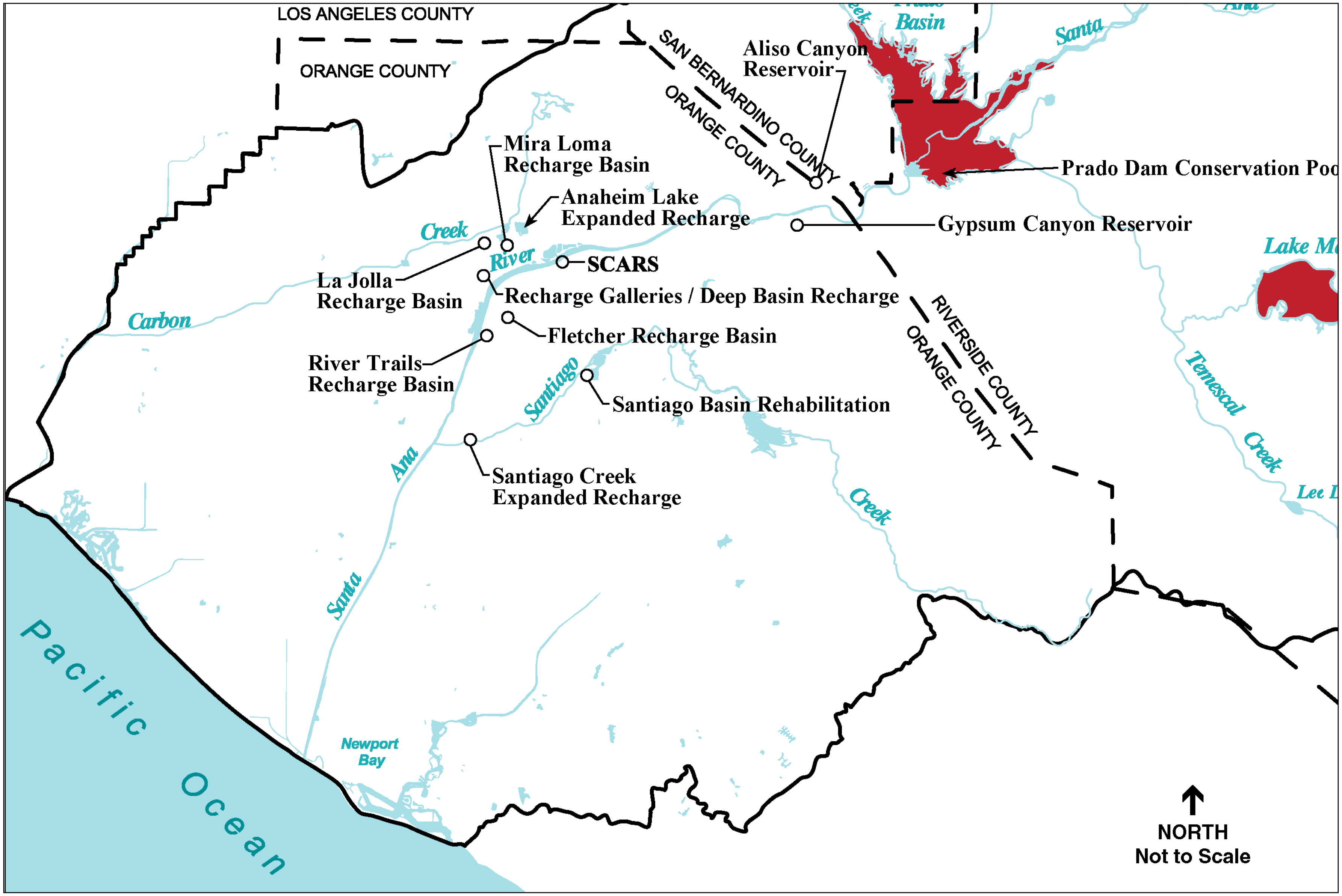
The proposed La Jolla Recharge Basin would add approximately 9,000 afy of recharge capacity to the Deep Basin System. The proposed site is a nine-acre parcel located between West La Jolla Street and West Orangethorpe Avenue just west of Red Gum Street in the City of Anaheim. The site is currently outdoor storage yards. Following property acquisition, the existing structures would be demolished, the site cleared, excavated, and graded. Depth of the excavation would be



SOURCE: OCWD, 2003

OCWD . 202291

Figure 3-1
Existing and Projected Sustained Recharge Capacity



SOURCE: OCWD, 2005

OCWD . 202291

Figure 3-2
Proposed Near-Term and Long-Term Projects

10-15 feet below existing ground level, requiring the removal and disposal of up to 150,000 cubic yards of soil. Completion of the basin including access roads, utility areas, and staging areas would require grading of approximately 50,000 cubic yards of soil. Water would be pumped from Miller Basin into Carbon Creek. The project would install a diversion structure within the creek to divert water into the new recharge basin.

Figure 3-3 shows the location of the proposed La Jolla Recharge Basin. The District expects to publish an EIR for the La Jolla Recharge Basin in 2006.

Mira Loma Recharge Basin

The proposed Mira Loma Recharge Basin would add approximately 9,000 afy of recharge capacity to the Deep Basin System. The proposed site of the Mira Loma Recharge Basin is a nine-acre parcel south of Mira Loma Avenue, just east of North Kraemer Boulevard. The site is surrounded by light industrial and commercial land uses. The site is occupied by a parking lot and a light industrial building used by United Plastics Group. Following property acquisition, the existing warehouse structures would be demolished and cleared from the site. Construction activities would consist of excavation, grading, and installation of a pump station and piping. Depth of the excavation would be 10-15 feet below existing ground level, requiring the removal and disposal of up to 150,000 cubic yards of soil. Completion of the basin including access roads, utility areas, and staging areas would require grading of approximately 50,000 cubic yards of soil.

Figure 3-3 shows the location of the proposed Mira Loma Recharge Basin. The District expects to publish an Initial Study for the Mira Loma Recharge Basin in 2006.

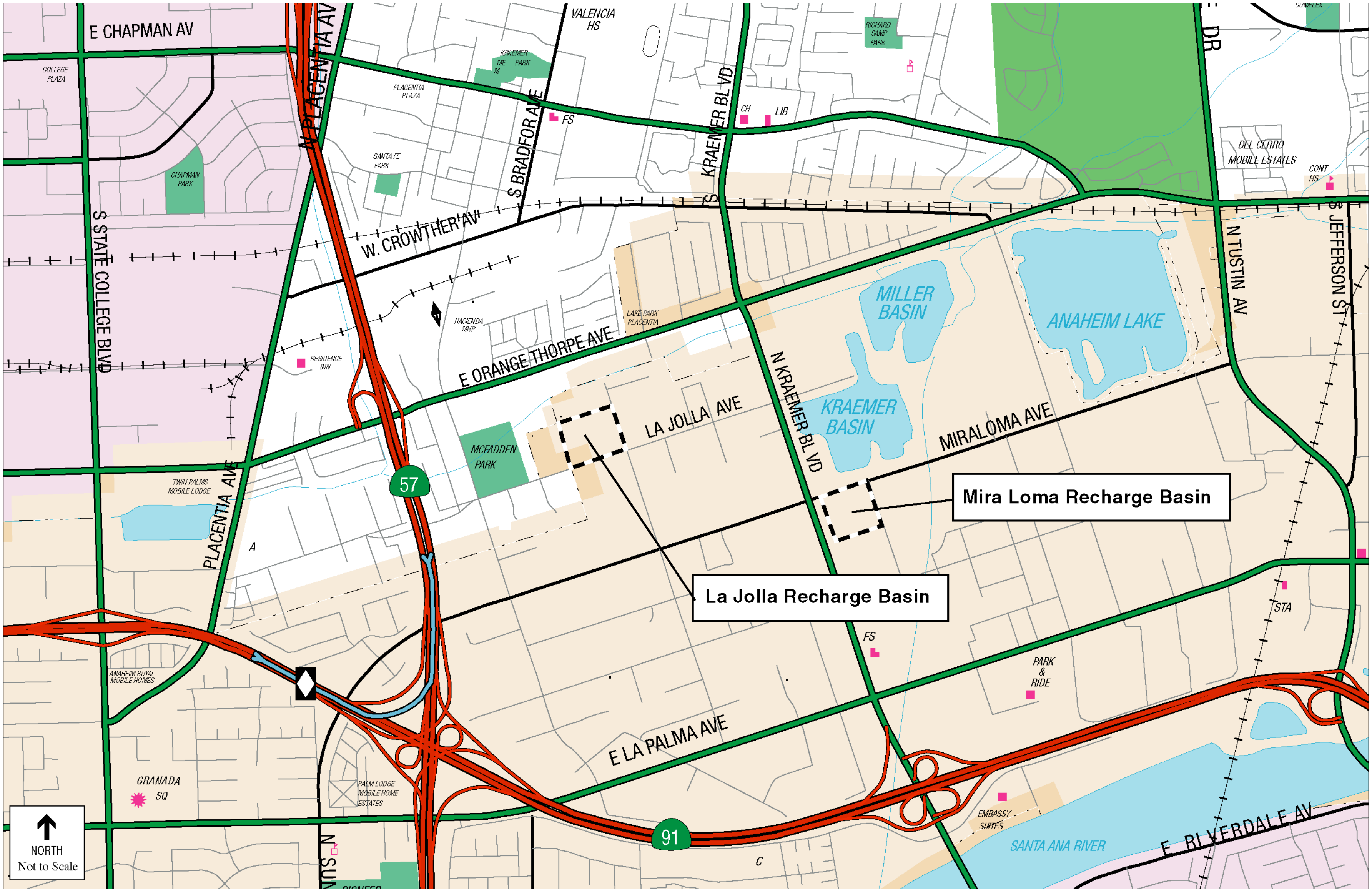
Basin Cleaning Vehicles

Clogging of the recharge basins due to fine silt and clay particles, biological growth, and compaction significantly reduces percolation rates. Clogging affects mainly the top one inch ofsediment. Currently, each basin is emptied twice per year using submersible pumps, and the silt layer is removed by heavy equipment. While one basin is being cleaned, the supply to other basins is maintained by means of bypass pipelines. A twice-yearly cleaning cycle increases percolation by as much as 40 percent. However, during cleaning, the basin is unable to percolate water, which reduces the District's capacity to capture and store water supplies.

Since 1994, three Basin Cleaning Vehicle (BCV) prototypes have been developed and tested. A fourth generation BCV is now being tested in several basins. The BCVs break up the clogging sediment layer, allowing the basins to be cleaned while they contain water. The silt-sand water suspension is captured under a suction hood where the sand drops back onto the bottom while silt-laden water is pumped to shore for dewatering and disposal. **Figure 3-4** shows the most recent BCV model developed by OCWD. BCVs are proposed for use in six of the District’s existing recharge basins to increase annual recharge capacity.

Santiago Creek Expanded Recharge

Santiago Creek located in the City of Orange conveys storm flows to the Santiago Basins and on to the SAR. Downstream of the basins, the Santiago Creek traverses soils with high percolation capacity. The District currently discharges approximately 15 cfs into the creek from Santiago



SOURCE: ESA, Thomas Brothers Maps, 2005

OCWD . 202291

Figure 3-3

Proposed La Jolla and Mira Loma Recharge Basins Location Map

SOURCE: ESA, 2005/OCWD

OCWD . 202291

Figure 3-4
Fourth Generation Basin Cleaning Vehicle
Currently in Operation

Pits or the District's pipeline that conveys water from Burris Pit to the Santiago Pits. This water flows toward the SAR, but percolates before reaching Hart Park in the City of Orange. The creek is lined with concrete for approximately 1,500 feet as it traverses Hart Park.

This concrete area is used as a parking lot for the park. The District is proposing to install a 36-inch diameter pipeline or a culvert for an approximate length of 1,500 feet through the parking lot. The culvert could be open or covered with a grate. The project will allow the District to discharge up to 30 cfs from Santiago Basin into the creek without flooding the parking area of Hart Park, constituting a 15 cfs increase over existing operations. The culvert or pipeline through the parking lot would be designed to accommodate existing traffic and parking demands in the parking lot. Construction would include excavating a trench to a depth of approximately 10 to 15 feet, requiring removal and disposal of up to 1,500 cubic yards of soil. The project would require approximately six months to complete and would add an additional 3,000 afy of recharge capacity to the creek. **Figure 3-5** shows the location of the proposed Santiago Creek Expanded Recharge Project. This project is provided project-level analysis in this PEIR. Appendix I includes an Initial Study evaluating potential impacts of the project.

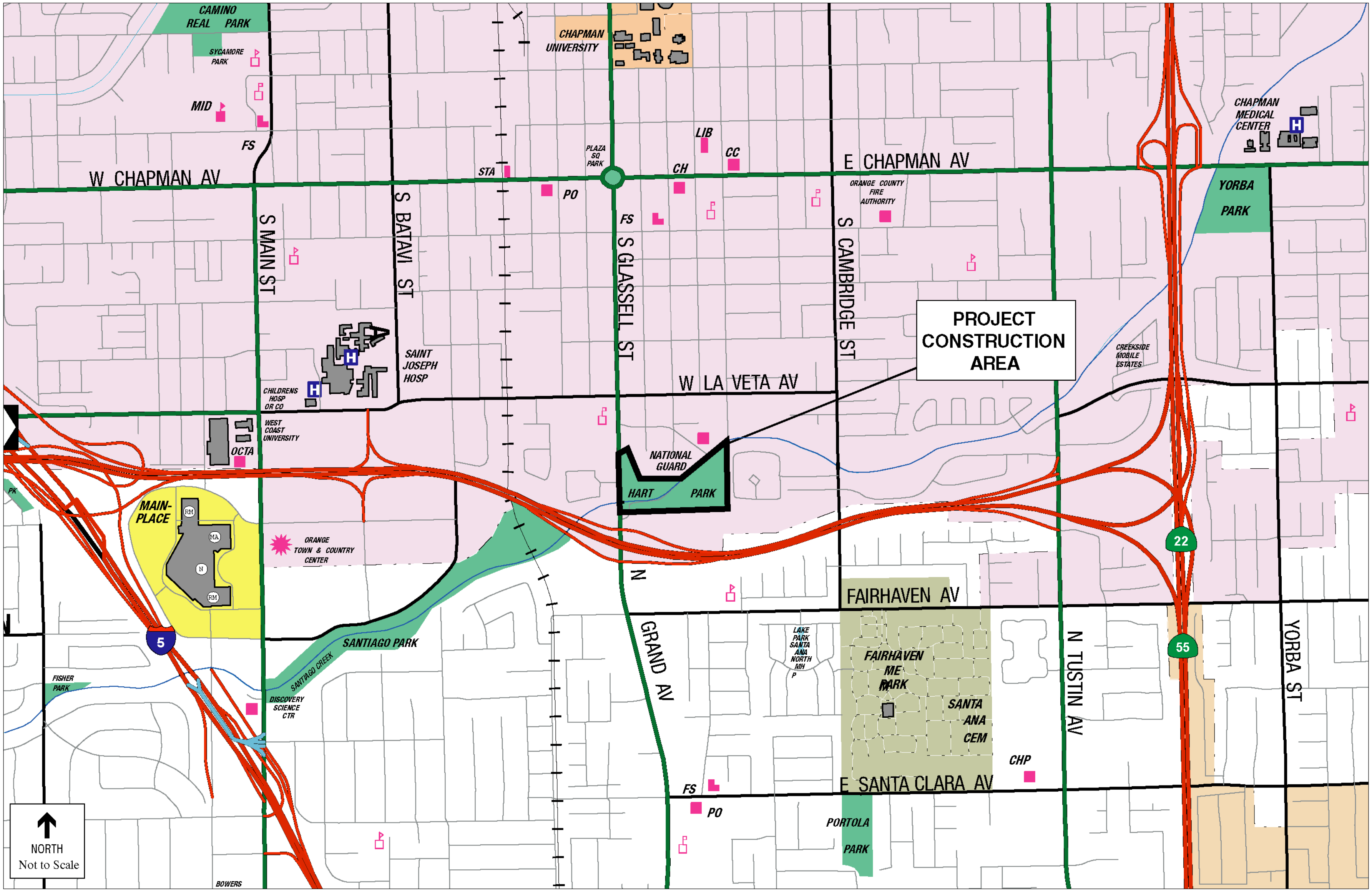
Anaheim Lake Expanded Recharge

The Anaheim Lake is the largest recharge basin of the Deep Basin System located on Mira Loma Avenue in Anaheim. The lake is 49 feet deep and encompasses 72 acres with 2,000 af of storage capacity. There are three islands in the lake. The Anaheim Lake Expanded Recharge project would involve draining the lake and flattening the islands using heavy earth moving equipment. The bottom of the basin would be groomed and the lake refilled with water. Removing the islands would increase the basin's recharge capacity. Construction would require approximately six months, but would be separated into two three-month periods during the drier summer months over two consecutive years. This project is provided project-level analysis in this PEIR. Appendix I includes an Initial Study evaluating potential impacts of the project.

Prado Dam Conservation Pool Elevation to 508 feet asl

The *Water Control Manual for the Prado Dam and Reservoir*, completed in 1994, identifies operational requirements for the dam and reservoir. The reservoir is operated to provide a maximum conservation pool of 494 feet asl during the winter months and 505 during the summer months. The USACE is considering a proposal presented by the District to modify the Prado Dam Water Control Manual to increase both the winter and summer conservation pool elevations. This would substantially increase the storage capacity behind the dam. The increased storage capacity would allow for capture and recharge of more storm water that could be slowly released to the District's recharge facilities. As lead agency, the USACE prepared a Feasibility Study and Draft EIS/EIR in 2004, assessing the proposal to raise the Prado Dam conservation pool. The District is the local sponsor of the project. The Draft EIS/EIR considers raising the conservation pool as high as 508 feet asl during both summer and winter seasons. However, the recommended plan covered in the Draft EIS/EIR is to raise the pool to 498 feet asl during the winter and maintain the pool at its current level of 505 feet asl during the summer.[2] A revised EIR is being circulated in 2006.

2 USACE, 2004.



SOURCE: Thomas Brother Maps, 2005

OCWD . 202291

Figure 3-5
Santiago Creek Expansion Project Location Map

Long-Term Recharge and Storage Facility Projects

The District has conceptualized numerous diversion, storage, and recharge projects to accommodate diversion of increased river flows over the long-term. These future projects would effectively utilize the projected increase in SAR flows for beneficial purposes. The list of future projects includes additional recharge basins, raising Prado Dam conservation pool to an elevation of 514 feet asl, and constructing surface reservoirs. Prospective reservoir sites include Aliso Canyon and Gypsum Canyon in the Chino Hills and Santa Ana Mountains respectively. To effectively implement each long-term project, new diversion facilities would be necessary. Each long-term project also would require additional environmental review to comply with CEQA. The long-term projects are assessed in this EIR in a programmatic manner, and project locations are shown in Figure 3-2**.**

Prado Dam Conservation Pool Elevation to 514 feet asl

The District has considered sponsoring a project to increase the maximum elevation of the summer conservation pool behind Prado Dam to an elevation of 514 feet asl. This would provide an additional 23,600 af of storage. Implementation of this project would require substantial modifications by the USACE to the Prado Dam Water Control Manual, requiring environmental review to comply with NEPA and CEQA.

Fletcher Recharge Basin

The site for Fletcher Recharge Basin is on the south side of West Fletcher Avenue, just east of North Batavia Street. Surrounding land uses are light industrial and multi-family residential. A school and church are located near the property. The site is vacant with a drainage ditch traversing the property. The property is owned by the Orange County Flood Control District, and OCWD needs its approval for the project to proceed. The site would be cleared, excavated, and graded. A pipeline from the Burris Pit System would be installed to convey water to the basin.

Additional Recharge Basins and BCVs

The District has assessed numerous locations that could provide additional recharge capacity. These areas generally are located near the existing recharge facilities where soil formations are suitable. Since open recharge basins constitute the District’s primary mechanism for recharging water into the ground, the District will continue to add new locations in the future. The District estimates that an additional 150 acres in appropriate locations could supply an additional 77,000 afy to the overall system recharge capacity.

In addition, using BCVs for Burris Pit and Bond Pit would increase recharge in these basins by up to 25,000 afy. These two basins are cleaned less often than the other basins. The District would use BCVs in these areas only after the technology and operational procedures have been fully developed in the other basins.

Deep Basin Filtration Recharge

The District is considering constructing deep basin filtration recharge systems that would consist of an array of large diameter dry wells that would provide conduits through surface geology with low permeability. The wells would be covered by an overlying sand and gravel layer that would capture sediments and provide filtration treatment prior to the water reaching the wells and percolating into the deep permeable soils. This type of system could provide access to water bearing formations that were previously inaccessible to surface recharge. The District has not yet identified suitable locations for this type of system.

Recharge Galleries

The District is considering utilizing recharge galleries. A recharge gallery is a horizontal subsurface recharge system, similar to a leach field, with perforated pipes to recharge water underground. The distribution system would consist of perforated pipes buried in a gravel-filled trench. The trench would be typically less than 10-feet deep with spacing between rows varying from 2 feet to 20 feet depending on the hydraulic conductivity of the soil.

An advantage of recharge galleries is that they can be constructed beneath areas with existing improvements (such as under parks, greenbelts, or parking lots). A lease or easement for the project site would be required. The systems would require prefiltration of the water prior to entering the piping to avoid clogging the system. The District has not yet identified suitable locations for this type of system.

Subsurface Collection/Recharge System (SCARS) – Multiple Sites

The Subsurface Collection/Recharge System (SCARS) would consist of a combination of "In-Situ Filtration" and "Recharge Galleries." In-Situ Filtration would consist of utilizing the natural percolation in the riverbed soils to provide a preliminary filtration of the water. A shallow subsurface collection system constructed similar to a Recharge Gallery would be installed beneath the surface to collect water that percolates from the Main River System and convey it to deep basin recharge systems or a Recharge Gallery. Since the percolated water would be filtered, clogging of the galleries would be slow.

Gypsum Canyon and Aliso Canyon Reservoirs

The District has considered constructing reservoirs in the Chino Hills and Santa Ana Mountains to store storm water. Storm water flows captured behind Prado Dam would be pumped to the reservoirs and released back through the conveyance pipeline to the river of the year for recharge during dry periods. Construction of new surface reservoirs would require additional environmental review. Figure 3-2 identifies prospective locations for these reservoirs.

3.3 CEQA Compliance Summary

Some of the additional recharge facilities, listed as potential near-term projects in the District's 1992 Application, have since been implemented by the District or are in progress. Separate CEQA evaluation was completed or is being competed by the District for each of these projects. These include:

- La Jolla Recharge Basin – EIR to be published in 2006.
- Mira Loma Recharge Basin – Initial Study to be published in 2006.
- Basin Cleaning Vehicles (BCVs) for five existing recharge basins – CEQA Categorical Exemption processed by OCWD in May 2003.

- Prado Dam Conservation Pool elevation 508 feet asl – Draft Environmental Impact Statement for 505 feet asl published July 2004. EIR to be published in 2006.

Appendix C includes a summary of the CEQA Findings for each of these projects where Findings were appropriate. These existing CEQA documents are available for public review at the OCWD administrative offices or are appended here in **Appendix L**.

3.4 Required Approvals

Appropriation

The permit to divert water would be issued by the State Water Resources Control Board.

Anaheim Lake Expanded Recharge

Santa Ana Regional Water Quality Control Board	State-wide construction storm water discharge permit (SWPPP)

Santiago Creek Expanded Recharge

City of Orange	Encroachment permit
U.S. Army Corp of Engineers	Clean Water Act, Section 404 permit
Santa Ana Regional Water Quality Control Board	Clean Water Act, Section 401 certification; Construction SWPPP
California Department of Fish & Game	Streambed Alteration Agreement

CHAPTER 4

Project-Level Environmental Analysis of Santa Ana River Diversions, Anaheim Lake Expansion, and Santiago Creek Expansion

4.1 Introduction

CEQA Guidelines Section 15125 requires that an EIR examine effects of a project with respect to existing conditions at the time the NOP is published. *CEQA Guidelines* Appendix G provides a list of environmental resource areas to be assessed:

Land Use and Planning	Transportation/Circulation	Public Services
Agricultural Resources	Biological Resources	Utilities
Population and Housing	Mineral Resources	Aesthetics
Geology and Soils	Air Quality	Noise
Hydrology and Water Quality	Cultural Resources	Recreation
Hazards / Hazardous Materials		

This PEIR covers each of these areas. It combines some resource issues that are closely related and have few impacts into a single section to avoid redundancy. Mineral Resources are discussed in the Geology and Soils section and Agricultural Resources and Recreation are discussed in the Land Use section.

Few, if any, of the resource areas listed above would experience potentially significant impacts from the project. Potential impacts to Public Services and Utilities are not assessed in this PEIR since the project would not affect these resources. The proposed project would not create housing or other development that would increase the need for fire protection, police protection, or the utilization of school and park facilities, or other public facilities. In addition, the proposed project would not involve any development that would create wastewater, require new water or wastewater treatment facilities, require substantial storm water drainage or treatment facilities, or require additional water supply. Therefore these resource areas were eliminated from further analysis.

The following sections provide environmental setting for the remaining resources identified in the *CEQA Guidelines*. Potential impacts are evaluated for water diversions as well as for the Anaheim Lake Expanded Recharge project and the Santiago Creek Expanded Recharge project. The assessment of diversions is generally focused within the hydrology and biology sections. A summary of CEQA analysis previously conducted for projects listed in the application is included in **Appendix C**.

4.2 Santa Ana River Hydrology and Water Resources

4.2.1 Summary of Santa Ana River Hydrology

The SAR watershed shown in Figure 2-1 stretches from the San Bernardino Mountains to the Pacific Ocean. Precipitation in the region is generally limited to the winter months. SAR flows follow an annual cycle, increasing in the winter in response to periodic storms and decreasing in the summer. Base flow in the SAR consists almost entirely of discharges of treated municipal wastewater upstream of Prado Basin.[1]

Figure 4.2-1 summarizes river flow through Prado Dam since 1934 as measured by USGS flow gages. As shown on this graph, since the mid-1970s both SAR base flow and storm flow at Prado Dam have increased notably. This trend is projected to continue with increased urbanization in the watershed. Annual storm flow varies widely year to year ranging in the last ten years from approximately 10,600 acre-feet (af) in water year (WY) 2002 to 439,000 af in WY 1993.

Much of the increased base flow originates as wastewater discharges from upstream wastewater treatment plants. As reported by the Watermaster, wastewater discharges to the SAR upstream of Prado Dam increased from 47,100 afy in 1970 to 180,706 afy in 2000. At this rate of increase, upstream wastewater discharges would reach 230,000 afy by 2020. Actual increases in future wastewater discharges to the river will depend on regional growth, regional water supplies, infrastructure development, rainfall, and local wastewater reclamation projects.

Historic SAR Flow

The flow regime in the lower SAR is highly variable. During the dry season much of the flow in the SAR just downstream of Prado does not reach the ocean because of percolation, diversion, or evaporation; typically, only storm flow volumes would exceed these significant demands and deliver water to the mouth of the SAR. As the California Department of Water Resources (DWR) notes in Bulletin No. 15 – Santa Ana River Investigation (1959),[2] surface outflow from the Santa Ana forebay is largely storm runoff.

Long-term flow records for the lower SAR illustrate the variable nature of seasonal flow in this reach of the river. The USGS maintains long-term stream flow records of the lower SAR at two stations: 1) in Santa Ana near 17th Street[3] and 2) just downstream of the Prado Dam.[4] Both stations have records dating back to the early 1920s. (See **Appendix D** for summary data.) The early records show the lower river at Santa Ana dried up completely in the summer between June and November every year, each of the ten years prior to the formation of OCWD in 1933. The early stream flow records for the gage near the present day Prado Dam indicate that the mean daily flow generally decreased to below 50 cfs in the summer but did not dry up completely. This

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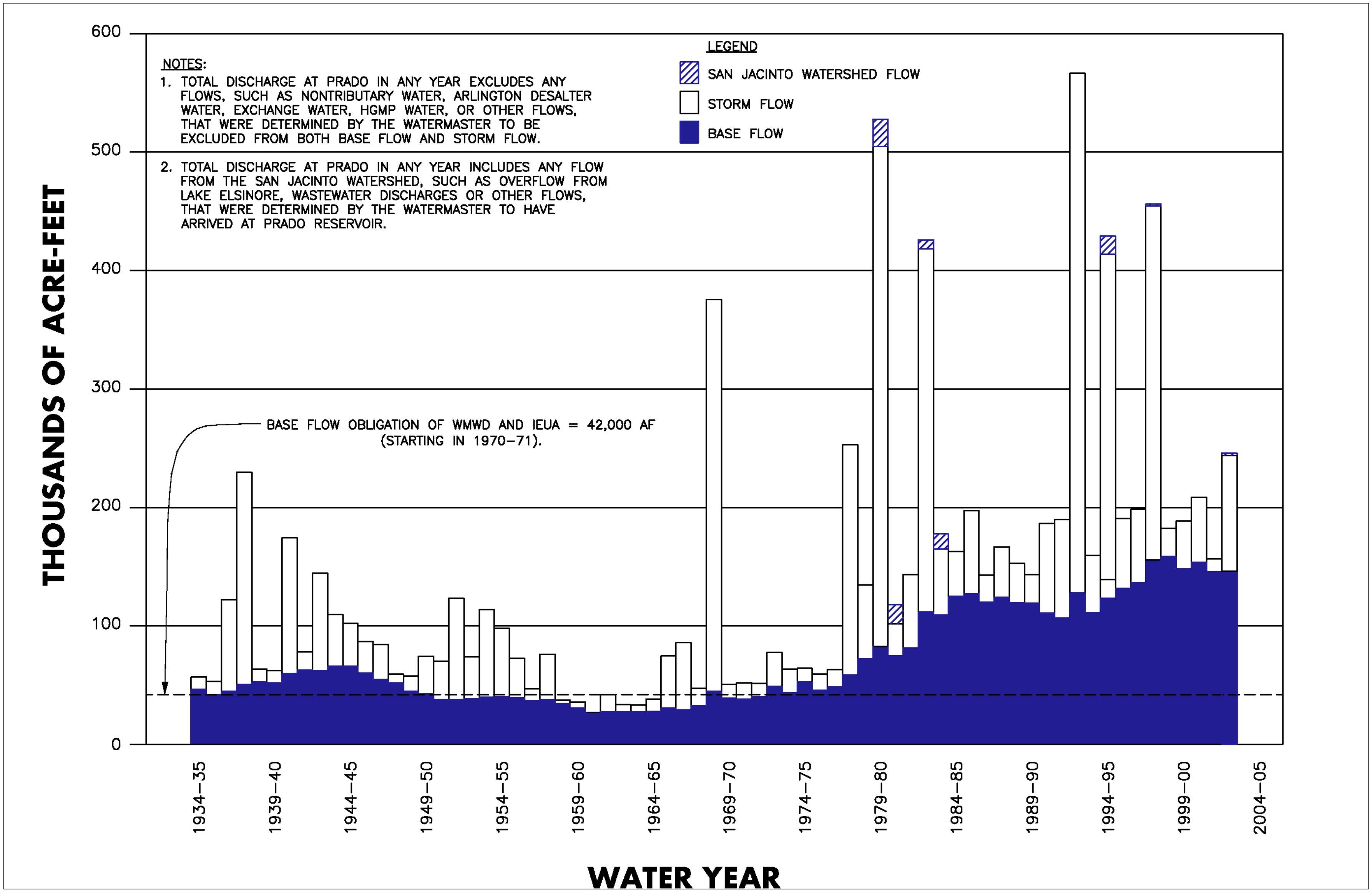
1 Burton et al., 1998.
2 DWR, 1959.
3 USGS Gage no. 11078000 (1924 to present).
4 USGS Gage nos. 11074500 (1920 to 1940) and 11074000 (1941 to present).



SOURCE: SAR Watermaster Annual Reports, 2003

OCWD . 202291

Figure 4.2-1
Santa Ana River Flows at Prado Dam from 1934 to 2001

indicates that SAR water reaching Orange County in the summer percolated naturally, evaporated, was transpired by plants, or was diverted for agricultural or municipal supply at least as early as the 1920s, resulting in no summer flows reaching the ocean.

Figure 4.2-2 presents flow duration curves for the 1920 to 2003 period (the period of record) for the two long-term USGS gages, each further segregated into pre-Prado Dam (1920 to 1940) and post-Prado Dam (1941 to 2003) time periods. The steeply sloping duration curve is characteristic of a highly variable stream,[5] and the general shift to the right indicates that the magnitude and frequency of flows have increased in the post-Prado Dam period (additional flow duration curves are provided in Appendix D). Over time, the comparative flow regime at the two stations has not changed dramatically; namely, consistent perennial flow occurs just downstream of Prado Dam and highly varied, ephemeral flow occurs near Santa Ana. Over the long-term, the magnitude of flows recorded in the SAR at Santa Ana has increased, though the duration of flow is highly seasonal in nature. Figure 4.2-2 illustrates that flows exceed 1,000 cfs below Prado Dam less than five percent of the time. Although the operation of Prado Dam affects the magnitude and duration of flows downstream, and climate patterns affect long-term variability, the principal cause for the increase in the volume of flow is attributable to the significant urbanization of the watershed over the last thirty to forty years. (The sharp decline in the curve below Prado Dam at 100 percent represents brief periods of low flow (e.g., approximately 2.4 cfs for one month in 1978).)

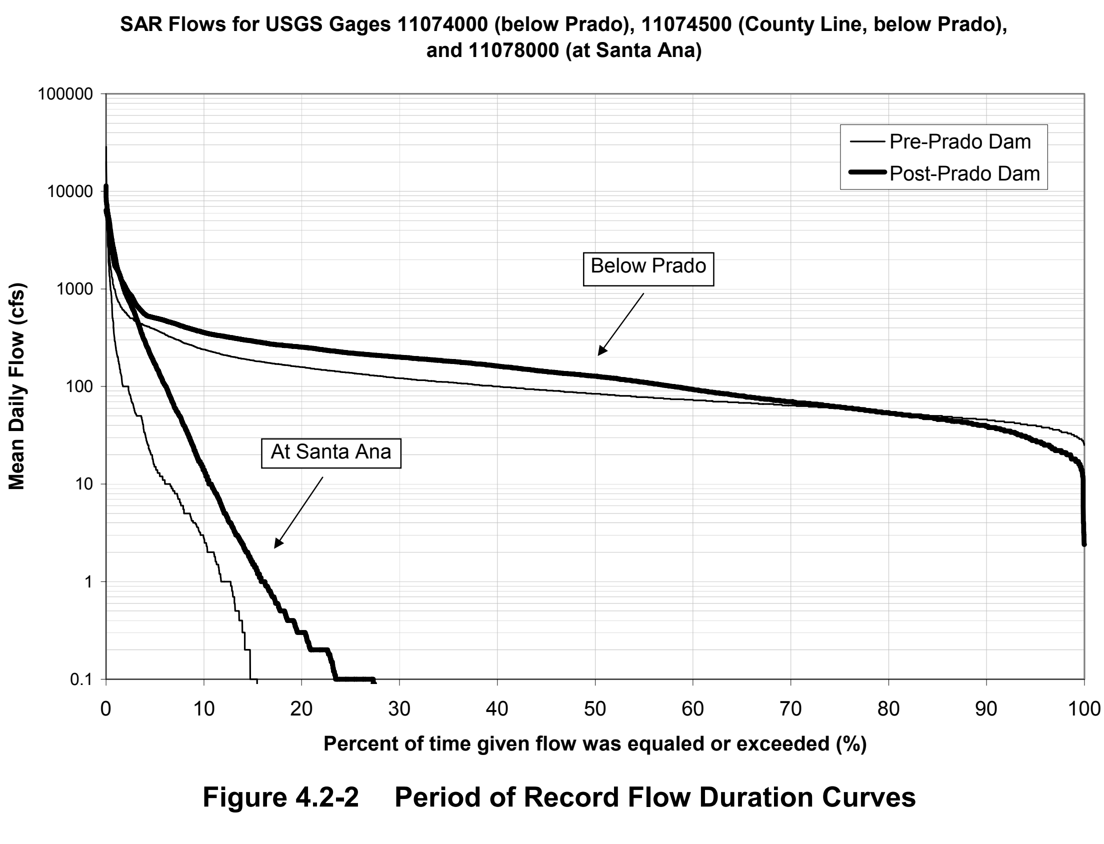


Figure 4.2-2 Period of Record Flow Duration Curves

[5] Leopold, 1994.

Urbanization and the Increase in Santa Ana River Flow

Base flow and storm flow have increased in the SAR watershed due to urbanization. As shown in **Table 4.2-1**, both the USGS gaged SAR flows at Prado Dam and near Santa Ana (downstream of

TABLE 4.2-1
SAR AVERAGE FLOWS

Water Years / Time Period	Average Annual Flow Below Prado Dam (acre-feet)[c]	Average Annual Flow at Santa Ana (acre-feet)[d]
1928-1938[a]	84,500	17,400
1924-1940[b]	88,763[b]	16,924[b]
1941-1970	88,035	22,698
1950-1988	126,380	43,169
1971-2003	220,070	76,706
1989-2003	268,770	90,150

SOURCES:
[a] Reported in Department of Water Resources Bulletin No. 15 (1959).
[b] USGS Gage no. 11074500.
[c] USGS Gage no. 11074000 (unless otherwise noted).
[d] USGS Gage no. 11078000 (unless otherwise noted).

the OCWD operations area) have recorded an increase in the average annual flow volume. The flow recorded at the Santa Ana gage in large part represents the volume of water bypassing the OCWD operations area.

Urbanization increases river flows in two principal ways: 1) increasing impervious (paved) surface area increases surface runoff which increases storm flows and 2) increasing wastewater effluent discharge increases base flows. In addition to increasing river flows, urbanization exacerbates flood risk in the basin and decreases the rate of naturally-occurring groundwater recharge. As development progresses and impervious (paved) surface area increases, the natural mechanism for replenishing the primary municipal water supply (groundwater) is “sealed off.” Natural groundwater recharge decreases and greater amounts of surface runoff and storm water are either captured and stored or conveyed through the river system via flood control works.

As municipal water use has increased and the capacity of municipal wastewater treatment plants has increased, the discharge of municipal wastewater in the SAR also has increased. Municipal wastewater discharges are expected to continue to increase as development of the watershed progresses.

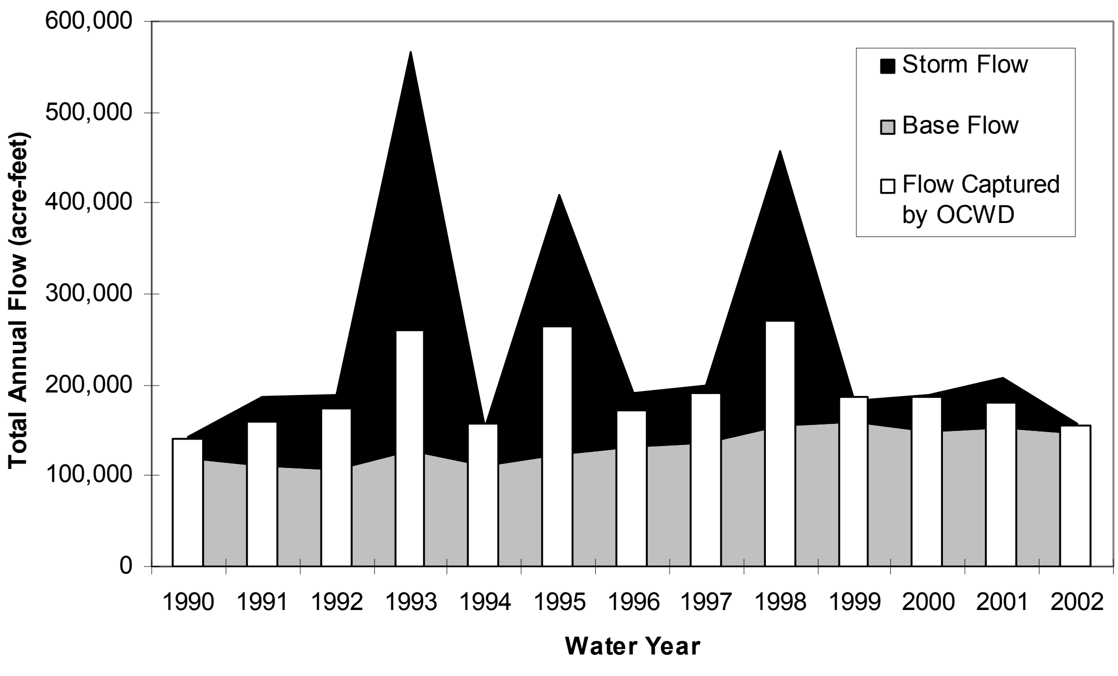
SAR Watermaster Reports

The annual SAR Watermaster Report has documented river flows at Prado Dam since 1934. The SAR Watermaster divides SAR flows reaching the Prado Dam into three categories: base flow, storm flow, and non-tributary flow. Each of these categories is described in the paragraphs below. **Table 4.2-2** summarizes SAR Watermaster data on annual historic river flows passing through Prado Dam since 1990, and **Figure 4.2-3** presents a graph of this information.

TABLE 4.2-2
COMPONENTS OF ANNUAL SAR FLOW AT PRADO DAM (WY 1990 TO 2003)

Water Year	Rainfall (in)	Base Flow (ac-ft)	Storm Flow (ac-ft)	Total Flow (ac-ft)
1989-90	8.53	119,149	24,314	144,817
1990-91	15.48	111,151	75,275	195,186
1991-92	16.54	106,948	82,729	198,280
1992-93	30.92	128,068	438,563	571,137
1993-94	11.62	111,186	41,622	159,560
1994-95	25.14	123,468	284,651	429,270
1995-96	11.92	131,861	58,692	217,160
1996-97	18.64	136,676	61,783	249,682
1997-98	33.41	155,711	300,604	462,645
1998-99	8.02	158,637	23,673	184,998
1999-00	11.09	148,269	40,269	207,850
2000-01	16.13	153,914	54,621	222,559
2001-02	5.08	145,981	10,615	174,968
2002-03	16.22	146,113	97,810	256,157

SOURCE: SAR Watermaster, 2004.



SOURCE: SAR Watermaster, 2004.

Figure 4.2-3 Components of Annual SAR Flow Volume at Prado Dam

Base Flow

Base flow in the lower SAR has increased primarily from contributions of treated wastewater effluent from upstream communities. **Figure 4.2-4** shows the locations of the primary wastewater treatment plants discharging effluent to the river. **Figure 4.2-5** shows the similarity between base flow and wastewater discharges recorded by the SAR Watermaster.

Base flow below Prado Dam generally remains below 200 cfs in the summer and below 300 cfs in the winter. Since the District's maximum recharge capacity is approximately 500 cfs, flows in excess of 500 cfs generally reach the ocean.

Non-storm water flow in the SAR has averaged approximately 135,000 afy in the last ten years. Non-wastewater discharges add approximately 5,000 to 10,000 afy to base flow upstream from the District's operations. Virtually all non-storm flow is captured by the District for groundwater recharge.

Storm Flow

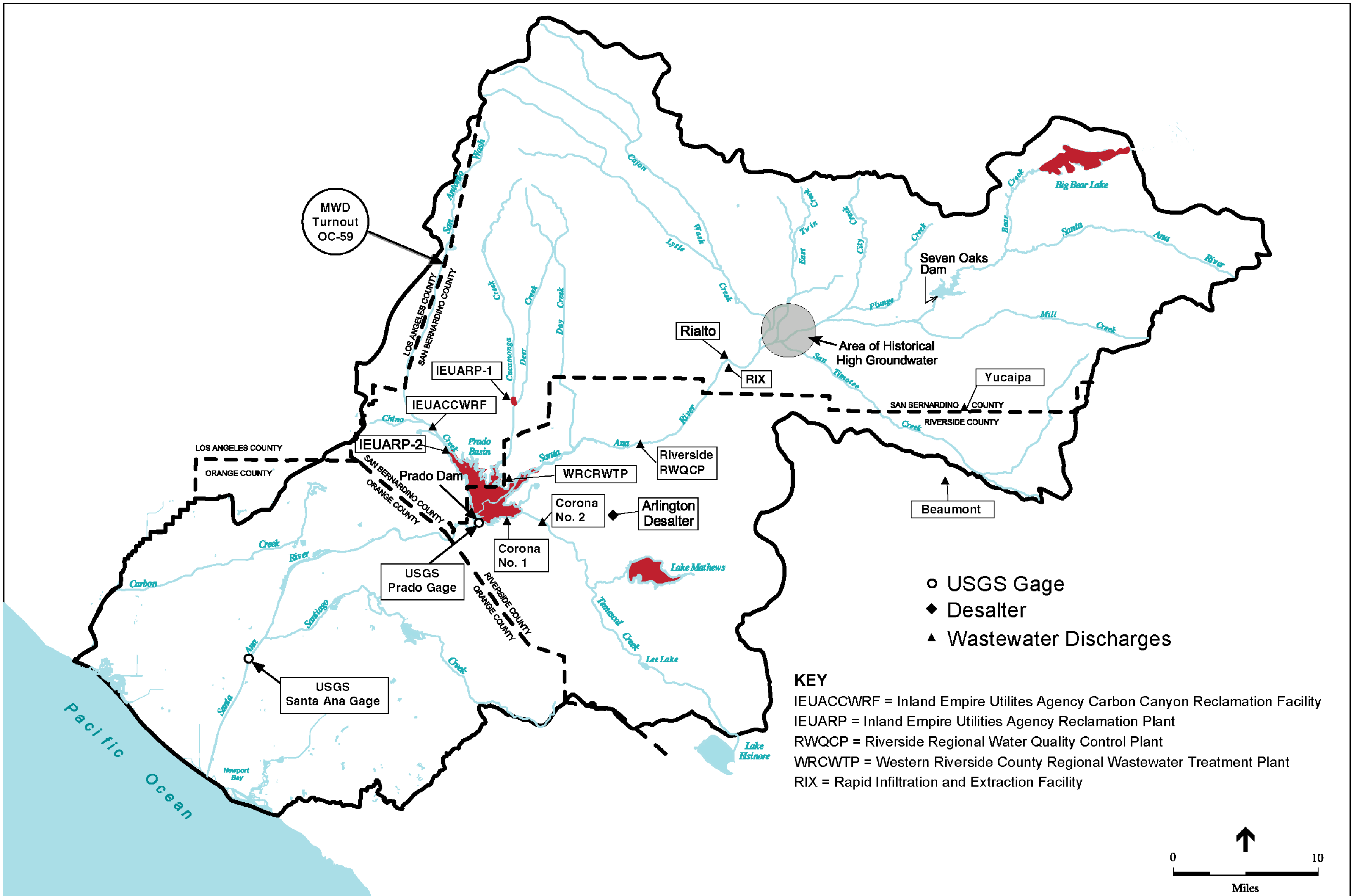
Storm flow is intermittent, typically occurring between November and March. Table 4.2-2 summarizes total storm flow volumes at Prado Dam over the last 14 years. During peak rainfall years, storm flow volumes at Prado Dam closely resembles flow recorded at the USGS Santa Ana flow gage downstream of OCWD operations near 17th Street. Most of the peak storm flow volume passing through the OCWD operations area is not captured (Figure 4.2-3). When the river is running high (1,000-2,000 cfs), the District's inflatable dams are deflated and virtually all flow that does not percolate through the river bottom reaches the ocean. OCWD estimates that approximately 100 cfs is recharged through the river bed during these events. These periods rarely last more than a few days, but in some winter months successive storms can keep the river flowing at levels over 2,000 cfs for weeks.

Non-Tributary Flow

As mandated by the 1969 Stipulated Judgment, the SAR Watermaster records and maintains an accurate record of annual river flows. Non-tributary flow is comprised of water purchased by OCWD and released into the SAR above Prado Dam for groundwater recharge downstream and flows originating in the San Jacinto River watershed. Therefore, some non-tributary flows originate from outside the SAR watershed. The primary sources of non-tributary flows include: 1) State Water Project (SWP) water released into San Antonio Creek from turnout OC-59, 2) water from the WMWD Transfer Program, 3) Arlington Desalter discharge water, and 4) water from the High Groundwater Mitigation Project.[6] Some of the non-storm water reaching Prado Dam is not included in the calculations of base flow. Nonetheless, these non-tributary flows contribute to the total volume of water reaching Prado Dam and subsequently the District's points of diversion and recharge basins. Non-tributary flows are described below.

SWP Delivery/Releases to San Antonio Creek. The District periodically purchases State Water Project (SWP) water from MWD to augment SAR supplies. MWD releases water from its Foothill Feeder Turnout OC-59 into San Antonio Creek near the City of Upland. The location of

6 SAR Watermaster, 2004.



SOURCE: Santa Ana River Watermaster, 2005

OCWD . 202291

Figure 4.2-4
Location of Wastewater Discharge to Santa Ana River

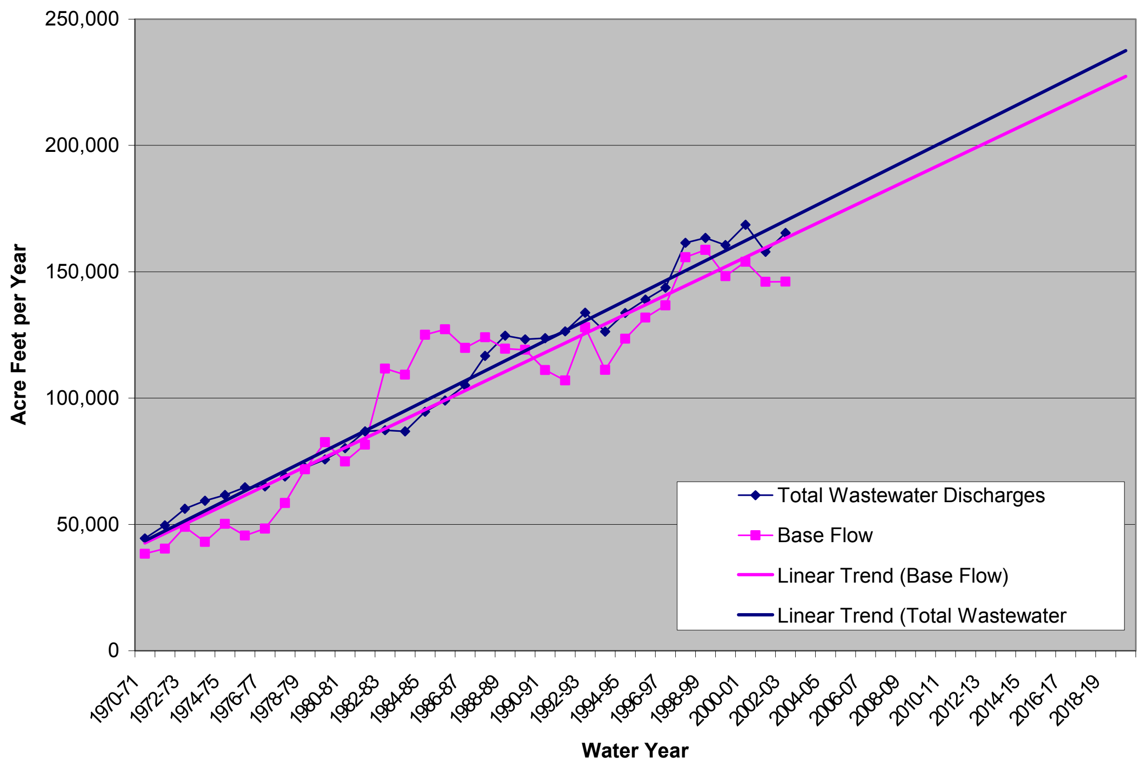


Figure 4.2-5 Base Flows and Wastewater Treatment Discharges in the SAR

MWD OC-59 is shown on Figure 4.2-4. San Antonio Creek flows into Chino Creek, which feeds the SAR at Prado Basin.

Arlington Desalter. The Arlington Desalter Plant was installed in 1990 to assist in remediating groundwater contamination in western Riverside County. The location of the plant is shown in Figure 4.2-4. The plant operates five groundwater extraction wells and removes total dissolved solids (TDS) with a capacity of six million gallons per day (mgd). The product water not utilized in the project area is purchased by OCWD and is transported via the SAR.

High Groundwater Mitigation Project. The High Groundwater Mitigation Project (HGMP) extracts groundwater beneath the City of San Bernardino. The project was initiated by San Bernardino Valley Municipal Water District (Muni) to decrease liquefaction potential during seismic events. In Water Year 2002, the HGMP pumped and discharged 4,400 af into the SAR.[7] The project could be expanded to pump up to 20,000 af from the groundwater basin into the SAR during a wet year.

San Jacinto Watershed. Figure 2-1 identifies the San Jacinto portion of the SAR watershed. The San Jacinto watershed feeds Lake Elsinore in Riverside County. Lake Elsinore holds the runoff and only rarely overflows to the SAR. The San Jacinto sub-watershed has contributed to SAR flows in only five years since 1980 (see Figure 4.2-1). Eastern Municipal Water District has occasionally discharged treated wastewater into Temescal Creek. These flows have occurred only

7 SAWPA, 2004.

rarely in the past but could occur more frequently in the future as population and water usage increase in the San Jacinto River watershed. Urban Runoff Downstream of OCWD Operations

The SAR also receives some non-storm urban runoff downstream of the District's operations. Since the end of 2002, perennial flow from urban runoff has been captured and diverted by the Orange County Flood Control District (OCFCD) through a removable dam located just upstream of the I-405 crossing. The diverted water is conveyed to the Orange County Sanitation District (OCSD) Reclamation Plant No. 1 for treatment and is discharged to the ocean through an offshore outfall pipe. The dry-weather urban runoff treatment program was initiated to assist in improving ocean water quality at the beaches near the mouth of the SAR. In 2003 and 2004, OCSD treated 180.5 and 191.8 acre-feet of water, respectively, from the SAR.

Future SAR Flow Projections

Under existing conditions in the SAR watershed, flow volumes greater than 570,000 afy already have passed through Prado Dam and OCWD's Main River System (Figure 4.2-1 and Table 4.2-2). Therefore, the volume of water requested in the District's Application already has been present in the SAR during wet years.

As the SAR watershed continues to develop, even more water is expected to reach the OCWD operations area under future conditions. As water is made available to meet a growing municipal demand, wastewater treatment discharge volumes are expected to increase base flow in the SAR, as shown in Figure 4.2-5. However, lower water usage rates, recycling, and conservation measures may affect this future flow increase.

Storm flow is also projected by the USACE to increase as urbanization and impermeable surface area increase. Impermeable surfaces allow storm runoff to reach the river faster, increasing the peak flow volume while at the same time reducing the time that the peak takes to reach Prado Dam. Storm flow volumes vary significantly from year to year depending on precipitation.

Quantification of Future Flows

Both the USACE and SAWPA have projected future increases in storm and base flows in the SAR. Detailed summaries of both analyses can be found in Appendix D. **Appendix K** provides data supporting USACE and SAWPA flow projection. The projections by both entities exceed the amount of water requested in the District's Application.

The USACE is responsible for the major flood control facilities and operations along the SAR (such as Prado Dam), and has significant expertise in understanding and projecting peak flows on the river for the reasonably foreseeable future. As part of its latest feasibility study for increasing water conservation at Prado Dam,[8] the USACE estimated future flow variability in the SAR under wet, dry, and average precipitation conditions. The USACE estimates that urbanization will increase flow volume reaching Prado Dam. In a future wet year (2052) with precipitation similar to water year 1978/79, the USACE estimates that 847,000 af could reach Prado Dam. The flow volume at Imperial Highway, approximately nine miles below Prado Dam where OCWD's Main River System begins, would be 868,000 af in a similar year. The USACE projections are

8 USACE, 2004: see Appendices C and D for additional information.

based on population growth estimates within the SAR watershed for the year 2052 and the associated effects of urbanization on storm and base flows.

SAWPA has independently projected flow volume in the SAR for the year 2025 under wet, dry, and average precipitation conditions. SAWPA did not take into consideration the effects of increased imperviousness on storm flows and made projections for a shorter period of time than USACE. As a result, SAWPA's projections were lower than the USACE projections. SAWPA estimated the future flow volume at Prado Dam in a wet year could reach 562,300 afy by the year 2025. Unlike the USACE estimates, SAWPA's projections accounted for flow diversions for upper watershed recycling projects and additional flow contributions: the Arundo Removal Program[9] and the High Groundwater Mitigation Project. These programs enhance river flow volumes.

As described in the cumulative assessment of water availability in Appendix D, the increased future flow volumes projected by SAWPA and USACE could be offset by diversions associated with pending applications for water rights in the upper SAR watershed above Prado Dam.

Water Quality

The quality of SAR water is dependent on wastewater discharges, storm flow, groundwater flow, and urban runoff. During periods of storm flow, TDS concentrations are generally lower since stormwater runoff typically has a lower TDS than base flow. Due to the transient nature of storm flows, TDS concentrations in the SAR below Prado Dam can fluctuate by over 100 mg/L over a period of one week or less. In the period from 1985 to 2005, TDS concentrations in SAR water below Prado Dam generally ranged from 200 milligrams per liter (mg/L) to 750 mg/L. The majority of the TDS measurements were between 400 and 700 mg/L. On a volume-weighted average basis, the TDS concentration from January 2000 to December 2004 was 498 mg/L (Annual Report of Santa Ana River Water Quality, June 2005, prepared by Wildermuth Environmental).[10] By comparison, the average concentrations of TDS in Colorado River water supplied by MWD is 700 mg/l and SWP water is 250 mg/l.[11] TDS concentrations in the Orange County groundwater basin have steadily increased over the years as a result of various factors, including increasing salt content in the SAR, which in turn is due to use of imported municipal supply and wastewater discharge. The District has implemented a salinity management program for the basin that includes supporting the construction of desalting facilities upstream of Prado, such as the Arlington Desalter. Product water from these desalting facilities is considered non-tributary water that assists in reducing overall TDS. The Orange County groundwater basin Salinity Management Program also provides for purchasing imported water with low TDS when available to further reduce overall TDS.

Water quality objectives are included in the Regional Board's Basin Plan for the Santa Ana River. The objectives for Reach 3 of the river include TDS, nitrogen, hardness, sodium, chloride, sulfate, boron, and chemical oxygen demand. As described in the Annual Report of Santa Ana River Water Quality (2005, Wildermuth Environmental), the water quality in Reach 3 of the SAR in 2004 met these objectives. Over a twenty two year period through 2004, basin plan objectives

[9] See Section 4.3 Biological Resources for an explanation of the Arundo Removal program.
[10] Orange County Water District.
[11] USBR/MWD Salinity Management Report, SAR Watermaster Reports, 1998.

have been exceeded by chemical oxygen demand nine times, nitrogen seven times, hardness twice, sulfate twice, and TDS once. Since 1999, no water quality objectives have been exceeded.

The District operates the Prado Wetlands within Prado Basin as a means of reducing nitrogen in the river water. Approximately 50 percent of SAR water is diverted through these wetlands providing a substantial reduction in nitrogen.

The District maintains a water quality monitoring program for SAR water upstream of the District's diversion location near Imperial Highway. Water samples are collected in numerous locations upstream and downstream of Prado Dam. On a monthly basis, the District collects samples to analyze for general minerals and nutrients at Imperial Highway and below Prado Dam. Additionally, on a quarterly basis, metals, radioactivity constituents, and organics that have drinking water standards are sampled at Imperial Highway. The District also collects samples annually for general minerals and nutrients at twelve sites along the Santa Ana River and its tributaries. Water quality results are compiled and made available to the Santa Ana Regional Water Quality Control Board (SARWQCB) and the California Department of Health Services (DHS).

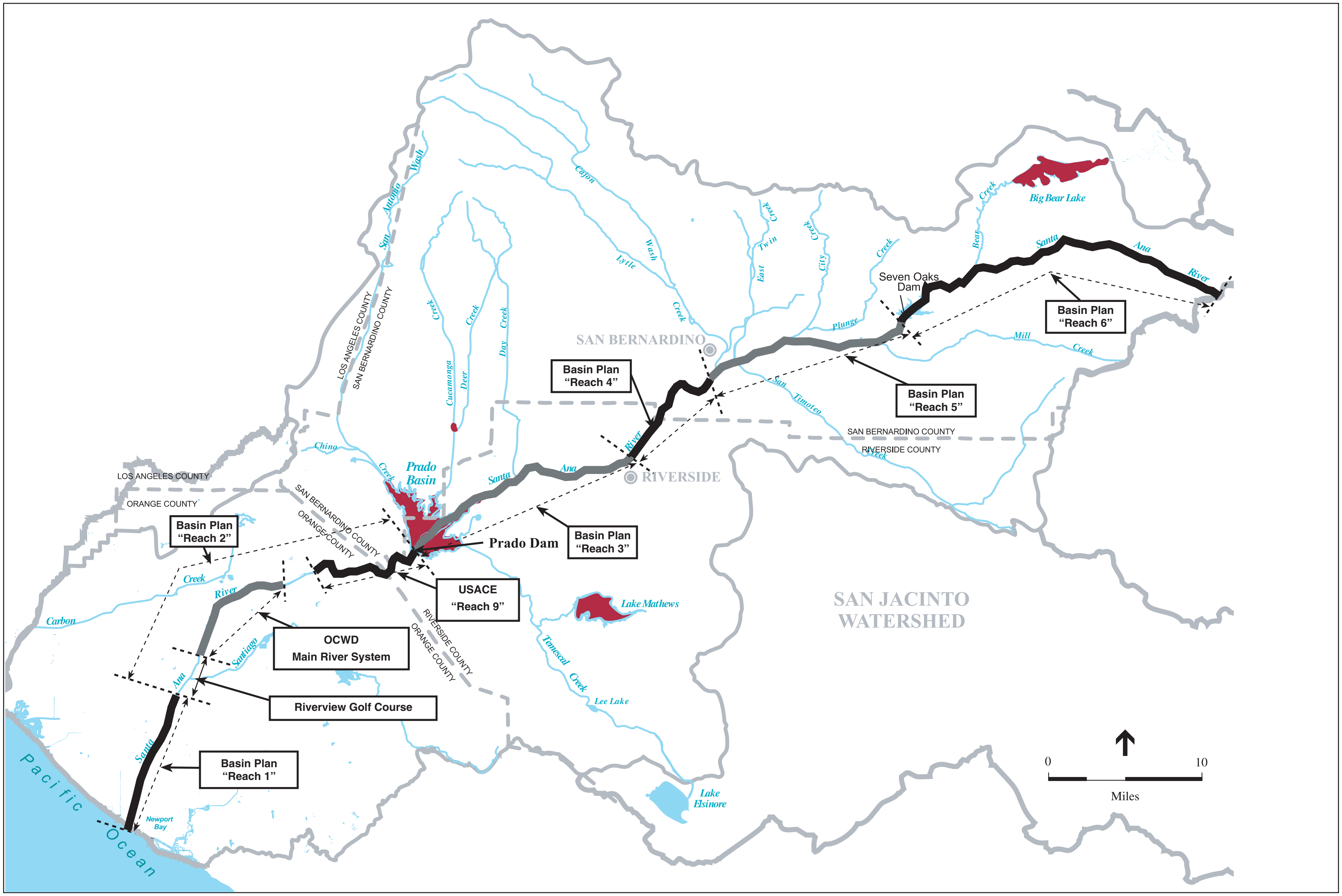
The USGS completed an analysis of storm water quality within the SAR in 2000. The study found considerable variability in storm water chemistry between individual storm events and seasons. The study concluded that total nitrogen levels in storm flow are less than in base flow and that the source nitrogen in base flow is primarily wastewater discharges that are diluted during storm events. Concentrations of dissolved organic carbon and pesticides increase during storm flows.[12] Maximum pesticide concentrations in storm flow did not exceed Maximum Contaminant Levels established by the US Environmental Protection Agency (US EPA). Most of the detections of pesticides were at concentrations less than one microgram per liter and less than the detection limits obtained with standard drinking water analyses.

The National Water Research Institute (NWRI) completed an independent review of a major study of Santa Ana River water quality in 2004.[13] The Santa Ana River Water Quality and Health (SARWQH) Study was conducted by the District to examine the use of Santa Ana River water for recharging the groundwater basin in light of the high percentage of treated wastewater in the base flow of the river. The multi-disciplinary study included hydrogeology, microbiology, toxicology, and organic water quality evaluations. At the request of the District, NWRI formed a Scientific Advisory Panel to provide independent review and guidance to the SARWQH Study. NWRI's review concluded that the recharge of SAR water to the groundwater basin does not threaten water quality or public health and that groundwater transit of recharge Santa Ana River water produces a quality and composition of dissolved organic carbon that is comparable to other sources of drinking water, such as the Colorado River. The study recommended that the District continue to monitor the quality of the Santa Ana River and groundwater for chemical and biological constituents of public health concern.

Beneficial Uses

The SARWQCB's Basin Plan identifies beneficial uses for each reach of the SAR. **Figure 4.2-6** provides an overview of the watershed, demarcating the six reaches of the river as described in

[12] Izbicki *et al*, 2000.



SOURCE: SARWQCB Basin Plan, 1995

OCWD . 202291

Figure 4.2-6

Santa Ana River Watershed with Reaches, designated in Basin Plan the Basin Plan prepared by the SARWQCB. Reach 1 is defined as the portion of the river from the tidal prism at the beach up to 17th Street in Santa Ana. Reach 2 is defined as the stretch from 17th Street up to Prado Dam. Beneficial uses identified for each reach are summarized in **Table 4.2-5**.

TABLE 4.2-5
BENEFICIAL USES OF LOWER REACHES OF SAR

	MUN	AGR	GWR	REC 1	REC 2	WARM	WILD	RARE
Reach 1	+	--	--	X*	X	I	I	--
Reach 2	+	X	X	X	X	X	X	X

I Intermittent beneficial use.
X Present or potential beneficial use.
+ Excepted from Municipal and Domestic Supply (MUN).
* Access prohibited in all or part by Orange County Flood Control District.

SOURCE: SARWQCB Basin Plan.

Table 4.2-6 provides a definition of each beneficial use. The Basin Plan acknowledges that virtually all base flow below Prado Dam is diverted for groundwater recharge by the District.[14]

TABLE 4.2-6
DEFINITIONS OF BENEFICIAL USES

MUN	Municipal and Domestic Supply (**MUN**) waters are used for community, military, municipal or individual water supply systems. These uses may include, but are not limited to, drinking water supply.
AGR	Agricultural Supply (**AGR**) waters are used for farming, horticulture or ranching. These uses may include, but are not limited to, irrigation, stock watering, and support of vegetation for range grazing.
GWR	Groundwater Recharge (**GWR**) waters are used for natural or artificial recharge of groundwater for purposes that may include, but are not limited to, future extraction, maintaining water quality, or halting saltwater intrusion into freshwater aquifers.
REC1	Water Contact Recreation (**REC1**)[a] waters are used for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses may include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, and use of natural hot springs.
REC2	Non-contact Water Recreation (**REC2**) waters are used for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water would be reasonably possible. These uses may include, but are not limited to, picnicking, sunbathing, hiking, beach combing, camping, boating, tide pool and marine life study, hunting, sightseeing, and aesthetic enjoyment in conjunction with the above activities.
WARM	Warm Freshwater Habitat (**WARM**) waters support warm water ecosystems that may include, but are not limited to, preservation and enhancement of aquatic habitats, vegetation, fish, and wildlife, including invertebrates.
WILD	Wildlife Habitat (**WILD**) waters support wildlife habitats that may include, but are not limited to, the preservation and enhancement of vegetation and prey species used by waterfowl and other wildlife.
RARE	Rare, Threatened or Endangered Species (**RARE**) waters support habitats necessary for the survival and successful maintenance of plant or animal species designated under state or federal law as rare, threatened or endangered.

[a] Access prohibited or limited by Orange County Flood Control District in Reach 1 and portions of Reach 2.

SOURCE: SARWQCB, 1994.

14 SARWQCB, Basin Plan, 1995.

The Basin Plan has developed water quality objectives for each of the identified beneficial uses. Reach 1 has been associated with flood flows only and has no water quality objectives. Reach 2 has an objective for TDS of 650 mg/l on a five year average basis, and Reach 3 has an objective for TDS of 700 mg/l for base flow. The SARWQCB conducts a monitoring program separate from the District's program to assess potential impacts to the designated beneficial uses.

Two reaches of the SAR above Prado Dam (Reaches 3 and 4) are listed on the State Water Resources Control Board's (SWRCB) list of impaired water bodies compiled pursuant to Section 303(d) of the federal Clean Water Act (CWA). The two reaches on the list each occur upstream of Prado Dam and the impairments are attributable to pathogens caused by dairies and other non-point sources. The SAR downstream of Prado Dam to the ocean is not included on the list of impaired water bodies. The SARWQCB is developing total maximum daily loads (TMDLs) for the upper reaches of the SAR to eliminate the identified water quality impairments.

Groundwater

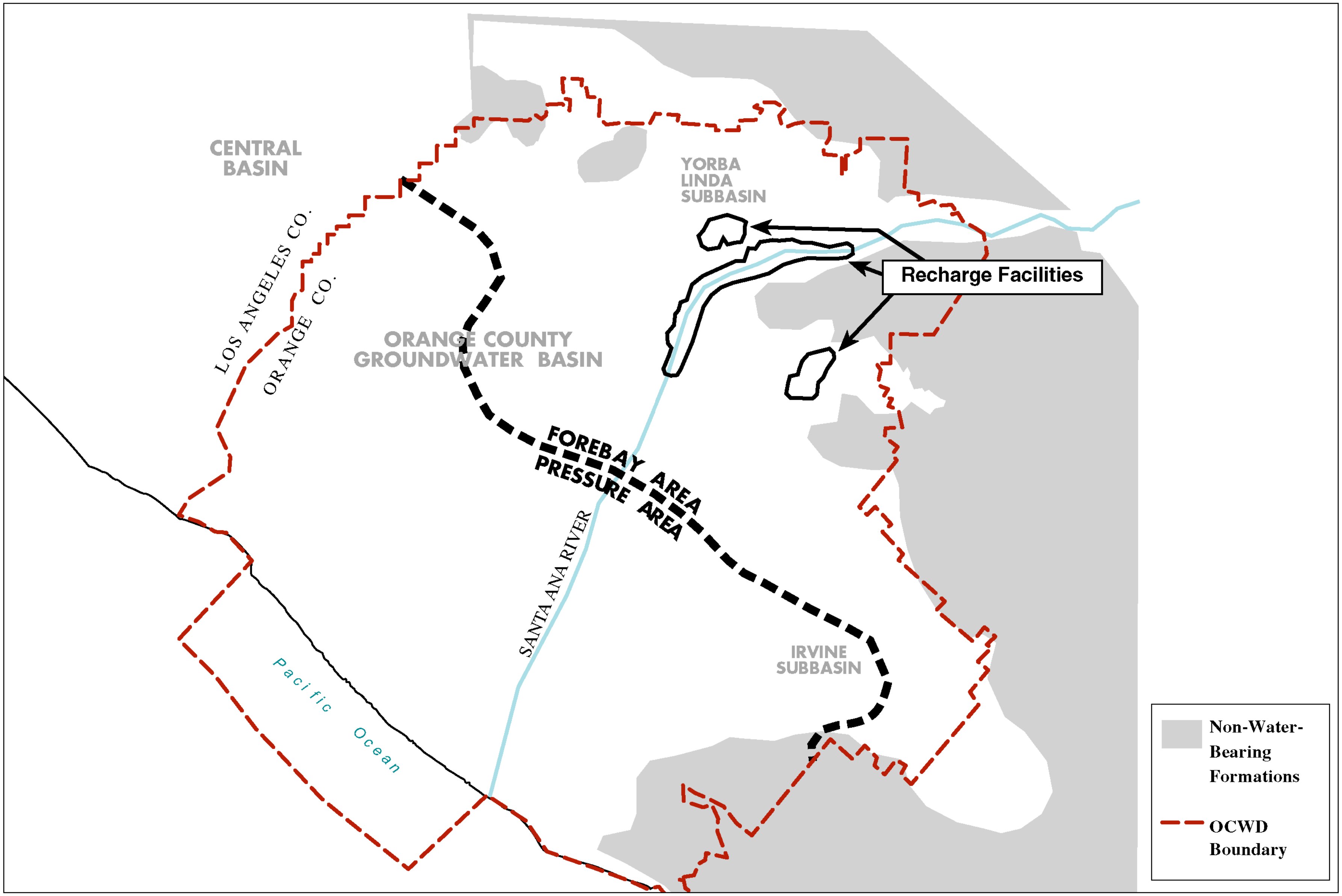
The Orange County groundwater basin underlies northern Orange County and is bordered by the Santa Ana Mountains to the east, the Pacific Ocean to the west, the Newport-Inglewood Fault Zone to the southwest, and the Coyote Hills to the north. The basin is contiguous and directly connected with the Central Basin of Los Angeles County to the northwest. The basin reaches depths of over 2,000 feet and is comprised of a complex series of interconnected sand and gravel deposits. The aquifer is divided into three sections: shallow, principal, and deep. The shallow aquifer supplies approximately five percent of the total water produced from the basin. Most of the production wells in the basin extract water from the principal aquifer.

The basin is divided into two segments: the forebay and the pressure areas as shown in **Figure 4.2-7**. The forebay soils consist mainly of highly permeable sands and gravels with few clay and silt deposits. Surface infiltration recharge systems are generally only effective within the forebay area. Recharge in the pressure area requires the use of injection wells.

The District estimates that up to 380,000 afy are extracted from the basin via over 500 wells, although 96 percent of the water is extracted from approximately 200 large-producer wells. Each of the large-producer wells are metered to provide accurate extraction data.

The Department of Water Resources estimated in 1967 that the basin could hold approximately 38 million af of water.[15] In 1957, the groundwater levels were at their lowest measured level. For the next 12 years, large supplies of imported water were recharged into the basin to remediate the overdraft condition. By 1969, the basin was filled to what has since been considered its capacity. Since that time, the volume of water in the basin (and storage availability) has fluctuated seasonally and over longer periods such as multi-year droughts. **Figure 4.2-8** summarizes the fluctuations in storage availability or accumulated overdraft since 1959.

The basin has been in a long term overdraft condition. As shown in Table 2-4, in 2003-04 the District's annual recharge volume including injection totaled 220,000 afy. In the same year, the District estimated that an additional 60,000 af was recharged into they ground naturally from



SOURCE: Orange County Water District, 2005

OCWD . 202291

Figure 4.2-7
Generalized Map of the Orange County Groundwater Recharge Basins and Vincinity

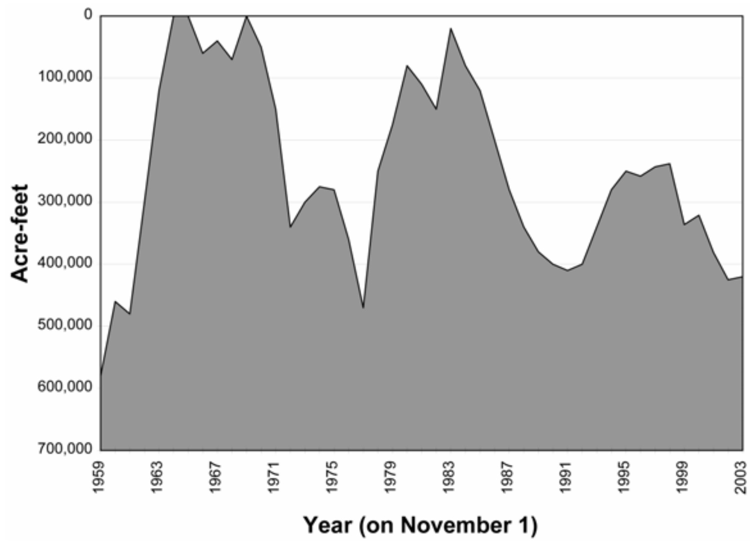


Figure 4.2-8 Historic Accumulated Overdraft in Orange County Groundwater Basin

runoff in the hills and open space areas overlying the groundwater basin. Under these conditions, total annual recharge is 330,000 af. In wetter years, these volumes would be greater. Recent production has exceeded 337,000 afy, indicating a deficit. This deficit can be made up in wet years when incidental recharge is greater and water demand is less. However, over the long run, with no additional recharge, the annual production would need to be curtailed to avoid overdraft.

To better manage the groundwater basin, the District has developed a groundwater flow model of the Orange County Water Basin to assist in managing future recharge and extraction. The model allows the District to forecast effects of increased recharge and extraction in specific locations and to predict potential groundwater mounding. The model was used to assess potential impacts of several future scenarios of increasing production from 350,000 afy to 490,000 afy. The model identified potential groundwater mounding at the recharge sites as recharge volumes in the forebay are increased to offset the increased groundwater production volumes. The model indicated that increased recharge within the pressure zone using injection wells and increased extraction near the forebay recharge locations would alleviate potential impacts associated with increased production.

4.2.2 Other Orange County Surface Water Resources

Surface water within the OCWD boundary primarily consists of the SAR, Santiago Creek, Santiago Reservoir (Irvine Lake), Carbon Creek, numerous flood control channels, coastal wetlands, the existing recharge basins, and the Pacific Ocean. Summer flows in the SAR are diverted within the Main River System; only the occasional winter storm flows reach the ocean. The SAR is described in more detail in Chapter 2. The SAR tributary creeks and flood control channels typically convey perennial urban runoff to the SAR and to the coastal wetlands.

The OCWD Main River System is located in an area of relatively flat topography, sloping gently toward the SAR and Pacific Ocean. Local cities maintain separate storm drain systems that feed into regional trunk drains maintained by the Orange County Flood Control District (OCFCD). The trunk drains drain to flood control channels, creeks and the SAR. Historically, Orange County has been vulnerable to flooding from the SAR during peak rainfall events. Since 1989, the USACE has significantly reduced flood risks along the SAR through implementation of the SAR Mainstem Project. However, flood-prone areas still exist along the lower SAR. None of the recharge basins are located within the FEMA designated flood plain.

4.2.3 River Management and Regulatory Authorities

US Army Corps of Engineers

The USACE is responsible for providing flood control along navigable “Waters of the US”. On the SAR, the USACE owns and operates Prado Dam. USACE has delegated responsibility for flood control downstream of Prado Dam to OCFCD. OCFCD maintains the river levees and concrete channels, and clears vegetation downstream of Ball Road. The USACE also administers permits pursuant to Section 404 of the CWA for activities conducted within “Waters of the US”. The USACE and OCFCD are co-sponsors of the SAR Mainstem Project, which was designed to improve flood protection within the SAR watershed. (See **Appendix F** for additional information about the SAR Mainstem Project.)

State Water Resources Control Board

The SWRCB was established through the California Porter-Cologne Water Quality Act of 1969 and is the primary state agency responsible for water quality management in California. The SWRCB’s policies are implemented by the nine Regional Water Quality Control Boards (RWQCB). The project site is located in the Santa Ana Region 8. Under California law, SWRCB, Division of Water Rights is responsible for issuing appropriation permits pursuant to Division 2, Part 2 of the California Water Code. The SWRCB maintains accounts of water rights in the State and determines when rivers are fully appropriated.

Section 402 of the federal CWA established the National Pollution Discharge Elimination System (NPDES) to regulate discharges into “Waters of the US”. The US EPA authorized the SWRCB to issue NPDES permits in the State of California in 1974. NPDES permits establish thresholds for pollutant discharges and operational conditions for industrial facilities and wastewater treatment plants. Non-point source NPDES permits are also required for municipalities and unincorporated communities with populations greater than 100,000 to control urban storm water runoff. These municipal permits require the preparation of Storm Water Management Plans (SWMPs) that reflect the environmental concerns of the local community.

Individual storm water NPDES permits are required for specific industrial activities and for construction sites greater than five acres. State-wide general storm water NPDES permits have been developed to expedite discharge applications. They include the State-wide industrial permit and the state-wide construction permit. A prospective applicant may apply for coverage under one of these permits through the preparation of a Storm Water Pollution Prevention Plan (SWPPP). SWRCB is planning new requirements for storm water permits for construction activities on sites between one and five acres. The new requirements are scheduled to be implemented during the construction of this project.

Section 303(d) of the CWA requires the SWRCB to list impaired water bodies in the state and determine TMDLs for pollutants or other stressors impacting water quality. Portions of the SAR are listed as impaired water bodies although TMDLs have not yet been determined. As mentioned previously, the impaired reaches of the SAR are upstream of Prado Dam.

California Department of Health Services

DHS is the state agency responsible for identifying and enforcing drinking water standards. DHS has adopted drinking water quality standards for large system water suppliers promulgated in Title 22 of the California Code of Regulations. DHS issues permits for the approximately 200 large system production wells that produce the majority of groundwater from the groundwater basin.

Santa Ana Regional Water Quality Control Board

The SARWQCB implements the NPDES permitting program for the SAR watershed pursuant to Section 402 of the federal CWA. The US EPA has delegated California's NPDES permitting program to the State. The SARWQCB adopted a Basin Plan that identifies beneficial uses of the SAR. The Basin Plan identifies water quality objectives for the identified beneficial uses.

Orange County Flood Control District

The OCFCD is a division of the Orange County Resources and Development Management Department with responsibility for maintaining flood control facilities within the SAR channel, including the levees and concrete linings. The OCFCD currently has responsibility for operation of the Seven Oaks Dam, although this will be transferred to local flood control districts. The OCFCD is the local sponsor for the SAR Mainstem Project.

Santa Ana River Watermaster

The SAR Watermaster is a five-member committee appointed by the court to administer the provisions of the 1969 Stipulated Judgment. The SAR Watermaster is made up of representatives from each of the parties to the Judgment. The SAR Watermaster maintains a continuous accounting of storm flows and base flows, entitlement credits and debits, and water quality data. This information is reported to the court and the parties annually for each water year (October 1 to September 30). River flows recorded in the annual Watermaster Report are determined from river gages managed by the USGS; the USGS maintains a SAR flow gage at the Prado Dam discharge point.

Santa Ana Watershed Project Authority

The Santa Ana Watershed Project Authority (SAWPA) was created in 1972 as a joint powers authority mandated to manage water quality within the watershed for multiple beneficial purposes. SAWPA's member agencies include Muni, Western, OCWD, IEUA and the Eastern

Municipal Water District (EMWD). SAWPA's initial action was to assist with preparation of the Basin Plan under contract to the SARWQCB. SAWPA recently prepared an Integrated Water Resource Plan (IWRP) for the watershed describing the existing water resources, projected water demand, and long-range water quality planning needs for the region. The District's operations are a key component of the SAWPA IWRP.

4.2.4 Significance Criteria

The *CEQA Guidelines* identify the following significance criteria for potential hydrology and water resources issues. The project would be considered to cause significant effects if it would:

- violate any water quality standards or waste discharge requirements;
- substantially deplete groundwater supplies or interfere substantially with groundwater recharge;
- substantially alter existing drainage patterns resulting in substantial erosion and/or flooding on-site or off-site;
- create runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial sources of polluted runoff;
- substantially degrade overall water quality;
- place structures within a 100-year flood hazard zone that would impede or redirect flood flows;
- expose people or structures to significant risk of loss, injury or death involving flooding, including flooding from failure of a dam or levee; and
- expose people or structures to significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow.

4.2.5 Impacts and Mitigation Measures

Impact HYDRO-1: Diversion of SAR water would reduce the volume of water that would otherwise reach the ocean. This would be a less than significant impact.

Diversion of SAR Water

The District's proposed diversion of SAR water could reduce the amount of water that would otherwise reach the ocean. The District would attempt to divert all base flow and as much storm flow as possible to a maximum total diversion of 505,000 afy. Since virtually all base flow is currently diverted, the continued diversion of increasing base flow would result in no impacts. Future diversions of storm flow could result in an overall reduction of water reaching the ocean from existing conditions. The following sections assess the impact of the proposed diversions.

Base Flow

The proposed diversions would not change daily operations or conditions in the lower SAR. River flow would continue to be regulated at Prado Dam in accordance with the USACE-approved Water Control Manual. The District would continue to capture essentially all base flow released from Prado Dam, allowing virtually no base flow to bypass the Main River System to the concrete-lined portion of the SAR or the ocean. Base flow is expected to increase due to urbanization, and the District proposes to increase water diversions commensurate with base flow increases.

The continued diversion would result in a condition that is similar to the historical flow regime of the lower SAR. River flow records indicate that the SAR has been dry in the summer downstream of 17th Street in Santa Ana since the USGS began recording stream flow there in 1923, which was ten years prior to the formation of OCWD. Historical literature also suggests that prior to the start of agricultural diversions in the mid-1800s, similar hydrologic conditions existed in Santa Ana such that summer flows percolated into the ground prior to reaching the ocean, leaving the lower reach dry (see Chapter 2.0). Furthermore, SAR Watermaster records indicate that more water reaches the ocean on an average annual basis under existing conditions than was the case before 1970. Therefore, the continued diversion of base flow as it increases would maintain existing 2002 baseline conditions (when the NOP for this EIR was published) and would maintain a hydrologic condition similar to the historical hydrologic condition of the lower SAR. The diversion of base flow would be considered a less than significant impact.

Storm Flow

Flow rates in the lower portion of the watershed are controlled primarily by the operation of Prado Dam. The frequency, timing, and volume of peak storm flow bypassing the District's recharge facilities depend on the rate and volume of water reaching Prado Basin, storage capacity above the dam, tributary flow below the dam, and the operational procedures adopted by the USACE. Previous analyses conducted pursuant to CEQA have evaluated the effects of the operation of Prado Dam, the on-going diversion and recharge operations, and flood control improvements in the river channel (see Appendix C).

Figures 4.2-1 and 4.2-3 illustrate the annual variation in SAR flows. Flows over 300 cfs only occur during the winter months. Figure 4.2-3 shows that OCWD is generally able to divert some storm flow each year. When the river flows are less than 300 cfs, sand berms are constructed in the river bottom to enhance percolation. Two inflatable rubber dams have been installed to allow diversion of river flow out of the river into recharge facilities. When river flows exceed 500 cfs, the sand berms are naturally washed away. When the river flow rate is 1,000 cfs to 2,000 cfs or higher, OCWD lowers the inflatable rubber dams, allowing river water to flow beyond the recharge area to the ocean.

The District would continue to divert storm flows with existing facilities. As more recharge basin and storage reservoir capacity is constructed, more storm water may be diverted from the river during storm flow events. During any year type (wet, average, or dry), OCWD will attempt to divert as much as possible downstream of Prado Dam up to the total requested 505,000 afy. During some years, this may result in no storm water reaching the ocean at all. This scenario has occurred on several occasions in the past (e.g., 1989/1990, 1960/1961). The SAR Watermaster has reported less than 5,000 afy reaching the ocean in 17 different years since 1955. Most of these low flow years occurred prior to 1970.

In the future, increased storage capacity above Prado Dam would assist in capturing more storm flow. In addition, increased recharge capacity in Orange County would allow more water to be diverted during moderate flow periods. This would reduce the annual volume of water that would otherwise reach the ocean. Depending on future increases in river flow, the increased diversion capacity could result in less water reaching the ocean than under existing conditions. This would not be considered a significant impact since the total volume of water reaching the ocean annually has steadily increased over the last three decades. The potential reduction in annual flows reaching the ocean would result in a condition more consistent with pre-development conditions.

Even with storage reservoirs and additional recharge capacity, peak flows will continue to reach the ocean during large storms. Given the nature of the storm flows in the watershed, even with all of OCWD's proposed storage and recharge projects in place, it is likely that large storm events could be experienced during any year type (wet, average, or dry) that would result in short periods of extremely high flows that would overwhelm diversion points and continue to the ocean. These high flow rates would be regulated by USACE flood control procedures. Under future conditions, annual volumes of SAR flow reaching the ocean would exhibit variability similar to existing conditions, depending on the nature of each storm event experienced in the season and the USACE's flood control operations.

In summary, with storage reservoirs constructed upstream of Prado Dam and increased recharge basin capacity, less storm water may reach the ocean during some years than would occur under current conditions. This is considered a less than significant impact for the following reasons:

1) Peak flows will continue to reach the ocean during large storm events that could occur in dry, average, or wet years. The duration and size of the peak flows could be reduced by diversions, but instantaneous peak flow rates could be similar to conditions without the project, depending on the operation of Prado Dam and the intensities of individual storms.

2) No biological resources or other beneficial uses downstream of OCWD's diversions would be adversely affected by the reduction in annual volume or duration of peak flows that would otherwise reach the ocean. (Effects of increased diversions on biological resources are discussed in Section 4.3.4.)

3) Total annual flow reaching the ocean has increased over the last 30 years. A reduction in the total volume of water reaching the ocean would resemble pre-1970 conditions.

4) Anticipated increases in river flows will partially off-set the effects of the proposed diversions.

Mitigation: None required.

Significance after Mitigation: Less than significant.

Beneficial Uses

The SARWQCB has designated beneficial uses of the SAR for Reach 1 and 2 (See Figure 4.2-6). Reach 1 is designated with REC1, REC2, and intermittent WILD and WARM beneficial uses. Existing conditions in Reach 1 would not be affected by the continued diversion of virtually all base flow. Further, OCFCD diverts dry weather flows at the I-405 crossing to improve water quality at downstream beaches. Additional base flow at the I-405 crossing would make it more difficult to divert dry weather urban runoff and could adversely affect ocean water quality.

Reach 2 is designated with REC1, REC2, WARM, WILD, RARE, AGR, and GWR (groundwater recharge) beneficial uses. The proposed project would not change the current conditions in the river with respect to beneficial uses and would help to achieve the GWR beneficial use. The project would benefit groundwater storage and water supply in the region and reduce overall demands for imported water in the SAR watershed. As Southern California is required to reduce its use of Colorado River water, the SAR remains a vital source of local water supply. The continued diversion would have no adverse impacts to designated beneficial uses of the SAR.

Upstream Water Rights

The diversions would have no effect on river flow upstream of Prado Basin. Future flows will likely increase irrespective of the District's appropriation permit. The proposed project provides the means to beneficially use water that reaches Prado Basin after leaving the upper watershed. This complies with the 1969 Stipulated Judgment, and would not impinge on the rights of upstream entities under the Judgment. The continued diversion would have no adverse impacts to other water rights to SAR water.

USACE Reach 8 and 9

Below Prado Dam, the volume and rate of water discharged from the dam are dictated by the terms of the USACE Water Control Manual, which has been reviewed pursuant to CEQA and NEPA and approved by the USACE.[16] Water releases from Prado Dam are adjusted to match OCWD's groundwater recharge capacity when possible to minimize flow passing OCWD's operations area.

The proposed project would not impact USACE Reaches 8 and 9 between Prado Dam and Imperial Highway. Future projects proposed by the District to increase the capacity of the conservation pool behind Prado Dam could affect flow volume below the dam. However, peak flows in these reaches are expected with similar size and frequency to existing conditions. If the operation of Prado Dam is modified to conserve greater volumes of water for release during dry weather periods, average flow during the dry weather could increase in Reaches 8 and 9 and at OCWD's Main River System. Projects related to the operation of Prado Dam will be reviewed pursuant to NEPA separately by the USACE. The continued diversion would have no adverse impacts to USACE Reaches 8 and 9.

[16] USACE, 1994

Water Quality

Water quality in the SAR is vulnerable to pollution potentially transported by treated wastewater effluent, storm water, urban runoff, upper-watershed groundwater, and accidental spills. The proposed project would not change this existing condition.

The groundwater basin is currently recharged primarily with SAR water. The quality of the SAR water is not anticipated to diminish as flows increase since much of the increased base flow will continue to be attributable to treated wastewater discharges. The quality of these discharges is regulated by the SARWQCB to protect beneficial uses of the SAR, which include groundwater recharge. The proposed project would not affect beneficial uses or water quality objectives of the river as assigned in the Basin Plan. No impacts to SAR water quality or groundwater quality are expected to result from the proposed project.

The District maintains a monitoring program to assess potential long-term water quality trends that could affect the groundwater basin. The District recently conducted the SAR Water Quality and Health study to evaluate SAR water quality and potential health risks. Based on the data collected during the study it was determined that the SAR and groundwater met all water quality standards and guidelines for organic and inorganic contaminants in drinking water. Furthermore, no chemicals of wastewater origin were identified at concentrations that would jeopardize public health in the SAR, in the infiltration basins, or in groundwater.[17]

Future management of the SAR as a critical regional water supply will continue to be the responsibility of the District, DHS, upstream water districts, the SARWQCB, and SAWPA. The District's application to the SWRCB for water rights will not alter this condition or adversely affect water quality of the river or groundwater.

Groundwater

The District's modeling of the Orange County groundwater basin indicates that the basin can be managed effectively to yield 460,000 to 490,000 afy without adversely affecting the condition of the basin provided that sufficient recharge water is available. The model inputs, assumptions, and results have been peer-reviewed by a panel of experts. The model indicates that groundwater mounding could occur near the recharge areas and could slow the rate of recharge. The District could alleviate mounding by modifying its management practices, such as facilitating extraction of groundwater closer to the recharge areas, increasing recharge at the sea-water intrusion barrier facilities, and increasing extraction from the deep aquifer.

As shown in **Table 4.2-7**, existing groundwater production provides approximately 67 percent of the water demand in the service area. Under future scenarios with the proposed near-term recharge capacity of an additional 97,000 afy, the basin could produce up to 427,000 afy and still avoid long-term overdraft. This would provide up to 75 percent of the annual water demand in 2025. The continued diversion would have no adverse impacts to groundwater.

[17] National Water Research Institute, Report of the Scientific Advisory Panel, *Santa Ana River Water Quality and Health Study,* August 2004.

TABLE 4.2-7
AVERAGE ANNUAL WATER BALANCE WITHIN OCWD

	Annual Recharge (afy)	Annual Production (afy)	Annual Water Demand (afy)	Percent of Demand supplied by Groundwater
Existing (2004)	330,000[a]	337,000[a]	500,000[a]	67
Future (2025 with near-term projects)	427,000	427,000	570,000[b]	75

SOURCES:
[a] OCWD, 2003-2004 Engineer's Report on Groundwater Conditions, Water Supply and Basin Utilization in the Orange County Water District. February 2005.
[b] MWDOC, Retail Demand Projection with 2004 Data, Producers Model (based on a survey of retail producers from 2004).

Anaheim Lake Expanded Recharge

Impact HYDRO-2: Construction activities associated with Anaheim Lake Expanded Recharge could temporarily add sediment and pollutants to urban runoff and storm water runoff.

The Anaheim Lake Expansion project would require the use of heavy earthmoving equipment, exposing soil and construction debris to rainwater. The work would occur within the existing lake boundaries, which would limit storm water runoff from the site. The activities would be similar to the District's existing lakebed cleaning operations, involving heavy equipment moving soils at the bottom of the lakebed. The District would be required to prepare a SWPPP to obtain coverage under the state-wide construction storm water discharge permit. SWPPPs are required for construction projects covering more than one acre. The SWPPP would detail methods to minimize construction runoff. Implementation of the SWPPP would ensure that construction activities would pose a less than significant impact to runoff water quality.

Mitigation Measure

M-HYDRO-1: The District will prepare and implement a Storm Water Pollution Prevention Plan as required for coverage under the statewide National Pollutant Discharge Elimination System construction permit. At a minimum, specific measures should include the following:

- Stockpiles of loose material shall be covered to prevent wind and water erosion and runoff diverted away from exposed soil.
- Concrete wash water will be collected and disposed of in the sanitary sewer.
- Fuel storage shall be within secondary containment

Significance after Mitigation: Less than significant.

Santiago Creek Expanded Recharge

Impact HYDRO-3: Construction activities associated with Santiago Creek Expanded Recharge temporarily could add sediment and pollutants to urban runoff and storm water runoff.

The Santiago Creek Expansion project would require the use of heavy earthmoving equipment, within a creek bed, potentially exposing soil and construction debris to storm water runoff. Operation of heavy equipment could lead to the release of oil onto the ground from engines and increase the potential for fuel spills during on-site refueling activities. Breaking of concrete could generate concrete debris and dust that could impact pH of receiving waters if washed into creek or river waters.

In addition, construction activities could add to urban runoff through concrete wash-out water and other equipment washing activities. Construction runoff adds sediment, changes pH and temperature, and introduces petroleum hydrocarbons to receiving waters. The District would ensure that construction contractors implement best management practices to reduce the potential for pollutants in runoff water. The best management practices (BMPs) would comply with requirements for statewide construction storm water discharge permits. Implementation of mitigation measures would minimize construction impacts to runoff water quality.

The Santiago Creek Expansion could require the acquisition of a Streambed Alteration Agreement from CDFG. In addition, a permit pursuant to Section 404 of the CWA would be required from the USACE prior to construction activities within “Waters of the US”.

Mitigation Measure

M-HYDRO-2: The District will prepare and implement a Storm Water Pollution Prevention Plan as required for coverage under the statewide National Pollutant Discharge Elimination System construction permit. At a minimum, specific measures should include the following:

- Stockpiles of loose material shall be covered to prevent wind and water erosion and runoff diverted away from exposed soil.
- Concrete wash water will be collected and disposed of in the sanitary sewer.
- Fuel storage shall be within secondary containment
- Construction debris including broken concrete will be removed from the creek.
- Construction activities in the creek will not occur during the rainy season.

Significance after Mitigation: Less than significant.

Impact HYDRO-4: Increased recharge within Santiago Creek could transport contaminants from surface soils in the area into the groundwater. Nearby production wells could be affected.

Implementation of the Santiago Creek Expanded Recharge project would increase the flow of water within the creek. This new water would percolate into the ground, eventually reaching the groundwater aquifer and augmenting the water supply in the underground basin. The percolating water could alter groundwater chemistry and transport contaminants and naturally occurring minerals in shallow soils into the deeper aquifer.

The District is proposing to double the rate of water discharge into the upper portion of Santiago Creek from 15 cfs to 30 cfs. To ensure that no impacts to a neighboring landfill and production wells would occur from the additional flow rate and volume, the District has implemented a groundwater monitoring plan to sample several shallow monitoring wells. The results of the monitoring are submitted to the RWQCB. The Groundwater Monitoring Plan is designed to identify potential effects to the shallow groundwater chemistry caused by the project. If adverse effects caused by the recharge project are identified in the monitoring plan, recharge operations will cease until the condition is resolved.

Approximately four active groundwater production wells currently operate within 500 feet of Santiago Creek between Hart Park and the SAR.[18] These wells pump 2,000 to 5,000 afy for municipal supply. No known contamination would be affected by the increased creek flows. However, if increased creek flow did encounter previously unknown contamination, water quality at the neighboring wells could be adversely affected. Implementation of the following mitigation measure would ensure that no impacts to neighboring production wells would occur as a result of the project.

Mitigation Measures

M-HYDRO-3: Prior to implementing the project, the District will conduct a Phase I Site Assessment for hazardous waste and soil contamination for the portion of the Santiago Creek between Hart Park and the SAR. The District will comply with recommendations contained in the Site Assessment to avoid transporting contamination.

M-HYDRO-4: If the Site Assessment identifies the potential for contaminated soils to be transported by the project, the District will either redesign the project to avoid this area or remediate the contamination prior to implementation of the project such that no adjacent properties or the groundwater basin would be adversely affected.

M-HYDRO-5: The District will notify the owners of active production wells within 500 feet of the lower reach of Santiago Creek between Hart Park and the SAR of the District's intent to increase its recharge of groundwater within Santiago Creek. In coordination with these well owners, the District will develop and implement a groundwater monitoring plan similar to the existing plan for the upper reach of the creek that will provide early detection of potential changes to groundwater chemistry resulting from the project. If the monitoring plan identifies adverse effects to water chemistry, the recharge operations causing the effect will cease. The results from periodic groundwater monitoring will be submitted to the RWQCB.

[18] OCWD, April, 1999.

M-HYDRO-6: If adverse effects to groundwater quality caused by the recharge project are identified during groundwater monitoring, recharge operations will cease until the condition is resolved.

Significance after Mitigation: Less than significant.

4.3 Biological Resources

4.3.1 Setting

This description of biological resources in the lower Santa Ana River is organized as follows:

- Historic Overview
- Current Conditions
  - Site description
  - Plant Communities
  - Wildlife
  - Macroinvertebrates and Fish
  - Special-status Species

Historic Overview

Southern California Coastal Drainages

The Los Angeles Basin is located in the southern California coastal drainage and is comprised of the Los Angeles, San Gabriel, and Santa Ana Rivers. The mild, Mediterranean climate of the L.A. Basin coastal plains fluctuated little over the last few million years.[1] Coastal mountain streams, such as the Santa Ana River (SAR), had perennial flow that often dried up at the foot of the mountains and preceded underground through the alluvial fans, sometimes reemerging at the surface closer to the ocean.[2] Riparian forests existed along stream boundaries.

Historically, the SAR watershed was comprised of about 3,900 miles of perennial and intermittent streams and only one large freshwater lake, Lake Elsinore.[3] The SAR was a typical coastal stream, with highly variable spatio-temporal flow conditions among reaches, seasons, and years. The SAR experiences intermittent flows during wet-weather months (November through March) with little or no flows in summer months.[4]

Native Americans inhabited the SAR watershed for at least 12,000 years until 1768 AD, using the river for food and water, but not to irrigate or cultivate crops.[5] The alteration of southern California coastal drainages occurred primarily within the last few hundred years, as activities of European settlers modified water courses and lowered the groundwater table.[6] The amount of

1 Johnson, 1977.
2 Swift et al., 1993.
3 Leidy, 2003.
4 USGS, 2005.
5 SAWPA, 2003.
6 Willett, 1941; Swift et al., 1993.

available riverine habitat declined due to logging, mining, flood control, water storage, and drought.[7]

During the Mission period (1769-1833), Spanish settlers brought aqueducts to California and introduced irrigation to the SAR watershed. During the Rancho period (1833-1850), the City of Santa Ana was founded, and private ranchers developed the watershed floodplains and diverted water from the SAR for small-scale irrigation of gardens. In the post-1850 Pioneer period, colonists settled in what is now Orange County, diverting water from SAR creeks and the mainstem to irrigate large agricultural operations, particularly citrus fields. Population explosions followed the agricultural period, leading to increased industrialization and urbanization in southern California. During the second half of the 20th century, municipalities usurped agriculture as the dominant land use in the SAR watershed.[8]

Today as the SAR flows out of the mountains into the Orange County Coastal Plain, the channel has been concrete-lined for flood control. In a natural environment, the lower SAR would have a much wider channel with meandering reaches due to the flashy flow regime and deposition of sediments. Figure 2-2 shows contrasting aerial photos of the SAR from 1938 through 2002. The coastal plain habitat of the lower SAR has been highly modified and managed by USACE and OCFCD to protect communities from storms and floods.

Wildlife

One of the characteristics of this type of "Mediterranean" climate-driven system is a tendency to generate habitat types in relatively small fragments, which can reestablish themselves after either flood or drought. The wildlife of the SAR watershed were adapted to these unique hydrologic conditions, particularly amphibians. Historically, over 13 amphibian species were found in the SAR, including the arroyo toad (*Bufo microscaphus californicus*), western toad *(Bufo boreas*), coast range newt (*Taricha torosa torosa*), arboreal salamander (*Aneides lugubris*), mountain yellow-legged frog (*Rana muscosa*), and California treefrog (*Hyla cadaverina*).[9] Periodic flood events provided breeding and overwintering habitats for amphibians. However, human development in the watershed dampened the effects of storm and flood events, and the resulting reduction of variable flow conditions degraded native amphibian habitat. This contributed to the decline in amphibian populations in the SAR, which is exacerbated by introduced species such as domestic cats and bullfrogs.

Reptile species historically found in the SAR include the southwest pond turtle (*Clemmys marmorata pallenscens*), two-striped garter snake (*Thamnophis hammondii*), and western aquatic garter snake (*Thamnophis couchi*).[10] Like amphibians, habitat loss and alteration led to declines in reptile species, many of which are listed as species of special concern in the state of California.

Prado Basin can be considered a surrogate for the former complex interspersion of ponds, channels, bars and islands within the SAR drainage basin. These habitats supported at least the

7 Swift et al., 1993.
8 SAWPA, 2003.
9 Leidy, 2003.
10 *Ibid*.

number and diversity of other taxa today extant at Prado Basin. Other habitats, including riparian habitats and adjacent uplands, would probably have supported more species than those present today in the River as a whole.

Fishes

The coastal and inland waters of southern California used to contain endemic communities of native freshwater fishes. This unique community of fishes was relatively small due to the topographic relief of southern California, which isolated fishes from other communities in adjacent continental areas.[11] There were 38 native freshwater taxa in this area,[12] all of which are either extirpated or have been severely reduced in numbers in their native range and are protected under federal or state conservation laws.[13] California has one of the largest numbers of non-native fishes in the United States, with over 100 introduced species identified in southern California alone, more than any other part of the state.[14]

The native fishes of the SAR typically were found throughout the Los Angeles Basin. Historically, there were at least eight endemic fish species in the SAR.[15] High-gradient upland stream habitats were inhabited by steelhead trout (*Oncorhynchus mykiss*), Santa Ana speckled dace (*Rhinichthys osculus*), and in larger rivers, Santa Ana suckers (*Catostomus santaanae*). Streams in low-gradient coastal plains were occupied primarily by arroyo chub (*Gila orcutti*), Pacific brook lamprey (*Lampetra pacifica*), unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), and Santa Ana suckers. The gravelly substrate and spring flows in low-gradient areas provided suitable habitat for spawning adults and juveniles of anadramous species such as steelhead and lamprey.

Currently in southern California, endemic freshwater fishes, such as the Santa Ana sucker and speckled dace, continue to be found only in the rivers of the Los Angeles Basin, including the SAR. However, as discussed later in this section, there is no critical habitat in the SAR for native fishes such as the Santa Ana sucker, and there are no native fishes found within the District's operations area on the river. **Table 4.3-1** lists native and introduced fishes of the SAR, as determined by Swift et al.[16]

Current Conditions

Methodology

References used in the preparation of this section include information from the following reports and surveys:

- Reconnaissance-level surveys conducted by ESA on December 2, 2002, May 20, 2003, and March 22, 2005;

[11] Culver and Hubbs, 1917; Minckley et al, 1986; and Swift et al, 1993.
[12] Moyle and Williams, 1990.
[13] Miller et al, 1989; Williams et al, 1989.
[14] Moyle, 1976a; Williams and Jennings, 1991.
[15] Swift et al., 1993.
[16] *Ibid*.

TABLE 4.3-1
NATIVE AND NON-NATIVE FISHES OF THE SANTA ANA RIVER

Species		Native or Introduced	Current Status
Common Name	**Scientific Name**		
Pacific lamprey	*Lampetra tridentate*	Native*	
Pacific brook lamprey	*Lampetra pacifica*	Native	Extirpated
Steelhead trout [1]	*Oncorhynchus mykiss*	Native*	FE
Rainbow trout [2]	*Oncorhynchus mykiss*	Native	
Arroyo chub	*Gila orcutti*	Native	CSC
Santa Ana speckled dace	*Rhinichthys osculus*	Native	CSC
Santa Ana sucker	*Catostomus santaanae*	Native	FT
California killifish	*Fundulus parvipinnis*	Native	
Unarmored threespine stickleback	*Gasterosteus aculeatus williamsoni*	Native*	FE/CE
Prickly sculpin	*Cottus asper*	Native*	
Striped mullet	*Mugil cephalus*	Native*	
Cutthroat trout	*Oncorhynchus clarki*	Introduced*	
Golden trout	*Oncorhynchus aguabonita*	Introduced	
Brown trout	*Salmo trutta*	Introduced*[a]	
Common carp	*Cyprinus carpio*	Introduced	
Goldfish	*Carassius auratus*	Introduced	
Sacramento blackfish	*Orthodon microlepidotus*	Introduced	
Golden shiner	*Notemigonus crysoleucas*	Introduced	
Fathead minnow	*Pimephales promelas*	Introduced	
Yellow bullhead	*Ameiurus natalis*	Introduced	
Brown bullhead	*Ameiurus nebulosus*	Introduced	
Black bullhead	*Ameiurus melas*	Introduced	
Channel catfish	*Ictalurus punctatus*	Introduced	
Western mosquitofish	*Gambusia affinis*	Introduced	
Sailfin molly	*Poecilia latipinna*	Introduced*[b]	
Largemouth bass	*Micropterus salmoides*	Introduced	
Redeye bass	*Micropterus coosae*	Introduced[c]	
Green sunfish	*Lepomis cyanellus*	Introduced	
Bluegill	*Lepomis macrochirus*	Introduced	
Black crappie	*Pomoxis nigromaculatus*	Introduced	
Mozambique tilapia	*Oreochromis mossambicus*	Introduced*	
Redbelly tilapia	*Tilapia zillii*	Introduced	
Threadfin shad	*Dorosoma petenense*	Introduced*	

1 Anadromous form.
2 Resident freshwater form.
* Diadromous species that migrate between freshwater and saltwater.
a Brown trout last documented in SAR by Deinstadt et al (1988).
b Sailfin molly last documented in SAR near Prado reservoir in 1991 (Swift et al., 1993).
c Redeye bass last documented in SAR in 1969 (Shapavalov, 1981).
FE=Federally endangered species; FT=Federally threatened species;
CE=California endangered species; CSC=California species of special concern.

SOURCES: Swift et al., 1993; Zembal and Hoffman, 2000; SAWPA, 2003; LACM, 2005.

- Records from the California Natural Diversity Database (CNDDB)[17] and California Native Plant Society (CNPS) Inventory of Rare and Endangered Vascular Plants of California;[18]
- The Draft EIR/EIS Relocation and/or Protection of the SAR Interceptor;[19]
- The Supplemental Final EIS/EIR for the Prado Basin and Vicinity, Including Reach 9 and Stabilization of the Bluff Toe at Norco Bluffs;[23]
- The Prado Basin Water Conservation Feasibility Study Main Report and Draft EIS/EIR;[24] and
- The Environmental Assessment of the Santa Ana Watershed Program, 2000-2002[25] (See **Appendix L-1**).

Site Description

The portion of the SAR below the Prado Basin, which is primarily in Orange County, is the focus of this report. For purposes of this analysis, the study area includes five stretches of the SAR in the vicinity of the OCWD project area:

- Prado Basin and the SAR to Imperial Highway,
- SAR between Imperial Highway to 17th Street,
- SAR below 17th Street to the Pacific Ocean,
- Anaheim Lake, and
- Santiago Creek.

Figure 4.3-1 delineates these reaches of the SAR.

Prado Basin

The Prado Basin is an 11,400-acre flood basin located north of State Route 91 (SR-91) and west of Interstate 15 (I-15) encompassing Prado Dam's potential inundation area. The area is bordered by the Chino Hills to the west, urban areas to the south and east, and rural dairy farms to the north. Chino Creek, Cucamonga Creek, and Temescal Wash merge with the SAR in this portion of the watershed, just before the river passes through the Santa Ana Mountains. Habitat within the Prado Basin consists primarily of riparian woodlands and wetland areas.

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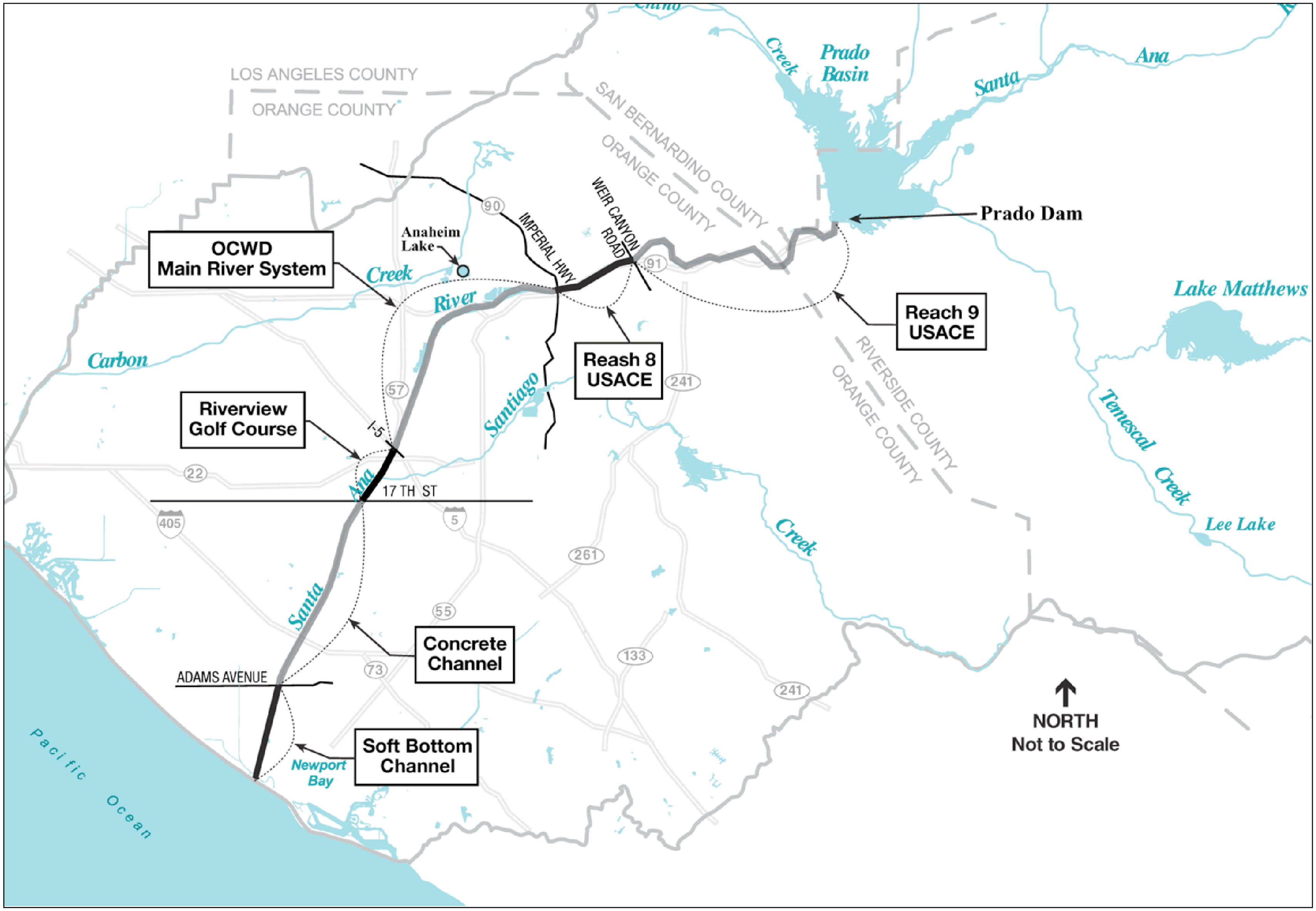
[17] CNDDB, 2005.
[18] CNPS, 2005.
[19] OCSD, 2000.
[23] USACE, November 2001.
[24] USACE, July 2004.
[25] Zembal and Hoffman, 2000.
[27] Orange County Water District Online, Prado Wetlands, http://www.ocwd.com/_html/prado.htm, accessed January 28, 2005.



SOURCE: OCWD, 2005

OCWD . 202291

Figure 4.3-1
Lower Santa Ana River Watershed with Biological Study Reaches

The District owns 2,150 acres behind Prado Dam and maintains 465 acres of constructed wetlands within Prado Basin. The constructed wetlands remove nitrogen from water diverted from the SAR. Approximately 20 tons of nitrate per month are removed through a system of 50 shallow ponds.[27] The water from the wetlands flows back into the Prado Basin above Prado Dam via Chino Creek. In addition to water quality, the wetlands are carefully managed to benefit endangered species, such as the least Bell's vireo (*Vireo bellii pusillus*) and the southwestern willow flycatcher (*Empidonax traillii extimus*). The District has established more than 124 acres within the Prado Basin as protected habitat for the vireo and funds a vireo monitoring program, which includes habitat restoration and brown-headed cowbird (*Mothrus ater*) trapping.[28]

Santa Ana River

The stretch of the SAR that extends from Prado Dam to Weir Canyon Road in Yorba Linda is referred to by the U.S. Army Corp of Engineers (USACE) as Reach 9. Reach 9 provides wetlands and riparian woodland habitat and functions as a wildlife corridor.[31] Below Reach 9, Reach 8 flows through urban areas of increasing density until it reaches the District's recharge facilities beginning at Imperial Highway in Anaheim. Three drop structures constructed by the USACE are located in Reach 8, preventing the upstream movement of fishes from downstream reaches of the SAR to Reach 9 and Prado Basin (Figure 4.3-1).

Below Imperial Highway, the SAR is a 300-foot wide, highly modified waterway with minimal vegetation and habitat. The District's Main River System operations occur within the riverbed from the Imperial Inflatable Dam to the State Route 22 (SR-22) overpass (Figure 4.3-1). Within this reach of the river, the District forms berms from the river sediment to slow the water and promote recharge. Earth moving operations within the river prevent the establishment of riparian or other in-channel wetland habitat. Riverbanks are cleared of vegetation as part of the District's operations as well as for flood control maintenance. Also within this reach, there are 10 drop structures built by OCFCD that impede potential upstream movement of fishes.

From the SR-22 overpass to 17th Street in Santa Ana, the Riverview Golf Course occupies the floodplain, the riverbanks, and the upper terrace of the SAR. The golf course is landscaped with non-native species of turf grass and ornamental trees. A narrow channel, approximately 10-20 feet wide, conveys water through the golf course to 17th Street.

From 17th Street to the Pacific Ocean, the SAR is a nine-mile long, concrete-lined channel constructed by USACE and OCFCD. The channel has a concrete bottom from 17th Street to Adams Avenue and a soft bottom from Adams Avenue to the ocean (Figure 4.3-1). The channel upstream of Adams Avenue is trapezoidal, approximately 300 feet wide, and 30-40 feet deep. The channel lies in an area bounded by urban development on both sides until it spills into the Pacific Ocean.

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[28] Orange County Water District Online, Prado Wetlands, http://www.ocwd.com/_html/prado.htm, accessed January 28, 2005

[31] USACE, 2001.

The Orange County Flood Control District (OCFCD) and USACE periodically remove vegetation from the SAR river channel below OCWD's Main River System for routine flood control maintenance purposes. No riparian habitat is allowed to remain within the main river channel in these areas. OCFCD has been managing the lower SAR for flood control since 1938, and it began improving the reach below 17th Street in 1956.[32] Recently in 2003-2004, USACE dredged the reach below Adams Avenue, excavating to design grade.[33] These activities are in accordance with the USACE Santa Ana River Main Stem Project, which manages Prado Dam and the lower SAR for flood protection. Other activities on the SAR such as water conservation and recreation are secondary management objectives to flood control (see Appendices C and F).

In 2002, Orange County Sanitation District (OCSD) started diverting and treating dry weather flow from the SAR at Plant No. 1, just below Interstate 405 (I-405). Dry-weather flows in the river at this point result from urban runoff and watering activities at the golf course upstream. OCSD's dry weather flow diversions prevent non-point source pollution (from urban runoff) from reaching Newport Beach and Huntington Beach. OCSD discharges the treated water into the ocean through a 4-mile ocean outfall pipe.

Several wetlands exist to the east of the SAR near its mouth, such as Talbert Nature Preserve and the Santa Ana River Salt Marsh, but they are separated from the SAR by concrete flood control levees. The 92-acre SAR Salt Marsh (formerly Newport Slough) was established by the USACE as mitigation for flood control improvements that were part of the Phase 1 General Design Memorandum (GDM) for the Santa Ana River Main Stem Project.[34] West of the SAR mouth is Talbert Marsh, recently restored by Huntington Beach Wetlands Conservancy. Talbert Marsh is 40 feet wide between Pacific Coast Highway (PCH) and OCSD's Plant No. 2. Also west of the SAR mouth on Huntington State Beach is the California least tern ecological reserve, established by the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) in 1964. This 7.5 acre sanctuary is intended to protect a nesting colony of California least terns (*Sterna antillarum browni*), which are considered endangered at both the state and federal level.

Anaheim Lake

Anaheim Lake, located in the City of Anaheim, is a man-made lake and recharge basin, consisting of a 67-acre engineered deep gravel pit with open water. The lake has a maximum depth of approximately 50 feet. The lake is periodically emptied to remove silt from the bottom. The area is surrounded predominantly by industrial development.

Three islands are located within Anaheim Lake. One island is completely flat and covered with non-native grasses. A second island has several Mexican fan palms spaced uniformly with non-native grasses. A third island contains three dead eucalyptus (*Eucalyptus* spp.) trees, one of which hosts a single cormorant (*Phalocrocorax* sp.) nest.[35] This third island is located in the southwest corner of Anaheim Lake, where there is an existing cormorant rookery in the blue gum

32 OCFCD, 1972.
33 Personal communication, Hayley Lovan, USACE Los Angeles District, January 30, 2005.
34 USACE, 1980.
35 Site survey conducted on March 22, 2005 by ESA.

eucalyptus (*Eucalyptus globulus*) that border the lake. Sixty-two cormorant nests were observed at Anaheim Lake in March 2005.

Santiago Creek

Santiago Creek starts in the Santa Ana Mountains, flows through an unincorporated portion of Orange County, and then runs in a generally southwest direction until it empties into the SAR at the Riverview Golf Course in the City of Santa Ana. The creek bed varies from paved to earthen until it passes Hart Park, at which point the creek bed has been lined by USACE with a mix of broken concrete rip rap and gravel. For the most part, the Santiago Creek channel is flat-bottomed and trapezoidal in shape and varies in width from 20 feet to 75 feet. Santiago Creek is located in a heavily developed area and is used as a parking lot in certain locations (e.g., Hart Park). Currently, flows along the creek are dependent on storm water runoff (several storm drains feed the creek) and on the District's intermittent pumping of 15 cubic feet per second (cfs) of water from Santiago Basin for groundwater recharge purposes. Along Santiago Creek, south of Hart Park, a slope stabilization project was installed in several areas. Wire mesh has been placed over the existing banks by OCFCD, and this mesh is held in place with stakes. In several locations, this slope stabilization project is failing.

Plant Communities

Prado Basin and SAR to Imperial Highway

The Prado Basin includes approximately 4,100 acres of riparian habitat. The dominant plant community is willow woodland consisting of several species of willow (*Salix sp*.), mulefat (*Baccharis salicifolia*), California rose (*Rosa californica*), poison hemlock (*Conium maculatum*), wild grape (*Vitis californica*), and hoary nettle (*Urtica dioica* sp. *holosericea*), as well as the invasive giant reed (*Arundo donax*) and cocklebur (*Xanthium strumarium*). The perennial flow of water through the basin has contributed to the formation of extensive wetland habitat. Other habitats in the area include riparian scrub, eucalyptus woodland, coastal sage scrub, oak woodland, freshwater marsh, freshwater ponds, sandy wash, non-native invasive (e.g., giant reed), and riverine.[36]

SAR Reach 9 supports approximately 315 acres of wetland habitat, predominantly willow or cottonwood-willow riparian habitat. Also present in this area are riparian scrub, freshwater pond and marsh, perennial stream and associated sandy wash, and the non-native giant reed and eucalyptus forest plant communities.[37]

Overall, Prado Basin and SAR Reach 9 support over 300 vascular plant species, one-third of which are characteristic of floodplain and riparian habitats, and two-thirds of which are common to both riparian and upland communities. The area also supports approximately 100 species of non-native plants.[38]

[36] USACE, 2001.
[37] *Ibid.*
[38] *Ibid.*

The three drop structures in SAR Reach 8 create sediment bars which support giant reed, mulefat, beggars ticks (*Bidens pilosa*), willow herb (*Epilobium ciliatum*), water smartweed (*Polygonum amphibian emersa*), arroyo willow (*Salix lasiolepis*), and hoary nettle (*Urtica dioica* ssp. *holoserica*).

SAR Between Imperial Highway and 17th Street

Between Imperial Highway and 17th Street, the SAR is a managed, earthen channel that is generally kept free of upland vegetation by OCFCD and OCWD. Non-native grasses and other weedy vegetation within the riverbed and on the levees are subject to removal during routine maintenance activities. Limited instream freshwater marsh vegetation exists consisting of species that rapidly re-establish after disturbance in areas that have pooled or in slow-moving water. Typical plant species include cattail (*Typha* spp.), bulrush (*Scirpus* spp.), water smartweed, water primrose (*Ludwigia peploides*) and duckweed (*Lemna minor*). The ten drop structures in this reach create sediment bars which support giant reed, mulefat, beggars ticks, willow herb, arroyo willow, and hoary nettle. From SR-22 to 17th Street, the river is located within a golf course consisting of manicured turf grass and other ornamental non-native vegetation.

SAR Below 17th Street to the Ocean

The reach between 17th Street and Adams Avenue was lined with concrete by USACE and has no vegetation. Between Adams Avenue and the ocean sparse growth of non-native grassland species occurs on the channel bottom. Small willow saplings and giant reed canes periodically occur in this stretch of the SAR, however, their distribution is patchy and disjunct. Such intermittent vegetation growth becomes temporarily established at different sections of this reach due to the accumulation of sediment but is subject to eradication by storm flows or channel maintenance practices. USACE and OCFDC routinely remove vegetation from the river channel, preventing substantial development of riparian habitat. In 2003-2004, USACE dredged the reach below Adams Avenue, excavating to design grade, removing all vegetation.[39,40]

Santa Ana River Marsh Restoration. The Santa Ana River Salt Marsh is a restored wetland encompassing 92 acres east of the mouth of the SAR. The restoration of this marsh was incorporated into the USACE's Phase I GDM for the Santa Ana River Main Stem Project as mitigation for removing eight acres of salt marsh during the widening of the SAR mouth and as habitat for endangered bird species (see Appendix F).[41] Prior to restoration, vegetation in the salt marsh was degraded due to reductions in tidal elevations as dikes were built to facilitate the suburban development of surrounding areas. The remnant native salt marsh species found in the wetland include alkali heath (*Frankenia grandifolia*), saltgrass (*Distichlis spicata*), and pickleweed (*Salicornia virginica*).[42]

[39] USACE, 2002.
[40] Personal communication, Hayley Lovan, USACE, Los Angeles District, January 30, 2005.
[41] USACE, 1980.
[42] USACE, 1987.

Anaheim Lake

At Anaheim Lake, on-site vegetation consists of ornamental landscape trees, shrubs, and groundcovers. Much of the site consists of non-native grassland, especially the outer boundaries of the site and the tops of the three main islands within Anaheim Lake. Trees at the site are predominantly located around the perimeter with seven trees situated on the two southern islands. Plant species observed on the site include dwarf nettle (*Uritica urens*), storksbill (*Erodium* sp.), mustard (*Brassica* sp.), slender oats (*Avena barbata*), ripgut brome (*Bromus diandrus*), crowfoot grass (*Dactyloctenium aegyptium*), jimson weed (*Datura* sp.), wild radish (*Raphanus* sp.), Bermuda grass (*Cynodon dactylon*), California dandelion (*Taraxacum californicum*), Washington fan palm (*Washingtonia filifera*), blue gum eucalyptus, pine (*Pinus* sp.), tobacco (*Nicotiana* sp.), and Indian fig (*Opuntia ficus-indica*). Vegetation at this site is limited by management practices and by the fluctuating water level within the lake.

Santiago Creek

Santiago Creek is located within a heavily developed area and is subject to small and intermittent flows, and thus a mix of non-native grasses and vegetation with some riparian habitat occurs throughout the creek. Intermittent flows from the adjoining storm drain system and from Santiago Basin and Burris Pit have allowed minor amounts of riparian/wetland vegetation to become established within the creek bed but not along the banks. In addition, much of the vegetation within the creek bed shows signs of repeated disturbance. Species observed along the banks and within the creek bed of Santiago Creek, including dwarf nettle, giant reed, California sycamore (*Platanus racemosa*), mustard (*Brassica* sp.), slender oats, blue gum eucalyptus, castor bean (*Ricinus communis*), hairy senna (*Senna multiglandulosa*), coast live oak (*Quercus agrifolia*), heliotrope (*Heliotropum curavassicum*), cocklebur, ripgut brome, sow thistle (*Sonchus oleraceus*), iceplant (*Mesembryanthemum* sp.), oxalis (*Oxalis pes-caprae*), English ivy (*Hedera helix*), Mexican elderberry (*Sambucus mexicana*), mugwort (*Artemisia douglasiana*), common plantain (*Plantago major*), California poppy (*Eschscholzia californica*), mulefat, toyon (*Heteromeles arbutifolia*), walnut (*Juglans californica* var. *californica*), black cottonwood (*Populus balsamifera* sp. *trichocarpa*), mock orange (*Pittosporum undulatum*), bougainvillea (*Bougainvillea spectabilis*), pyracantha (*Pyrancantha angustifolia*), pine, tree tobacco (*Nicotiana glauca*), and Indian fig. At Santiago Park, evidence of a riparian habitat restoration project exists with willow, sycamore, and coast live oak saplings planted with fountain grass (*Pennisetum setaceum*) along the banks of Santiago Creek.

Sensitive Plant Communities

Several plant communities that occur in the vicinity of the lower SAR are considered sensitive by CDFG on the basis of substantially reduced area or number of natural occurrences or recognized threats to their existence. The CNDDB lists plant species and natural communities that occur within each U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle. The CNDDB documents several types of riparian forest and scrub in the quadrangles that include the SAR from Prado Basin to the ocean.[43] These communities are summarized in **Table 4.3-2.** Additional

[43] The USGS 7.5-minute quadrangles that include Prado Basin and the lower Santa Ana River in Orange County are: Corona North, Prado Dam, Black Star Canyon, Orange, Yorba Linda, Anaheim, and Newport Beach.

[47] Zembal and Hoffman, 2000.

TABLE 4.3-2
SPECIAL STATUS SPECIES REPORTED OR POTENTIALLY OCCURRING IN THE SANTA ANA RIVER PROJECT AREA, ORANGE COUNTY

Common name	*Scientific name*	Listing Status USFWS/CDFG/CNPS	Habitat Requirements
Plants			
Braunton's milk-vetch	*Astragalus brauntonii*	FE/--/List 1B	Closed-cone conifer forest, chaparral, coastal scrub, and valley foothill grasslands
San Fernando Valley spineflower	*Chorizanthe parryi* var. *fernandina*	FC/CE/List 1B	Sandy soils in coastal scrub
Santa Ana River woolystar	*Eriastrum densifolium ssp sanctorum*	FE/CE/List 1B	Coastal sage scrub, chaparral
Chaparral sand-verbena	*Abronia villosa* var. *aurita*	--/--/List 1B	Chaparral, coastal scrub, sandy areas
Coulter's saltbush	*Atriplex coulteri*	--/--/List 1B	Coastal bluff scrub, coastal dunes, coastal scrub, valley & foothill grassland in alkaline or clay soils
Crownbeard	*Verbesina dissita*	FT/CT/List 1B	Primarily on steep, rocky, north-facing slopes within 1.5 miles of the ocean in a maritime chaparral plant community. The densest populations are found on shaded slopes under a layer of shrubs.
South Coast saltscale	*Atriplex pacifica*	FSC/--/List 1B	Coastal bluff scrub, coastal dunes, playas, chenopod scrub
Davidson's saltscale	*Atriplex serenana var davidsonii*	--/--/List 1B	Coastal bluff scrub, coastal scrub
Plummer's mariposa lily	*Calochortus plummerae*	--/--/List 1B	Coastal scrub, chaparral, valley and foothill grassland, cismontane woodland, lower coniferous forest
Intermediate mariposa lily	*Calochortus weedii* var. *Intermedius*	--/--/List 1B	Coastal scrub, chaparral, valley and foothill grassland
Southern tarplant	*Centromadia parryi* ssp. *Australis*	--/--/List 1B	Often in disturbed sites near the coast amid marshes and margins of swamps, valley, foothill grassland & vernal pools
Tecate cypress	*Cupressus forbesii*	--/--/List 1B	Coniferous forest and chaparral, especially on north-facing slopes with groves associated with chaparral
Many-stemmed dudleya	*Dudleya multicaulis*	FSC/--/List 1B	Chaparral, coastal scrub, valley and foothill grassland
Los Angeles sunflower	*Helianthus nuttallii* ssp. *parishii*	FSC/--/List 1A	Coastal salt and freshwater marshes and swamps
Heart-leaved pitcher sage	*Lepichinia cardiophylla*	--/--/List 1B	Closed-cone coniferous forest, chaparral, cismontane woodland from 555-1,370 meters
Heart-leaved pitcher sage	*Lepichinia cardiophylla*	--/--/List 1B	Closed-cone coniferous forest, chaparral, cismontane woodland from 555-1,370 meters
Coast woolly-heads	*Nemacaulis denudata* var. *denudata*	--/--/List 1B	Coastal dunes
Crownbeard	*Berbesina dissita*	FT/CT/List 1B	Primarily on steep, rocky, north-facing slopes within 1.5 miles of the ocean in a maritime chaparral plant community. The densest populations are found on shaded slopes under a layer of shrubs.

TABLE 4.3-2
SPECIAL STATUS SPECIES REPORTED OR POTENTIALLY OCCURRING IN THE SANTA ANA RIVER PROJECT AREA, ORANGE COUNTY (CONT.)

Common name	Scientific name	Listing Status USFWS/CDFG/CNPS	Habitat Requirements
Invertebrates			
San Diego fairy shrimp	*Branchinect sandiegonensis*	FE/--	Inhabits vernal pools on mesas and floodplains in San Diego, Orange and Riverside counties
Mimic tryonia	*Tryonia imitator*	FSC/--	Coastal lagoons, estuaries and salt-marshes
Fish			
Santa Ana sucker	*Catostomus santaanae*	FT/CSC	Los Angeles Basin coastal streams
Santa Ana speckled dace	*Rhinichthys osculus*	FSC/CSC	Found in slow-moving or backwater streams with mud or sand substrates
Arroyo chub	*Gila orcutti*	FSC/CSC	Similar to speckled dace
Amphibians			
Western spadefoot toad	*Scaphiopus hammondii*	FSC/CSC	Floodplains and grassland pools
Arroyo toad	*Bufo microscaphus californicus*	FE/CSC	Semi-arid, near washes or intermittent streams, including valley-foothill and desert riparian
California red-legged frog	*Rana aurora draytonii*	FT/CSC	Shrubby riparian vegetation (e.g., arroyo willow) associated with deep, still, or slow-moving water
Coast range newt	*Taricha torosa torosa*	--/CSC	Coastal drainages and in terrestrial habitats when migrating over 1 km to breed in ponds, reservoirs & slow-moving streams
Reptiles			
Southwestern pond turtle	*Clemmys marmorata pallida*	FSC/CSC	Permanent freshwater ponds and slow streams edged with sandy soils for laying eggs
Northern red-diamond rattlesnake	*Crotalus ruber ruber*	FSC/CSC	Chaparral, woodland, grassland and desert areas
San Diego horned lizard	*Phrynosoma coronatum blainvillei*	FSC/CSC	Coastal sage scrub, arid chaparral
Coast patch-nosed snake	*Salvadora hexalepis virgultea*	FSC/CSC	Use small mammal burrows for refuge/overwintering in brushy or shrubby vegetation in desert sinks to around 7,000’
Two-striped garter snake	*Thamnophis hammondii*	--/CSC	In or near permanent fresh water, often along streams with rocky beds and riparian growth from sea to about 7,000’
Orange-throated whiptail	*Cnemidophorus hyperythrus*	FSC/CSC	Coastal scrub, chaparral, and valley-foothill hardwood habitats.
Birds			
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	--/CE	Riparian forests along flood bottoms of large river systems
Willow flycatcher	*Empidonax traillii*	--/CE	Willow thickets on edge of wet meadows, ponds or backwaters from 2,000’-8,000’
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE/--	Nests in riparian woodlands, but also found in low, brushy areas, especially near water.
California black rail	*Laterallus jamaicensis coturniculus*	FSC/CT	Salt-marshes bordering large bays
Belding’s savannah sparrow	*Passericulus sandwichensis beldingi*	FSC/CE	Coastal salt-marshes
Coastal California gnatcatcher	*Polioptila californica californica*	FT/CSC	Coastal sage scrub
Light-footed clapper rail	*Rallus longirostris levipes*	FE/CE	Salt-marshes with cordgrass and pickleweed
California least tern	*Sterna antillarum browni*	FE/CE	Coastal beaches and sandbars

TABLE 4.3-2
SPECIAL STATUS SPECIES REPORTED OR POTENTIALLY OCCURRING IN THE SANTA ANA RIVER PROJECT AREA, ORANGE COUNTY (CONT.)

Common name	Scientific name	Listing Status USFWS/CDFG/CNPS	Habitat Requirements
Least Bell's vireo	*Vireo bellii pusillus*	FE/CE	Low riparian vegetation near river bottoms
Golden eagle	*Aquila chrysaetos*	CSC/3511	Open hills with grassland, open scrub, adequate prey base, large trees or cliffs for nesting
Bald eagle	*Haliaeetus leucocephalsu*	FT(AD)/CE 3511	Nests in trees or cliffs near seacoasts, large lakes, rivers, or swamps.
Cooper's hawk	*Accipiter cooperi*	--/CSC	Nests in riparian growths of deciduous trees and live oak woodlands.
Long-eared owl	*Asio otus*	--/CSC	Only nesting birds are protected
Western burrowing owl	*Athene cunicularia hypugea*	FSC/CSC	Nests in mammal burrows in open, sloping grasslands
Coastal cactus wren	*Campylorhynchus brunneicapillus couesi*	--/CSC	Coastal sage scrub
Yellow-breasted chat	*Icteria virens*	--/CSC	Riparian corridors with willows or other dense foliage
Tricolored blackbird	*Agelaius tricolor*	FSC/CSC	Riparian thickets and emergent vegetation
Mammals			
Pacific pocket mouse	*Perognathus longimembris pacificus*	FE/CSC	Narrow coastal plains
San Diego desert woodrat	*Neotoma lepida intermedia*	FSC/CSC	Chaparral, coastal sage scrub, and desert habitats, with preference for moderate to dense canopies especially in rock outcrops/cliffs/slopes.
Pallid bat	*Antrozous pallidus*	--/CSC	Open, dry habitats with rocky outcrops, cliffs, caverns, and crevices for roosting, most commonly in deserts, grasslands, and shrublands, in addition to woodlands & forests
California mastiff bat	*Eumops perotis californicus*	FSC/CSC	Breeds in rugged, rocky canyons and forages in a variety of habitats. Roosts in crevices in cliff faces, high buildings, trees & tunnels

Name	Global Rank	State Rank
SENSITIVE PLANT COMMUNITIES		
California walnut woodland	G2	S2.1
Canyon live oak ravine forest	G3	S3.3
Riversidian alluvial fan sage scrub	G1	S1.1
Southern coast live oak riparian forest	G4	S4
Southern coastal salt marsh	G2	S2.1
Southern cottonwood willow riparian forest	G3	S3.2
Southern dune scrub	G1	S1.1
Southern foredunes	G2	S2.1
Southern interior cypress forest	G2	S2.1
Southern mixed riparian forest	G2	S2.1
SENSITIVE PLANT COMMUNITIES		
Southern sycamore alder riparian woodland	G4	S4
Southern willow scrub	G3	S2.1
Valley needlegrass grassland	G1	S3.1

STATUS CODES:

Federal Categories (U.S. Fish and Wildlife Service)
FE = Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FPE = Proposed for Listing as Endangered
FPT = Proposed for Listing as Threatened
FC = Candidate for Federal Listing
FSC = Federal Species of Concern
FSLC = Federal Species of Local Concern
BPA = Federal Bald Eagle Protection Act
AD = Proposed Delisting

State Categories (California Dept. of Fish and Game)
CE = Listed as Endangered by the State of California
CT = Listed as Threatened by the State of California
CR = Listed as Rare by the State of California
3511 = Fully Protected Species
*= Special Animals
CSC = California Species of Special Concern

The Nature Conservancy (TNC) – Global Heritage Program rarity ranks (for sensitive plant communities)
G1: Fewer than 6 viable occurrences worldwide and/or 2000 acres
G2: 6-20 viable occurences worldwide and/or 2000-10,000 acres
G3: 21-100 viable occurrences worldwide and/or 10,000-50,000 acres
G4: Greater than 100 viable occurrences worldwide and/or greater than 50,000 acres

Threat Ranks
0.1: Very threatened
0.2: Threatened
0.3: No current threats known

State Rarity Ranks:
S1: Fewer than 6 viable occurrences statewide and/or 2000 acres
S2: 6-20 viable occurences statewide and/or 2000-10,000 acres
S3: 21-100 viable occurrences statewide and/or 10,000-50,000 acres
S4: Greater than 100 viable occurrences statewide and/or greater than 50,000 acres

California Native Plant Society (CNPS)
List 1A = Plants presumed extinct in California
List 1B = Plants rare, threatened, or endangered in California and elsewhere
List 2 = Plants rare, threatened, or endangered in CA

SOURCE: CNDDB, 2005; CNPS, 2005.

information about sensitive plant communities in the study area is provided in the Special Status Species section of this chapter.

Invasive Arundo Removal

The giant reed, *Arundo donax*, is an exotic invasive species, native to China, which was introduced into the SAR for bank stabilization and erosion control.[47] *Arundo* uses large quantities of water compared to native species, outcompetes native vegetation that provides habitat for endangered and threatened species, and is a fire hazard. Thus, the eradication of *Arundo* is a priority for water agencies such as OCWD, flood control districts, environmental groups, and other stakeholders in the SAR watershed. There are approximately 10,000 acres of *Arundo* in the SAR watershed, which has been estimated to remove over 30,000 afy from the river through evapotranspiration.[48] The removal of 1,000 acres of Arundo from the SAR would conserve approximately 3,800 afy, enough water to supply 20,000 residents for one year.[49]

In 1995, the District contributed $1 million to the USFWS for removal of *Arundo* along the SAR and within tributaries such as Santiago Creek. This contribution was compensation for raising the conservation pool behind Prado Dam to its current elevation of 505 feet. In addition, "Team Arundo" formed in 2002 with a five-year plan to remove *Arundo* from the SAR watershed (see **Appendix L-5**). The members of "Team Arundo" are the Santa Ana Watershed Project Authority (SAWPA), Riverside County Parks and Open Space District, the Santa Ana Watershed Association of Resource Conservation Districts (SAWA), and Orange County Resources and Development Management Department (RDMD). The removal efforts of "Team Arundo" are funded by the Costa Machado Water Bond Act of 2000 (Proposition 13). Proposition 13 funds

48 Santa Ana Watershed Project Authority, http://www.sawpa.org/arundo/, accessed on January 26, 2005.
49 Zembal and Hoffman, 2000.
52 *Ibid*; USACE, 2001.

the Southern California Integrated Watershed Program (SCIWP), which provides funding to SAWPA for the purposes of rehabilitating and improving the SAR watershed, including the removal of non-native plants. “Team Arundo” will remove (and maintain) 3,000 acres of *Arundo* and other exotic plants in the SAR.

Wildlife

Prado Basin and SAR to Imperial Highway

Prado Basin and SAR Reach 9 support valuable and well-established wildlife habitats. The area functions as a wildlife corridor and major breeding area for numerous riparian species. There are seven amphibian species, 20 reptile species, 23 species of mammals, and over 200 species of birds in this portion of the SAR.[52] See Appendix L-1 for a recent list of birds observed by Zembal and Hoffman.[53]

Amphibian and reptile species located in Prado Basin and SAR Reach 9 during site surveys conducted in December 2002, include Pacific treefrog (*Hyla regilla*), African clawed frog (*Xenopus laevis*), western toad, western fence lizard (*Sceloporus occidentalis*), and gopher snake (*Pituophis melanoleucus*). Of the birds found in the project area, American crow (*Corvus brachyrhynchus*), house finch (*Carpodacus mexicanus*), barn swallow (*Hirundo rustica*), European starling (*Sturnus vulgaris*), mourning dove (*Zenaida macroura*), song sparrow (*Melospiza melodia*), brown-headed cowbird, and bushtit (*Psaltriparus minimus*) are perhaps the most common. Many bird species are known to breed and forage in Prado Basin and the river. Of particular interest is the least Bell's vireo, a federally-endangered species, which nests in the basin. Coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), deer mouse (*Peromyscus maniculatus*), and California ground squirrel (*Spermophilus beecheyi*) are among the more common mammals located in the area.[54]

The three drop structures in Reach 8 and additional structures downstream provide sediment bars which are vegetated and used by nesting spotted sandpipers (*Actitis macularia*). The pools are used for resting and foraging by other species of waterfowl as well.

SAR Between Imperial Highway and 17th Street

The SAR from Imperial Dam to 17th Street in Santa Ana provides limited habitat value for wildlife. The northern portion of this reach is continually managed for maximum percolation by the District’s earthmoving equipment (bulldozers, etc.), while the southern portion is maintained as a golf course. Surrounding development, highways, and city streets pose constraints on animal movement into or out of the site. Wildlife using the main channel are limited to those species adapted to landscapes highly altered by humans and tolerant of human presence, such as the western toad, red-tailed hawk (*Buteo jamaicensis*), great blue heron (*Ardea herodias*), American coot (*Fulica americana*), gull (*Larus* sp.), cormorant, and raccoon (*Procyon lotor*).

The Five Coves/Lincoln/Burris Pits, which begin at Highway 91 in the north and extend south to Ball Road, are relatively more complex and productive aquatic systems. These shallow recharge

53 Zembal and Hoffman, 2000.

54 *Ibid* ; USACE, 2001.

basins along the SAR are similar to and connected with the Off-River System. They are highly dynamic and ecologically represent habitats as variable as those in Prado Basin are static. A Forster's tern (*Sterna forsteri*) breeding colony (breeding colonies for this species are included in the California Special Animals List) in Burris Pit was first noted in 1999. Its history has been documented by Willick, and his reports describe the ephemeral avian habitats in some detail.[55] Forster's terns prefer vegetated ground for nesting, and the species has done well on islands or bars which stay above water long enough until the vegetation becomes too dense. In 2004, Willick observed the endangered California least tern nesting on a recently exposed sandbar which was devoid of vegetation initially, a situation typical for the species. The changing water conditions can thus support either species (as well as others such as American avocet [*Recurvirostra Americana*]) in patterns which vary from year to year. This type of habitat also may be present, in very limited amounts, on the berms and levees within the river channel itself.[56]

SAR Below 17th Street to the Ocean

Below 17th Street, the SAR has limited habitat value for wildlife because this stretch is primarily concrete and lacks the potential for significant vegetation to become established for any length of time. The USACE routinely dredges the soft-bottom portion of the channel below Adams Avenue.[57]

The density of surrounding development and the presence of several highways and many large city streets between the site and remaining fragments of natural habitat pose constraints on animal movement into or out of this area. The nearest areas containing natural habitat that could provide habitat connectivity lie at the end of the SAR near the Pacific Ocean. In a survey conducted for the USACE in 2002, 54 bird species were observed in the emerging riparian areas of the SAR below Interstate 405 (I-405), with the most abundant species being the brown-headed cowbird.[58] The abundance of cowbirds are one indication that wildlife in the SAR below Adams Avenue are adapted to landscapes highly altered by humans and tolerant of human presence, such as the black phoebe (*Sayornis nigricans*), rock dove (*Columbia livia*), gull, and western scrub jay (*Aphelocoma californica*). These species were observed during the field survey of the project area. These animals are all typical of urbanized areas and often nest in ornamental trees and shrubs or underneath structures, feeding on insects and fruit in nearby vegetation.

Some areas adjacent to the mouth of the SAR are managed for wildlife habitat. The Santa Ana River Salt Marsh, a degraded tidal saltmarsh, provides feeding habitat for the federally endangered California least tern and the state endangered Belding's savannah sparrow (*Passerculus sandwichensis beldingi*).[59] Ninety-six species of birds were observed in the SAR Salt Marsh in 1995-1996, including waterfowl, shorebirds, gulls, terns, passerines, raptors, and

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55 Willick, 2004.

56 The District recognizes its stewardship responsibilities in a variety of programs discussed elsewhere in the chapter (e.g., at Prado Basin and as a participant on the Santa Ana River Watershed Program). In response to this recent information on least and Forster's terns at Burris Pit, the District will consult with CDFG and USFWS to maximize beneficial uses of the SAR and avoid the "take" of sensitive and endangered species.

57 USACE, 2002.

58 Griffith Wildlife Biology, 2002.

59 Kelsey and Collins, 1997.

wading birds, with some species potentially breeding.[60] The most common species were American wigeon (*Anas americana*), semipalmated plover (*Charadrius semipalmatus*), willet (*Catoptrophorus semipalmatus*), and western sandpiper (*Calidris mauri*).

Anaheim Lake

At Anaheim Lake, the wildlife species that occur on-site include American crow, American white pelican (*Pelicanus erythrorhynchos*), American coot, cormorant, great egret (*Ardea alba*), snowy egret (*Egretta thula*), great blue heron, and other common waterfowl. Both red-tailed hawk and turkey vulture (*Cathartes aura*) were observed perching and hunting on the site, but no nests for these species were observed. A rookery of at least 62 cormorant nests exists along the southwestern boundary of the site in several large eucalyptus trees. There is one nest in the dead eucalyptus trees on the southwest island, but in March 2005, this nest was not occupied. There was extensive nesting activity in the mainland trees, but no cormorants were observed landing on or occupying the trees or nest on the island.

Santiago Creek

Santiago Creek has marginal habitat value. The density of surrounding development and the presence of several highways and many large city streets between the site and remaining fragments of natural habitat pose severe constraints on animal movement, with the exception of birds, into or out of this area. Wildlife using the site is predominantly limited to those species adapted to landscapes highly altered by humans and tolerant of human presence, such as the American crow, rock dove, western scrub jay, skunk, and raccoon. These species were among those observed during the field survey of the project area. These animals are all typical of urbanized areas and often nest in ornamental trees and shrubs or underneath structures, feeding on insects and fruit in nearby vegetation, and in trash in backyards and parks.

Macroinvertebrates and Fishes

Two macroinvertebrate species, the freshwater clam (*Anodonta* spp.) and crayfish (*Procambarus* spp.), are common in the SAR, primarily in the Prado Basin.[61] Along with fish, macroinvertebrates are an important component of the aquatic food web. Predators of invertebrates include bullfrogs (*Rana catesbeiana*), red-shouldered hawks (*Buteo lineatus*), herons, great egrets (*Ardea albus*), coyotes (*Canis latrans*), raccoons, and human beings. Two special-status invertebrates possibly occur in the lower SAR, San Diego fairy shrimp (*Branchinect sandiegonensis*) and mimic tryonia (*Tryonia imitator*) (Table 4.3-2).

Due to habitat alteration and the introduction of exotic species, the fishes of the SAR are predominantly non-native species.[62] At least 33 fish species have been introduced into the SAR, some of which are listed in Table 4.3-1.[63] Fourteen fish species commonly are found in the Prado Basin and Reach 9, including the fathead minnow (*Pimephales promelas*), western mosquitofish (*Gambusia affinis*), and common carp (*Cyprinus carpio*). There are few species of fish inhabiting

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60 *Ibid.*

61 Zembal and Hoffman, 2000.

62 *Ibid.*

63 SAWPA, 2003.

the SAR below Reach 9. The channel is highly modified and is subject to regular disturbance by USACE and OCFCD flood control activities and water diversion by OCWD and OCSD. Any fishes found below Reach 9 are likely migrants from upstream or the Pacific Ocean (see Appendix E).[64] The likelihood of establishing breeding populations of fishes in this stretch of the SAR is very small.[65]

Twenty-seven saltwater fish species have been captured in the SAR Salt Marsh at the mouth of the SAR. In 1996-1997, the five most common fish species in the salt marsh were arrow goby (*Clevelandia ios*), California killifish (*fundulus parvipinnis*), diamond turbot (*Hypsopsetta guttulata*), California halibut (*Paralichthys californiensis*), and topsmelt (*Atherinops affinis*).[66]

Three endemic freshwater fish species are still present in the SAR: the Santa Ana sucker, Santa Ana speckled dace, and Arroyo chub. The Santa Ana sucker and speckled dace are generally found between Mt. Rubidoux to the north of Prado Basin and Imperial Highway to the south of Prado Dam but upstream of the District's operations. All three fishes are species of special concern at the federal or state level (Table 4.3-1 and Table 4.3-2) and are discussed in greater detail below.

Special-Status Species

Special-status species are those plants and animals that, because of their recognized rarity or vulnerability to various causes of habitat loss or population decline, are recognized for protection by federal, state, or local agencies. Some of these species receive specific protection that is defined by federal or state endangered species legislation. Others have been designated as "sensitive" on the basis of adopted policies and expertise of state resource agencies or organizations with acknowledged expertise, or policies adopted by local governmental agencies such as counties, cities, and special districts to meet local conservation objectives. These species are referred to collectively as special status species.

A list of special-status plant and animal species reported to occur in the vicinity of the project site was compiled on the basis of data in the California Natural Diversity Database,[67] consultation with California Native Plant Society (CNPS) literature,[68] consultation with the USFWS, consultation with icthyologists (e.g., Thomas R. Haglund, Ph.D.), and biological literature of the region (e.g., Swift et al., 1993; Zembal and Hoffman, 2000). Other consulted references include the *Prado Basin Water Conservation Feasibility Study, July 2004*, the *Draft EIR/EIS Relocation and/or Protection of the SAR Interceptor*, and the *Supplemental Final EIR/EIS for Prado Basin and Vicinity, Including Reach 9 and Stabilization of the Bluff Toe at Norco Bluffs.* Table 4.3-2 summarizes the special-status species that potentially occur in the study area. However, many species have been extirpated from the SAR, as noted by the CNDDB and CNPS.

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64 Haglund and Baskin, 2005.
65 Personal communication, Thomas R. Haglund.
66 Reish, 1997.
67 CNDDB, 2005.
68 Skinner and Pavlik, 1994.

The Santa Ana woolly star (*Eriastrum densifolim*), a federally endangered species, used to be established in the SAR and its tributaries, but is considered extirpated from Orange and Riverside Counties due to urbanization.[69] In Prado Basin, the federally threatened bald eagle (*Haliaeetus leucocephalus*) was observed during the winter of 2000-2001.[70] Two other federally endangered birds, the least Bell's vireo and southwestern willow flycatcher (*Empidonax traillii extimus*), and the state endangered yellow-billed cuckoo (*Coccyzus americanus*), have been found in the Basin as well.[71] Cormorant rookeries exist at Anaheim Lake, and, as noted above, both Forster's and least terns have been recently reported from Burris Pit.

The federally endangered arroyo toad (*Bufo microscaphus californicus*) and federally threatened California red-legged frog (*Rana aurora draytoni*) are known to occur in the Prado Basin and Reach 9;[72] however, no individuals were detected during focused surveys by the USACE in 1997, 1998, and 1999.[73] The red-legged frog was last observed in the Prado Basin in 1984 and is probably extirpated from the area due to competition with bullfrogs.[74] Three special-status fish species are known to occur in the Prado Basin and Reach 9, the Santa Ana sucker, Santa Ana speckled dace, and arroyo chub.

Two special-status species have been observed by others in the SAR below I-405: the California least tern, which is present in the Ecological Reserve and SAR Salt Marsh at the mouth of the SAR, and the least Bell's vireo, which has been observed in low numbers in the main river channel, the adjacent Talbert Nature Reserve, and the SAR Salt Marsh.[75] In 2002, USACE initiated Section 7 consultation with USFWS, pursuant to the federal Endangered Species Act (FESA), regarding their recent dredging project near Adams Avenue and possible impacts on the least Bell's vireo. In its Biological Opinion (FWS-OR-1304.8), USFWS determined that removal of riparian habitat due to USACE's activities would not result in significant impact to the species (see **Appendix L-8**).[76] To mitigate the removed habitat, USACE must restore 17 acres of habitat in the vicinity of the project site, either through *Arundo* removal or habitat creation.

From the special species listed in Table 4.3.2 and the discussion above, this EIR focuses on activities that will occur downstream of the Imperial Highway to 17th Street, and considers that the species of greatest concern with respect to impact from the District's proposed project are the four fishes and three birds described in more detail as follows

Santa Ana Sucker

Status and Historical Distribution. This review of the Santa Ana sucker (SAS) (*Catostomus santaanae*) is supported by a technical memorandum provided by biological specialists, Thomas

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69 USACE, 1992.
70 USFWS, 2001.
71 Zembel and Hoffman, 2000.
72 *Ibid.*
73 USACE, 2001.
74 Zembal and Hoffman, 2000.
75 Kelsey and Collins, 1997; USACE, 2002 and Griffith Wildlife Biology, 2002.
76 USFWS, 2002.

R. Haglund, Ph.D., and Jonathan N. Baskin, Ph.D., which is included in Appendix E.[77] Historically, the SAS inhabited the Los Angeles Basin, which includes the Los Angeles, San Gabriel and Santa Ana River drainages.[78] The SAS was common in the 1970s[79] but experienced declines throughout most of its range.[80] The SAS populations in the three Basin rivers are listed as Threatened under the federal Endangered Species Act of 1973 (FESA) (65 FR 19686, April 2000). Approximately 75% of original sucker habitat has been lost due to stream modifications and diversions, dams, flood control features, and effects of urbanization.

Small populations of the SAS are still found in each native river basin.[81] The San Gabriel River contains the largest known endemic sucker population in the Basin and is the only population considered viable and self-sustaining.[82] In the SAR, the SAS has been extirpated from upper canyons and reaches and is restricted to lower portions of the river between Imperial Highway and Mt. Roubidoux where river flow is enhanced by wastewater.[83] This SAS population is not secure due to water quality problems.[84]

Life History. The only extensive life history study of the SAS was conducted in the Santa Clara River by Greenfield et al.,[85] although the Santa Ana Sucker Conservation Team is currently conducting an indepth multi-year study in the Santa Ana River (see Current Distribution). A population of SAS was introduced into Soledad Canyon in the Santa Clara River,[86] and so this population is considered non-native and thus not protected by the FESA. Typically, the SAS lives for two to four years and becomes reproductively mature in the first year. Fecundity is relatively high, with females producing 4,000 to 16,000 eggs. Spawning occurs between March and July,[87] a relatively extended reproductive period. These qualities allow the SAS to repopulate rivers quickly and adapt to naturally variable environments that drastically reduce population densities (e.g., severe periodic storms and floods). The SAS primarily eats detritus, algae, diatoms, and insects.

The SAS typically is found in streams that are less than seven meters wide, with depths ranging from a few centimeters to over one meter[88] and temperatures below 22 C (72 F).[89] Ideal flow rates for SAS vary from slight to swift. SAS prefer clear water, but they tolerate periodic severe flooding and thus can tolerate occasional turbidity. The best existing typical habitat for SAS is in

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77 Thomas R. Haglund and Jonathan N. Baskin, 2005. Memorandum Re: Status of Santa Ana suckers in the Santa Ana River with particular attention to their status downstream of Prado Dam. 23 March 2005.
78 Smith, 1966.
79 Moyle, 1976.
80 Moyle and Yoshiyama 1992.
81 Swift et al. 1993.
82 Moyle and Yoshiyama 1992.
83 Swift et al., 1993 and Moyle et al., 1995.
84 Moyle et al., 1995.
85 Greenfield et al., 1970.
86 Moyle, 1976.
87 *Ibid.*
88 Smith, 1966 and Deinstadt et al. 1990.
89 Moyle, 1976 and Saiki, 2000.

the San Gabriel River were summer flow is usually 4 cfs, river width is 5-8 m, and depths are 15-30 cm.[90]

Substrate preference varies by life stage. Adult SAS prefer gravel and cobble, and juveniles usually prefer sandy substrate and shallower water than adults.[91] SAS fry prefer very shallow water (<5 cm) at stream edges, which is typical of most young stream fishes. The presence of SAS is correlated with algae but not macrophytes. Riparian cover is not necessary when there are deep holes and riffles present for refuge. The SAS is not tolerant of polluted or highly modified streams.[92]

Current Distribution. The Santa Ana Sucker Conservation Team (henceforth "Sucker Team") was formed in 1999 to identify and implement conservation measures that would lead to the recovery of the SAS in the Santa Ana River (SAR) watershed. The Sucker Team is composed of the City of Riverside, the City of San Bernardino Municipal Water Department, Orange County Flood Control District, Orange County Water District, Riverside County, Riverside County Flood Control and Water Conservation District, San Bernardino County Flood Control District, and SAWPA. Scientific studies have been conducted for the Sucker Team in the SAR, both upstream and downstream of Prado Dam.[93] In addition to the Sucker Team, USACE and CDFG have conducted SAS surveys below Prado Dam.[94]

Currently, the SAS is rare below Prado Dam[95] where surveys sporadically have documented adult or young-of-the-year[96] (YOY) individuals. In 1986, 1987, 1994, and 1996, SAS were found in the first three miles of the SAR below Prado Dam in Reach 9 (65 FR 19687). But in 2000, no suckers were found in the same reach during a survey by Swift.[97]

In the early 1990s, adult suckers were regularly caught just upstream and downstream of Imperial Highway.[98] In 1990-91, four adult suckers were found near Imperial Highway, but in 1998-99, no suckers were found during a survey by Saiki.[99] In 1999-2000, USACE surveyed the river between Weir Canyon and Imperial Highway and found eight suckers.[100]

Despite the above-mentioned sightings of SAS, there are no recent comprehensive surveys of SAS below Prado Dam. There is no evidence of reproduction below Prado Dam, and it is uncertain whether there is a self-sustaining population of SAS below the Dam.[101] The population

90 Moyle et al., 1995.
91 Haglund et al. 2003.
92 Moyle and Yoshiyama, 1992.
93 Saiki 2000; Swift 2001; Haglund et al., 2001 and 2003.
94 Moyle et al., 1995; Baskin and Haglund 2000.
95 Haglund et al. 2003.
96 A juvenile fish that is less than one year old.
97 Swift, 2001.
98 Haglund and Baskin, 2005.
99 Saiki, 2000.
100 Baskin and Haglund, 2000.
101 Haglund and Baskin, 2005.

of SAS below the Dam is likely sustained by upstream immigration.[102] SAS larvae and fry have been found in and above Sunnyslope Creek, located about 15 miles north of Prado Dam, but are rare below this point.[103]

It is believed SAS have declined in abundance below the Dam in recent years.[104] The reaches above and below the dam are very different. The lower reaches are deeper, siltier and flow more slowly than upper reaches, and the reach near Imperial Highway is highly modified. This is illustrated in the memo by Haglund and Baskin provided in Appendix E.[105]

Steelhead Trout

The anadromous form of west coast steelhead trout (*Oncorhynchus mykiss*) is a federally protected species. There are 15 Evolutionarily Significant Units (ESUs) of steelhead in Washington, Oregon, Idaho, and California.[106] The Southern California steelhead ESU was listed as endangered in the 1997 final ruling by the National Marine Fisheries Service (NMFS) (62 FR 43937), and was reconfirmed in the species' latest status review (69 FR 33102).

At time of listing, the geographic range of Southern California steelhead designated by NMFS included all streams between (and including) the Santa Maria River in San Luis Obispo County and Malibu Creek in Los Angeles County. In 2002, NMFS extended the range beyond Malibu Creek to San Mateo Creek in northern San Diego County (67 FR 21586) because in 1999-2000 naturally-spawned steelhead were found in Topanga Creek and San Mateo Creek by biologists from NMFS and CDFG.

NMFS acknowledges that historically, steelhead were found in coastal river basins throughout California and as far south as northern Baja California, Mexico (62 FR 43937). Thus at one time, steelhead probably inhabited the Santa Ana River (SAR). The expanded range for Southern California steelhead, which includes the SAR, provides federal protection to all naturally-spawned populations within this area. However, there is no evidence of steelhead in the SAR (67 FR 21588). NMFS acknowledges that habitat conditions in virtually all streams between Malibu Creek and San Mateo Creek are not suitable for steelhead because they are highly modified. NMFS does not expect the SAR to support steelhead in the future (67 FR 21588; see **Appendix L-4**).

Santa Ana Speckled Dace

The Santa Ana speckled dace (*Rhinichthys osculus*) is a Species of Special Concern in California. This review of the speckled dace is based on information provided by CDFG[107] and Swift et al.[108] The speckled dace is one of the rarest native fishes in coastal southern California. The speckled dace was once common in upland mountainous regions of the Santa Ana, San Gabriel, and Los

[102] Haglund et al., 2003.
[103] Swift, 2001.
[104] Haglund et al., 2003; Haglund and Baskin, 2005.
[105] Haglund and Baskin, 2005.
[106] Busby et al., 1996.
[107] Moyle et al., 1995.
[108] Swift et al., 1993.

Angeles River systems. Today, the speckled dace's distribution is limited to the headwaters of the Santa Ana and San Gabriel Rivers, having been recently extirpated from the Los Angeles River drainage.

The speckled dace usually inhabits permanent flowing streams that are spring fed and have summer water temperatures of 17-20 C. Dace are usually found in shallow cobble and gravel riffles. The West, North, and East Forks of the San Gabriel River are the best existing examples of typical dace habitat, with waters flowing through steep rocky canyons about 5-8 m wide with chaparral-covered walls and overhanging riparian vegetation. Typical summer conditions in the West Fork include flows of 4 cubic feet per second (cfs) and depths of 15-30 cm. The presence of speckled dace is coincident with other native fishes such as steelhead trout and the SAS.

The speckled dace has experienced declines in abundance and distribution due to habitat loss from water diversions, urbanization of watersheds, introduced exotic species, and other anthropogenic activities. In the Santa Ana River, the speckled dace is found in specific tributaries above Prado Dam: Cajon Creek, Lytle Creek, City Creek, Strawberry Creek, and Silverado Canyon.

Arroyo Chub

The arroyo chub (*Gila orcutti*) is a Species of Special Concern in California. This review of the arroyo chub is based on information provided by CDFG[109] and Swift et al.[110] The native range of the arroyo chub includes the Los Angeles, San Gabriel, San Luis Rey, Santa Ana, and Santa Margarita Rivers, and Malibu and San Juan creeks. Today, the distribution of the arroyo chub has been drastically reduced, and in the Santa Ana River the chub is scarce between Riverside and the Orange County line. Arroyo chub have been successfully introduced into the Santa Ynez, Cuyama, and Mojave Rivers. If chub had not been introduced outside its native range, it would qualify for federal listing as a threatened species under the Endangered Species Act.

Arroyo chub are found in warm to cool streams (10-24 C) that are greater than 40 cm deep, have low flows, and have mud or sand substrates. Presently, the best habitat for arroyo chub is found in the West Fork of the San Gabriel River. Chub breed continuously between February and August, with most spawning occurring in June and July. Spawning typically occurs in pools or quiet edge waters with temperatures between 14-22 C. Fry occupy the quiet edge water under cover of vegetation for the first three to four months. Arroyo chub are adapted to tolerate hypoxic conditions and wide temperature fluctuations in coastal streams. Chub are omnivores, feeding mostly on algae, but also consuming insects and small crustaceans.

Similar to other fish species, the arroyo chub has experienced population declines due to the effects of urbanization in the Los Angeles metropolitan area—habitat degradation and competition with introduced species, such as red shiners (*Cyprinella lutren*sis).

[109] Moyle et al., 1995.
[110] Swift et al., 1993.

California Least Tern

The California least tern is endangered at both state and federal levels. It is one of the smallest members of its family, averaging only nine inches in length. Typically, these terns nest on the ground (unvegetated sites near water) in loose colonies and forage in shallow estuaries and lagoons, diving head first into the water after a wide variety of small fish. Formerly, California least terns nested regularly on sandy beaches and mudflats near the ocean. The construction of PCH in the early 20th century had a significant impact on California least terns, as well as other shorebirds, by directly destroying nesting beaches as well as making these areas more accessible to human encroachment.[111] Most California least terns nest only at a few select sites. In 1994, 76% of the population nested at nine sites, all in southernmost coastal California. Four of the nine sites (in Los Angeles, Orange, and San Diego counties) supported 48% of the breeding pairs.[112]

Double-crested Cormorant Rookery Site and Forster's Tern Nesting Colony

The nesting areas of both the cormorant and Forster's tern are included in the CDFG Special Animals List . The cormorant is a large (27 inches in length), dark waterbird with a long, hooked bill and long tail. Their colonies often, but not exclusively, nests in trees, alive or dead, and near water. Forster's tern are larger than least terns (14-16 inches long), and somewhat less colonial than either least terns or cormorants. Since their ground nests are lined with vegetetation (least tern nests are unlined), and they are associated more frequently with marshes, they are found in areas with more vegetation than least terns.[113]

4.3.2 Regulatory Setting

Wetlands Regulations

The regulations and policies of various federal agencies (e.g., the USACE, EPA and USFWS) mandate that the filling of wetlands be avoided unless it can be demonstrated that no practicable alternatives exist. The USACE has primary federal responsibility for administering regulations that concern waters and wetlands. In this regard, the USACE acts under two statutory authorities, the Rivers and Harbors Act (Sections 9 and 10), which governs specified activities in "navigable waters," and the Clean Water Act (CWA) (Section 404), which governs specified activities in "Waters of the US," including wetlands and special aquatic sites. The USACE requires that a permit be obtained if a project proposes placing structures within navigable waters. The EPA, USFWS, and several other agencies provide comment on USACE permit applications. The EPA has provided the primary criteria for evaluating the biological impacts of USACE permit actions in wetlands and other special aquatic sites.

The state's authority in regulating activities in wetlands and waters at the site resides primarily with the CDFG and the SWRCB. The CDFG comments on USACE permit actions under the Fish and Wildlife Coordination Act. In addition, the CDFG has jurisdiction over streams and riparian habitat pursuant to Sections 1600 *et seq*. of the California Fish and Game Code, which requires a Streambed Alteration Agreement for modifications to stream aquatic habitat or

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111 Zeiner et al, 1990.

112 USGS Information at: http://biology.usgs.gov/s+t/SNT/index.htm.

113 Terres, 1991.

supporting riparian vegetation. The SWRCB, acting through the SARWQCB, must certify that the USACE's permit action meets state water quality objectives (Section 401, CWA). Actions occurring in the Coastal Zone also may require California Coastal Commission review and approval.

Beneficial Uses

The SARWQCB prepared a Basin Plan for the SAR pursuant to the requirements of the CWA. The Basin Plan identifies beneficial uses for each reach of the river. These reaches are shown in Figure 4.2-6. Basin Plan Reach 1 is defined as the portion of the river from the tidal prism at the beach up to 17th Street in Santa Ana. Basin Plan Reach 2 is defined as the stretch from 17th Street up to Prado Dam. Beneficial uses identified for each reach are summarized in Table 4.2-5, and defined in Table 4.2-6.

The Basin Plan acknowledges that virtually all base flow below Prado Dam is diverted for groundwater recharge by the District.[114] Beneficial uses in Reach 1 include Intermittent Beneficial Uses of WARM and WILD, reflecting the ephemeral nature of storm flows within this reach. The project will not alter storm flows or the ephemeral nature of the river flows within this reach. Beneficial uses in Reach 2 include WARM, WILD, and RARE, reflecting primarily the habitat and species present in USACE Reach 9, which provide valuable aquatic and riparian habitat for wildlife, including some threatened and endangered species.

Santa Ana River Watershed Program

The goals of the Santa Ana River Watershed Program are to restore the natural functions of the SAR, to the extent possible, and to maximize the river's natural resources.[115] An environmental assessment of the Watershed Program for 2000-2002 is provided in Appendix L-1. The principal partners in the Watershed Program are the Santa Ana Watershed Association of Resource Conservation Districts (SAWA), OCWD, USFWS, RWQCB, USACE, and county flood control agencies. SAWA is comprised of five resource conservation districts (RCD): East Valley, Riverside-Corona, Inland Empire West, San Jacinto Basin, and Elsinore-Murietta-Anza RCD. The Watershed Program projects include the removal of exotic species such as *Arundo*, restoration of habitat and sensitive species, such as least Bell's vireo and southwestern willow flycatcher, and public education.[116] The monitoring program for vireos and flycatchers has been ongoing since 1986, and includes a cowbird trapping program as well. Brown-headed cowbirds decrease the reproductive success of vireos and other birds via brood parasitism. Cowbirds lay eggs in the nests of other birds, called hosts, which incubate and raise cowbird chicks often at the expense of their own young. As of 2003, there were 339 pairs of breeding male vireos in the Prado Basin, up from 281 pairs in 2000, and 19 pairs in 1986.[117]

[114] SARWQCB, Basin Plan, 1995.
[115] Zembal and Hoffman, 2000.
[116] Pike et al, 2004.
[117] *Ibid.*

Watershed Program activities are funded primarily through endowment proceeds and competitive grants[118] and are facilitated by SAWA and OCWD. In 1994, OCWD formed a Cooperative Agreement with the Department of the Interior and USACE, in which OCWD agreed to contribute $1 million to SAWA to mitigate for inundation of riparian habitat in Prado Basin caused by increasing the conservation pool behind Prado Dam to an elevation of 505 feet (see Appendix C).[119]

Special Status Species Regulations

Federal Endangered Species Act

Under the federal Endangered Species Act (FESA), the Secretary of the Interior and the Secretary of Commerce jointly have the authority to list a species as threatened or endangered (16 USC 1533(c)). Pursuant to the requirements of FESA, an agency reviewing a proposed project within its jurisdiction must determine whether any federally listed or proposed species may be present in the project region and determine whether the proposed project would have a potentially significant impact on such species. In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed to be listed under FESA or result in the destruction or adverse modification of critical habitat proposed to be designated for such species (16 USC 1536(3), (4)). Project-related impacts to these species or their habitats would be considered "significant." The "take" [120] prohibition of the FESA prohibits any action that adversely affects a member of an endangered or threatened species.

Critical Habitat Designations

Section 4(a)(3) and (b)(2) of the FESA requires the designation of critical habitat to the maximum extent possible and prudent based on the best available scientific data and after considering the economic impacts of any designations. Critical habitat is defined in section 3(5)(A) of the FESA as (1) areas within the geographic range of a species that are occupied by individuals of that species and contain the primary constituent elements (physical and biological features) essential to the conservation of the species, thus warranting special management consideration or protection, and (2) areas outside of the geographic range of a species at the time of listing but that are considered essential to the conservation of the species.

Santa Ana Sucker. The USFWS revised the critical habitat designation for the SAS in January 2005 (70 FR 425-458; see **Appendix L-2**), reducing the size of designated habitat from 21,129 acres to 8,305 acres, and only including streams in the San Gabriel River and Big Tujunga Creek in Los Angeles County (70 FR 437). In the original ruling (69 FR 8839), USFWS designated over 11,000 acres of critical habitat in the SAR above Prado Dam. The SAR contains

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118 Pike et al, 2004

119 USFWS, 2001.

120 "Take," as defined in Section 9 of the FESA, is broadly defined to include intentional or accidental "harassment" or "harm" to wildlife. "Harass" is further defined by the USFWS as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering. "Harm" is defined as an act which actually kills or injures wildlife. This may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

more than 60 percent of the remaining range of the SAS. Pursuant to Section 4(b)(2) of the FESA, this essential habitat has been excluded from the revised ruling because it is included in the Western Riverside Multi-Species Habitat Conservation Plan (MSHCP) and the Santa Ana Sucker Conservation Program (see below). Thus, USFWS determined that the benefits of excluding essential habitat already covered by the Western Riverside MSHCP and SAS Conservation Program outweighed the benefits of including them as critical habitat.

The USFWS designated critical habitat based on the following primary constituent elements:

1. A functioning hydrological system that experiences peaks and ebbs in the water volume reflecting seasonal variation in precipitation throughout the year;
2. A mosaic of sand, gravel, cobble, and boulder substrates in a series of riffles, runs, pools and shallow sandy stream margins;
3. Water depths of greater than 3 cm and bottom water bottom velocities greater than 0.03 m per second;
4. Non-turbid water or only seasonally turbid conditions;
5. Water temperatures less than 30 C (86 F);
6. Stream habitat that includes algae, aquatic emergent vegetation, macroinvertebrates, and riparian vegetation.

Steelhead Trout. The NMFS proposed critical habitat for steelhead trout in December 2004 (69 FR 71880; see **Appendix L-3**). There is no designated or proposed critical habitat for steelhead in the SAR (69 FR 71898).

In 1996, CDFG developed a Steelhead Restoration and Management Plan[121] to help reverse the decline in steelhead populations. The major factors contributing to the decline of steelhead in California is habitat loss and degradation. The Steelhead Plan identifies restoration and recovery objectives for steelhead in five south coast rivers (Carmel, Santa Ynez, Ventura, Santa Clara, and Malibu Creek), and coastal streams in San Luis Obispo and Santa Barbara Counties. In rivers south of Malibu Creek, such as the Santa Ana River, the Plan only recommends habitat assessments to identify locations with restoration potential.

Other Species. Portions of Prado Basin above Prado Dam are designated as critical habitat for the least Bell's vireo (59 FR 4845).

A small portion of Reach 9 is designated as critical habitat for the federally-threatened coastal California gnatcatcher (*Polioptila californica californica*) (65 FR 63680). In Biological Opinion FWS-SB-909.6, USFWS determined that USACE's Phase II of the SAR Main Stem Project would not adversely affect the proper functioning of this critical habitat as a corridor for species

121 Steelhead Restoration and Management Plan for California, February 1996, Department of Fish and Game, Sacramento, California.

dispersal in surrounding areas (see **Appendix L-7**).[122] Thus, the District's operations below Reach 9 also will not affect the gnatcatcher or its essential habitat.

Portions of Santiago Creek, upstream of the project site, are designated as critical habitat for the arroyo toad (66 FR 9414).

Santa Ana Sucker Conservation Program

The Santa Ana Sucker Conservation Program[123] was established in 2000 to promote the conservation of the SAS and to provide authorization for participating agencies to "take"[124] a limited number of suckers, pursuant the FESA, while implementing their Covered Activities (see **Appendix L-6**). The six agencies that participate in the SAS Conservation Program are OCWD, OCFD/RDMD, City of Riverside, Riverside County Flood Control and Water Conservation District, Riverside County, and San Bernardino County Flood Control District. In return for allowing Covered Activities to continue, the participants agree to fund research and restoration activities on the SAR and institute measures to avoid or minimize adverse effects to SAS.

There are two Covered Activities for OCWD. First is the Prado Wetlands Project in the Prado Basin, which requires maintenance of dikes and wetland ponds and reconstruction of dikes. Minimization Measures for this Activity include SAS survey and relocation efforts, which are to be implemented by a qualified biologist. Captured SAS must be relocated immediately to previously-designated upstream locations, along with other native fish species such as speckled dace and arroyo chub. The second Covered Activity is groundwater recharge between Imperial Highway and Ball Road, which requires levee construction and maintenance and sediment removal. There are two Minimization Measures for this Activity. First, OCWD, in conjunction with USFWS and other Conservation Program participants, must develop and implement a research program to assess the abundance of the sucker in the SAR between Prado Dam and the drop structures downstream of Imperial Highway. Once the research is completed, OCWD must initiate appropriate strategies to reduce adverse effects to the sucker, such as relocation, fish barriers, or habitat restoration. Second, OCWD must capture and relocate suckers that have been washed downstream, below the Imperial Inflatable Dam, after high flow events. USFWS will designate the upstream relocation location and a qualified biologist will execute the relocation activities. In addition to suckers, any other native fishes that are captured also must be relocated, and exotic fish that are captured must not be released back into affected reaches, or reaches supporting native fish.

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[122] USFWS, 2001.

[123] Draft Conservation Program for the Santa Ana Sucker (*Catostomus santaanae*) within the Santa Ana River watershed. Revision Date: February 24, 2003.

[124] "Take," as defined in Section 9 of the FESA, is broadly defined to include intentional or accidental "harassment" or "harm" to wildlife. "Harass" is further defined by the USFWS as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering. "Harm" is defined as an act which actually kills or injures wildlife. This may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

California Endangered Species Act

Under the California Endangered Species Act (CESA), the CDFG is responsible for maintaining a list of threatened and endangered species (California Fish and Game Code 2070), Candidate species, and Species of Special Concern. Pursuant to the requirements of CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any state listed endangered or threatened species may be present on the project region and determine whether the proposed project would have a potentially significant impact on such species. In addition, the CDFG encourages informal consultation on any proposed project that may impact a candidate species. If there were project-related impacts to species on the CESA threatened and endangered list, they would be considered "significant." Impacts to "species of concern" would be considered "significant" under certain circumstances, discussed below.

***CEQA Guidelines* Section 15380**

Although threatened and endangered species are protected by specific federal and state statutes, *CEQA Guidelines* Section 15380(b) provides that a species not listed on the federal or state list of protected species may be considered rare or endangered if the species can be shown to meet certain specified criteria. These criteria have been modeled after the definition in FESA and the section of the California Fish and Game Code dealing with rare or endangered plants or animals. This section was included in the *CEQA Guidelines* primarily to deal with situations in which a public agency is reviewing a project that may have a significant effect on, for example, a Candidate species that has not yet been listed by either the USFWS or CDFG. Thus, CEQA provides an agency with the ability to protect a species from a project's potential impacts until the respective government agencies have an opportunity to designate the species as protected, if warranted.

Other Statutes, Codes and Policies Affording Limited Species Protection

The federal Migratory Bird Treaty Act (16 U.S.C., Sec. 703, Supp. I 1989) prohibits killing, possessing, or trading in migratory birds except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs. Birds of prey are protected in California under the State Fish and Game Code, Section 3503.5 1992). Section 3503.5 states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Project impacts to these species would not be considered "significant" in this EIR unless they are known or have a high potential to nest on the site or rely on it for primary foraging.

The federal Bald Eagle Protection Act prohibits persons within the United States (or other places subject to U.S. jurisdiction) from "possessing, selling, purchasing, offering to sell, transporting, exporting or importing any bald eagle or any golden eagle, alive or dead, or any part, nest or egg thereof."

Vascular plants listed as rare or endangered by the CNPS,[125] but which have no designated status or protection under federal or state endangered species legislation, are defined as follows:

List 1A: Plants believed extinct
List 1B: Plants Rare, Threatened or Endangered in California and Elsewhere
List 2: Plants Rare, Threatened or Endangered in California, but More Numerous Elsewhere
List 3: Plants about which we need more information – a review list
List 4: Plants of limited distribution – a watch list

In general, plants appearing on CNPS List 1 or 2 are considered to meet CEQA's Section 15380 criteria and effects to these species are considered "significant."

4.3.3 Significance Criteria

Conclusions regarding the significance of impacts on vegetation and wildlife resources are based on criteria in the CEQA. See Regulatory Setting for additional discussion of the regulatory controls regarding this project.

Under CEQA, a project would be considered to have a significant effect on the environment if it would:

- Substantially diminish habitat for fish, wildlife or plants species;
- Cause a fish or wildlife population to drop below self-sustaining levels;
- Threaten elimination of a plant or animal community;
- Substantially affect an endangered, rare or threatened species of animal or plant or the habitat of the species;
- Decrease the number of or diminish the range of an endangered, rare or threatened species;
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species; impede use of native wildlife nursery sites;
- Substantially degrade the quality of the environment, including but not limited to:
  - the substantial adverse effect on or loss of federally protected wetlands;
  - the substantial degradation or loss of habitat, sensitive natural communities, or other resources identified in local or regional plans, policies, regulations or by lists compiled by CDFG or USFWS.
- Conflict with any local policies or ordinances protecting biological resources or with provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan or other local, regional, or state habitat conservation plan.

[125] Skinner and Pavlik, 1994.

CEQA Guidelines Section 15380 further provides that a plant or animal species may be treated as "rare or endangered" even if not on one of the official lists if, for example, it is likely to become endangered in the foreseeable future.

4.3.4 Impacts and Mitigation Measures

Diversion of SAR Water

The proposed diversion of additional SAR water would not alter existing conditions in the river. Currently, the USACE releases water from Prado Dam at a rate that accommodates the District's capacity for groundwater recharge when possible. The operation of the Prado Dam to maintain these flows has been evaluated and approved by USACE. Future increases in base flow would be diverted; the diversions would have no effect on the river upstream of Imperial Highway and would not change existing conditions downstream of Imperial Highway. The proposed action, therefore, would not affect biological resources in the river because existing facilities and conditions would not be altered. The following section summarizes the impact assessment.

Plant Communities

The proposed action would not affect the existing condition of plant communities in the lower SAR. No candidate or special-status plant species or community would be significantly affected by the anticipated increased diversions.

Minimal amounts of non-native grasses periodically grow near drop structures and along the banks of the existing Main River System between Imperial Highway and SR-22. However, all vegetation is routinely cleared by the District during regular maintenance and earth-moving activities. These in-stream activities, as well as existing recharge basins and use of the Prado Dam for conservation, have been previously evaluated pursuant to CEQA requirements, and the District has implemented mitigation for identified effects to biological resources. These effects and mitigation measures are summarized in Appendix C and include habitat restoration and *Arundo* removal programs. Flood control improvements downstream of Prado Dam have substantially altered the river from its natural state. These improvements also have been evaluated pursuant to CEQA and NEPA requirements, and mitigation measures for identified impacts to biological resources have been implemented by the USACE and OCFCD, as summarized in Appendix F.

The proposed diversion would not change existing facilities or activities in the lower SAR. The District would continue to periodically remove vegetation and create temporary levees to maximize the recharge capacity of the river bottom. Thus, plant communities and future habitat value in the Main River System would be similar to existing conditions.

Wildlife and Fishes

The continued and proposed diversions would not alter existing conditions in the SAR and would not impact wildlife or fishes that currently use the river channel. There is no permanent vegetation or habitat that supports native or sensitive wildlife or fish populations within the District's Main River System downstream of Imperial Highway. The District's in-stream activities and the flood-control improvements made by USACE and OCFCD minimize habitat availability for wildlife and fishes. The District's Main River System operations, existing recharge basins, and use of the Prado Dam for conservation, have been previously evaluated pursuant to NEPA and CEQA requirements. The impacts to biological resources and associated mitigations are summarized in Appendix C and include monitoring programs for least Bell's vireo and southwestern willow flycatcher; the Santa Ana sucker conservation program; brown-headed cowbird trapping programs; and redesigned drop structures that minimize fish injury and death. The effects of flood-control improvements on wildlife and fishes also have been evaluated pursuant to NEPA and CEQA requirements, as summarized in Appendix F.

The temporary establishment of non-native vegetation within the District's Main River System provides foraging and nesting habitat for various birds, such as cormorants, great blue heron, Forster's tern, and California least tern. The proposed action would not alter this existing condition.

The threatened SAS has been found in the SAR below Prado Dam. However, recent studies suggest there are no viable, reproducing SAS populations downstream of Imperial Highway.[126] Ten drop structures between Imperial Highway and SR-22 impede the movement of fishes into or out of the lower SAR. Nevertheless, storm flows can wash fishes, including the SAS, downstream from Reach 9 into the District's recharge area. The District participates in the Santa Ana Sucker Conservation Program (see Appendix L-6), which was established in 2000 pursuant to the FESA to allow multiple agencies that have jurisdiction over the SAR to "take" a limited number of suckers. The Conservation Program defines the allowed activities for each agency and provides mitigation measures to compensate for loss of suckers. The District's in-stream recharge operations are permitted under the Conservation Program. The District must capture and relocate any individual fish that are washed below Imperial Inflatable Dam after high flow events and implement a research program to advance sucker conservation upstream of its facilities in Reach 9. The proposed action would not alter these conditions or activities and therefore would not affect the current range of the SAS.

Bypass Flows

Currently during dry-weather months, USACE operates Prado Dam to maximize water conservation. Flow volumes are managed to minimize the amount of water bypassing the District's Main River System. There would be minimal beneficial impacts to downstream vegetation, wildlife, or fish if the District allowed bypass flows to occur.

Below SR-22, the river bed has been converted into a golf course. Downstream of the golf course, the river is contained within a concrete-lined channel. Even with bypass flows, there would be no valuable habitat for wildlife or fishes because the river lacks suitable substrate to support vegetation and periodic flood-control maintenance activities remove vegetation. In addition, a concrete flood control structure impedes fish migration and prohibits connectivity with suitable habitat in upstream reaches. USACE and OCFCD periodically dredge the soft bottom of the SAR below Adams Avenue to maintain the flood control channel. This prevents the permanent establishment of instream and riparian vegetation, which could provide habitat for wildlife.

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[126] Haglund and Baskin, 2005.

These activities were permitted and reviewed under NEPA/CEQA during the USACE's development of the Phase II GDM for the SAR Mainstem Project (see Appendix F).

Some urban runoff enters the river channel downstream of the golf course. OCSD currently diverts dry-weather flows in the SAR near the I-405 crossing to its treatment plant to prevent non-point source pollution from reaching Newport Beach and Huntington Beach at the mouth of the SAR. The treated water is discharged into the ocean through a four-mile ocean outfall pipe. Bypass flows below OCWD's operations could interfere with this program that protects beach water quality if dry weather flows increased substantially.

Anaheim Lake Expanded Recharge

Impact BIO-1: Implementation of the proposed project at Anaheim Lake could result in impacts to nesting cormorants, herons, egrets, raptors and other birds protected by the Migratory Bird Treaty Act.

The proposed project involves removing three islands from Anaheim Lake. Great egrets, snowy egrets, great blue heron, turkey vulture and red-tailed hawk have been observed at Anaheim Lake. Numerous mature eucalyptus trees border the site, providing potential nesting habitat for waterfowl and raptors. A double-crested cormorant rookery has been established along the southwestern border of the project site within several of these trees.

The current noise and activity from the District's periodic maintenance activities would be similar to the project's construction activities. Maintenance activities, which include earth moving, have been compatible with bird nesting at the site. Therefore, construction would not be considered to have potentially significant effects on the neighboring rookery.

The rookery includes one apparently inactive nest in one eucalyptus tree on the southwestern island that will be removed as part of the project. The trees (three in all) on this island are dead. The rest of the cormorant rookery (62 nests) exists in the trees bordering Anaheim Lake. The proposed project would not remove these trees or any other eucalyptus trees bordering the site that could provide future nesting sites for cormorants. Only one inactive nesting site on one island will be affected, which should not have a significant impact on the rookery.

This notwithstanding, the destruction of trees during the breeding season (March 1 to July 31) has the potential to result in direct mortality of nesting bird species and would be considered a significant impact. The potential take of individual birds, eggs, and/or active nests may be avoided by restricting tree removal to outside of the breeding season. Implementation of the following mitigation measures would reduce the potential impact to nesting birds to less than significant levels.

Mitigation Measures

M-BIO-1: The identified nesting trees will be removed outside the March 1 – July 31 breeding period. OCWD shall conduct pre-construction surveys for nesting birds within 30 days prior to removing the trees. The results of the surveys shall be forwarded to the USFWS and CDFG. If birds are found to be nesting in the trees to be removed during the survey, the tree removal will be delayed until the nests are no longer in use.

M-BIO-2: OCWD shall construct artificial nesting platforms, to replace the number of active nests present during the breeding season before the trees on the island are removed. See Payne and Copes (1990) for successful platform design.

M-BIO-3: OCWD will consult with CDFG prior to removing nesting trees to determine what additional measures, if any, will be required to offset project impacts to the cormorant rookery.

Significance after Mitigation: Less than significant.

Santiago Creek Expanded Recharge

Impact BIO-2: Implementation of the Santiago Creek Expanded Recharge project would occur within the creek bed subject to USACE, RWQCB, and CDFG jurisdiction.

Under the proposed project, flows along Santiago Creek between the Santiago Pits and the Santa Ana River would increase from intermittent flows of 15 cfs to a constant flow of 30 cfs, which is anticipated to completely infiltrate into the creek bed upstream of the confluence with the Santa Ana River. Santiago Creek qualifies as an intermittent stream and as “Waters of the US” subject to jurisdiction of the USACE and CDFG. The increase of water flows along this section of the creek would not result in the discharge of any fill material into jurisdictional waters, therefore operation of the proposed action would not trigger the need to obtain a 404 permit from the USACE. However, construction of the pipeline would occur within the creek bed and would therefore require a 404 permit from the USACE. In addition, construction within the creek bed to place the bypass pipeline would require a Section 401 certification from the SARWQCB.

Direct changes to the bed of Santiago Creek would occur in the currently paved portion of Santiago Creek at Hart Park. The bed would be modified to allow percolation into the groundwater aquifer. A section of pipe would be installed under the existing parking lot that would allow flows along Santiago Creek to percolate into the groundwater aquifer at Hart Park. No vegetation or habitat would be created by its construction, but the bed modification would be subject to a Streambed Alteration Agreement under Section 1600 *et seq.* of the Fish and Game Code.

No other disturbance of bed and bank or riparian vegetation of either Santiago Creek or the SAR would result from the proposed action. Implementation of the proposed project, with respect to increased flows along Santiago Creek, would be anticipated to create additional or enhanced riparian habitat within Santiago Creek and, would thereby have a moderately beneficial impact on the project area.

Mitigation Measures

M-BIO-4: Prior to construction within Santiago Creek, the District shall obtain a permit from the USACE pursuant to Section 404 of the CWA. The final permit shall be submitted to the SARWQCB in application for certification pursuant to Section 401 of the CWA.

M-BIO-5: Prior to construction within Santiago Creek, the District shall obtain a Streambed Alteration Agreement from CDFG pursuant to Section 1600 et seq. of the California Fish and Game Code.

M-BIO-6: Prior to construction within Santiago Creek, the District shall consult with CDFG to determine any additional notifications or measures required to offset project impacts.

Significance after Mitigation: Beneficial.

Impact BIO-3: Increasing the flow in Lower Santiago Creek from 15 cfs to 30 cfs could affect existing vegetation and encourage development of riparian habitat.

Under the proposed project, flows along Santiago Creek between the Santiago Pits and the SAR at Riverview Golf Course would be increased from intermittent flows of 15 cfs to a constant flow of 30 cfs. Currently, creek flow ends at Hart Park. With the introduction of the bypass pipeline, the lower portion of the creek to the SAR would have perennial flow. This additional water would enhance riparian habitat for the length of the creek. However, some species of plants native to the region could be adversely affected by the persistent flow. Root systems of the existing riparian vegetation could be damaged from inundation. This impact would be offset by expansion of native but hydrophytic riparian vegetation into the channel bed from its current position restricted to the banks. Currently water is discharged intermittently from Santiago Pits, stopping when headwaters approach the Hart Park parking area. When the water infiltrates the creek bed, the pumps are turned on again. With the installation of the bypass pipeline, the pumps would operate at 30 cfs until the headwaters reached the SAR. The pumping would be stopped if the headwaters reached the SAR, to avoid discharging water into the golf course. Directly downstream from the discharge point, water would cover the creek bed most of the time. Some existing plants may be inundated in the upstream area. Downstream, closer to the golf course, the water level would decrease as water percolates into the ground. Currently, mature trees exist along the edges of the creek. However, flood control has necessitated removing vegetation from the creek bed itself. As a result, no mature trees exist within the creek bed that would be subject to inundation. Adding perennial flow into the creek bed would not inundate mature trees.

The District is currently implementing an arundo removal program for the entire length of Santiago Creek. Removal of the invasive species will improve the riparian habitat and encourage native species. Although the addition of perennial flow in the creek would alter the existing habitat, favoring species needing more water, the habitat value would increase, providing nesting habitat and a wildlife corridor in an otherwise developed urban area. This would be considered a beneficial impact.

Mitigation: None required.

Significance after Mitigation: Beneficial.

4.4 Land Use

4.4.1 Setting

The District's service area covers the primarily urbanized portions of northern Orange County. Land uses are dominated by residential, commercial and light industrial uses. Recreational, agricultural and open space uses are also scattered throughout the service area. Only a few unincorporated areas are included in the service area generally on the urban fringe, coastal, and hilly areas. These areas remain relatively undeveloped.

The District owns approximately 1,500 acres of land used for the existing recharge program. The majority of the District's existing and proposed recharge operations are located within approximately one mile of the SAR in the cities of Orange and Anaheim.

Anaheim Lake

The proposed Anaheim Lake expanded recharge site is located in the City of Anaheim north of Mira Loma Avenue and west of North Tustin Avenue. The site is designated as Water Uses in the General Plan Land Use Element. The site is zoned Specific Plan 94-1, Development Area 6. Surrounding land uses include industrial and commercial, with residential areas across West Orangethorpe Avenue north of the site. The site is operated as a recharge basin and is also used for recreational fishing and boating.

Santiago Creek

The proposed Santiago Creek expanded recharge site is located in Hart Park in the City of Orange east of South Glassell Street and north of the SR-22. The site is bordered by single and multiple family residences and a nearby school. The site is zoned for Single Family Residential (R1-6), Multiple Family Residential (R-3), and Recreation Open Space (RO).

Conservation Plans

The NCCP is a cooperative effort of public and private partners to protect habitats and species. The NCCP program, which began in 1991 under the State's Natural Community Conservation Planning Act, is a broad-based ecosystem approach that identifies and provides for the regional or areawide protection of plants, animals, and their habitats, while allowing compatible land use and economic activity. The NCCP is divided into eleven planning subregions, which include the Palos Verdes peninsula in Los Angeles County, the southwestern corner of San Bernardino County, portions of Orange County, and western Riverside and San Diego Counties. In Orange County and San Diego County, the subregions are further divided into subareas. Santiago Creek is located within the Coastal/Central Orange County NCCP. There is no habitat conservation plan applicable to Anaheim Lake.

Recreation

Orange County Regional Parks provide a wide range of activities such as hiking, boating, picnicking, camping, biking, and nature study for the communities in which they are located.

Recreation sites include parks, golf courses, rivers, beaches, and open space. The largest single open space feature in the county is the Cleveland National Forest, established in 1908. Other open space areas include the Starr Ranch Audubon Sanctuary, Crystal Cove State Park (located along the Irvine Coast), and Chino Hills State Park (adjoining San Bernardino and Orange counties). Open space is also provided by County regional parks and local City parks within the suburban and urban setting. When completed, the SAR Trail and Parkway will connect 110 miles from the San Bernardino Mountains to the Pacific Ocean. The trail will provide a place for people to enjoy a variety of natural open space and developed park sites, bicycling, hiking, equestrian, camping, and educational opportunities.

The City of Anaheim Department of Parks, Recreation, and Community Services currently maintains 41 park sites, two of which are undeveloped, and two additional parks and a large open space area in Deer Canyon are in the planning stages.[1] Total public park acreage is 515.5 acres, with 370.0 acres of developed local parks, 125.0 acres of special use parks, and 20.5 acres of undeveloped parks. The City also operates two golf courses and public school recreational facilities are made available on a limited basis to the public. The County of Orange operates several regional parks and several other recreational and athletic facilities are privately operated. In addition, several of the District's recharge basins (Anaheim Lake and the Santa Ana River Lakes) are stocked for sportfishing.

In the City of Orange, there are 16 city-owned parks totaling 169 acres, a Senior Center, three County parks, several private parks, and two privately owned golf courses. The City also maintains a joint use agreement to use school recreation facilities during non-school hours. In addition, a network of biking, hiking, and equestrian trails connect to the regional trail system in adjacent communities and outlying County areas.

Santiago Creek is one of the few open space corridors remaining in the city. Beneficial recreational uses identified by the SARWQCB include REC1 and REC2, however access to the creek is prohibited in all or part by the Orange County Environmental Management Agency.[2] The SARWQCB also identifies warm freshwater habitat and wildlife habitat as beneficial uses for the creek. With the assistance of the National Park Service Rivers, Trails, and Conservation Assistance Program, the city is in the process of creating a Master Plan for Santiago Creek. The Master Plan will address three major components: greenway, floodway, and trail. The City plans to begin construction of the Santiago Creek Trail in the park in the spring. The City hopes to extend the trail along the entire length of the creek through the City and connect with the SAR Trail to the west and wilderness areas east of the City.

The portion of the SAR from 17th Street in Orange to Prado Dam is designated as Reach 2 by the SARWQCB. Santiago Creek discharges to the river in this reach. Beneficial recreational uses identified in the Basin Plan by the SARWQCB for this reach of the SAR includes REC1 and REC2. In addition, the river is also designated warm freshwater habitat, wildlife habitat, and rare, threatened, or endangered species habitat.

1 City of Anaheim, Parks, Recreation, and Community Services Element of the General Plan, 1994.
2 SARWQCB, *Water Quality Control Plan, SAR Basin*, 1995.

Agriculture

The history of Orange County includes a long and prosperous period of agriculture with its beginnings in the late 1700s when Spanish missionaries came to California. Large Spanish rancheros raised crops and cattle and traded their goods with arriving ships. After the end of the Mexican-American War in 1848, the dominance of the rancheros began to wane. Cattle ranching lost its prominence when the flood of 1861 and the three years of drought that followed killed many cattle, which were replaced with sheep and agriculture when conditions improved. By the late 1800s, agriculture had become the county's way of life. Oranges were so well recognized as the main crop of the area that when the county was officially formed in 1889, legislation was passed to name it after the produce. The decline of the county's agriculture industry began after World War II when soldiers who had been trained at Southern California's military bases returned after the war and brought their families.

Housing needs soared and farmland was bulldozed to make way for houses, which in turn created demands in other industries. As a result, the county's economy shifted from agriculture to manufacturing, entertainment, tourism, and other service industries.

In 1982, the State of California's Department of Conservation Division of Land Resource Protection began compiling farmland maps to identify areas suitable for agricultural production based on physical and chemical characteristics of soils and actual land use. These farmland maps are created through the Farmland Mapping and Monitoring Program and include the following eight categories that are based on soil surveys.[3]

- Prime Farmland
- Farmland of Statewide Importance
- Unique Farmland
- Farmland of Local Importance
- Grazing Land
- Urban and Built-Up Land
- Other Land
- Water

The proposed project sites are located in areas designated "Urban and Built Up Land" or "Other Land.[4]" Similar to the project site, much of the land surrounding the sites is also designated "Urban and Built Up Land." Small pockets of areas designated "Other Land" are also scattered throughout the area.

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3 California Department of Conservation Division of Land Resource Protection, Farmland Mapping and Monitoring Program. *Orange County Important Farmland Map - 2004.* Sacramento, 2004.

4 *Ibid.*

4.4.2 Regulatory Setting

The proposed near term recharge projects would occur within the cities of Orange and Anaheim in Orange County. Therefore, the proposed projects would be subject to the local plans and policies of the cities and the county. The General Plans for each jurisdiction contain goals, policies and implementation measures, that, together with land use designations and zoning codes, are designed to guide land use and resource planning and development.

The Orange County General Plan assesses the availability of recreational facilities in Orange County and provides information and policies on the protection and encouragement of recreational resources throughout the County. The Orange County General Plan includes a recreation element. The goal of the recreation element is to provide adequate cost-effective recreational opportunities on a regional scale, for Orange County residents and visitors.

The Growth Management Element of the City of Anaheim General Plan provides guidance for the orderly growth and development of the City according to the General Plan. Included are goals and policies to guide land use, parks and open spaces, and infrastructure development in the City.

The Parks, Recreation, and Community Services Element of the City of Anaheim General Plan, in conjunction with the Environmental Resource and Management Element, provides the primary policy guidance for the development of the city's park, recreation, and community service system. The goals of the element are to enhance the city's quality of life for residents, workers, and visitors by providing a wide range of sufficient recreational opportunities in a safe environment.

The City of Orange General Plan includes an Open Space and Conservation Element that identifies the city's open space and natural resources and establishes policies directed toward managing these resources for the long-term benefit of the community. Protection, conservation, and enhancement of the city's environmental and recreational resources are the primary goal of this element. Other major goals of the element include participating in regional programs to improve air quality in the air basin, protecting the City's water resources, allowing for the continued extraction of aggregate resources, reserving scenic lands, and developing and maintaining recreational open space, parks, and trails.

The California Land Conservation Act of 1965, also known as the Williamson Act, enables local governments to enter into contracts with private landowners to restrict parcels of land to agricultural or open space use while promoting efficient urban growth patterns. In return, landowners receive property tax assessments that are much lower than normal because they are based upon farming and open space uses as opposed to full market value. The minimum contract term is ten years and automatically renews on the anniversary date unless nonrenewal is initiated by the landowner or local government. Generally, any lands that are enrolled in the program cannot be converted until the contract term is reached. Local activities such as eminent domain, or, in some cases city annexation, can result in the termination of Williamson Act contracts.[5]

[5] California Department of Conservation, Division of Land Resources Protection website, http://www.consrv.ca.gov/DLRP/lca/overview/program_struct_admin.htm, accessed February 3, 2005.

4.4.3 Significance Criteria

The land use analysis evaluates the consistency of the project with the type and intensities of land uses existing and proposed on and near the site. The CEQA *Guidelines* establishes that a project would normally have a significant effect on existing land uses, including recreation and agricultural resources, if it would:

- physically divide an established community;
- conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance);
- conflict with any applicable habitat conservation plan or natural community conservation plan;
- increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated;
- include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment;
- convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use;
- conflict with existing zoning for agricultural use, or a Williamson Act contract;
- involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use.

4.4.4 Impacts and Mitigation Measures

This analysis is based on the land use survey conducted by ESA in September 2002, and the goals and policies of the General Plans of Orange County, the City of Orange, the City of Anaheim, and applicable local and regional plans or policies.

Diversion of SAR Water

The District's proposed diversion of additional SAR water would not alter existing conditions within the river. The water diverted from the river would be stored in the groundwater basin. Minimal impacts to land uses would occur from the increased diversions. The use of existing recharge and conveyance facilities would be compatible with existing uses. No land uses changes would occur. No mitigation measures would be necessary.

Anaheim Lake Expanded Recharge

Impact LU-1: The Anaheim Lake Expanded Recharge project could temporarily reduce the availability of recreational resources.

The Anaheim Lake Expanded Recharge project would require draining the lake and excavating the existing islands. During this time, the lake would be unavailable for recreational use. Draining and excavation would be scheduled to take place for three months at a time during two consecutive summers. Currently, during routine maintenance, the lake is drained periodically during the dry summer months and the top layer of sediment is excavated in order to maintain recharge rates. During this time, the lake is closed to recreational activities for periods of up to three months. Implementation of the proposed project would require the closure of the lake for a total of six months spread over two consecutive summers. This short-term impact would not be considered significant and recreational activities would resume when the lake is refilled and restocked with fish.

Mitigation: None required.

Significance after Mitigation: Less than significant

Santiago Creek Expanded Recharge

Impact LU-2: The Santiago Creek Expanded Recharge project would be located within an applicable habitat conservation plan or NCCP.

The proposed project is located within the jurisdiction of the Coastal/Central Orange County NCCP. There are no sensitive species or habitat in the proposed project area in Santiago Creek, and therefore construction of the proposed project would not conflict with the NCCP. Furthermore, once construction is complete, implementation of the proposed project would increase stream flow in the creek and enhance riparian habitat (see Section 4.3, Biology Resources for a more complete discussion). Therefore, operation of the proposed project also would not conflict with the NCCP.

Mitigation: None required.

Significance after Mitigation: Less than significant

Impact LU-3: The proposed Santiago Creek Expanded Recharge project could temporarily reduce the availability of recreational resources.

The proposed Santiago Creek Expanded Recharge project would involve the installation of a 36-inch diameter underground pipe for approximately 1,500 feet along the portion of the creek that runs through Hart Park. Currently, storm flows in the creek sheet flow across the park's parking lot. After installation of the pipeline, water would flow beneath the parking lot except during high flows that exceed the capacity of the pipeline. When this occurs, creek flows would overflow through the parking lot similar to existing conditions.

During construction, recreational activities in the park along the creek would be restricted for approximately six months. This is considered a temporary impact. The City of Orange is planning to construct the Santiago Trail along portions of the Santiago Creek including Hart Park. The District is coordinating with the city's community services department to minimize the construction period. After construction, the pipeline would allow use of the park for more days than are currently available since there would be fewer overflows into the parking lot. It is not anticipated that this would increase the use of the park to the extent that would cause accelerated deterioration or overcrowding of the existing facilities. Therefore, impacts during construction and after project completion would not be significant.

Mitigation: None required.

Significance after Mitigation: Less than significant

4.5 Aesthetics

4.5.1 Setting

Orange County consists of urbanized flatlands and hills, sandy beaches, rocky coastal points, and mountain ridges reaching elevations of 4,500 feet asl. The Pacific shoreline is characterized by broad sandy beaches extending into shallow offshore waters, coastal bluffs, uplifted marine terraces, and marshes. The twin-peaked heights of the Santa Ana Mountains form a saddleback through which the SAR flows from San Bernardino County. The Santa Ana Mountains divide the coastal plains from the inland deserts, with ridgelines along the eastern county border.

More than half of Orange County is urbanized, including nearly all of the District's service area. Cleveland National Forest, established in 1908 south of the SAR watershed, is the County's largest single open space feature. Other open space areas include the Starr Ranch Audubon Sanctuary, Crystal Cove State Park (located along the Irvine Coast), and Chino Hills State Park (adjoining San Bernardino and Orange counties). Open space is also provided by County local parks within the suburban and urban setting.

The District's service area is already highly urbanized, consisting of residential, commercial and light industrial uses. Recreational, agricultural, and open space uses are scattered throughout the service area. Caltrans has designated the portion of State Route 91 that parallels the SAR from State Route 55 to the eastern border of the City of Anaheim as a Scenic Highway. In addition, the Pacific Coast Highway through Orange County has been proposed as a potential scenic highway but has not been officially designated.

Like much of Orange County, the District's recharge facilities exist in an area that has been developed within the last 50 years. The recharge basins are generally located within the light industrial area of Anaheim. Landscaping with non-native trees and shrubs along the edges of the basins shields the lakes from public view. Public access is provided to the Anaheim Lakes for recreational fishing.

4.5.2 Regulatory Setting

California Scenic Highway Program

California's Scenic Highway Program was created by the State Legislature in 1963 to preserve and protect scenic corridors from changes that could diminish the aesthetic value of adjacent lands. The Scenic Highway Program is codified in the Streets and Highways Code, Section 260 et seq. The regulations provide for the preparation of scenic corridor protection plans. Official scenic highway status places no restrictions for improvements on scenic highways or land uses on adjacent lands. The program attempts to coordinate transportation and land use modifications with the protection of scenic values to the maximum extent feasible.

4.5.3 Significance Criteria

According to the *CEQA Guidelines* Appendix G, a project would be considered to have a significant impact if it would:

- have a substantial adverse effect on a scenic vista;
- substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;
- substantially degrade the existing visual character or quality of the site and its surroundings; or
- create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.

An impact would also be considered significant if the project conflicted with an adopted policy regarding aesthetics and visual resources. The significance of impacts related to the visual quality of the environment is analyzed from two perspectives: the temporary impacts of construction activities and the long-term impacts associated with operation.

4.5.4 Impacts and Mitigation Measures

Diversion of SAR Water

The District's proposed diversion of additional SAR water would not alter existing conditions within the river. The water diverted from the river would be stored in the groundwater basin. Minimal impacts to local aesthetics or character would occur from the increased diversions. The physical appearance of the existing recharge facilities would not be modified. With more water available during dry weather periods, the recharge basins may be full more often, which would enhance visual character. No mitigation measures would be necessary. Individual construction projects to increase recharge capacity are assessed separately.

Anaheim Lake Expanded Recharge

Impact AES-1: Construction of the Anaheim Lake Expanded Recharge project would pose temporary aesthetics impacts.

Construction activities may be seen from adjacent residential neighborhoods. The potential short-term visual impacts include exposed soil, dirt storage, and construction staging areas. However, the site is generally shielded from off-site views. Construction would occur over a six-month period and would be similar to maintenance activities. Due to the short-term nature of construction activities, this is considered a less than significant impact.

Mitigation: None required.

Significance after Mitigation: Less than significant.

Santiago Creek Expanded Recharge

Impact AES-2: Construction at Santiago Creek would pose temporary aesthetic impacts.

Construction activities may be seen from adjacent residential neighborhoods and Hart Park. The potential short-term visual impacts include exposed soil, dirt storage, and construction staging areas. Construction would occur over a six-month period. The site would be returned to a condition similar to existing conditions. Due to the short-term nature of construction activities, this is considered a less than significant impact.

Mitigation: None required.

Significance after Mitigation: Less than significant.

4.6 Air Quality

4.6.1 Setting

The service area is located within the jurisdictional boundaries of the South Coast Air Quality Management District (SCAQMD), within the South Coast Air Basin (SCAB). The SCAB encompasses 6,745 miles and includes some portions of San Bernardino, Riverside, Los Angeles, and Orange Counties.

Regional Climate

The SCAB is primarily a coastal plain with interconnected valleys and low hills progressing into high mountain ranges on the perimeter. The region is located within a semi-permanent high-pressure system that lies off the coast. As a result, the weather is mild, tempered by a daytime sea breeze and a nighttime land breeze. This mild climate is infrequently interrupted by periods of extremely hot weather, winter rainstorms, and Santa Ana (offshore) winds. Rainfall in the SCAB is primarily restricted to November through April, with rainfall totals being highly variable from year to year, averaging 16 inches annually.

The SCAB has a low average wind speed of 5.7 miles per hour (mph) in downtown Los Angeles. Inland areas record slightly lower wind speeds, while coastal areas average approximately 2 mph greater than downtown. Because of the low average wind speed, air contaminants in the SCAB do not readily disperse. On spring and summer days air flows out of the SCAB through mountain passes or is lifted by the warm vertical currents produced by the heating of the mountain slopes. From late summer through the winter months, lower wind speeds and the earlier appearance of offshore breezes combine to trap air in the SCAB.

The SCAB is sometimes is affected by the presence of a persistent temperature inversion layer, which limits vertical dispersion of air pollutants. In a normal atmosphere, temperature decreases with altitude. In an inversion condition temperature increases with altitude. As the pollution rises it reaches an area where the ambient temperature exceeds the temperature of the pollution. This causes the pollution to sink back to the surface. This phenomena acts to trap air pollution near the surface.

In summer, the longer daylight hours and bright sunshine combine to cause a reaction between hydrocarbons and oxides of nitrogen to form ozone. In winter, the greatest pollution problems are carbon monoxide and nitrogen oxides, which are trapped and concentrated by the inversion layer.

4.6.2 Regulatory Setting

Applicable Regulations

Federal Standards

The federal Clean Air Act (CAA) of 1970 is the comprehensive law that regulates air emissions from area, stationary, and mobile sources. The law authorized the U.S. EPA to establish National

Ambient Air Quality Standards (NAAQS) to protect public health and the environment. The goal of the Act was to set and achieve NAAQS in every state by 1975.

The Act was amended in 1977 primarily to set new goal dates for achieving attainment of NAAQS since many areas of the country had failed to meet the deadlines. The 1990 amendments to the CAA in large part were intended to meet unaddressed or insufficiently addressed problems such as acid rain, ground level ozone, stratospheric ozone depletion, and air toxics.

NAAQS have been established for carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10}), and lead (Pb). These contaminants are referred to as criteria pollutants. **Table 4.6-1** summarizes state and federal air quality standards for these criteria pollutants.

TABLE 4.6-1
AMBIENT AIR QUALITY STANDARDS FOR CRITERIA POLLUTANTS

Pollutant	Averaging Time	California Standard	Federal Primary Standard	Reported Pollutant Health and Atmospheric Effects	Major Pollutant Sources
Ozone (O_3)	1 hour	0.09 ppm	0.12 ppm	High concentrations can directly affect lungs, causing irritation. Long-term exposure may cause damage to lung tissue.	Motor vehicles.
	8 hours	---	0.08 ppm		
Carbon Monoxide (CO)	1 hour	20 ppm	35 ppm	Classified as a chemical asphyxiant, CO interferes with the transfer of fresh oxygen to the blood and deprives sensitive tissues of oxygen.	Internal combustion engines, primarily gasoline-powered motor vehicles.
	8 hours	9 ppm	9.0 ppm		
Nitrogen Dioxide (NO_2)	Annual Average	---	0.05 ppm	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown.	Motor vehicles, petroleum-refining operations, industrial sources, aircraft, ships, and railroads.
	1 hour	0.25 ppm	---		
	1 hour	0.25 ppm	---		
	24 hours	0.04 ppm	0.14 ppm		
Suspended Particulate Matter (PM_{10} and $PM_{2.5}$)	Annual Geometric Mean	30 µg/m^3 (PM_{10})	65 µg/m^3 ($PM_{2.5}$)	May irritate eyes and respiratory tract, decreases in lung capacity, cancer and increased mortality. Produces haze and limits visibility.	Dust and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g. wind-raised dust and ocean sprays).
	Annual Arithmetic Mean	---	50 µg/m^3 (PM_{10})		
	24 hours	50 µg/m^3 (PM_{10})	150 µg/m^3 (PM_{10})		
			15 µg/m3 ($PM_{2.5}$)		
Lead	Monthly	1.5 µg/m^3	---	Disturbs gastrointestinal system, and causes anemia, kidney disease, and neuromuscular and neurologic dysfunction (in severe cases).	Present source: lead smelters, battery manufacturing & recycling facilities. Past source: combustion of leaded gasoline.
	Quarterly	---	1.5 µg/m^3		

SOURCE: California Air Resources Board, *Ambient Air Quality Standards*, January 25, 1999.

State Standards

In 1967, California's legislature passed the Mulford-Carrel Act, which established the California Air Resources Board (CARB). The CARB set state air quality standards for criteria pollutants. The state standards for these pollutants are more stringent than the corresponding federal standards (see Table 4.6-1). As in the federal CAA, the California CAA classifies areas as either being in "attainment" or "non-attainment" for these criteria pollutants. Areas designated as non-attainment are then given a set time frame to achieve attainment.

Local Regulations

The project site is located within the jurisdiction of the SCAQMD. The SCAQMD prepared a CEQA Handbook to assist with evaluation of potential air impacts of projects within the SCAB.

The CEQA Handbook establishes significance thresholds for daily operational and construction air emissions. **Table 4.6-2** summarizes these thresholds.

TABLE 4.6-2
SCAQMD AIR POLLUTION SIGNIFICANCE CRITERIA

Air Pollutant	Project Construction	Project Operation
Carbon Monoxide (CO)	550 lbs. Per day	550 lbs. Per day
Reactive Organic Compounds (ROC)	75 lbs. Per day	55 lbs. Per day
Nitrogen Oxides (NOx)	100 lbs. Per day	55 lbs. Per day
Particulates (PM10)	150 lbs. Per day	150 lbs. Per day

SOURCE: South Coast Air Quality Management District.

Sensitive Receptors

Some land uses are considered more sensitive to air pollution than others due to the types of population groups or activities involved. SCAQMD includes in its list of sensitive receptors residence, schools, playgrounds, childcare centers, convalescent homes, retirement homes, rehabilitation centers, and athletic facilities. Sensitive population groups include children, the elderly, and the acutely and chronically ill, especially those with cardio-respiratory diseases. Residential areas are also considered to be sensitive to air pollution because residents tend to be home for extended periods of time, resulting in sustained exposure to any pollutant present.

4.6.3 Significance Criteria

The *CEQA Guidelines* checklist provides the following thresholds for determining significance with respect to air quality. Air quality impacts would be considered significant if the project would:

- conflict with or obstruct implementation of the applicable air quality plan;
- violate any air quality standards or contribute substantially to an existing or projected air quality violation;
- result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality

standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);

- expose sensitive receptors to substantial pollutant concentration; or
- create objectionable odors affecting a substantial number of people.

In addition, the SCAQMD has adopted air quality thresholds of significance for construction activities and project operations that are shown in Table 4.6-2.

4.6.4 Impacts and Mitigation Measures

Diversion of SAR Water

The District's proposed diversion of additional SAR water would not alter existing conditions within the river. The water diverted from the river would be stored in the groundwater basin. Minimal additional air emissions would result from the project. Existing earth moving operations associated with operations and maintenance of recharge basins and river recharge capacity would not change from existing conditions. No mitigation measures would be necessary. Individual construction projects to increase recharge capacity are assessed separately.

Anaheim Lake Expanded Recharge

Impact AIR-1: Construction activities would emit criteria pollutants.

Earth moving activities within Anaheim Lake would temporarily increase air emissions from construction equipment. Construction-related emissions primarily would be: 1) dust generated from soil handling; 2) exhaust emissions from powered construction equipment; and 3) motor vehicle emissions associated with construction activities. The Anaheim Lakes Expanded Recharge project would flatten islands that currently exist in Anaheim Lake. The proposed project would require the temporary drainage of half of Anaheim Lake. No other construction activities would be required for this project.

It is estimated that two scrapers, one dozer, and one motor grader would operate at the site simultaneously. It is further assumed that 20 employees would travel 30 miles to and from the job site, and a water truck would travel 10 miles per day at the job site. Construction-phase air quality impacts were analyzed quantitatively utilizing construction emissions estimation worksheets (**Appendix G**). The worksheets follow methodology outlined in the SCAQMD CEQA Air Quality Handbook and utilize emissions factors found in the EMFAC-2002 air emissions models and CARB Emission Inventory Publication number MO99-32.3.

The air emissions calculations assume that construction emissions would last approximately six months and would vary day to day depending on the activities being performed. Fugitive dust emissions would vary depending on the level and type of activity, silt content of soil, and prevailing weather. Some fugitive dust would be larger-diameter particles that would settle out of the atmosphere close to the site of the actual activity. Smaller-diameter dust would remain suspended for longer periods and would include PM_{10}. Fugitive dust emissions were calculated utilizing emissions factors found in Table 11.9-1 of U.S. EPA's AP-42 compilation of emissions factors and SCAQMD CEQA Air Quality Handbook.

Table 4.6-3 shows the emissions associated with construction of the Anaheim Lake Expanded Recharge project. The estimated emissions assume that measures required in the SCAQMD Fugitive Dust Rule 403 would be implemented as summarized in the following:

- Trucks hauling soil, sand and other loose materials, will be covered or maintain at least two feet of freeboard;
- Paved access roads, parking area, and staging areas at construction sites shall be swept daily with water sweepers;
- Streets shall be swept daily with SCAQMD Rule 1186 certified water sweepers (recommend water sweepers with reclaimed water) if visible soil material is carried onto adjacent public streets; and
- Speeds on unpaved roads shall be limited to 15 miles per hour for construction equipment.

TABLE 4.6-3
ESTIMATED CONSTRUCTION EMISSIONS

Air Pollutant	Santiago Creek	Anaheim Lake	Significance Criteria
Carbon Monoxide (CO)	18 lbs./day	21 lbs./day	550 lbs./day
Reactive Organic Compounds (ROC)	2 lbs./day	5 lbs./day	75 lbs./day
Nitrogen Oxides (NO_x)	21 lbs./day	72 lbs./day	100 lbs./day
Particulates (PM_{10})	9 lbs./day	52 lbs./day	150 lbs./day

SOURCE: South Coast Air Quality Management District.

As shown in Table 4.6-3, emissions associated with construction of the Anaheim Lake Expanded Recharge project would not exceed SCQAMD daily emissions thresholds for criteria pollutants. Impact would be less than significant.

Mitigation: None required.

Significance after Mitigation: Less than significant.

Santiago Creek Expanded Recharge

Impact AIR-2: Construction activities would emit criteria pollutants.

The Santiago Creek Expanded Recharge project would construct a 1,600 foot pipeline to convey water to the southern portion of Santiago Creek to maximize recharge. The project would include the installation of a 36-inch pipeline across Heart Park on Orange.

It is estimated that two scrapers, one backhoe, and one trencher would operate at the site. It is further assumed that 20 employees, would travel 30 miles to and from the job site, 10 haul trucks would travel 15 miles to and from the job site, and a water truck would travel 10 miles per day at the job site. Fugitive dust emission calculations from the loader/backhoe were found in the EPA AP-42 compilation of emissions factors Table 11.9-1.

As shown in Table 4.6-3, emissions associated with construction of the pipeline at the Santiago Creek Expanded Recharge Zone would not exceed SCAQMD daily thresholds for criteria pollutants. The estimated emissions assume that measures required in the SCAQMD Fugitive Dust Rule 403 would be implemented as summarized above. Impact would be less than significant.

Mitigation: None required.

Significance after Mitigation: Less than significant.

4.7 Cultural Resources

4.7.1 Setting

Prehistoric Setting

The coastal Southern California region contains an archaeological record that represents a wide array of cultural traditions spanning much of the Holocene Epoch (~10,000 years ago to the present). Wallace[1] suggested four prehistoric periods for coastal southern California, referred to as horizons, that emphasize the archaeological cultures and the relationships between them. The horizons are useful in that they reflect important changes in the material culture of prehistoric southern Californians. Briefly, the four periods are described below:

Horizon I: The San Dieguito horizon is the earliest period with sites distributed in San Diego County, the Colorado Desert, and northward along the California coast. This horizon dates between 8,500 before present (BP) and 9,000 BP. The San Dieguito deposits are characterized by a lack of grinding implements. The San Dieguito remains suggest that cultures specialized for the exploitation of marine and littoral resources existed locally prior to 7,000 years ago.

Horizon II: The next period is often referred to as the Millingstone Horizon or Encinitas Tradition, which occurred from about 8,000 BP to 3,000 BP. Periodic climatic changes during this period of the Holocene may have driven the cultural changes marking the onset of the period. Increased dependence on plant foods is reflected by the frequent presence of seed processing tools, manos and metates. Projectile points are rare, and are usually of types suggesting use of the atlatl (spear thrower). The technological and economic focus that represented this horizon proved to be a stable strategy that lasted roughly 5,000 years with little evident change.

Horizon III: The third prehistoric period is known as the Intermediate Horizon. The period is relatively well developed locally in the Orange County area. Horizon III is characterized by the introduction of small projectile points, suggesting increased hunting and the introduction of the use of the bow and arrow. It is during this period that true maritime exploitation and occupation of the Channel Islands begins. The duration of Horizon III is roughly from 3,000 to 1,000 years BP.

Horizon IV: The final prehistoric period begins about 1,000 BP and ends with the arrival of Europeans. In Orange County, the prehistoric period ended with the overland expedition of Portola in 1769. Horizon IV is marked by large increases in population, production of many more works of art and permanently occupied villages.

Ethnographic Setting

Historic native groups were referred to by the Europeans by names derived from the nearest mission. Thus, people residing near San Juan Capistrano became Juaneño and those near San Gabriel became Gabrielino. The Native inhabitants of the Orange County area at the time of

[1] Wallace, W.J. 1955. *A Suggested Chronology for Southern California Coastal Archaeology*. Southwestern Journal of Anthropology 11(2): 214-30.

European contact are likely to have been Gabrielino, but the traditional boundary with the Juaneño is not far distant, and may have shifted over time.

The Gabrielino occupied nearly all of the Los Angeles basin in Los Angeles and Orange counties. Their traditional lands included the watersheds of the San Gabriel, Santa Ana, and Los Angeles rivers, several of the smaller streams of the Santa Monica Mountains and Santa Ana Mountains, to Aliso Creek in Orange County. They also inhabited the offshore islands of San Clemente, Santa Catalina, and San Nicolas. Precise data on village locations can no longer be obtained. As with the northern groups, these southern coastal groups subsisted by hunting and gathering with a substantial reliance in coastal areas on marine food resources such as fish, shellfish and marine mammals, as well as terrestrial resources.

Historic Setting

As in Los Angeles County, Gaspar de Portola passed through what is today Orange County on his exploration in 1769 between San Diego and Monterey. In 1776, Mission San Juan Capistrano was founded by Father Junipero Serra. An outpost had been established the previous year by Father Fermin Lasuen, but Native American unrest in San Diego forced abandonment of the site.

Only two land grants were awarded during the Spanish Period in what today is Los Angeles and Orange Counties. The first, extending over what is now Los Angeles County, was awarded to Manuel Nieto in 1784. The second rancho was the vast Santiago de Santa Ana given to Jose Antonio Yorba in 1810, and was the only Spanish land grant that lies entirely in what is now Orange County. When Yorba retired from military service he received the parcel in lieu of a pension for his many years of faithful service to the Spanish Crown. With him in this venture was his nephew Juan Pablo Peralta. No other settlements were established in Orange County during the Spanish period.

Like Los Angeles County, the ranchos of Orange County prospered during the Mexican Period. Nineteen new ranchos were granted. Like the other missions, San Juan Capistrano was secularized and its lands given out to private citizens. Dana Point became a well-used place to exchange hides and tallow with passing foreign ships. An experimental colony of German settlers was founded in Anaheim in 1857. It was the first community in what was to become Orange County other than the mission at San Juan Capistrano and the several private ranchos.

Orange County remained part of Los Angeles County until 1883 when local leaders, including James Irvine, decided they could better handle their own affairs than far away Los Angeles. This American Period in Orange County largely paralleled that of Los Angeles County of which it once was a part.

Paleontological Setting

Paleontological resources in the form of fossilized remains of organisms that lived in the region in the geologic past are present in the geologic formations throughout Orange County. Deposits along the Orange County coast have produced abundant invertebrate fossils, as well as scattered, significant vertebrate remains of ocean-dwelling creatures. Much of the fossil-bearing rock formations occur in South Orange County, such as the Newport Bay District, San Joaquin Hills

District, and the Laguna Hills/Dana Point Area. The region is typified by crystalline basement rocks (metamorphic & plutonic) overlain by sedimentary and volcanic rocks.

Methods

A records search of all pertinent survey and site data was conducted at the South Central Coastal Information Center at California State University, Fullerton (SCCIC File # 2059) (See **Appendix H**). The records were accessed by utilizing the Orange, Calif. USGS 7.5-minute quadrangle map, Orange County. The review incorporated the proposed project footprints for the Anaheim Lake and Santiago Creek sites along with a 1,000 foot Study Area radius (subsequently referred to as the Project Area). Previous surveys and archaeological site records were accessed as they pertained to the Study Area. Records were accessed and reviewed in the *Directory of Properties in the Historic Property Data File for Orange County* for information on sites of recognized historical significance within the *National Register of Historic Places*, the *California Register of Historic Resources*, the *California Inventory of Historic Resources* (1976), the *California Historical Landmarks* (1996), and the *California Points of Historical Interest* (1992).

Three cultural resource studies have been conducted within the Anaheim Lake and Santiago Creek project areas. These studies did not reveal any previously unidentified cultural resource sites:

Clewlow, W.C. 1974. *Preliminary Report of the Potential Impact on Archaeological Resources of the Proposed Gas Transmission Pipeline from Los Angeles Harbor to Yorba Linda*. On File at the South Central Coastal Information Center, Fullerton, Calif. [SCCIC # 1596].

Conkling, S.W., D. McLean, and B. Sturn 1994. *Cultural Resources Assessment for Five Vacant Lots and 42 Potential Historic Buildings within the Northeast Anaheim Redevelopment Area, Orange County, Calif.* On File at the South Central Coastal Information Center, Fullerton, Calif. [SCCIC # 2501].

Padon, Beth 1994. *Cultural Resource Review for Groundwater Replenishment System Program EIR/Tier I/ EIS, Orange County Water District and County Sanitation Districts of Orange County.* On File at the South Central Coastal Information Center, Fullerton, Calif. [SCCIC # 1836].

Three prehistoric archaeological sites have been identified within a ¼ mile radius of Anaheim Lake (30-000428, 30-000429, and 30-000430), which are described below. None of these sites are located within the footprint of construction and none are listed on the National Register Archaeological Determination of Eligibility list. No historical archaeological sites have been identified within a ¼ mile radius of Anaheim Lake.

Prehistoric sites identified as CA-ORA-428, 429, and 430[2] contain assemblages of manos, metate fragments or slabs, and faunal remains. Each site occurred just north of the project area near the Carbon Canyon drainage. Although site records did not elaborate on the age of the sites, they would likely be from the Millingstone period in coastal southern California prehistory.

2 Recorded by Hall, Cooley, 1973. Archaeological Site Survey Records, Orange County. On file at the South Central Coastal Information Center, Fullerton, Calif.

4.7.2 Regulatory Setting

The Orange County General Plan outlines specific policies and goals related to the preservation of cultural resources within the county that are in accordance with CEQA. The following policies addressing archaeological, paleontological, and historical resources shall be implemented at appropriate stage(s) of planning, coordinated with the processing of a project application, as follows:

- Identification of resources shall be completed at the earliest stage of project planning and review such as general plan amendment or zone change;
- Evaluation of resources shall be completed at intermediate stages of project planning and review such as site plan review, subdivision map approval, or at an earlier stage of project review; and
- Final preservation actions shall be completed at final stages of project planning and review such as grading, demolition, or at an earlier stage of project review.

4.7.3 Significance Criteria

In accordance with *CEQA Guidelines*, the project would pose a significant impact to cultural resources, if it would:

- Cause a substantial adverse change in the significance of a historical resource;
- Cause a substantial adverse change in the significance of an archaeological resource;
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature; and
- Disturb any human remains, including those interred outside of formal cemeteries.

4.7.4 Impacts and Mitigation Measures

Diversion of SAR Water

The District's proposed diversion of additional SAR water would not alter existing conditions within the river. The water diverted from the river would be stored in the groundwater basin. Minimal impacts to cultural resources would occur from the increased diversions. No mitigation measures would be necessary. Individual construction projects to increase recharge capacity are assessed separately.

Anaheim Lake Expanded Recharge

Impact CULT-1: Implementation of the Anaheim Lake Expanded Recharge project could affect unknown, potentially significant prehistoric and historic resources.

The Anaheim Lake Expanded Recharge project would involve cutting down the existing island and spreading the material uniformly on the bottom of the lake. It is possible, although unlikely, that the island or shore areas may contain previously unknown archaeological or paleontological resources. However, given the proximity of the project area to previously identified prehistoric resources, previously unidentified prehistoric materials could be encountered. Implementation of mitigation measures would ensure that no significant impacts to archaeological or paleontological resources would occur.

Mitigation Measure

M-CULT-1: Pursuant to *CEQA Guidelines* 15064.5 (f), "provisions for historical or unique archaeological resources accidentally discovered during construction" will be instituted. In the event that any prehistoric or historic subsurface cultural resources are discovered during ground disturbing activities, all work within 50 feet of the resources shall be halted and the District shall consult with a qualified archaeologist or paleontologist to assess the significance of the find. If any find is determined to be significant, representatives of the District and the qualified archaeologist and/or paleontologist would meet to determine the appropriate course of action. All significant cultural materials recovered shall be subject to scientific analysis, professional museum curation, and a report prepared by the qualified archaeologist according to current professional standards.

Significance after Mitigation: Less than significant.

Santiago Creek Expanded Recharge

Impact CULT-2: Implementation of the Santiago Creek Expanded Recharge project could affect unknown, potentially significant prehistoric and historic resources.

The parking area within Hart Park was installed over 50 years ago. The side walls of the creek have some architectural uniqueness that could be of historic value. Mitigation measures to reduce impacts to historic resources would effectively reduce the potential impact to less than significant levels. In addition, excavation within Santiago Creek could uncover previously unknown archaeological or paleontological resources. Implementation of mitigation measures would ensure that potential impacts would be less than significant.

Mitigation Measures

M-CULT-2: Prior to excavation, a qualified architectural historian shall conduct a survey of the Hart Park construction area. The historian shall determine the potential significance of the Hart Park parking area. The historian shall prepare a report identifying the significance and recommending measures to minimize the potential impact. Measures may include minimizing the construction area to avoid construction impacts to side walls and access routes.

M-CULT-3: Pursuant to *CEQA Guidelines* 15064.5 (f), "provisions for historical or unique archaeological resources accidentally discovered during construction" will be curated. In the event that any prehistoric or historic subsurface cultural resources are discovered during ground disturbing activities, all work within 50 feet of the resources shall be halted and the District shall consult with a qualified archaeologist or paleontologist to assess the significance of the find. If any find is determined to be significant, representatives of the District and the qualified archaeologist and/or paleontologist would meet to determine the appropriate course of action. All significant cultural materials recovered shall be subject to scientific analysis, professional museum curation, and a report prepared by the qualified archaeologist according to current professional standards.

Significance after Mitigation: Less than significant.

4.8 Geology and Soils

4.8.1 Setting

Regional

The Orange County coastal plain is essentially an alluvial basin where differential subsidence and uplifting have occurred since the late Cretaceous period. The geologic substructure is subject to considerable tectonic stress and numerous faults traverse the region. The Newport-Inglewood fault zone along the coast creates a barrier for the western edge of the coastal groundwater basin. The Santa Ana Mountains form the eastern edge of the basin. Soils within the area are characteristic of the Southern California coastal plain, consisting of alluvial deposits and floodplain soils. The Loma Ridge and San Joaquin Hills form the impermeable barrier to the south of the basin.

The Orange County groundwater basin is over 2,000 feet deep consists of a complex series of interconnected sand and gravel deposits with discontinuous clay and silt layers. In the coastal and central portions of the basin, the lenses of lower-permeability clay and silt deposits become more common, creating lower permeability and greater separation between the shallow aquifer and the principal and deep aquifers.

Soils

Much of the soils in the region were deposited as alluvial and fluvial deposits throughout the SAR historic floodplain. Soils in the areas proposed for the La Jolla and Mira Loma recharge basins as well as the Santiago Creek expansion project consist of the Metz-San Emigdio series are well drained and exhibit moderate slopes and low shrink-swell potential. The soils consist of loamy sands and fine sandy loams.[1]

Seismology and Faults

Like much of Southern California, the site is within a seismically active area. The geologic substructure beneath Orange County is subject to considerable tectonic stress. **Table 4.8-1** lists major active faults in the region and provides the maximum moment (MM) magnitude. The MM magnitude is an estimate of the size of a characteristic earthquake capable of occurring on a particular fault, as measured by physical movement on the fault. In comparison, the Richter Scale measures the amplitude of the seismic wave. The scales are similar but the MM magnitude is generally slightly lower than the Richter Scale. Major active faults in Orange County include the Newport-Inglewood Fault at the coast and the Whittier Fault Zone along the western edge of the Puente Hills and Santa Ana Mountains. Lesser faulting occurs throughout the county, although no other faults are known to be active within the last 10,000 years.[2]

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1 USDA, Soil Conservation Service, Orange County and Western Riverside County Soil Survey, 1978.

2 Jennings, Fault Map of California, 1988.

TABLE 4.8-1
MAJOR FAULT ZONES IN ORANGE COUNTY

Fault Zone	MM Magnitude
Newport-Inglewood	6.9
Whittier	6.8
San Jacinto	7.2
Elsinore	7.1

SOURCE: California Department of Mines and Geology: Maps of Known Active Fault Near-Source Zones in California, 1998.

Geologic Hazards

Geologic hazards include seismic hazards and unstable soils. Seismic hazards include surface rupture, ground shaking, landslides, and liquefaction. Rupture of the surface during an earthquake is generally limited to the narrow strip of land immediately adjacent to the fault on which the earthquake is occurring. Surface fault rupture may occur suddenly during an earthquake or slowly in the form of fault creep and almost always follows pre-existing faults, which are zones of weakness. Not all earthquakes will result in surface rupture. The Alquist-Priolo Earthquake Fault Zone Act instigated a state-wide program to identify fault zones that are susceptible to surface rupture. Numerous rupture zones were identified in Orange County. Ground shaking intensity can vary depending on the overall magnitude of the earthquake, distance to the fault, focus of earthquake energy, and type of geologic material underlying the area. Areas that are underlain by bedrock tend to experience less ground shaking than those underlain by unconsolidated sediments such as artificial fill.

Liquefaction occurs when water-saturated sandy soil materials lose strength and become susceptible to failure during strong ground shaking in an earthquake. Liquefaction potential is greatest in areas with shallow groundwater and saturated soils. Soil type, climate, topography, slope geometry, and excavations influence the potential for slope failures and landslides. Shaking during an earthquake may lead to seismically induced landslides, especially in areas that have previously experienced landslides or slumps, in areas of steep slopes, or in saturated hillsides. The California Geologic Survey (CGS) Seismic Hazard Zone Maps for Orange County identify areas subject to liquefaction and landslides. Seismically-induced lateral spreading involves primarily lateral movement of earth materials due to ground shaking. It differs from slope failure in that complete ground failure involving large movement does not occur due to the relatively smaller gradient of the initial ground surface. Lateral spreading occurs by near-vertical cracks with predominantly horizontal movement of the soil mass involved.

In addition to seismic hazards, soils can exhibit characteristics that can restrict development. Expansive soils possess a "shrink-swell" behavior that occurs in fine-grained clay sediments from the process of wetting and drying, which may result in structural damage over a long period of time. Settlement occurs when loose, soft soil material comprised of sand, silt, clay, and/or peat if not properly engineered, has the potential to settle after a building is placed on the surface. Settlement of the loose soils generally occurs slowly, but over time can damage structures.

The extraction of water, mineral, or oil resources can result in subsidence from the removal of supporting layers in the geologic formation. Neighboring oil extraction activities could promote localized subsidence. The impacts of subsidence could include lowering of the land surfaces, increased potential for flooding, potential disturbance to buried pipeline and associated structures, and damage to structures designed with minimal tolerance for settlement.

Other geologic hazards include underground gasses generated by oil deposits. Naturally occurring methane and hydrogen sulfide gas can reach the surface from underground deposits through fissures in the geologic formations as well as through poorly abandoned or sealed wells.

Mineral Resources

The Surface Mining and Reclamation Act (SMARA) of 1975 implemented a program to identify mineral resources of state-wide significance. The Orange County Classification Report prepared pursuant to SMARA was adopted in 1983. The Classification Report identified aggregate resources along the SAR and Santiago Creek. The designation of local resources does not limit land uses in these areas, but rather identifies potential locations of suitable material in the county to meet the local aggregate demand. Local planning authorities may use this information in their planning efforts. The Orange County General Plan acknowledges the mineral zones identified in the Classification Report.

4.8.2 Regulatory Setting

Applicable Regulations

Alquist-Priolo Earthquake Fault Zones

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 requires that special geologic studies be conducted to locate and assess any active fault traces in and around known active fault areas prior to development of structures for human occupancy. This state law was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures.

The Alquist-Priolo Act’s main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults or within fifty feet of an active fault. The Act defines “a structure for human occupancy” as any structure expected to have a human occupancy rate of more than 2,000 person-hours per year. This Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. The law requires the State Geologist to establish regulatory zones (Earthquake Fault Zones) around the surface traces of active faults and to issue appropriate maps. These maps (Alquist Priolo Maps) are distributed to all affected cities, counties and state agencies for their use in planning and controlling new or renewed construction. Local cities and counties must regulate certain development projects within the zones, including by withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement. Projects include all land divisions and most structures for human occupancy.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides. The purpose of the Act is to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects with these zones. Seismic Hazard maps have been completed for much of the Southern California region.

California Building Code

The *California Building Code* (CBC) is certified in the California Code of Regulations (CCR), Title 24, Part 2, which is a portion of the California Building Standards Code. Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable. Published by the International Conference of Building Officials, the Uniform Building Code (UBC) is a widely adopted model building code in the United States. The CBC incorporates by reference the UBC with necessary California amendments. About one-third of the text within the CBC has been tailored for California earthquake conditions.

Orange County General Plan

The Orange County General Plan Natural Resources Element identifies objectives and policies toward mineral extraction:

> Goal 2: Promote the wise management of agricultural and mineral resources in order to protect these resources for existing and future needs.
>
> > Objective 2.1: Reduce dependence on imported resources through sound management of local mineral lands.
> >
> > > Policy C.3: Mineral Uses: To ensure the efficient use of all mineral lands consistent with sound resource management practice.
> > >
> > > Policy C.4: Mineral extraction: To ensure opportunities for the extraction of minerals in the County and to protect the environment during and after these minerals are being extracted.

4.8.3 Significance Criteria

The proposed project may result in a significant impact if it would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to California Division of Mines and Geology Special Publication 42.
  - Strong seismic ground shaking.

  - Seismic-related ground failure, including liquefaction.
  - Landslides.

- Result in substantial soil erosion or the loss of topsoil;
- Be located on strata or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on-or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse; or,
- Be located on expansive soil, as defined in Table 18-1-B of the UBC, creating substantial risks to life or property;
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

4.8.4 Impacts and Mitigation Measures

Diversion of SAR Water

The District's proposed diversion of additional SAR water would not alter existing conditions within the river. The water diverted from the river would be stored in the groundwater basin. Minimal geologic hazards would occur from the increased diversions. No mitigation measures would be necessary. Individual construction projects to increase recharge capacity are assessed separately.

Anaheim Lake Expanded Recharge

The Anaheim Lake Expanded Recharge Project would be subject to seismic impacts similar to existing conditions. The project would cut down the existing islands and spread the soils uniformly at the bottom of the lake. No geologic impacts would occur.

Santiago Creek Expanded Recharge

Impact GEO-1: The Santiago Creek Expanded Recharge Project would be subject to geologic hazards including unstable soils and seismic hazards such as surface rupture, ground shaking, landslides, and liquefaction.

Santiago Creek would be subject to seismic hazards. No Alquist-Priolo Zones exist within the project area from Santiago Pits to the SAR, making surface rupture unlikely. However, the proposed bypass pipeline through the parking area at Hart Park would be subject to ground shaking. There is a potential for seismically-induced liquefaction to occur within the creek bed due to the presence of saturated sandy soils. However, the integrity of the creek bed would not be compromised. The project would not involve placing residences in seismic hazard zones or increase flood risks. The project would not increase liquefaction or landslide hazards for neighboring land uses. The bypass pipeline would be constructed to withstand strong ground shaking pursuant to the UBC. Seismic impacts would be considered less than significant.

Mitigation: None required.

Significance after Mitigation: Less than significant

Impact GEO-2: The Santiago Creek Expanded Recharge Project would occur within an area that has been identified as a mineral resource zone for aggregate material.

Santiago Creek is designated as a mineral resource zone for aggregate material. The Santiago Pits now used as recharge basins were created by mineral extraction activities. The County and the city of Orange approve land uses in the area, including assigning areas for mineral extraction. There are currently no plans by the city or county to conduct aggregate mining in the lower Santiago Creek area downstream of the Santiago Pits. The city is in the process of preparing a management plan for the creek. Increasing the flow in the creek from 15 cfs to 30 cfs would not affect future land use decisions for the creek. The project would not permanently obstruct extraction of mineral resources. Therefore, the impact to mineral resources would be considered less than significant.

Mitigation: None required.

Significance after Mitigation: Less than significant

4.9 Hazards & Hazardous Materials

4.9.1 Setting

Hazardous substances include chemicals regulated by both the United States Department of Transportation's (DOT) "hazardous materials" regulations and the EPA "hazardous waste" regulations. Hazardous materials are substances that have the capacity of causing a health hazard during exposure. Hazardous wastes require special handling and disposal because of their potential to damage public health and the environment. Hazardous wastes can occur in soils and in building materials. Past uses can contaminate soils, groundwater, and surface water through the improper disposal of wastes. Industrial uses can be sources of solvents, petroleum products, and metals. Agricultural uses can result in contamination from pesticides, herbicides, pathogens, and high levels of nitrates from fertilizers and animal waste.

Many areas of Orange County were previously used for agriculture including ranching, sheep production, and orange groves. Rapid post World War II urbanization converted these farming activities to residential, commercial, and industrial land uses. Potential subsurface contamination consists of pesticides and herbicides from past agriculture, leaking underground storage tanks (USTs), and contamination from improper disposal of chemicals and wastes from industrial and military land uses.

4.9.2 Regulatory Environment

The principal federal regulatory agency for hazardous substances is the U.S. EPA. The key federal regulations pertaining to hazardous substances are the:

- Resource Conservation and Recovery Act (RCRA);
- Superfund Amendment and Reauthorization Act (SARA) Title III; and
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

In addition, a number of federal regulations exist regarding the use, removal, and disposal of asbestos containing materials. Applicable federal regulations are primarily contained in Titles 29, 40, and 49 of the Code of Federal Regulations. In California, Title 22 and Title 23 of the CCR address hazardous materials and wastes. Title 22 defines, categorizes, and lists hazardous materials and wastes. Title 23 addresses public health and safety issues related to hazardous materials and wastes and specifies disposal options.

The Hazardous Waste Control Law (HWCL) is the State law similar to the federal RCRA program. HWCL is implemented by regulations contained in Title 26 of the CCR, which describes the requirements for the proper management of hazardous wastes, including:

- Criteria for identification and classification of hazardous wastes;
- Generation and transportation of hazardous wastes;

- Design and permitting of facilities that recycle, treat, store, and dispose of hazardous wastes;
- Treatment standards;
- Operation of facilities and staff training; and
- Closure of facilities and liability requirements.

Title 26 regulations include over 800 materials that may be hazardous and the criteria for identifying, packaging, and disposing of wastes identified as being hazardous. Title 26 also establishes permit requirements for facilities that recycle, treat, store, or dispose of hazardous wastes. Under HWCA and Title 26, the generator of a hazardous waste must complete a manifest that accompanies the waste from the generator to the transporter to the ultimate disposal location. Copies of the manifest must be filed with the Department of Toxic Substances Control (DTSC).

The DTSC and the RWQCB share oversight responsibility for underground storage tanks and hazardous waste site remediation. The Orange County Environmental Health Division is the local administration agency regulating hazardous materials and hazardous wastes in Orange County, except in the cities of Anaheim, Fullerton, Orange, and Santa Ana. In these cities, local departments oversee the cleanup of sites within the city limits involving soil and/or groundwater contamination.

The General Plan for each jurisdiction contains goals, policies, and implementation measures that are designed to protect public health and safety from a variety of hazards. Therefore, the proposed projects would be subject to the local plans and policies of the cities and county where they are located.

4.9.3 Significance Criteria

The criteria used to determine the significance of an impact are based on the Initial Study checklist in Appendix G of the State *CEQA Guidelines.*

The proposed project may result in a significant impact if it would:

- create a significant hazard to the public or environment through the routine transport, storage, use, or disposal of hazardous materials;
- create a significant hazard to the public through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- emit hazardous emissions or handles hazardous or acutely hazardous materials, substances, or waste be within ¼-mile of an existing or proposed school;
- be located on a site that is known to contain hazardous materials or is listed on a site compiled pursuant to Government Code Section 65962.5, and as a result could create a significant hazard to the public or the environment;
- result in a safety hazard for people residing or working in the project area for a project located within an airport land use plan, within two miles of a public airport or within the vicinity of a private airstrip;

- impair or interfere with the implementation of an adopted emergency response plan or emergency evacuation plan; or
- expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

4.9.4 Impacts and Mitigation Measures

Diversion of SAR Water

The District's proposed diversion of additional SAR water would not alter existing conditions within the river. The water diverted from the river would be stored in the groundwater basin. Minimal hazards would occur from the increased diversions. Hazardous waste sites including leaking underground storage tank sites occur in numerous locations throughout the OCWD service area. It is the responsibility of the site operators to manage and remediate these sites in coordination with the RWQCB or DTSC. Increased diversions would have no effect on existing contamination plumes. No mitigation measures would be necessary. Individual construction projects for new recharge basins are assessed separately.

Anaheim Lake Expanded Recharge

Implementation of the Anaheim Lake Expanded Recharge project would not involve generation or storage of hazardous materials or wastes. No impacts would be anticipated.

Santiago Creek Expanded Recharge

Impact HAZ-1: The Santiago Creek Expanded Recharge project could encounter soil during excavation that has been exposed to contamination.

The Santiago Creek Expanded Recharge project would involve diverting up to 15 cfs of water from Santiago Basin into Santiago Creek and excavating within the creek bed beneath an existing concrete slab. The concrete slab was installed over 50 years ago, so it is unlikely that excavation activities would encounter contaminated soils.

A database search conducted for the project identified no indication of contamination at the project site.[1] One leaking UST site was identified within ½ mile of Hart Park, located at the Exxon Service Station, 2701 Grand Avenue. No other information regarding the nature of the leak was reported. Other USTs were identified on Grand Avenue near the Santiago Creek crossing, but no leaks were reported. The following mitigation measures would ensure that the project would not transport existing contamination onto neighboring properties or into the groundwater.

1 EDR, November 2002.

Mitigation Measures

See **M-HYDRO-3** and **M-HYDRO-4**.

Significance after Mitigation: Less than significant.

Impact HAZ-2: Construction activities within Santiago Creek could result in spilling hazardous materials into the creek.

During construction of the Santiago Creek Expanded Recharge project, heavy machinery would operate within the creek bed. Any seepage from engines or fuel spills during fueling operations could contaminate soils in the creek.

Mitigation Measures

M-HAZ-1: No refueling of heavy equipment shall be conducted within the creek bed.

M-HAZ-2: Drip pans shall be placed under heavy equipment within the creek bed when not in operation.

Significance after Mitigation: Less than significant.

4.10 Noise

4.10.1 Setting

Noise Sources and Levels

Environmental noise is usually measured in A-weighted decibels (dBA). A decibel (dB) is a logarithmic unit of sound energy intensity. Sound waves, traveling outward from a source, exert a sound pressure level (commonly called "sound level"), measured in decibels. A dBA is a decibel corrected for the variation in frequency response of the typical human ear at commonly encountered noise levels. In general, the human ear can perceive a 3-dBA increase or decrease in noise levels; a difference of 10 dBA is typically perceived as a doubling of loudness.

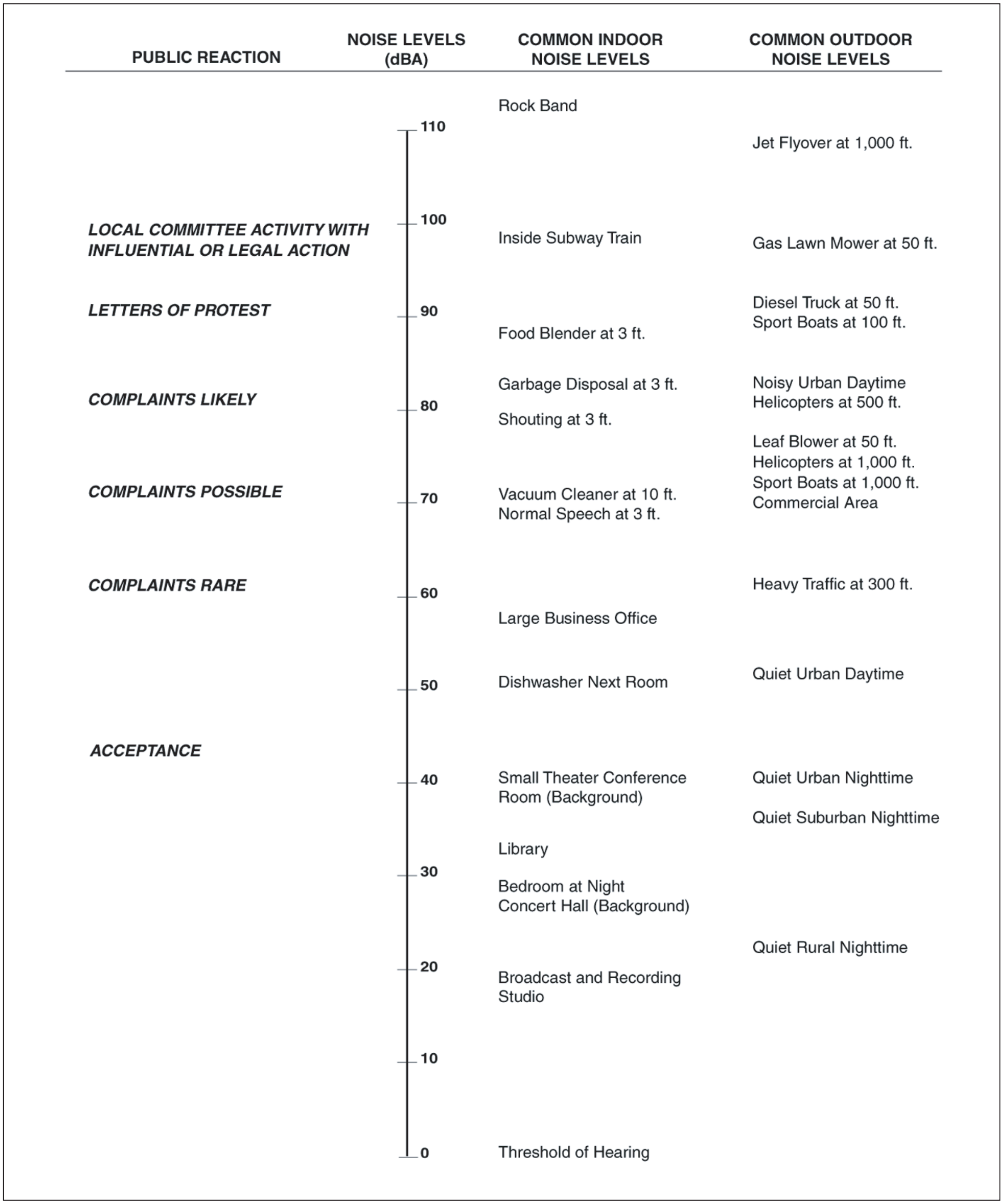
Since environmental noise levels typically fluctuate over time, different types of noise descriptors are used to account for noise variability. These descriptors include L_{eq} (equivalent sound level), L_{dn} (day-night sound level), and Community Noise Equivalent Level (CNEL). The L_{eq} is the actual time-averaged sound level for a specific period. CNEL and L_{dn} values are derived from the averaging of L_{eq} values over a 24-hour period, with a weighting factor applied to evening and nighttime L_{eq} values. For CNEL, the noise levels in the evening time period (7:00 p.m. to 10:00 p.m.) are penalized by 5 dBA (that is to say, 5 dBA are added to noise level results to derive the CNEL value), while nighttime noise (10:00 p.m. to 7:00 a.m.) is penalized by 10 dBA. For L_{dn}, nighttime noise (10:00 p.m. to 7:00 a.m.) is penalized by 10 dBA. All L_{eq}, CNEL and L_{dn} values reported herein reflect A-weighted decibels unless noted otherwise.

Sound Propagation and Attenuation

Noise sources can be categorized as either "line sources" or "point sources." For a "line source" of noise, such as a heavily traveled roadway, the noise level generally decreases by 3 dBA for each doubling of distance between the noise source and the noise receptor. In many cases, with the combined effects of environmental factors, such as wind conditions, temperature gradients, characteristics of the ground and the air, and the presence of vegetation, perceived noise levels may decrease by 4.5 dBA for each doubling of distance. Some representative sounds and associated noise levels and general public reactions to these noise levels are shown in **Figure 4.10-1**.

The increase in noise attenuation in exterior environments is particularly perceived where the following conditions exist:

- a low percentage of truck traffic;
- the view of a roadway is interrupted by isolated buildings, clumps of bushes, and scattered trees;
- the intervening ground is soft or covered with vegetation; or
- the source or receptor is located more than three meters above the ground.



SOURCE: Caltrans Noise Manual California State Department of Transportation, March 1980.

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Figure 4.10-1
Common Noise Levels and Public Reaction

In an area that is free of barriers, the sound level resulting from a single "point source" of noise generally decreases by 6 dBA for each doubling of distance. A temporarily stationary mobile source, such as an idling truck or other heavy duty equipment operating within a confined area, such as a construction site, can also be considered a “point source” of noise, exhibiting the same decrease in sound level.

Sensitive Receptors

Some land uses are considered more sensitive to ambient noise levels than others. Residences, schools, libraries, churches, hospitals, nursing homes, auditoriums, parks, and outdoor recreation areas are generally more sensitive to noise than are commercial and industrial land uses.

4.10.2 Regulatory Setting

Various federal, state, and local agencies have developed guidelines for evaluating the compatibility of different land uses and various noise levels.

Federal Regulations

Federal regulations establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under the Code of Federal Regulations (CFR), Title 40, Part 205 Subpart B. The federal truck passby noise standard is 80 dBA at 15 meters (approximately 50 feet) from the vehicle pathway centerline. These standards are implemented through regulatory controls on vehicle manufacturers.

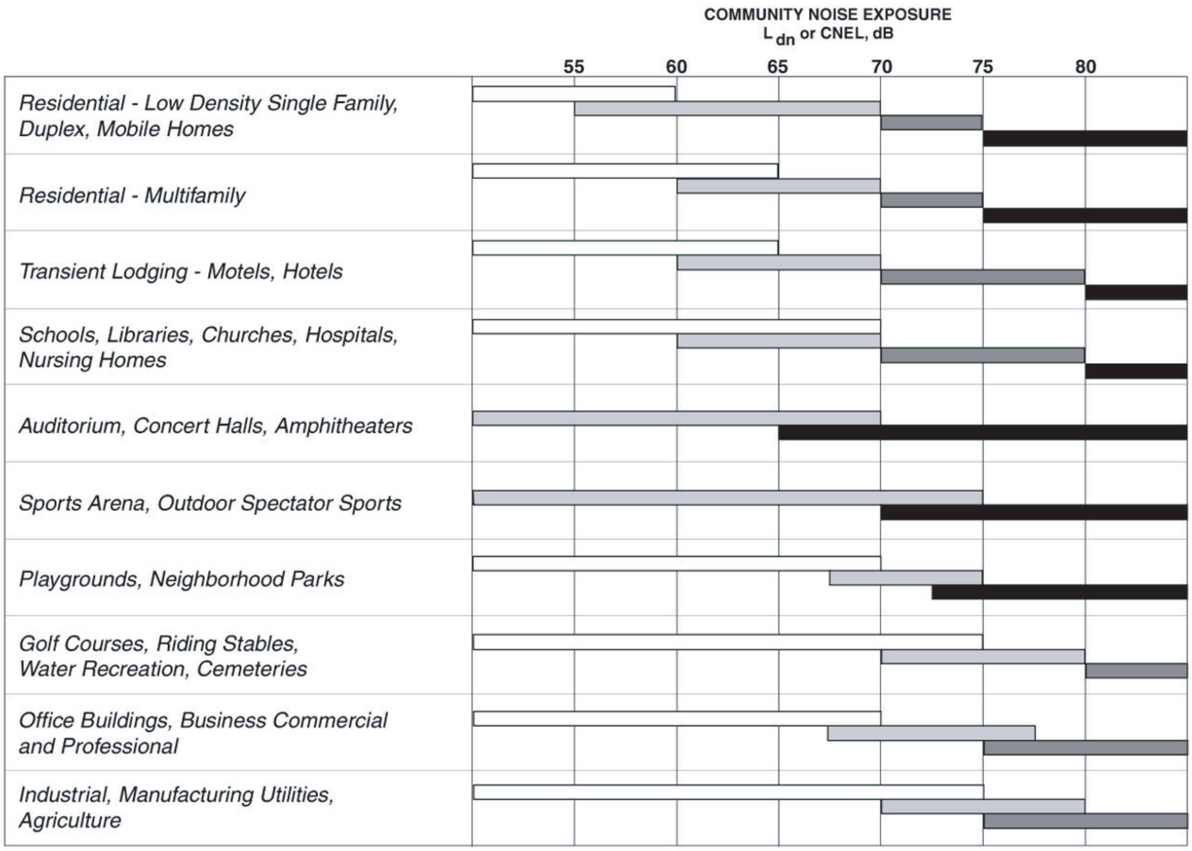
State Regulations and Compatibility Guidelines

The State of California establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the State passby standard is consistent with the federal limit of 80 dBA. The State passby standard for light trucks and passenger cars (less than 4.5 tons, gross vehicle rating) is also 80 dBA at 15 meters from the roadway centerline (California Vehicle Code Sections 23130 and 23130.5; 27150 et.seq.; 27204 and 27206). These standards are implemented through controls on vehicle manufacturers and by legal sanction of vehicle operators by state and local law enforcement officials.

The California DHS, in coordination with the Governor’s office of Planning and Research, has established noise compatibility guidelines for different land uses. These guidelines are shown in **Figure 4.10-2**. According to these guidelines, noise levels exceeding 70 db, L_{dn} are normally unacceptable for residential uses; noise levels within 60 and 70 dB, L_{dn} are conditionally acceptable for such uses. Schools, libraries, churches, hospitals and nursing homes are treated as noise-sensitive uses, which require acoustical studies within areas experiencing noise levels that exceed 60 dB, L_{dn}.

Local Noise Ordinance

The project would be required to comply with two cities’ noise ordinances. The City of Orange noise ordinance is found in City of Orange Municipal Code, Title 8, Health and Safety Code, Chapter 8.24, Noise Control. The City of Anaheim’s noise ordinance is found in Anaheim



LEGEND:

NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any building involved are of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made.

Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction or development should generally not be undertaken.

SOURCE: California Department of Health. Guidelines for the Preparation and Content of Noise Elements of the General Plan. November 1990.

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Figure 4.10-2
Noise and Land Use Compatibility Matrix Guidelines

Municipal Code, Title 6, Public Health and Safety, Chapter 6.70 Sound Pressure Levels. The noise ordinances include noise regulations for addressing specific types of noise sources. In both Cities' noise ordinances, an exemption for construction related noise is given.

The City of Anaheim Noise Ordinance, Section 6.70.010 states, "Sound created by construction or building repair of any premises within the City shall be exempt from the application of this chapter during the hours of 7:00 a.m. to 7:00 p.m." The City of Orange Noise ordinance, Section 8.24.070 (E) states, "The following activities are exempted from provisions of this chapter. Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a Federal Holiday.

4.10.3 Significance Criteria

The *CEQA Guidelines* checklist provides the following thresholds for determining significance with respect to noise. Noise impacts would be considered significant if the project would:

- Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Expose persons to or generate excessive groundborne vibration or groundborne noise levels;
- Create a substantially permanent increase (greater than 3 dBA) in ambient noise levels in the project vicinity above levels existing without the project;
- Create a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- Be located within an airport land use plan or be located where such a plan has not been adopted and expose people residing or working in the project area to excessive noise levels; or
- Be located within the vicinity of a private airstrip and expose people residing or working in the project area to excessive noise levels.

4.10.4 Impacts and Mitigation Measures

Diversion of SAR Water

The District's proposed diversion of additional SAR water would not alter existing conditions within the river. The water diverted from the river would be stored in the groundwater basin. The increased diversions would not increase noise emissions. No mitigation measures would be necessary. Individual construction projects to increase recharge capacity are assessed separately.

Anaheim Lake Expanded Recharge

Impact NOISE-1: Implementation of the Anaheim Lake Expanded Recharge project would temporarily increase noise in local areas.

Construction activities associated with the Anaheim Lake Expanded Recharge project could intermittently generate high noise levels on and adjacent to the construction site. Construction activities would include the use of heavy construction equipment for ground clearing and soil movement operations. Construction activity noise levels at and near the project site would fluctuate depending on the particular type, number, and duration of uses of various pieces of construction equipment.

As shown in **Table 4.10-1**, ground clearing activities result in an average noise level of 84 dBA 200 feet from the construction activities. This noise level would be attenuated to approximately 78 dBA at 400 feet, which is the distance to the closest sensitive receptor at the Anaheim Lake project. In addition to attenuation by distance, intervening geographic features would attenuate the noise even further.

TABLE 4.10-1
TYPICAL CONSTRUCTION NOISE LEVELS

Construction Phase	Noise Level (dBA, L_{eq}[a])
Ground Clearing	84
Excavation	89
Foundations	78
Erection	85
Finishing	89

a. Average noise levels correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase of construction and 200 feet from the rest of the equipment associated with that phase.

SOURCE: Bolt, Baranek, and Newman, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, 1971.

The City of Anaheim Noise Ordinance, Section 6.70.010 states, "Sound created by construction or building repair of any premises within the City shall be exempt from the application of this chapter during the hours of 7:00 a.m. to 7:00 p.m." Compliance with the Noise Ordinance would ensure a less than significant impact.

Mitigation: None required.

Significance after Mitigation: Less than significant.

Santiago Creek Expanded Recharge

Impact NOISE-2: Implementation of the Santiago Creek Expanded Recharge project would temporarily increase noise in local areas.

Construction activities associated with the Santiago Creek Expanded Recharge project could generate intermittent, high noise levels on and adjacent to the construction site. Construction activities would include the use of heavy construction equipment for ground clearing and soil movement operations. Construction activity noise levels at and near the project site would fluctuate depending on the type, number, and duration of uses of various pieces of construction equipment.

The City of Orange Noise ordinance, Section 8.24.070 (E) states, "The following activities are exempted from provisions of this chapter. Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a Federal Holiday."

Installation of the bypass pipeline in the Hart Park parking area will entail breaking up concrete using jack-hammers. Jack hammers can emit noise levels up to 82 dBA at distances of 50 feet.[1] Several residences exist within 100 feet of the construction area. During concrete breaking activities, noise levels at local residences will be elevated above normally acceptable levels. The City of Orange noise ordinance exempts construction activities from complying with ambient standards. Therefore, the impact would be less than significant. Nonetheless, local residences could be affected during the temporary construction activities. Therefore, the following mitigation measure is recommended.

Mitigation Measure

M-NOISE-1: Prior to construction activities in Hart Park, notices will be sent to neighboring residences within a 1,000 foot radius of the construction area providing the planned construction schedule and including a contact number.

Significance after Mitigation: Less than significant.

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1 Bolt, Bernanek and Newman, *Noise From Construction Equipment and Operations, Building Equipment and Home Appliances*, U.S. EPA, 1971.

4.11 Traffic

4.11.1 Setting

A complex matrix of roadways services urbanized Northern Orange County. Major Interstate Freeways 5 and 405 run north-south. SR-91 connects the eastern inland counties with the coastal plains. SR-55 connects the coastal communities of Costa Mesa and Newport Beach with the SR-91. SR-57 connects SR-91 with the inland empire cities north of the Puente Hills including Pomona. Major boulevards transect the cities, providing non-freeway routes from the mountains to the coast. State Routes 91, 55 and 57 experience significant commuter traffic during peak hours.

According to the California Department of Transportation (Caltrans), SR-91 near the District's recharge facilities handles approximately 246,000 average daily trips (ADT). In the same area SR-55 handles approximately 216,000 ADT. East Orangethorpe handles 19,000 ADT and Kraemer Boulevard 25,000 ADT. The smaller feeder streets of Mira Loma and La Jolla experience levels of approximately 13,000 ADT. Glassel Street near Santiago Creek experiences 30,000 ADT.[1]

4.11.2 Significance Criteria

The *CEQA Guidelines* find impacts to traffic to be significant if the project were to cause any of the following conditions:

- Cause in an increase in traffic which is substantial in relation to existing traffic load and capacity of the street system;
- Exceed a level of service standard established by the county congestion management agency for designated roads or highways;
- Substantially increase hazards due to design features (e.g., sharp curves) or incompatible use (e.g., farm equipment);
- Result in inadequate emergency access;
- Result in inadequate parking capacity; or
- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks or lanes).

4.11.3 Impacts and Mitigation Measures

Diversion of SAR Water

The District's proposed diversion of additional SAR water would not alter existing conditions within the river. The water diverted from the river would be stored in the groundwater basin. The increased diversions would not impact local traffic or transportation infrastructure. No

1 Orange County Transportation Authority, 2004 Traffic Flow, July 1, 2005, available at http://www.octa.net/streets/volume/2004.pdf.

mitigation measures would be necessary. Individual construction projects to increase recharge capacity are assessed separately.

Near-Term Projects

Each near-term project has been evaluated under separate CEQA review (except the Anaheim Lake Expanded Recharge and the Santiago Creek Expanded Recharge projects evaluated below). Implementation of the near-term recharge projects could affect local traffic during construction. Operational traffic would be minimal and would not significantly affect local streets.

Implementation of the near-term storage project (raising Prado Dam conservation pool elevation to 508 feet asl) would not affect traffic. Appendix C summarizes the impact assessments conducted by the USACE in 1992 and again in 2004 for use of the Prado Dam for conservation. The 1992 evaluation concluded that the project would not adversely affect local traffic. (See Chapter 5.0 for summary evaluation of future recharge facilities and storage reservoirs.)

Anaheim Lake Expanded Recharge

Impact TR-1: Construction activities would temporarily add to existing traffic loads on local arterial roads and freeways.

Construction of the Anaheim Lake Expanded Recharge Project temporarily would add traffic to local city streets. During construction of the project, traffic may increase up to 60 additional daily trips for worker commute. No soil hauling operations would be necessary. Construction is expected to last a total of six months spread over two consecutive summers. The construction would occur within the existing Anaheim Lake and would not result in changing traffic patterns. The project does not involve construction within Caltrans right-of-way. The additional daily trips are considered minimal in comparison to total daily volumes on adjacent roadways. Therefore, impact would be less than significant.

No roads would be inundated as a result of the project. The project would not be located near an airport, and would not affect air traffic patterns or result in an increased safety risk to aircraft. The proposed project would not impact emergency access routes or result in inadequate emergency access.

Mitigation: None required.

Significance after Mitigation: Less than significant.

Santiago Creek Expanded Recharge

Impact TR-2: Construction activities for the Santiago Creek Expanded Recharge project could impact traffic flow and parking in Hart Park.

The paved portion of Santiago Creek supplies parking for Hart Park in the City of Orange. Installation of the by-pass pipeline through the parking area would temporarily affect parking and through traffic. No construction activities would take place within Caltrans right-of-way. The construction would take approximately six months. Once the by-pass is installed, flow in the creek released from Santiago Pits for recharge would not impact the parking area.

Mitigation Measure

M-TR-1: Prior to construction, the District shall obtain an encroachment permit from the City of Orange. The encroachment permit will include a traffic control plan that will provide for temporary parking during construction.

Significance after Mitigation: Less than significant.

CHAPTER 5
Program-Level Environmental Analysis of Future Projects

5.1 Introduction

The District has identified storage and recharge projects that can accommodate diversions of increased river flows. Some of these projects will be implemented in the near future. Others may be implemented over a longer term. These future projects are described in Chapter 3 and conceptual project locations are indicated in Figure 3-2. Future projects that have not received project-level evaluation under CEQA are assessed in this chapter in a programmatic manner. For purposes of this analysis, the projects are grouped into four categories—surface recharge basins, enhancement of existing recharge basins, subsurface recharge systems, and storage reservoirs—as indicated below in **Table 5-1**. This chapter assesses potential environmental impacts for each category of future project. Mitigation strategies are developed to reduce potential impacts. The near-term projects listed in Table 5-1 are currently being evaluated separately on a project-level basis. Each of the longer-term projects will require subsequent evaluation under CEQA as details for the project are developed. The mitigation strategies provided in this PEIR serve as a guide for future environmental analysis.

TABLE 5-1
FUTURE PROJECT CATEGORIES

Surface Recharge	Enhancement of Existing Recharge	Subsurface Recharge	Storage Reservoirs
Near-Term Projects			
• La Jolla Recharge Basin			• Prado Dam Conservation Pool Elevation 508 feet
• Mira Loma Recharge Basin			
Long-Term Projects			
• Fletcher Recharge Basin	• Basin Cleaning Vehicles (BCVs)	• Subsurface Collection/ Recharge Systems (SCARS)	• Prado Dam Conservation Pool Elevation 514 feet
• Additional Recharge Basins		• Recharge Galleries	• Gypsum Canyon Reservoir
• Deep Basin Filtration Recharge			• Aliso Canyon Reservoir

5.2 Surface Recharge Basins

Construction of recharge basins may require demolition of existing structures, clearing of the site, and substantial excavation within urban areas with varied neighboring land uses. Excavated soil may need to be removed from the site, requiring a substantial number of haul trucks. In addition, installation of conveyance facilities could require trenching through city streets and construction of pump stations. The following sections evaluate potential impacts associated with these types of construction activities.

5.2.1 Hydrology

Storm Water Quality

Similar to near-term projects, construction of recharge basins could affect storm water quality through soil erosion, equipment washing, and on-site chemical use including fuel storage. Implementation of best management practices including compliance with storm water pollution prevention plans would minimize construction storm water quality impacts. Once constructed, operations would have little effect on storm water quality. Nonetheless, each facility including pump stations and administrative areas such as parking lots would be required to comply with the intent of the County's Drainage Area Management Plan requirements. The following mitigation measures minimize the effects to storm water quality.

Mitigation Measures

RB-HYDRO-1: The District will prepare and implement Storm Water Pollution Prevention Plans as required for coverage under the statewide National Pollutant Discharge Elimination System construction permit.

RB-HYDRO-2: The District will design facilities to be consistent with Orange County's storm water quality requirements.

Significance after Mitigation: *Less Than Significant.* With project design and construction conforming to regional storm water quality protection best management practices adopted by the county, impacts to storm water quality resulting from implementation of the surface recharge projects should be minimized, resulting in less than significant impacts to water quality.

Groundwater Quality

The additional groundwater recharge facilities could increase groundwater mounding that could slow recharge rates and modify groundwater flow. New recharge basins could be located near existing production wells and alter the water quality produced from these wells. In addition, depending on site selection, new recharge locations could affect existing contamination in surface soils potentially transporting contamination to the groundwater. This would be considered a potentially significant impact to be assessed in subsequent project-level environmental analysis. The significance of the impact would depend on the proximity of identified contamination. The following mitigation measures would assist in minimizing the potential effects.

Mitigation Measures

RB-HYDRO-3: Prior to implementation of new recharge facilities, the District shall conduct groundwater modeling to evaluate the ability of the groundwater basin to accommodate the additional water at the specific recharge location. If modeling concludes that the basin can not accommodate the additional recharge, no recharge basins will be constructed in that area.

RB-HYDRO-4: The District shall continue to coordinate with the Department of Health Services and local water producers to effectively manage and maintain high water quality. The District shall continue water quality monitoring of recharge water to assess the potential for affecting groundwater quality. The District shall submit water quality monitoring results to the Department of Health Services. If monitoring identifies water quality concerns, OCWD shall coordinate with the Department of Health Services to develop and implement necessary water quality protection measures.

RB-HYDRO-5: Prior to implementation of new recharge facilities, the District shall conduct Phase I site assessments for each potential recharge basin prior to approval to assess potential for soil contamination to exist on site or in neighboring areas that could be affected by the project. If contaminated soils are identified the District will implement measures to prevent adversely affecting groundwater.

Significance after Mitigation: *Less than Significant.* Implementation of the identified mitigation measures would ensure that surface contamination would not be transported to groundwater. Site selection and continued river water quality monitoring would minimize the potential effect.

5.2.2 Biological Resources

The lower SAR watershed overlying the Orange County groundwater basin is largely urbanized, supporting minimal natural habitats. However, depending on the location of new recharge facilities, natural habitats within open space or existing surface waters could be affected by construction. The significance of this impact would depend on the type of natural vegetation displaced and the wildlife that may utilize the habitat. Additional environmental analysis would be required for each project site to evaluate potential impacts and develop mitigation measures to avoid or substantially reduce their effects. The following mitigation measures would reduce the effects to biological resources.

Mitigation Measures

RB-BIO-1: The District will consult with resource agencies including the USFWS, CDFG, the USACE, and the RWQCB to obtain necessary permits prior to implementation of projects that could result in disturbance to biological resources.

RB-BIO-2: The District shall implement a pre-construction mitigation strategy first to identify sensitive habitats, plants, and wildlife species, and then to avoid impacts if possible. If avoidance is not possible, the District shall minimize the impact and compensate in accordance with permitting requirements. This general mitigation strategy is summarized below.

- Determine if sensitive habitats or species are present: The District will retain qualified biologists to survey the project site for sensitive habitats, plants, and wildlife species.

- Avoid loss of sensitive habitats and species: The District will avoid disturbing sensitive biological resources, if possible. During project planning and siting, alternative locations or project configurations would be evaluated.
- Minimize loss of sensitive habitats and species: If avoidance is not possible, the District will limit construction activities in and around sensitive habitats and species to the minimum area necessary.
- Compensate for unavoidable loss of sensitive habitats and species: If avoidance is not possible, the District will compensate for the unavoidable losses in coordination with the USFWS and CDFG. Compensation for sensitive habitats and special-status plant communities could involve either purchasing property with similar habitat or plant communities and providing for their protection and management for wildlife value in perpetuity, or enhancing sensitive habitat and plant communities within existing conservation areas.

Significance after Mitigation: *Less Than Significant*. Since the recharge basins would likely be located in the urban areas overlying the Orange County groundwater basin, it is likely that sites could be identified during a site screening process that would have minimal impact on local biological resources. The mitigation strategy to survey, avoid if possible, and then compensate for impacts would ensure that regional resource management agency permit requirements would be adopted. Therefore, this impact would be considered less than significant.

5.2.3 Land Use and Recreation

The OCWD service area is primarily urbanized, consisting of residential, commercial, and light industrial uses. Recharge basins may not be compatible with surrounding land uses, zoning ordinances, or conservation plans. This would be determined according to the terms of relevant city and/or county general plans and HCP/NCCPs. The District may need to obtain encroachment permits, easements, or other permits such as Conditional Use Permits (CUPs) from the appropriate jurisdictional agency prior to construction activities as needed to obtain local approval.

The proposed recharge basins also could be located near recreational resources such as walking/hiking trails, bicycle paths, and parks. A regional network of trails, many of which are located adjacent to the SAR and its tributaries, are maintained by local agencies. Construction activities could temporarily impact the use and availability of parks, trails, and other recreational resources. The following mitigation measures would reduce the effects to neighboring land uses.

Mitigation Measures

RB-LU-1: The District shall conduct siting studies to determine the most suitable locations to place facilities. Siting studies shall consider existing and planned land uses in the vicinity of the project. Projects will be located in areas with suitable neighboring land uses wherever feasible.

RB-LU-2: If sensitive land uses cannot be avoided, buffer zones, access controls, and visual screens will be implemented to minimize impacts wherever feasible.

RB-LU-3: The District shall identify locations for project facilities that minimize impacts to recreational facilities.

RB-LU-4: For projects located near recreational areas, the District shall coordinate with the applicable recreation or park agency to identify ways to minimize impacts of project construction on recreational activities. Measures may include but are not limited to:

- Posting of signage indicating dates during which use of recreational areas would be restricted due to construction;
- Placement of fencing to isolate construction areas and allow continued use of other areas of recreational parks and facilities; and
- Timing of construction activities to avoid peak recreational use seasons.

Significance after Mitigation: *Less Than Significant.* With implementation of the mitigation measures requiring that siting studies be conducted to avoid constructing near sensitive land uses, this impact would be considered less than significant.

5.2.4 Aesthetics

Impacts from installation of recharge basins could affect aesthetic resources and viewsheds. The OCWD service area contains a few scenic highways and some scattered agriculture, open space, and parks. Recharge basins in urbanized areas would not be expected to affect long-range views. However, surface recharge basins could affect existing character of local areas. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects. The following mitigation measures would reduce the effects to local aesthetic character.

Mitigation Measures

RB-AES-1: The District shall design facilities to be consistent with local policies and programs to protect scenic values and to avoid visual intrusions.

RB-AES-2: The District shall incorporate landscaping plans into final designs of project facilities to mask views of new structures.

Significance after Mitigation: Since facilities would be consistent with local planning ordinances and zoning codes, aesthetic impacts would be *less than significant.*

5.2.5 Air Quality

The SAR watershed and OCWD service area are located within the jurisdictional boundaries of the SCAQMD. The construction of surface recharge projects would generate air emissions that would vary with the size, nature, and location of the projects. Construction activities could include significant earth moving and off-site hauling which could result in emissions exceeding SCAQMD significance thresholds. Additional environmental analyses would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measures

RB-AIR-1: The District shall establish best management practices (BMPs) to reduce air emissions from construction projects. BMPs may include measures such as restricting hours of use of construction equipment, minimizing idling, using fuel additives or alternatives in construction equipment, and implementing dust control plans.

RB-AIR-2: The District shall require contractors to comply with its BMPs and with SCAQMD emissions regulations.

Significance after Mitigation: *Potentially Significant.* Although mitigation measures could reduce the effects, the volume of daily construction emissions would depend on the scale of the construction project and the schedule. Therefore, air emissions resulting from construction activities could exceed daily thresholds of significance and remain potentially significant.

5.2.6 Cultural Resources

Implementation of recharge facilities could require excavation in areas of moderate to high potential for subsurface archaeological resources. Excavation, trenching for foundations, pipe installation, landscaping, and other earth disturbing activities associated with project development could result in adverse impacts to previously-unknown archaeological resources. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measure

RB-CULT-1: The District shall conduct archaeological and paleontological resource evaluations before and during construction activities as appropriate to minimize impacts to cultural resources.

Significance after Mitigation: *Less Than Significant.* Archaeological and paleontological resources could be located throughout Orange County. However, implementation of the appropriate level of surveys, avoidance, collection and curation would likely reduce the impact to less than significant.

5.2.7 Geology and Soils

Localized areas of unsuitable soils, areas of potential surface rupture, landslide hazard areas, and liquefaction hazard areas could affect the integrity of recharge basins. The sides of the basins would be subject to sloughing during strong ground shaking events. The integrity of the side walls would be affected by continual saturation. Failure of the basin side walls could result in lower storage capacity, could encroach on neighboring land uses, and could affect pumping equipment. In addition, conveyance pipelines could be subject to rupture from excessive ground shaking and earth movement. Conducting groundwater recharge could increase liquefaction hazards for neighboring structures due to the increase saturation of soils.

Mitigation Measure

RB-GEO-1: The District shall prepare site-specific, design-level geotechnical investigations for each site prior to the commencement of construction. Each investigation shall include an analysis of expected geologic hazards at the site and recommended measures to avoid the hazards. The investigations will include assessing liquefaction hazards to neighboring structures. The District shall include recommended measures necessary to avoid geologic hazards in design specifications.

Significance after Mitigation: *Less Than Significant.* Implementation of geotechnical investigations would ensure that construction would not result in significant geological impacts. Therefore the impact would be considered less than significant.

5.2.8 Hazards and Hazardous Materials

Future recharge sites could be located in areas that have surface and subsurface contamination from past land uses. In Orange County, many areas were previously used for agriculture and some have been converted to commercial or industrial uses. Contamination on properties adjacent to proposed surface recharge sites could potentially migrate on site or be influenced by new recharge facilities. Percolating water may influence soil contamination plumes on adjacent properties, which could ultimately affect groundwater as discussed earlier. During construction of recharge facilities, contaminated soils could be exposed during excavation. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measures

See **RB-HYDRO-5**.

RB-HAZ-1: Excavated materials containing hazardous waste shall be disposed of in accordance with applicable hazardous waste transportation and disposal regulations by the District within 90 days of excavation.

Significance after Mitigation: *Less Than Significant.* Implementation of environmental assessments and proper disposal of hazardous waste would ensure that construction would not result in significant impacts. Therefore the impact would be considered less than significant.

5.2.9 Noise

The construction of recharge basins would temporarily increase noise. Some construction activities could be located near sensitive receptors and could last for a long period of time. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measures

RB-NOISE-1: The District will require contractors to comply with local noise ordinances.

RB-NOISE-2: The District shall implement procedures to reduce noise generation from project construction activities. Typical noise control procedures could include the following:

- Require construction contractors to comply with the construction hours and days limitations established in local noise ordinances. Night-time construction would require approval from local jurisdictions.
- Require all construction contractors to locate fixed construction equipment (e.g., compressors and generators) as far as possible from noise-sensitive receptors.

- Equipment used in the construction of individual projects and management actions shall be muffled and maintained in good operating condition. Internal combustion engine-driven equipment shall be fitted with intake and exhaust mufflers that are in good condition.
- Additional noise attenuating measures include changing the location of stationary construction equipment and/or staging areas; notifying adjacent residences and nearby sensitive receptors in advance of construction work; shutting off idling equipment; rescheduling construction activities; requiring on-going construction noise monitoring to assure adherence to City/County construction equipment standards; and/or installing temporary barriers around stationary construction noise sources.

Significance after Mitigation: *Less Than Significant.* Since the project would adhere to local noise ordinances protecting the public from nuisance noise, potential noise impacts would be considered less than significant.

5.2.10 Traffic

Impacts to traffic from implementation of surface recharge projects would be similar to the near-term projects. Traffic could be affected temporarily if pipeline installation required construction along or across roadways. Soil removal activities for establishing new recharge basins could require large numbers of haul trucks on local and regional transportation corridors. These potential impacts would be minimized through the establishment of traffic control plans and obtaining encroachment permits from local cities and Caltrans. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or reduce their effects.

Mitigation Measures

RB-TR-1: The District will consult with local jurisdictions and Caltrans when considering future projects to develop measures to minimize impacts to traffic from construction activities. The District will implement these measures wherever feasible.

RB-TR-2: The District shall obtain encroachment permits from local jurisdictions and Caltrans prior to construction when construction would result in work within roadway easements or would require lane closures.

RB-TR-3: The District shall minimize heavy-duty truck traffic associated with soil hauling and deliveries during peak traffic periods.

Significance after Mitigation: *Less Than Significant.* Implementation of mitigation measures to coordinate with local jurisdictions and obtain encroachment permits would ensure that potential issues are resolved and impacts to traffic would be less than significant.

5.3 Enhancement of Existing Recharge Systems

Development of BCVs that could be effective in the deeper recharge basins associated with the Santiago Pits could substantially improve recharge capacities. The self-propelled underwater vehicles would remove silt from the bottom of the basins to reduce clogging. As has been demonstrated with the District's existing BCVs, no adverse impacts to environmental resources would result from the use of these underwater lake-bed cleaning machines. The technology of these electric vehicles will likely improve in future years. No adverse impacts are anticipated with the long-term use of BCVs.

5.4 Subsurface Recharge Systems

Subsurface recharge systems would be constructed within the urbanized portion of Orange County in area previously developed with surface improvements. Construction activities could include drilling underneath existing structures to place a network of sub-surface piping. These systems could also be placed when surface development is modified resulting in demolition of existing structures, placement of underground recharge system, and subsequent development on the surface. Soil excavation could require substantial volumes of dirt to be hauled through city streets. Installation of conveyance pipelines could require substantial trenching through city streets and construction of pump stations. The following sections evaluate potential impacts associated with these types of construction activities.

5.4.1 Hydrology

Storm Water Quality

Similar to long-term surface recharge projects, the construction of Recharge Galleries and Subsurface Collection/Recharge Systems (SCARS) could impact water quality. Erosion and runoff from project construction sites after storm events could create potentially significant water quality impacts to the SAR and other receiving waters. Compliance with storm water discharge regulations and implementation of best management practices would minimize construction storm water quality impacts.

Mitigation Measures

See **RB-HYDRO-1** and **RB-HYDRO-2**.

Significance after Mitigation: *Less Than Significant.* Implementation of mitigation measures would ensure that storm water protection standards adopted by the county would be applied to the projects. Impacts to storm water quality would be less than significant.

Groundwater Quality

Installation of subsurface recharge systems would increase the District's annual groundwater recharge capacity. The additional recharge coupled with incidental recharge and other District projects, such as prospective surface recharge basins, could create groundwater mounding that would slow recharge rates and reduce actual recharge capacity if not managed correctly. This would be considered a potentially significant impact of implementing the proposed subsurface recharge projects. In addition, existing contamination in subsurface soils could be transported into the groundwater through new subsurface recharge locations. This also would be a potentially significant impact to groundwater quality.

Mitigation Measures

See **RB-HYDRO-3, RB-HYDRO-4, RB-HYDRO-5,** and **RB-HYDRO-6**.

Significance after Mitigation: *Less than Significant.* Implementation of the identified mitigation measures would ensure that surface contamination would not be transported to groundwater. Site selection and continued river water quality monitoring would minimize the potential effect.

5.4.2 Biological Resources

Recharge Galleries or SCARS would be implemented within previously developed areas such as beneath parks or parking lots. Potential effects to biological resources would be minimal. However, construction of SCARS could temporarily disrupt the riverbed soils in the SAR, which could impact in-stream vegetation, fish, and wildlife. The significance of the impacts of the subsurface recharge projects would depend on the type of natural vegetation disturbed and the wildlife that utilize the vegetation cover as habitat. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measures

See **RB-BIO-1** and **RB-BIO-2**.

Significance after Mitigation: *Less Than Significant.* The imposed mitigation strategy to survey, avoid if possible, and then compensate for impacts would comply with regional resource management agency permit requirements. Furthermore, since the recharge basins would likely be located in the urban areas overlying the Orange County groundwater basin, it is likely that sites could be identified during a site screening process that would have minimal impact on local biological resources. Therefore, this impact would be considered less than significant.

5.4.3 Land Use and Recreation

The Recharge Galleries and SCARS would likely have little impact on surrounding land use because most of the operation would occur subsurface. However, future locations of these projects could be located near parks or trails along the SAR that might be temporarily disrupted during construction. Construction could limit access and availability of public recreation facilities. Additional environmental analysis would be required to evaluate this potential impact and develop mitigation measures to avoid or reduce its effects.

Mitigation Measures

See **RB-LU-1, RB-LU-3,** and **RB-LU-4**.

Significance after Mitigation: *Less Than Significant.* With implementation of the mitigation measures requiring that siting studies be conducted to avoid constructing near sensitive land uses, this impact would be considered less than significant.

5.4.4 Aesthetics

Recharge Galleries and SCARS would not have a significant impact on aesthetics or viewsheds, since the facilities would be underground. No impacts are anticipated.

Mitigation: None required.

Significance After Mitigation: Less than significant.

5.4.5 Air Quality

The SAR watershed and OCWD service area are located within the jurisdictional boundaries of the SCAQMD. The construction of Recharge Galleries and SCARS would generate air emissions that would vary with the size of the projects. Construction activities could include significant earth moving which could result in emissions exceeding SCAQMD significance thresholds. Additional environmental analyses would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measures

See **RB-AIR-1** and **RB-AIR-2**.

Significance after Mitigation: *Potentially Significant.* The volume of daily construction emissions would depend on the scale of the construction project and the schedule. Therefore, air emissions resulting from construction activities could exceed daily thresholds of significance. Air emissions remain potentially significant.

5.4.6 Cultural Resources

Similar to surface recharge basins, the implementation of Recharge Galleries and SCARS could result in impacts to cultural resources. Both subsurface recharge projects would require substantial drilling and excavation. The recharge basins would be excavated in areas of moderate to high potential for subsurface archaeological resources. If present, previously unknown archaeological and paleontological resources could be impacted. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measure

See **RB-CULT-1**.

Significance after Mitigation: *Less Than Significant.* Archaeological and paleontological resources could be located throughout Orange County. Implementation of the appropriate level of surveys, avoidance, collection and curation would likely reduce the impact to less than significant.

5.4.7 Geology and Soils

The proposed subsurface Recharge Galleries and SCARS would be subject to seismic hazards, including ground shaking, liquefaction, and surface rupture. Subsurface recharge projects could affect liquefaction hazards of surface improvements. Conducting groundwater recharge could increase liquefaction hazards for neighboring structures due to the increase saturation of soils. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measure

See **RB-GEO-1**.

Significance after Mitigation: *Less than Significant.* Implementation of the identified mitigation measures would ensure that seismic hazards would be minimized. Site selection and project design would minimize the potential effect.

5.4.8 Hazards and Hazardous Materials

Future Recharge Gallery sites could transport subsurface contamination from past land uses, such as agriculture, commercial, or industrial uses, to groundwater. In addition, subsurface contamination on properties adjacent to Recharge Galleries or SCARS could potentially migrate on site or be influenced by new recharge facilities. Percolating water may influence soil contamination plumes on adjacent properties, which could ultimately affect groundwater. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measures

See **RB-HYDRO-5** and **RB-HAZ-1**.

Significance after Mitigation: *Less than Significant.* Implementation of the identified mitigation measures would ensure that subsurface contamination would not be transported to groundwater. Site selection and operational controls would minimize potential adverse effect.

5.4.9 Noise

The operation of Recharge Galleries and SCARS would not produce any significant noise impacts. However, the construction of Recharge Galleries and SCARS would temporarily increase noise. Although locations for the subsurface recharge projects have not been identified, some facilities could be located near sensitive receptors and could last for a long period of time. Therefore, construction activities could significantly impact noise levels. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measures

See **RB-NOISE-1** and **RB-NOISE-2**.

Significance after Mitigation: *Less Than Significant.* Since the project would adhere to local noise ordinances protecting the public from nuisance noise, potential noise impacts would be considered less than significant.

5.4.10 Traffic

Similar to surface recharge basins, there could be significant impacts to traffic from construction of Recharge Galleries and SCARS. Traffic could be affected if pipeline installation required construction along or across roadways. Soil removal activities for establishing new recharge basins could require large numbers of haul trucks on local and regional transportation corridors. These potential impacts would be minimized through the establishment of traffic control plans and obtaining encroachment permits from local cities and Caltrans. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measures

See **RB-TR-1** through **RB-TR-3**.

Significance after Mitigation: *Less Than Significant.* Implementation of mitigation measures to coordinate with local jurisdictions and obtain encroachment permits would ensure that issues are resolved and impacts to traffic would be less than significant.

5.5 Storage Reservoirs

Future storage projects include construction of off-river storage reservoirs and the raising of the conservation pool behind Prado Dam. Raising the conservation pool behind Prado Dam would provide additional storm water storage capacity. The project would be conducted by the USACE with OCWD acting as the local sponsor. The USACE and OCWD are currently considering operation of the dam to accommodate a conservation pool summer elevation of 508 feet amsl. Although the feasibility study evaluates the 508-foot elevation, the USACE and OCWD's recommended project would keep the summer elevation at 505 feet amsl and raise the winter conservation pool from 494 feet to 498 feet amsl. The impact analysis associated with the recent EIR/EIS summarizes the effects of raising the winter pool to 498 feet amsl. The District and USACE have also considered the possibility of raising the summer conservation pool to 514 amsl in the longer term. Table 5-1 lists impacts associated with the raising of the winter conservation pool to 498 feet amsl (summarized from the USACE Draft EIS published in July of 2004) and provides a comparison with the possibility of raising the summer conservation pool to 514 feet amsl. **Table 5-2** summarizes potential impacts of increasing the conservation pool elevation.

Two potential off-river storage facilities have been considered by the District: Gypsum Canyon Reservoir and Aliso Canyon Reservoir. These two facilities would be located within the Santa Ana Mountains above the river. Storm water captured in the conservation pool behind Prado Dam would be diverted from a new point of diversion and pumped through a conveyance system to the storage reservoirs. Each dam would have the capacity to hold up to 30,000 acre feet of water. The captured water would be stored until the flow in the river dropped low enough to accommodate the additional flow. Construction activities could include construction of a diversion facility within the Prado conservation pool, trenching through Prado Basin and within the mountains, blasting for road cuts and dam preparation, concrete hauling and placement, and soil hauling. Once the dam is constructed, the canyon would be periodically inundated. The following sections discuss potential environmental impacts associated with off-river storage projects. **Tables 5-3** and **5-4** summarize impacts associated off-river storage projects.

5.5.1 Hydrology

Storm Water Quality

Construction of off-river storage reservoirs could affect storm water runoff quality. Construction in mountain areas could promote significant erosion at road cuts. The District would be required to prepare SWPPPs for each construction activity. Compliance with storm water discharge

TABLE 5-2
IMPACT SUMMARY FOR PRADO DAM CONSERVATION POOL EXPANSION

Resource	498/505-foot Elevation Impacts* (winter/summer)	514-foot Elevation Impacts
Hydrology	Increased sediment deposition within the reservoir of approximately 96 acre-feet per year. This deposition amounts 6 inches of volume loss over life of the project. The fifty year period prior to the need for sediment cleaning would be reduced by about 6 years. This would be considered a less than significant impact.	Sedimentation within the reservoir would increase over the 498/505-foot level and would slightly decrease the time until sediment cleaning was required.
	Annual groundwater recharge capacity would increase by 6,000 to 10,000 acre feet.	Annual groundwater recharge capacity would increase slightly over the 498/505-foot level.
	Potentially increased erosion downstream along the Santa Ana River at the River View Golf Course.	Erosion downstream along the Santa Ana River at the River View Golf Course would potentially be slightly greater than at the 498/505-foot level.
	Increased inflow to Prado Reservoir would impound more water during the flood season which would improve the quality of both reservoir water and the water released downstream.	Increased inflow would impound more water than at the 498/505-foot level; consequently, the downstream water quality would be slightly better.
Biology	Impacts to biological resources are related to duration of inundation associated with flood events.	Impacts to biological resources are related to length of inundation associated with flood events.
	Least Bell's Vireo and Southwestern Willow Flycatcher critical habitat inundation of approximately 933 acres.	Least Bell's Vireo and Southwestern Willow Flycatcher critical habitat would be substantially higher than at the 498/505-foot level.
	Least Bell's Vireo nests at elevations up to 505 feet may be inundated by sudden and substantial rises in pool elevation after April 1.	Least Bell's Vireo nests at elevations up to 514 feet would be inundated by sudden and substantial rises in pool elevation after April 1.
	Regular inundation to 498 feet may destroy integrity of dikes protecting freshwater marsh vegetation and result in permanent reduction of that vegetation type unless mitigation was implemented.	Regular inundation to 514 feet would likely destroy integrity of dikes protecting freshwater marsh vegetation and result in permanent reduction of that vegetation type without mitigation was implemented.
		Reduced storm flows could affect sand bank morphology that could affect aquatic and riparian habitats.
Land Use and Recreation	Minor increases in the length of inundation and associated reduction in availability of several leased areas within the inundation zone.	Moderate to severe increases in the length of inundation and associated reduction in availability or abandonment of some leased areas in the inundation zone.
	Increases in downstream flow would flood portions of Green River Golf Course for additional short-term periods compared to existing conditions resulting in reduction of availability.	Increases in downstream flow would flood portions of Green River Golf Course for additional short-term periods compared to existing conditions resulting in reduction of availability.

TABLE 5-2
IMPACT SUMMARY FOR PRADO DAM CONSERVATION POOL EXPANSION (CONT.)

Resource	498/505-foot Elevation Impacts* (winter/summer)	514-foot Elevation Impacts
Aesthetics	Minimal changes to views from residences surrounding Prado Basin.	Minimal to moderate changes to views from residences surrounding Prado Basin.
	Minor changes to views from State Route 71 related to higher water levels. Would not substantially alter existing views.	Minor changes to views from State Route 71 related to higher water levels. Would not substantially alter existing views.
	Increases in downstream flow would flood portions of Green River Golf Course for additional short-term periods compared to existing conditions and slightly alter the views.	Increases in downstream flow would flood portions of Green River Golf Course for additional short-term periods compared to existing conditions and slightly alter the views.
Air Quality	No short-term construction-related impacts expected.	Some short-term construction related impacts would occur.
	Minor increases in PM_{10} and NO_x during operation and maintenance of dam and increased maintenance of downstream infiltration facilities. Expected to be within federal deminimis levels. Would not affect any local sensitive receptors.	Minor increases in PM_{10} and NO_x during operation and maintenance of dam and increased maintenance of downstream infiltration facilities. Expected to be within federal deminimis levels. Would not affect any local sensitive receptors.
Cultural Resources	Potential significant impacts to historical archaeological sites potentially eligible for listing on the National Register of Historic Places. Sites require test excavation to determine eligibility. If eligible, mitigation measures would be developed in accordance with 36 CFR 800 in consultation with the State Historic Preservation Office and the Advisory Council on Historic Preservation.	Potential significant impacts to historical archaeological sites potentially eligible for listing on the National Register of Historic Places. Sites require test excavation to determine eligibility. If eligible, mitigation measures would be developed in accordance with 36 CFR 800 in consultation with the State Historic Preservation Office and the Advisory Council on Historic Preservation.
Geology	Potential for increased seepage under dam from increased impoundment. Dam has concrete key wall and sheet pile cut off to minimize seepage.	Potential for increased seepage under dam from increased impoundment. Dam has concrete key wall and sheet pile cut off to minimize seepage.
	Increase in sediment deposition within reservoir of approximately 96 acre-feet per year. This deposition amounts to 6 inches of volume loss over life of the project.	Increased sediment deposition within reservoir above the approximately 96 acre-feet per year deposited in at the 498/505-foot level. This deposition amounts to 6 inches of volume loss over life of the project.
Hazards	No known contaminated sites would be affected.	No known contaminated sites would be affected.
Noise	No short-term construction-related impacts expected. Some potential noise impacts from maintenance vehicles.	Localized, short-term construction noise impacts from increasing dam elevation. Some potential noise impacts from maintenance vehicles.
Traffic	Short-term increases in traffic associated with construction to raise Prado Dam.	Short-term increases in traffic associated with construction to raise Prado Dam.
	Minor short-term increases in traffic associated with increased maintenance of infiltration basins along Santa Ana River downstream of Prado Dam.	Minor short-term increases in traffic associated with increased maintenance of infiltration basins along Santa Ana River downstream of Prado Dam.

Note: The impact evaluation of the Prado Dam expansion to the 498-foot elevation is based on the analysis in U.S. Army Corps of Engineers' *Prado Basin Water Conservation Feasibility Study* (July 2004). The impacts of raising Prado Dam to the 514-foot elevation are described in comparison to the existing 505-foot level.

SOURCE: U.S. Army Corps of Engineers. 2004. Prado Basin Water Conservation Feasibility Study, Prado Dam, Riverside and San Bernardino Counties, California. Main Report and Draft Environmental Impact Statement/Environmental Impact Report. Draft F5. July 2004. U.S. Army Corps of Engineers Los Angeles District, Planning Division, Plan Formulation Branch.

TABLE 5-3
IMPACTS SUMMARY FOR THE GYPSUM CANYON RESERVOIR

Resource	Impacts
Hydrology	Gypsum Creek runoff currently enters the Santa Ana River unimpeded. Dam construction would control the release of this runoff allowing more efficient capture downstream along the Santa Ana River during high flow events. There is potential for increased groundwater discharge from the Gypsum Creek to the Santa Ana River.
Biology	Potential impacts to biological resources are related to construction activities, dam site footprint, and the duration of inundation associated with water storage. Surveys for the Mountain Park Specific Plan Amendment Project did not identify any Bell's Least Vireo or Southwestern Willow Flycatcher nests in the vicinity. Grassland, woodland and riparian habitats along Gypsum Creek would be affected by the dam and reservoir pool. Mitigation for habitat loss, particularly riparian habitat, may be required. Reduced storm flows could affect sand bank morphology that could affect aquatic and riparian habitats.
Land Use and Recreation	Approximately 20 percent of areas designated for residential development areas in the Mountain Park Specific Plan Amendment would be inundated by the reservoir at a pool elevation of 600 feet. Portions of hillside collector roads as identified in the Mountain Park Specific Plan Amendment along the west and east sides of Gypsum Creek would be inundated by the reservoir at a pool elevation of 600 feet. A portion of the proposed County Regional Riding and Hiking Trail along Gypsum Creek as identified in the Mountain Park Specific Plan Amendment would be inundated by the reservoir at a pool elevation of 600 feet. The uppermost portion of the reservoir pool would extend into the Natural Community Conservation Plan/Habitat Conservation Plan designated area. An existing pipeline crossing at approximately 460 feet elevation may require enhancement to prevent adverse impacts from inundation. Residents in reasonably foreseeable homes on adjacent hillslopes and ridges and recreational users of Featherly Regional Park and Gypsum Canyon open space would notice noise and traffic.
Aesthetics	Minor views of new dam along State Route 71. Substantial views of dam and inundation area from hillslopes and ridges above the canyon, both from reasonably foreseeable homes and recreational use of the Gypsum Canyon open space.
Air Quality	Short-term increases in PM_{10} and NO_x expected during construction may exceed short-term thresholds of significance. Sensitive receptors in the vicinity include reasonably foreseeable new homes on the adjacent hillslopes and ridges and users of Featherly Regional Park and Gypsum Canyon open space. Although these impacts would be short-term, they could be significant due to the existing poor air quality. Minor increases in PM_{10} and NO_x during operation and maintenance of dam and increased maintenance of downstream infiltration facilities. Expected to be within operational thresholds of significance.
Cultural Resources	No sites currently known to be eligible for listing on the National Register of Historic Places. Potential significant impacts to archaeological sites that may be present and potentially eligible for listing on the National Register of Historic Places. Sites require test excavation to determine eligibility. If eligible, mitigation measures would be developed in accordance with 36 CFR 800 in consultation with the State Historic Preservation Office and the Advisory Council on Historic Preservation to prevent significant adverse impacts.
Geology	No faults occur within the immediate vicinity although strong ground shaking would be anticipated from earthquakes on the Whittier fault. Storage reservoir dams would be designed to address local rock and seismic conditions.

TABLE 5-3
IMPACTS SUMMARY FOR THE GYPSUM CANYON RESERVOIR (CONT.)

Resource	Impacts
Hazards	Former rock quarry exists on east side of lowermost canyon. Further analysis would be required to assess potential for contamination. A "Rocket Fuel Test Site" at approximately 500 feet elevation on the east side of Gypsum Canyon is indicated on topographic map. Further analysis would be required to assess potential for contamination.
Noise	Construction would cause localized, short-term noise. Sensitive receptors could include reasonably foreseeable homes on adjacent hillslopes and ridges and users of Featherly Regional Park and Gypsum Canyon open space.
Traffic	During construction entry and exit of truck traffic along State Route 91/Gypsum Canyon may require traffic management and safety plans to prevent significant adverse impacts.

Note: The impact evaluation for the Gypsum Canyon Reservoir project is based on an Initial Study for Mountain Park Specific Plan Amendment Project (Bon Terra Consulting 2004), which is considered a reasonably foreseeable project. Information from Black & Veatch (1989) describing potential off-channel storage reservoirs was also used in this analysis.

SOURCE: Black & Veatch. 1989. Potential off-channel storage reservoirs. Prepared for Orange County Water District. November 8, 1989. BonTerra Consulting. 2004. Initial Study for the Mountain Park Specific Plan Amendment Project, City of Anaheim, California. July 19, 2004.

regulations and implementation of best management practices would minimize construction storm water quality impacts. Raising of the Prado Dam conservation pool would not adversely affect storm water quality.

Mitigation Measures

See **RB-HYDRO-1** and **RB-HYDRO-2**.

Significance after Mitigation: *Less Than Significant.* With project design and construction conforming to regional storm water quality protection best management practices adopted by the county, impacts to storm water quality resulting from implementation of the surface recharge projects would be considered less than significant.

Storm Water Hydrology

The District's ability to capture increased quantities of storm flow will largely rely on storm water storage projects. By increasing the conservation pool elevation behind Prado Dam and building additional storage reservoirs, greater volumes of storm flows could be captured and released back into the river during dry periods. This could reduce total storm flow volume reaching the ocean.

OCWD and USACE have proposed raising the Prado conservation pool to capture more storm flow behind the dam during winter months and have recently published the Draft EIS for this project. According to the environmental impact analyses, raising the conservation pool would have beneficial impacts on water quality below Prado Dam and would reduce sediment deposition at downstream flood control facilities. Reduced sediment in the lower reaches and mouth of the river would reduce the dredging requirements now imposed by flood control managers. This is seen as a beneficial impact in the EIS.

TABLE 5-4
IMPACTS SUMMARY FOR THE ALISO CANYON RESERVOIR

Resource	Impacts
Hydrology	Aliso Creek runoff currently enters the Santa Ana River unimpeded. Dam construction on Aliso Creek or its tributaries would control the release of some of this runoff allowing more efficient capture downstream along the Santa Ana River during high flow events.
Biology	Potential impacts to biological resources are related to construction activities, dam site footprint, and the length of inundation associated with water storage. Riparian habitat may exist along Aliso Creek, Bane Canyon and other creeks. Potential for Mitigation may be required for dam site footprint and reservoir pool inundation. Potential to inundate a wide variety of habitats including walnut woodlands, scrub and chaparral, coastal sage scrub, and California sagebrush. Potentially significant adverse impacts to habitats and threatened and endangered species. Reduced storm flows could affect sand bank morphology that could affect aquatic and riparian habitats.
Land Use and Recreation	Two potential reservoir sites are identified in Aliso Canyon. The first site is located along upper Aliso Canyon in the vicinity of Rolling M Ranch, along lower Bane Canyon, lower Telegraph Canyon, and lower Water Canyon. The second site is located in the two first tributaries that drain into Aliso Creek on the north side of the valley. Both sites are located within Chino Hills State Park. The first site is 100 percent located within the state park and within the Water Canyon Natural Preserve. The lower portions of the second site are located within the state park while much of the upper part of the reservoir would be located outside the park. A portion of the unpaved Bane Canyon Road leading from the state park entrance into the park would be inundated by reservoir site 1. Reservoir site one would inundate Rolling M Ranch, the equestrian staging center, and several trails. Reservoir site two would inundate portions of trails near the dam site. Both reservoir sites would be readily visible to recreationists from several trails. The Metropolitan Water District of Southern California Lower Feeder pipeline would be avoided. Significant adverse impacts are expected to land use and recreation from inundation of a portion of Chino Hills State Park and Water Canyon Natural Area.
Aesthetics	Views of dam and inundation area from ridges and views above the canyons above the two sites within Chino Hills State Park.
Air Quality	Short-term increases in PM_{10} and NO_x expected during construction may exceed thresholds of significance. Sensitive receptors within Chino Hills State Park may experience short-term impacts. Although these impacts would be short-term, they could be significant due to the existing poor air quality. Minor increases in PM_{10} and NO_x during operation and maintenance of dam and increased maintenance of downstream infiltration facilities. Expected to be within operational thresholds of significance.
Cultural Resources	Significant adverse impacts to potentially historic sites such as the Rolling M Ranch buildings and historic barns and other structures in that vicinity from inundation by reservoir site one. Potential significant impacts to archaeological sites that may be present and potentially eligible for listing on the National Register of Historic Places. Sites require test excavation to determine eligibility. If eligible, mitigation measures would be developed in accordance with 36 CFR 800 in consultation with the State Historic Preservation Office and the Advisory Council on Historic Preservation.

TABLE 5-4
IMPACTS SUMMARY FOR THE ALISO CANYON RESERVOIR (CONT.)

Resource	Impacts
Geology	No faults occur within the immediate vicinity although strong ground shaking would be anticipated from earthquakes on the Whittier fault. Dam would be designed to address local rock and seismic conditions.
Hazards	The area would require investigation for potential hazardous materials at dam sites and reservoir inundation areas.
Noise	Localized, short-term noise from construction and truck traffic entering and driving through park. Recreationist sensitive receptors within Chino Hills State Park would be affected for short periods.
Traffic	Construction traffic would enter Chino Hills State Park from the north at the park entrance. Otherwise new roads would have to be built into the state park from the vicinity of State Route 91 in Santa Ana Canyon. During construction entry and exit of truck traffic along State Route 71/Aliso Canyon would require traffic management and safety plan to prevent significant adverse impacts.

Note: The impact evaluation for the Aliso Canyon Reservoir project is based on a study by Black & Veatch (1989) of two potential off-channel storage reservoirs sites in Aliso Canyon. The first site is located along upper Aliso Canyon in the vicinity of Rolling M Ranch and along lower Bane Canyon. The second site is located in the two first tributaries that drain into Aliso Creek on the north side of the valley immediately upstream of their confluence with the Santa Ana River.

SOURCE: Black & Veatch. 1989. Potential off-channel storage reservoirs. Prepared for Orange County Water District. November 8, 1989.

The off-stream storage projects in Gypsum and Aliso Canyons would be fed from the Prado Dam conservation pool via a pipeline and pump station. Implementation of these off-river storage reservoirs could decrease annual volumes of storm water released from the dam by up to the proposed maximum reservoir capacity of 30,000 fy foe each reservoir, depending on the pumping capacity installed and the annual rainfall volume and intensity. This stored water would later be released into the river at rates the OCWD diversion facilities could accommodate. Although some water would be diverted to these off-river reservoirs during peak flow events, most of the peak storm flow would bypass Prado Dam with similar frequency to existing conditions, responding to precipitation within the watershed. Peak storm flows (often greater than 5,000 cfs) would far exceed diversion capacities that would likely be less than 1,000 cfs. Capturing storm water behind Prado Dam and in off-river storage reservoirs would not significantly reduce storm flow bypassing Prado Dam. Increased capture of storm flow would be considered a less than significant impact. Future projects that increase the capture of storm water would be subject to USACE approval and would subject to NEPA and CEQA review requirements.

Mitigation: None required.

Significance after Mitigation: Not applicable.

5.5.2 Biological Resources

The proposed storage reservoirs and conservation pool projects could involve the removal or disturbance of natural vegetation in open space areas, resulting in a potentially significant impact on sensitive plant and wildlife communities. Behind Prado Dam, inundation at higher elevations would affect the critical habitat of two federally-listed endangered species, the least Bell's vireo and southwestern willow flycatcher. A higher conservation pool also could inundate freshwater marsh vegetation that is currently protected by dikes. Habitat suitable for the Santa Ana sucker could also be affected. Table 5-2 summarizes the impacts to biological resources from raising the Prado Dam conservation pool.

Construction activities for storage reservoirs could disrupt biological resources. Depending on the size of the dams and reservoirs, permanent loss of riparian habitat, woodlands, scrub, and chaparral habitats could occur, resulting in a significant impact to vegetation and resident wildlife. Depending on the type of habitats displaced by the reservoirs, significant impacts to threatened and endangered species are possible as well (see Tables 5-2 and 5-3). Mitigation for habitat loss would be required. In addition, the Prado Basin, Gypsum Canyon, and Aliso Canyon lie within the boundaries of the Coastal/Central Orange County NCCP subregion and the Western Riverside Multi-Species HCP. Development of these projects could conflict with the goals of the NCCP and HCP. As a result, all three projects could pose a significant impact to biological resources.

Mitigation Measures

See **RB-BIO-1** and **RB-BIO-2**.

Significance after Mitigation: *Potentially Significant.* Construction of reservoirs in natural habitat areas could result in potentially significant impacts to plants and wildlife.

5.5.3 Land Use and Recreation

The proposed storage reservoir projects might be incompatible with surrounding land uses and zoning ordinances. Gypsum Canyon is located in the Santa Monica Mountains south of the SAR and leads into Featherly Regional Park along the SAR. Lower Gypsum Canyon is considered open space in the City of Anaheim's Mountain Park Specific Plan,[1] which is currently being amended for consistency with land use designations in Anaheim's revised General Plan (May 2004). Aliso Canyon is located in Chino Hills State Park north of the SAR. Thus, Gypsum Canyon and Aliso Canyon dams and reservoirs would alter the character of existing open space areas (see Tables 5-2 and 5-3). Raising the conservation pool behind Prado Dam to 514 feet would flood areas that are currently used as open space and wildlife habitat (see Table 5-1). In addition, the Prado Basin, Gypsum Canyon, and Aliso Canyon lie within the boundaries of the Coastal/Central Orange County NCCP subregion and the Western Riverside Multi-Species HCP. Development of these projects could conflict with the goals of the NCCP and HCP. As a result, all three projects could pose a significant impact to land use.

Gypsum and Aliso Canyons are undeveloped open spaces that contain hiking, biking, and equestrian trails. Thus, the construction of both canyon reservoirs would impact the use or availability of recreational resources. A regional network of trails, many of which are located adjacent to the Santa Ana River and its tributaries, are maintained by local agencies. Raising the conservation pool behind Prado Dam could affect the trails and other recreational resources

1 City of Anaheim. 2004. Initial Study for the Mountain Park Specific Plan Amendment Project. Prepared by BonTerra Consulting, Costa Mesa, California.

within Prado Basin. Additional environmental analysis would be required to evaluate these potential impacts and develop mitigation measures to avoid or reduce their effects.

Mitigation Measures

See **RB-LU-1** through **RB-LU-4**.

Significance after Mitigation: *Potentially Significant.* Placing reservoirs in recreation areas, parks, or conservation areas could result in a potentially significant land use impacts.

5.5.4 Aesthetics

Future surface reservoirs at Gypsum and Aliso Canyons could impact scenic vistas and local scenic resources. The dam locations may be visible for some distances from State Route 71 and hillslopes and ridges above the canyons. Construction of the reservoirs and access roads could require cuts into the bedrock. This would be considered a potentially significant impact to aesthetics (see Tables 5-2 and 5-3). The Santa Ana Mountains and Chino Hills State Park are currently undeveloped. Installation of the dams and reservoirs would significantly alter the character of these open space areas. Additional environmental analysis would be required to evaluate these potential impacts.

Mitigation Measures

See **RB-AES-1** and **RB-AES-2**.

Significance after Mitigation: *Potentially Significant.* Construction of dams in natural areas would significantly alter the character of the area, resulting in potentially significant impacts.

5.5.5 Air Quality

The SAR watershed and OCWD service area are located within the jurisdictional boundaries of the SCAQMD. The construction of surface reservoirs could generate air emissions that would vary with the size of the projects. Construction activities would include significant earth moving which could result in emissions exceeding SCAQMD significance thresholds. Due to the large size of the Gypsum and the Aliso Canyon Reservoirs, potentially significant construction impacts could result to air quality. Sensitive receptors in the canyons, such as homes on adjacent hillsides, could experience temporary, short-term increases in emissions such as PM_{10} and NO_x. Additional environmental analyses would be required to evaluate potential impacts (see Tables 5-1 through 5-3) and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measures

See **RB-AIR-1** and **RB-AIR-2**.

Significance after Mitigation: *Potentially Significant.* Construction could result in daily emissions exceeding thresholds of significance. Construction air emissions impacts are potentially significant.

5.5.6 Cultural Resources

Implementation of surface reservoir projects could significantly impact cultural resources by inundating archaeological and historic resources. Historic sites and structures might be affected (see Tables 5-1 through 5-3), such as the Rolling M Ranch in Aliso Canyon, which could be eligible for listing on the National Register of Historic Places. Large earth moving operations and blasting into the mountainsides could destroy previously unknown archaeological and paleontological resources. Additional environmental analysis would be required to evaluate potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measure

See **RB-CULT-1**.

Significance after Mitigation: *Less than Significant.* Construction or reservoirs could affect previously unknown archaeological sites. Additional investigations and implementation of mitigation measures would reduce effects to less than significant levels.

5.5.7 Geology and Soils

The prospective surface reservoir projects could be subject to geologic hazards from unstable soils and formations depending on the dam designs and locations (see Tables 5-1 through 5-3). The reservoir sites could be within the Active Fault Near-Source Zones of Chino-Central Avenue Fault, Elsinore Fault, or the Whittier Fault.[2] Strong ground shaking would be anticipated from earthquakes along the Whittier fault. Geotechnical evaluations would be required prior to approving construction of a dam. Dams would be designed to address local rock and seismic conditions.

Mitigation Measure

See **RB-GEO-1**.

Significance after Mitigation: *Potentially Significant.* Construction of dams could affect unique geologic features. This impact is considered potentially significant.

5.5.8 Hazards and Hazardous Materials

There are no known contaminated sites within Prado Basin that would be inundated by an elevated conservation pool behind Prado Dam. Oil wells within the inundation area have been abandoned. Shooting ranges using lead shot are outside of the conservation inundation zone. However, the canyon reservoir locations could be close to sites containing potentially hazardous materials (see Tables 5-1 through 5-3). There is a Rocket Fuel Test Site in Gypsum Canyon that could be inundated if the reservoir was above the 500-foot elevation line. Aliso Canyon would require additional investigation to determine if hazardous materials existed at dam sites and reservoir inundation areas. Compliance with hazardous waste handling and disposal regulations would ensure that impacts from hazardous materials remained less than significant.

2 California Department of Conservation, Division of Mines and Geology, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada, 1998.

Mitigation Measure

See **RB-HAZ-1**.

Significance after Mitigation: *Less than Significant.* Additional study is needed to determine if hazardous materials are within proposed inundation areas. With further investigation to ensure the appropriate locations, implementation of mitigation measures would ensure that this impact would be reduced to less than significant levels.

5.5.9 Noise

The construction of storage reservoirs in Gypsum and Aliso Canyon would temporarily increase noise (see Tables 5-2 and 5-3). Some construction activities could be located near sensitive receptors, such as hillside residences, and could last for a long period of time. Therefore, construction activities could create significant impacts to noise. Raising the level of the conservation pool behind Prado Dam would not result in impacts to noise. However, operation of pumps to convey storm water into storage reservoirs could increase localized noise (see Table 5-1). Additional environmental analysis would be required to evaluate potential impacts and develop mitigation measures to avoid or substantially reduce their effects.

Mitigation Measures

See **RB-NOISE-1** and **RB-NOISE-2**.

Significance after Mitigation: *Potentially Significant.* Construction may include blasting that could generate significant noise impacts. This impact is potentially significant.

5.5.10 Traffic

The construction of surface reservoirs could significantly affect traffic conditions (see Tables 5-2 through 5-4). The installation of pipelines between the main SAR channel and off-river storage facilities could disrupt roadways, creating significant impacts to traffic along SR-91 and local feeder streets for the duration of the construction period. Construction of Aliso Canyon Reservoir might require new roads to be built from SR-91 into Chino Hills State Park. These potential impacts would be minimized through the establishment of traffic control plans and obtaining encroachment permits from local cities and Caltrans.

Mitigation Measures

See **RB-TR-1** through **RB-TR-3**.

Significance after Mitigation: *Less than Significant.* Regional traffic could be affected during construction. Mitigation would be implemented to reduce this temporary effect to less than significant levels.

CHAPTER 6

Growth Inducement Potential and Secondary Effects of Growth

6.1 Overview

The *CEQA Guidelines* (Section 15126.2(d)) require that an EIR evaluate the growth-inducing potential of a proposed action. Growth inducing potential is defined by the *CEQA Guidelines* as:

> …the ways in which a proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this definition are public works projects, which would remove obstacles to population growth…. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

A project can have direct and/or indirect growth inducement potential. Direct growth would result if a project involved construction of new housing. A project can have an indirect growth inducement effect if it would establish substantial, new, or permanent employment opportunities and indirectly stimulate the need for additional housing and services. Similarly, a project would have an indirect growth inducement effect if it would remove an obstacle to additional growth and development, such as providing urban services, such as water supply, to un-served or underserved areas.

OCWD does not supply water directly to customers for use. Rather, OCWD is responsible for maintaining and protecting the groundwater basin under northern and central Orange County to maximize its beneficial uses by others. As discussed further in this section, while OCWD does have an important role in the region's water supply management, it does not have a role in either planning or approving land use development and growth or in extending water service to specific areas, developments or users within its service area.

This section reviews the population growth projections for Orange County and the OCWD service area and describes the existing and projected water demand and water supply conditions. It provides a description of OCWD's role in managing the regional groundwater basin and in protecting the local water supply and discusses the growth inducement potential of OCWD's proposed project. Finally, the section reviews the potential secondary effects associated with the land uses and growth planned by the city and county land use jurisdictions within the OCWD service area. These cities and the County have analyzed the potential environmental effects of their adopted General Plans and identified potential impacts and mitigation measures to address the effects of planned growth.

6.2 Population

Since the 1950s, Orange County has experienced rapid change from a rural, agricultural area to a densely populated region of over three million people. The northern portion of Orange County was extensively developed in the 1970s and 1980s and continues to increase in population density. Since 1990 Orange County's population has increased by an average 1.7 percent annually, compared with a 1.46 percent increase in Southern California as a whole.[1] As shown in **Table 6-1**, the Southern California Association of Governments (SCAG) projects that Orange County's population will increase to 3.49 million by the year 2020, just over 12 percent. SCAG estimates that most of the projected growth in Southern California will result from local birth rates rather than immigration, which accounted for most of the growth in the 20th Century.[2] Based on SCAG's review of growth trends, much of the future growth in the county will occur in the portion of the county that is already developed, much of it within the District's service area.

TABLE 6-1
POPULATION PROJECTIONS (MILLIONS OF PEOPLE)

	2005	2010	2025
Orange County [a]	3.10	3.29	3.49
OCWD Service Area [b]	2.27	2.33	2.55

SOURCES: (a) SCAG Growth Forecasting, City Projections (http://www.scag.ca.gov/forecast/downloads/2004GF.xls);
(b) Center for Demographic Research, MWDOC.

The District's service area encompasses most of the urbanized portion of northern Orange County (see Figure 1-1 and Table 1-1, in Chapter 1). As of 2005, approximately 2.27 million people lived within the District's service area, accounting for approximately 73.2 percent of the county's total population (see Table 6-1). The District projects the population within its service area will increase to 2.55 million people by 2025 – about a 12 percent increase similar to that projected by SCAG for the county overall, and will continue to represent about three-quarters of the County's total population in the future as it does now.

SCAG growth estimates are used as a basis for regional planning efforts such as future transportation infrastructure needs. OCWD obtained population projections within its service area using data compiled by the Center for Demographic Research (CDR) at the California State University in Fullerton. The CDR maintains population records and conducts estimates of future population within Orange County based on locally planned land uses, historic birth rates, and immigration trends.

1 SCAG, RTP PEIR, February 1, 2001.
2 *Ibid.*

6.3 Water Supply and Demand

Supply

Water supply needs in Orange County are met largely with a combination of local groundwater and surface water imported from Northern California and from the Colorado River along with local surface water and water recycling efforts. The following reviews the region's existing and future water supply options.

Groundwater

Groundwater provides about half of the water supply used countywide while imported surface water provides the other half. However, the County's groundwater resources underlie the northern and central portions of the county – and in this part of the county groundwater provides up to 75 percent of the water supply needs. By contrast, southern Orange County is virtually 100 percent dependent on imported water.

As described throughout this report, OCWD manages the county's vast groundwater basin; the District boundary encompasses the northern and central portions of the county underlain by the groundwater basin. OCWD does not supply water directly to customers. Groundwater is pumped from the local groundwater basin and distributed to customers by local cities and retail water agencies and companies. OCWD replenishes the groundwater basin largely by recharging Santa Ana River water into the aquifer and by importing some additional water from Metropolitan for recharge as well.

Surface Water

The Metropolitan Water District of Southern California (Metropolitan) manages and coordinates the delivery of imported surface water supplies from the Colorado River and from Northern California through the State Water Project with six southern California counties including Orange County. Four agencies in Orange County import surface water supply from Metropolitan: the Municipal Water District of Orange County (MWDOC) and the cities of Anaheim, Fullerton, and Santa Ana. MWDOC is a water wholesale agency that does not provide water directly to customers but rather sells it to its approximately 30 member agencies, comprising cities and water districts throughout the county. These member agencies are the local water retailers, selling water directly to their local customers. The cities of Anaheim, Fullerton, and Santa Ana retail water directly to their customers.

Metropolitan provides approximately 50 percent of the water supply for Orange County, on average. **Table 6-2** summarizes Metropolitan's single dry-year supply portfolio through 2020, identifying existing supplies and the supplies under development both for additional import as well as locally within Metropolitan's service area. By the year 2020 Metropolitan projects that water demands within its service area will increase almost 15 percent. As shown in the table, Metropolitan has developed a multiple supply portfolio to meet current demands and to accommodate growth demands within its service area without increasing pressure on groundwater production.

TABLE 6-2
METROPOLITAN'S SINGLE DRY-YEAR SUPPLY CAPABILITY AND DRY-YEAR LOCAL SUPPLIES (AFY)

	2005	2010	2020
Current Supplies			
Colorado River	742,000	885,700	1,135,200
California Aqueduct	1,017,300	1,803,200	842,300
In-Basin Storage	730,400	790,000	757,900
Supplies under development			
Colorado River	0	0	114,800
California Aqueduct	0	175,000	370,000
In-Basin Storage	0	89,000	200,000
Local supplies (Includes entire Metropolitan service area)			
Local groundwater	1,366,400	1,366,400	1,366,400
Local runoff	135,000	135,000	135,000
Los Angeles Aqueduct	150,000	150,000	150,000
Total Demands on Metropolitan	2,169,300	2,096,100	2,487,900

SOURCE: Metropolitan, Draft Regional Urban Water Management Plan, May 2005.

Future Supply Options

The water wholesale and retail agencies within the OCWD service area will continue to use a combination of local groundwater and imported surface water to meet their water supply needs as they do now. In addition, several supply options are also being evaluated to improve supply reliability and increase overall supply for the future. These supply options include:

- Imported surface water from Metropolitan
- Increased local recycled water
- Local surface water
- Water transfers – imported surface water from entities other than Metropolitan
- Desalination

Table 6-2, above, reviews the supplies Metropolitan has under development to meet the future needs of its members including those in Orange County. Local agencies also continue to pursue water recycling projects and there are currently three desalination projects under investigation in Orange County. In addition, MWDOC and some of its member agencies are exploring long-term relationships with water suppliers in Northern California to arrange for possible water transfers. MWDOC indicates that while imported supplies will continue to be an important part of the supply mix for the County and within the OCWD service area, it and its member agencies are working to improve water reliability by developing new local supplies and thereby reduce the dependence on imported supply overtime.

Demand

The Orange County General Plan states that municipal and industrial (M&I) water uses comprise about 90 percent of the total demand. Of this M&I use, approximately 65 percent is for residential uses.[3] **Table 6-3** compares water usage, population, and rainfall in Orange County from 1990 to 2000. As shown in this table, M&I water usage has varied from 190 to 230 gallons per capita per day (gpcd). M&I water demand fluctuates year-to-year depending on rainfall, with higher usage rates generally occurring in dry years and lower usage rates in wet years.

TABLE 6-3
ORANGE COUNTY HISTORIC PER CAPITA M&I WATER USAGE AND RAINFALL

Year (June to June)	M&I Water Usage (af) (1)	Estimated population (millions) (2)	Per capita (MI) (gpcd) (3)	Rainfall (inches) (4)
1990	618,000	2.40	230	8.7
1991	577,000	2.45	210	11.3
1992	532,000	2.50	190	15.6
1993	565,000	2.54	198	24.1
1994	567,000	2.57	197	12.1
1995	570,000	2.59	196	24.8
1996	611,000	2.63	207	11.3
1997	642,000	2.68	214	13.5
1998	589,000	2.74	192	30.6
1999	630,000	2.80	201	7.6
2000	674,000	2.86	210	8.1

1 M&I consumption usage includes recycled water; does not include agricultural water or replenishment of storage. Data collected by MWDOC, 2000
2 Center for Demographic Research CSU Fullerton, MWDOC, 2000
3 gpcd = gallons per capita per day
4 Rainfall at Santa Ana Civic Center gage (OC#21)

SOURCE: MWDOC 2000 RUWMP Update.

In 2004 total demand in Orange County was 683,000 AFY (MWDOC; mwdoc.com/fast_facts.htm, September, 18, 2005). As shown in **Table 6-4,** imported water purchased from Metropolitan by Orange County member agencies provided about half of that water last year. Within OCWD's service area, total 2004 demand was approximately 500,000 AFY, with groundwater production providing about 337,000 AFY or 67 percent of this total demand.

Metropolitan has prepared a draft 2005 Regional Urban Water Management Plan (RUWMP) that presents its water demand projections for each county within its service area. **Table 6-5** summarizes Metropolitan's projected total water demand in Orange County through the year 2025. Based on Metropolitan's projections, water demand in Orange County is expected to increase about nine percent over the next 20 years.

3 Orange County Advance Planning Program, Resources Element, RES-2-65.

TABLE 6-4
TOTAL WATER PURCHASED FROM METROPOLITAN BY ORANGE COUNTY MEMBER AGENCIES IN 2004

	2004 (afy)
Anaheim	26,357
Fullerton	17,272
Santa Ana	20,459
MWDOC	297,944
Total	**362,032**

SOURCE: Metropolitan, Draft Regional Urban Water Management Plan, May 2005.

TABLE 6-5
TOTAL RETAIL DEMAND PROJECTIONS FOR ORANGE COUNTY (AFY)

	2005	2010	2025
Orange County	677,700	707,900	741,400

SOURCE: Metropolitan, Draft Regional Urban Water Management Plan, May 2005.

MWDOC is currently preparing its 2005 Urban Water Management Plan update. MWDOC's assessment of projected demand in Orange County indicates that water demand will increase at an average rate of 0.5 percent per year in the future, compared to a historical demand growth of approximately 1.54 percent per year. MWDOC also projects that long-term conservation measure are expected to maintain the M&I per capita use at approximately 210 gallons per capita per day.

Table 6-6 shows a 2025 projection of water demand within the OCWD service area and the District's estimate of groundwater production based on its future recharge operations resulting from implementation of the proposed near-term projects to increase its recharge capacity by 97,000 afy. With this increased recharge capacity the District estimates that groundwater production could increase to 427,000 afy and represent up to 75 percent of the total projected

TABLE 6-6
EXISTING AND PROJECTED GROUNDWATER PRODUCTION AND WATER DEMAND WITHIN OCWD SERVICE AREA

	Annual Recharge (afy)	Groundwater Production (afy)	Water Demand (afy)	Percent of Water Demand Supplied by Groundwater
2004	330,000	337,000	500,000	67%
2025	427,000*	427,000*	570,000	76%

* Assumes existing recharge of 330,000 afy plus 97,000 afy provided with near-term projects. This amount is based on recharge capacity and may only be available in wetter years. Dry years may yield substantially less recharge water with commensurate lower groundwater production.

SOURCE: OCWD, MWDOC.

2025 water demand. However, water may not be available from the SAR in all years to make use of the available recharge capacity; in dry years groundwater recharge and, in turn, groundwater production could be substantially less. OCWD's 427,000 afy recharge capacity does not represent a reliable, guaranteed annual supply, but rather represents a potential amount of recharge that could be available to meet local needs.

6.4 Growth Inducement Potential

OCWD's project proposal to secure SAR appropriation rights and divert increasing river flows for groundwater recharge would not have a direct growth-inducing effect. OCWD's project does not involve construction of new housing and would not substantially expand or establish new employment opportunities that, in turn, would generate housing development. Nor would the project provide water supply infrastructure to a previously undeveloped or underserved region.

As described in the sections above, OCWD has responsibility for protection and management of Orange County's groundwater basin. The District's proposed project would enhance recharge of the groundwater basin as a means to increase and maximize the basin's sustainable yield. This would help reduce the area's reliance on imported water supply to meets its future needs. It would not change the need for local communities to meet this water need or to import water supply to meet a portion of their existing or future water demands.

OCWD has an indirect role in the region's water supply delivery process. It does not have authority or responsibility for providing water service directly to customers. OCWD does not make decisions about when and where to extend water service for existing or new development. The cities and water agencies within the District are responsible for assessing the water supply needs of their customers, for extending and maintaining infrastructure to deliver that water and for securing adequate supplies through a combination of pumping local groundwater and purchasing imported surface water supplies.

OCWD's proposed project to increase groundwater recharge with diversion of increasing SAR flows would play an important role in managing the area's groundwater supply for use by an expanding population. In this way, OCWD's project would help support growth planned by the County and cities within its service area. However, as described above, these communities within the OCWD service area have other existing and future sources of water supply to help meet increasing needs. While MWDOC and other local agencies are interested in maximizing the use of local water sources, primarily the groundwater basin, and limiting reliance on imported water, and OCWD is committed to helping meet that goal, other sources of supply are available or could be pursued to meet future increases in water demands. These other sources include increased import of water from Metropolitan, increased local water recycling, water transfers for import from others outside the region, and desalination. OCWD's proposed project would not cause or induce growth within the area since it is reasonably foreseeable that the major water suppliers within OCWD's service area (MWDOC, and the cities of Anaheim, Fullerton, and Santa Ana) and/or the local communities and water agencies within the MWDOC service area would pursue other water supply options to meet the needs of planned growth in the absence of OCWD's proposed project.

A review of several of the existing General Plans for the cities in the OCWD service area indicates that these communities have each determined that water supply is not a significant constraint to its planned growth. These General Plans acknowledge that growth would stress the existing water supply infrastructure requiring infrastructure expansion and increased water imports, but that imported water would likely be available to meet projected demands. This conclusion is supported by the local Urban Water Management Plans (UWMP) as well as by Metropolitan's and MWDOC's Regional UWMPs. OCWD's proposed project to increase local groundwater resources would serve as one measure to address or "mitigate" the secondary effect (i.e., increased demand) of planned growth on the existing water supply system and it would reduce the need to rely on increasing water imports.

6.5 Land Use and Growth Management Plans and Policies and Secondary Effects of Planned Growth

As outlined in Section 6.2, above, population within Orange County and specifically within the OCWD service area is projected to increase about 12 percent over the next 20 years. Approximately three-quarters of the county's population live in the northern and central parts of the county within OCWD's service area. The county and local cities have planned for additional land use development through their General Plan process and they are responsible for approving the timing, location and density of specific new developments and land uses in accordance with these plans. Following is a review of land use plans within the OCWD service area and a summary of the conclusions the County and local cities have made about the secondary environmental effects of their planned growth. This section also reviews major regional plans and actions that contribute to mitigation of the secondary effects of planned growth.

General Plans

Local cities and the county regulate land use and growth within the OCWD service area through General Plans that establish land use goals and policies, identify the proposed magnitude and pattern of growth within their community, and present plans for accommodating planned growth with adequate provision of services and management of resources. Each city and the county have prepared EIRs on their General Plans. Each General Plan EIR assesses potential significant impacts of growth associated with the projected future population and proposed land use pattern. These General Plans and associated EIRs are available for review at the planning department offices for each of the cities within the OCWD service area and for Orange County. **Table 6-7** summarizes conclusions made by several of the cities within the OCWD service area regarding the potential impacts of planned growth after implementation of mitigation measures.

Cities with certified General Plan EIRs have acknowledged that potentially significant impacts could result from implementation of their General Plans. Where mitigation measures would not reduce these impacts to less than significant levels, the cities have adopted a CEQA statement of overriding considerations explaining that impacts could not be avoided. The cities provide the justification for proceeding to adopt the General Plan in light of other benefits that would result. Several cities have identified unavoidable significant impacts to air quality, traffic, and noise as a

TABLE 6-7
IMPACT SUMMARIES FROM SELECT LOCAL GENERAL PLAN EIRS

	Impact Area															
	Aesthetics	Agri - culture	Air Quality	Biology	Cultural Resources	Geo and Soils	Hazards	Hydrology	Land Use	Mineral Resources	Noise	Pop and Housing	Public Services	Recreation	Traffic	Utilities and Service Systems
City																
Anaheim	LS	LS	**S**	LS/M	LS/M	LS/M	LS/M	LS/M	LS/M	LS	**S**	LS/M	LS/M	LS/M	**S**	LS/M
Fountain Valley	N/A	LS/M	LS/M	LS/M	LS/M	LS/M	N/A	LS/M	LS/M	N/A	LS/M	**S**	LS/M	LS/M	LS/M	LS/M
Fullerton	LS/M	N/A	**S**	LS/M	LS/M	LS/M	LS/M	LS/M	LS/M	N/A	**S**	LS/M	**S**	LS/M	**S**	LS/M
Huntington Beach	LS	N/A	**S**	LS/M	LS	LS/M	LS	LS	LS	N/A	**S**	LS	LS	LS	**S**	LS/M
Newport Beach	N/A	N/A	**S**	N/A	N/A	N/A	N/A	N/A	LS	N/A	**S**	N/A	N/A	N/A	**S**	N/A
Orange	LS/M	LS/M	**S**	LS	LS/M	LS/M	LS	LS/M	**S**	LS/M	LS/M	LS	LS/M	LS	LS/M	LS/M
Regional																
SCAG RTP	**S**	N/A	**S**	**S**	**S**	**S**	**S**	**S**	**S**	N/A	**S**	**S**	**S**	N/A	**S**	**S**

LS = Less than significant
LS/M = Less than significant with mitigation
S = Significant, unavoidable
N/A = Not analyzed

Note: The city of Santa Ana does not have a recent General Plan.

SOURCE: City of Anaheim. General Plan EIR. 2004.
City of Fountain Valley. *General Plan EIR*. 1995.
City of Fullerton. General Plan EIR. 1998.
City of Huntington Beach. *General Plan EIR*. 1995.
City of Newport Beach. *General Plan EIR*. 1988.
City of Orange. *General Plan EIR*. 1989.
SCAG. *Regional Transportation Plan EIR*, 2004.

result of planned growth. However, none of the cities have found that the impact of planned growth on the local water supply is a significant constraint. Although the General Plans acknowledge that the planned growth would stress water supply services, the EIRs conclude that water sources would become available to prevent a significant constraint to growth.

Urban Water Management Plans

Pursuant to the Urban Water Management Act, major water suppliers are required to prepare urban water management plans explaining water supply and demand projections within their respective districts for normal and dry-year periods. These plans are updated every five years, and new plans are required in 2005. OCWD is not required to prepare an urban water management plan since it is not a water supplier. Four water districts encompass OCWD's service area: the City of Fullerton, the City of Anaheim, the City of Santa Ana, and the MWDOC. Each of these districts has prepared an urban water management plan that rely on conservation and imported water to meet future water demand.

Regional Resource Management Plans

Local planning jurisdictions rely largely on regional resource management agencies to mitigate the direct and cumulative effects of growth on the environment. It is the responsibility of regional resource managers to evaluate effects of growth and prepare plans to mitigate identified effects where possible. Several regional agencies including SCAG, SCAQMD, SAWPA,

MWDOC, and Metropolitan Water District of Southern California (Metropolitan) evaluate impacts of projected growth on regional resources and have each prepared resource management plans to mitigate potential significant impacts. Some of these regional resource management plans are summarized below.

The SCAG Regional Comprehensive Plan and Guide (RCPG) completed in 1996 combines regional planning efforts into a single focused document, addressing several core elements including transportation, air quality, water quality, and hazardous waste management. These elements provide a basis for regional conformity review for state and federal resource management regulations. The RCPG also addresses as ancillary or advisory guidance the following elements: economic issues, housing, human resources, public finance, open space and conservation, water resources, energy resources, and integrated solid waste management.

In 2004, SCAG prepared an EIR on its Regional Transportation Program (RTP). The RTP acts as a long-term planning and management plan for the regional transportation system, providing mitigation measures to offset the impacts of growth. SCAG updates growth projections for counties and cities annually. The most recent population projections are from the 2004 RTP PEIR. SCAQMD updated the SCAB Air Quality Management Plan (AQMP) in 1997. The AQMP analyzes air quality impacts of projected growth and provides measures to offset those impacts. The AQMP relies on short term and intermediate term attainment measures which were to be adopted by 2000, and long-term attainment measures utilizing advances in technology reasonably expected to be available by the year 2010. On January 12, 1999, the U.S. EPA proposed a partial disapproval of the ozone portion of the 1997 AQMP. In response, the SCAQMD prepared the 1999 Ozone State Implementation Plan revision.

SAWPA completed the Integrated Watershed Plan in 2002 for the Santa Ana River watershed. The plan identifies water quality concerns within the entire watershed and identifies projects to remediate poor water quality. Metropolitan and MWDOC each have prepared RUWMPs that identify projected water demand for the region and identify water supply sources to meet the demand. These plans are exempt from CEQA evaluation.

Other agencies such as the SARWQCB, CDFG, USFWS, and USACE have instigated permitting programs to assist in developing mitigation monitoring and reporting plans for projects potentially impacting natural resources. OCWD implements several programs that mitigate potential growth effects as described below. Local cities and Orange County also manage local resources through long-range planning processes and development permitting programs. **Table 6-8** lists agencies in the Southern California region that have the authority to implement major mitigation measures for growth-related impacts. The secondary effects of growth in Orange County are evaluated and mitigated through these regional authorities.

OCWD Activities that Mitigate Secondary Effects of Growth

Over the years the District has become involved in numerous projects that assist in alleviating impacts caused by urban development on the local water resources including groundwater and surface water. These are briefly discussed in the following text.

Seawater Intrusion Barrier

The District has operated the Talbert Seawater Intrusion Barrier since the 1970s to protect the Orange County groundwater basin from seawater intrusion. Due to over-pumping, the groundwater basin was subjected to intrusion from seawater in the coastal areas. The project injects water into the ground through a series of wells along Ellis Avenue in Fountain Valley and Huntington Beach. The injected water provides a barrier against the underground seawater, protecting the resource for storage of potable water. The water used for injection has been a combination of highly treated purified wastewater, groundwater from deep aquifers, and potable water supplied by Metropolitan.

Groundwater Replenishment System

The Groundwater Replenishment System (GWRS) is being implemented by the District in coordination with the Orange County Sanitation District (OCSD). The project will provide advanced treatment to wastewater supplied by OCSD to augment the regional water supply. The project will produce water that meets drinking water standards and will be injected into the Talbert Seawater Intrusion Barrier and also be piped upstream to Kraemer Basin to be recharged into the groundwater basin. The first phase will have the capacity to treat and recharge 70,000 afy. This project will provide a new water source for the region and reduce future demands for imported water.

TABLE 6-8
KEY REGIONAL RESOURCE MANAGEMENT AND/OR PROTECTION AGENCIES WITH A ROLE IN ADDRESSING SECONDARY EFFECTS OF PLANNED GROWTH IN ORANGE COUNTY

Agency	Authority
US Environmental Protection Agency	Responsible for enforcing environmental protection laws including Clean Air Act, Clean Water Act, hazardous waste regulations, and solid waste regulations.
US Fish and Wildlife Service	Responsible for protecting wildlife. Enforces Endangered Species Act and issues Biological Opinions for projects that could affect endangered species.
US Army Corps of Engineers	Responsible for providing flood protection. Administers Section 404 of the Clean Water Act for projects impacting "Waters of the US".
California Department of Fish and Game	Responsible for protection of wildlife in California. Enforces California Endangered Species Act and issues Streambed Alteration Agreements for projects impacting wetland areas.
State Department of Health	Responsible for the purity and portability of domestic water supplies for the state.
California Air Resources Board	Responsible for adopting and enforcing standards, rules, and regulations for the control of air pollution from mobile sources throughout the state.
Local Agency Formation Commission	Empowered to approve or disapprove all proposals to incorporate cities to form special districts or to annex territories to cities or special districts. Also empowered to guide growth of governmental service responsibilities.
Southern California Association of Governments	Formed to provide more effective regional planning in southern California. Responsible for developing regional plans, including: Regional Comprehensive Plan and Guidelines, Regional Transportation Plan, Regional Housing Needs and Employment Assessment, and Air Quality Management Plan.
South Coast Air Quality Management District	Adopts and enforces local regulations governing stationary sources of air pollutants. Develops the regional Air Quality Management Plan with SCAG.
County of Orange	Responsible for planning, land use, and environmental protection of unincorporated areas. The Orange County Board of Supervisors revised the Growth Management Element of its County General Plan on October 19, 1993.
Orange County Flood Control District	Responsible for providing regional flood control facilities within Orange County. Plan storm drainage and flood control facilities on a countywide, regional basis.
Regional Water Quality Control Board, Santa Ana Region	Responsible for maintaining water quality. Formulates and adopts water quality control plans for the District's service area. Implements portions of the CWA.
Metropolitan Water District	Responsible for the development, storage, transportation and wholesaling of water to member agencies for domestic and municipal purposes. Obtains water from California State Water Project and Colorado River Aqueduct.
Municipal Water District of Orange County	Provides water for service area. Responsible for preparing a Regional Urban Water Management Plan that assesses the availability of water.
Orange County Sanitation District	Collects, treats, and disposes wastewater within northern Orange County.
Orange County Water District	Manages Orange County groundwater basin. (See following sections).
Local cities (within the Districts' service area)	Responsible for adoption of local general plans and various planning elements and local land use regulations. Adopt and implement local ordinances for control of environmental impacts.

SOURCE: Environmental Science Associates.

Green Acres Project

The Green Acres Project is another project coordinated with the OCSD to reclaim wastewater for beneficial uses. Approximately 7.5 mgd is currently provided advanced treatment at the District's Green Acres Project Treatment Plant. The highly treated reclaimed water is pumped to local consumers for use in landscape irrigation and other non-potable uses. The project assists in reducing the region's imported water and groundwater demands.

Prado Basin Wetlands

The District manages a wetland area within Prado Basin that provides nitrogen removal treatment for SAR water. The 465-acre wetlands treat up to 200 cfs of river water. Adjacent OCWD lands provide valuable habitat for endangered bird species such as the Least Bell's vireo and southwestern flycatcher. The nitrogen removal process assists in maintaining the quality of recharge water. The District is planning an expansion of the treatment wetland.

Santa Ana Watershed Project Authority

The District is a member agency of SAWPA. SAWPA has instigated numerous projects to protect the natural resources in the SAR watershed from the effects of growth and expanding development including the following:

- Arundo Removal Program in Santiago Creek and along portions of the SAR
- Groundwater desalting within the Chino Basin and Arlington sub-basin
- Santa Ana Sucker Conservation Program
- Least Bell's Vireo Management Program

CHAPTER 7
Cumulative Analysis

7.1 Introduction

CEQA requires that an EIR assess the cumulative impacts of a project with respect to past, current, and probable future projects within the region. *CEQA Guidelines* (Section 15355) define cumulative effects as "two or more individual effects that, when considered together, are considerable or which compound or increase other environmental impacts." The cumulative impact from several projects result from the incremental impacts of the proposed project when added to other closely related, and reasonably foreseeable, future projects. This section assesses whether OCWD's proposed SAR diversions and projects proposed to implement the diversions and groundwater recharge of SAR flows would result in cumulatively significant effects when considered together with other diversions and local projects.

Pursuant to Section 15130 of the *CEQA Guidelines*, this analysis lists other proposed diversions and projects within the SAR channel that could result in similar environmental impacts. Pertinent guidance for cumulative impact analysis is given in Section 15130 of the *CEQA Guidelines*:

- An EIR shall discuss cumulative impacts of a project when the project's incremental effect is "cumulatively considerable" (i.e., the incremental effects of an individual project are considerable when viewed in connection with the effects of past, current, and probable future projects, including those outside the control of the agency, if necessary);
- An EIR should not discuss impacts that do not result in part from the project evaluated in the EIR;
- A project's contribution is less than cumulatively considerable, and thus not significant, if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact;
- The discussion of impact severity and likelihood of occurrence need not be as detailed as for effects attributable to the project alone;
- The focus of analysis should be on the cumulative impact to which the identified other projects contribute, rather than attributes of other projects that do not contribute to the cumulative impact.

This section provides an overview of the impacts associated with the proposed project that could contribute to cumulative impacts. The existing conditions within the watershed are summarized and a list of proposed diversions and projects within the SAR channel is included. Potentially cumulative effects of the proposed diversions and projects are also evaluated.

7.2 Project Impact Summary

7.2.1 Diversions

OCWD's proposed diversions could reduce the annual volume of storm water that would flow through the lower SAR and reach the ocean. As discussed in Section 4.2, this impact would be less than significant since no environmental resources or beneficial uses would be adversely affected. No other adverse impacts to environmental resources are identified resulting from the proposed diversions.

7.2.2 Recharge and Storage Projects

Chapters 4 and 5 of this EIR identify impacts associated with construction and operation of facilities needed to accommodate increased diversions. **Table 7-1** lists impacts identified with constructing and operation recharge basins and storage reservoirs.

TABLE 7-1
SUMMARY OF PROJECT IMPACTS

		Future Projects		Specific Projects	
	SAR Water Diversion	Recharge Basins	Storage Reservoirs	Anaheim Lake Expansion	Santiago Creek Expansion
Hydrology	LS	LS/M	LS/M	LS/M	LS/M
Biology	NI	LS/M	PS	LS/M	NI
Land Use/Recreation	NI	LS/M	PS	LS	LS
Aesthetics	NI	LS/M	PS	LS	LS
Air Quality	NI	PS	PS	LS	LS
Cultural Resources	NI	LS/M	LS/M	LS/M	LS/M
Geology	NI	LS/M	PS	NI	LS
Hazards	NI	LS/M	LS/M	NI	LS
Noise	NI	LS/M	PS	LS	LS
Traffic	NI	LS/M	LS/M	LS	LS

PS= Potentially Significant Unavoidable
LS/M = Less than Significant with Incorporation of Mitigation
LS = Less than Significant
NI = No Adverse Impact

7.3 Existing Conditions

Chapter 2 provides an overview of the existing conditions within the SAR watershed. Specific on-going activities within the Prado Basin and SAR channel that could result in impacts similar to those identified for the proposed project include the following:

- Prado Basin Arundo Removal
- Prado Wetlands

- OCFCD dry weather diversions
- SAR channel maintenance

These activities are summarized briefly below.

Prado Basin Arundo Removal

OCWD manages portions of the Prado Basin for riparian habitat value that provides nesting habitat for the least Bell's vireo and southwestern willow flycatcher. OCWD has partnered with SAWPA to undertake activities aimed at removing the invasive species *Arundo donax* within the basin. These activities have significantly enhanced habitat values within the basin.

Prado Wetlands

OCWD operates and maintains the Prado Wetlands, which cover approximately 465 acres within Prado Basin. These constructed wetlands reduce nitrogen levels in SAR water. Approximately 50 percent of the SAR flow is diverted through these wetlands and then back to the SAR channel within the Prado Basin upstream of Prado Dam. The wetlands provide a substantial water quality benefit as well as habitat and conservation benefits to locally threatened species.

Dry Weather Diversions

Since the end of 2002, dry-weather urban runoff in the SAR has been captured and diverted by the OCFCD, using a removable dam located just upstream of the I-405 crossing. The diverted water is conveyed to the OCSD Reclamation Plant No. 1 for treatment and is discharged to the ocean through OCSD's offshore outfall pipe. The dry-weather urban runoff treatment program was initiated to assist in improving ocean water quality at the beaches near the mouth of the SAR. In 2003 and 2004, OCSD treated 180.5 and 191.8 acre-feet of water, respectively, from the SAR.

SAR Channel Maintenance

The OCFCD and the USACE are responsible for maintaining the flood control improvements along the SAR channel. The USACE has completed most of the flood control improvements to the SAR within Orange County. Chapter 2 of this EIR provides a description of the existing improvements. Periodic maintenance of the channel conducted by the OCFDC and the USACE to maintain flood protection include dredging in the soft bottom portions of the river and vegetation removal throughout the length of the channel.

7.4 Cumulative Projects List

7.4.1 Projects Affecting Prado Basin and Lower SAR

Table 7-2 identifies a list of activities planned or underway within the Prado Basin and lower SAR channel that comprise the cumulative projects list. The Table identifies potential cumulative effects associated with these projects. The following sections provide brief descriptions of each of these projects.

TABLE 7-2
PROJECTS CONSIDERED FOR CUMULATIVE EFFECTS

Project	Project Sponsor	Implementation Schedule	Proximity to Project Site	Component of OCWD Project that could Contribute to Cumulative Effect	Areas of Potential Cumulative Effect
Santa Ana River Flood Control Mainstem Project (SARP)	USACE/ OCFCD	On-going	• Norco Bluffs Stabilization (upstream from Prado Basin) • Raising of Prado Dam • Reach 9 Bank Stabilization • Reach 1 Channel Excavation	Diversions	Hydrology and biology
OCWD Long-Term Facilities Plan	OCWD	2006	OCWD service area	Diversions and facilities	Construction impacts, land use, and groundwater
Prado Basin Land Use Master Plan	USACE	2006	Prado Basin	Future Storage Reservoirs including conservation behind Prado Dam	Land use
Prado Wetlands Expansion	OCWD	2007	Prado Basin	Future Storage Reservoirs including conservation behind Prado Dam	Water quality and biology
Groundwater Replenishment System	OCWD	2007	Kraemer Recharge Basin	Recharge projects	Groundwater
Proposed Reclamation Projects	Multiple agencies	On-going and proposed through 2010	Rialto, Riverside, San Bernardino (RIX), Western Riverside Waste Water Treatment Plant, Corona, and Chino Basin	Diversions and recharge projects	Water quality and hydrology
Proposed Upstream Diversions	Multiple agencies	2006	Upstream of Prado Basin	Diversions	Hydrology and biology

Santa Ana River Flood Control Mainstem Project

USACE currently is implementing Phase II of the SARP, which is designed to provide protection against a 190-year flood in the Santa Ana River watershed. USACE projects currently under construction within Prado Basin include raising the physical height of Prado Dam to 594.4 feet above NGVD, stabilizing Norco Bluffs, and constructing new dikes and floodwalls in Prado Basin. These projects have been the subject of previous environmental review pursuant to NEPA and CEQA and are currently under construction.[1]

USACE is currently excavating sediment near the mouth of the SAR. This periodic maintenance activity is necessary to maintain flood protection and will be implemented by OCFCD in the future. USACE prepared an Addendum to the SARP EIS and implemented additional mitigation to compensate for habitat that had developed in the lower channel.

1 USACE, 2001, Prado Basin and Vicinity, Including Reach 9 and Stabilization of the Bluff Toe at Norco Bluffs, Supplemental Final EIS/EIR, November 2001.

Long-Term Facilities Plan

The District is currently preparing a Long-Term Facilities Plan (LTFP) identifying facilities and projects needed to protect and maintain the Orange County groundwater basin. The LTFP also evaluates potential annexations to the service area. The LTFP will be completed and approved in 2006.

Prado Basin Master Plan

The USACE is currently preparing a Master Plan for future use of property within the Prado Basin. The Master Plan will establish compatible uses within the basin, taking into account floodplain easement restrictions. No additional property, beyond that already leased, is being considered for development within the basin as part of this Master Plan. The Master Plan will provide a framework to approve land uses within the basin and to ensure consistency of leased areas with long-range planning goals.

River Road Wetlands Expansion

OCWD is planning to develop an additional 194 acres of treatment wetlands upstream of the River Road crossing.[2] This proposed project will further improve water quality in the river and improve the quality of the water recharged into the Orange County groundwater basin downstream of Prado Dam. In addition, this project will benefit the recovery of endangered species, such as the least Bell's vireo and the southwestern willow flycatcher, by restoring and enhancing wetland, riparian, and woodland habitats, and will contribute to water conservation through the removal of non-native *Arundo donax* from the project site.

Groundwater Replenishment System

OCWD is in the process of implementing a recycled water project known as the Groundwater Replenishment System (GWRS) that will utilize Kraemer Basin for groundwater recharge. OCWD is constructing treatment facilities and a pipeline to convey highly treated recycled water from the treatment plant in Fountain Valley to the spreading areas in Anaheim. Water also will be injected in the Talbert Seawater Intrusion Barrier in Fountain Valley and Huntington Beach. The first phase will have the capacity to treat and recharge 70,000 afy.

7.4.2 Projects Affecting SAR Flows

Water Reclamation Projects

Numerous water reclamation projects are planned in the upper SAR watershed that could reduce dry weather base flows in the river channel. SAWPA has compiled estimates of regional recycling goals totaling 100,000 afy.[3] These estimates represent long term planning goals for the year 2025 that may or may not be achieved. The water availability assessment included in Appendix D summarizes the estimated wastewater recycling volumes planned for the future and provides a more realistic estimate of approximately 64,000 afy. This amount represents

2 SAWPA, *Santa Ana Integrated Watershed Plan (SAIWP)*, June 2005.
3 SAWPA, S*anta Ana River Projected Flow Impacts Report*, March 2004.

implementation of aggressive recycling programs in the watershed during a normal year. This demand could decrease during wet years. Actual recycled water use may exceed these amounts depending on future customer demands.

Proposed Cumulative Diversion List

Several upstream water districts (San Bernardino Valley Municipal Water District, Western Municipal Water District, the Chino Basin Water Conservation District, the San Bernardino Valley Water Conservation District, and the City of Riverside) have applied to the SWRCB for rights to divert SAR water for beneficial uses. **Table 7-3** summarizes the applications currently before the SWRCB for rights to appropriate SAR water. The service areas of OCWD and other applicants are shown in **Figure 7-1**.

TABLE 7-3
SUMMARY OF APPLICATIONS TO APPROPRIATE SAR WATER PENDING SWRCB REVIEW

Applicant	Application No.	Volume Requested (afy)
Upper Watershed		
San Bernardino MWD/Western MWD	WA 31165	100,000
Chino Basin Watermaster[(a)]	WA 31369	97,000
San Bernardino MWD/Western MWD	WA 31370	100,000
San Bernardino Valley Water Conservation District	WA 31371	55,464
City of Riverside	WA 31372	41,400
Lower Watershed		
OCWD	WA 31174	505,000

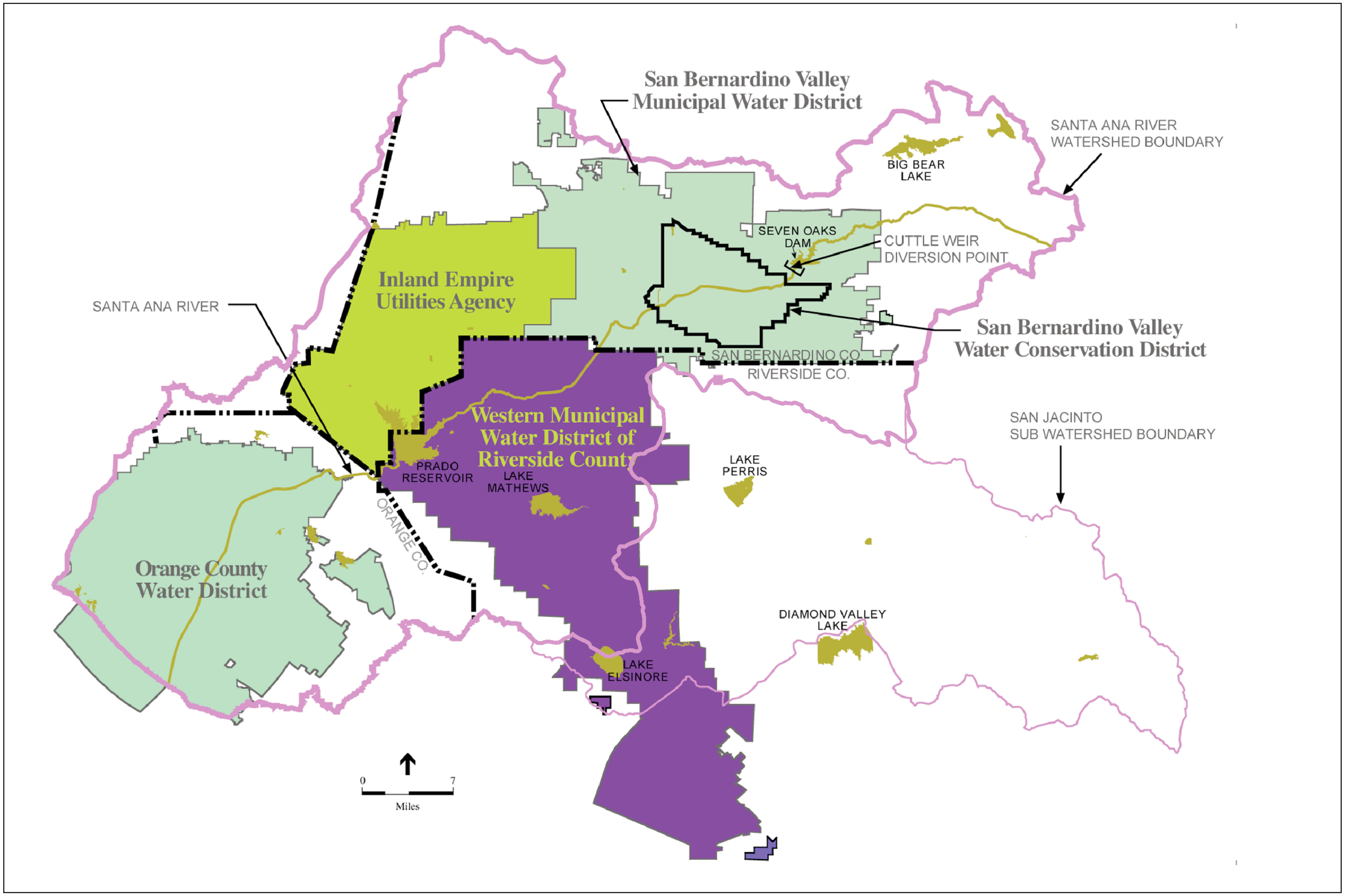
(a) The Chino Basin Watermaster application primarily represents water rights for and potential diversions by the Inland Empire Utilities Agency.

SOURCE: Orange County Water District

7.5 Cumulative Impact Assessment

The lower SAR watershed (below Prado Dam) is distinct from the upper watershed. Prado Dam divides the two portions of the watershed. OCWD is the only entity diverting water for beneficial uses downstream of Prado Reservoir, and is the only applicant requesting rights to water below Prado Dam. All other new applications request the right to divert water upstream of Prado Reservoir. The following cumulative impact analysis focuses on the impacts associated with the District's proposed project as follows:

- Cumulative effects of SAR diversions
- Cumulative effects of implementing OCWD's future storage and recharge projects
- Cumulative effects of two projects: Anaheim Lake Expansion Project and the Santiago Creek Expanded Recharge Project.



SOURCE: OCWD

OCWD . 202291

Figure 7.1
Major Water District Service Areas within the Santa Ana Watershed

7.5.1 SAR Diversion

Hydrology

Proposed increases in SAR flow diversions upstream of Prado Basin combined with OCWD's proposed diversions would cumulatively reduce the volume of water that would otherwise flow in the river channel to the ocean. OCWD's diversion of SAR water is discussed in Section 4.2 of this document and is considered less than significant. The proposed diversions upstream of Prado Basin listed in Table 7-3 could result in cumulative reduction in river flows. The cumulative future condition of river flows is described in detail in Appendix D. **Figure 7-2** summarizes gauged flow in the river during a recent wet year (1992/1993) and then provides an estimated SAR flow fifty years from now, during a similar type of wet year, accounting for the continued flow increases attributable to upstream urbanization and proposed upstream and OCWD diversions (listed in Table 7-3). The following sections evaluate the significance of this cumulative impact.

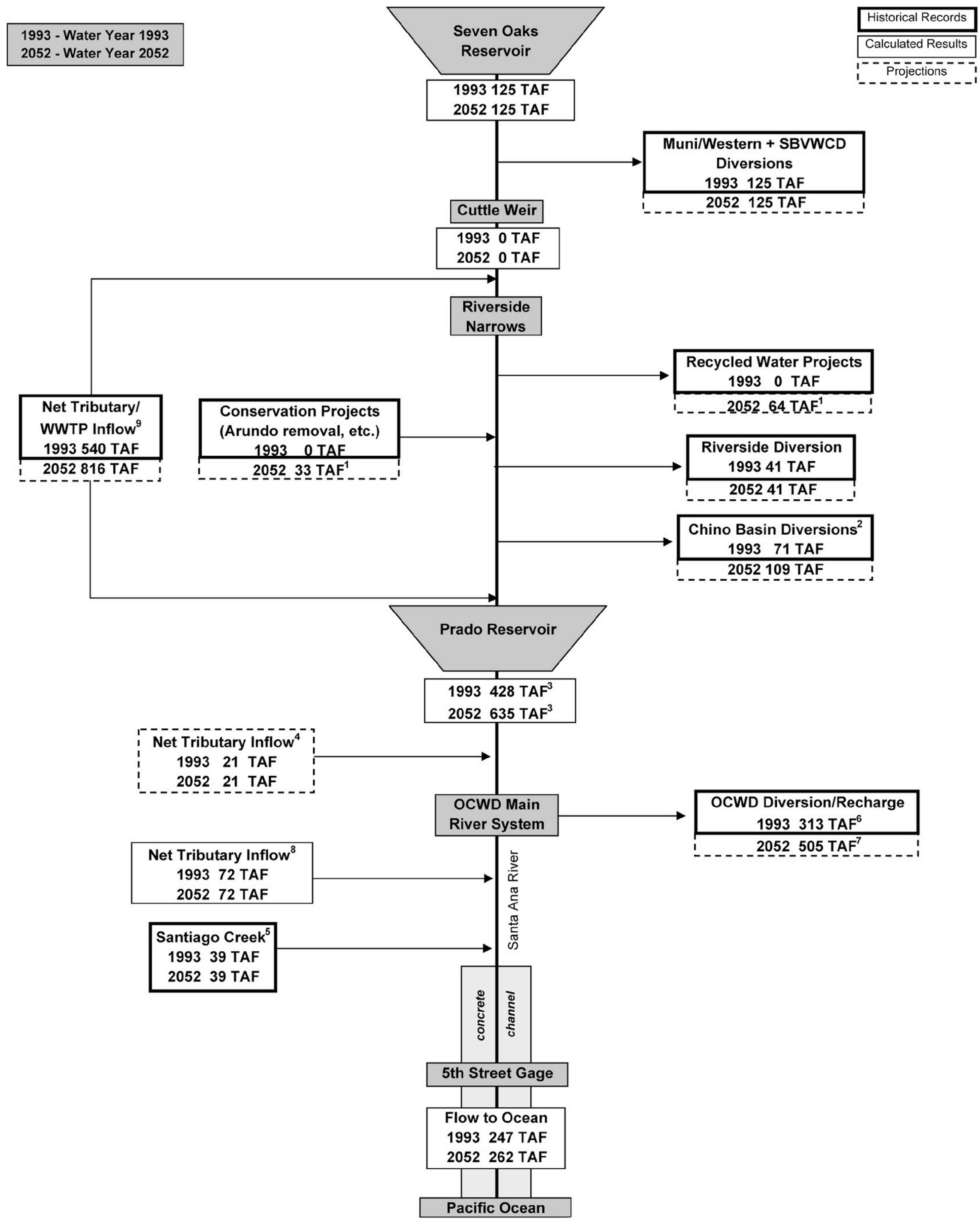
Base Flow Diversions

During dry weather, base flow reaching Prado Dam consists almost exclusively of wastewater discharge. The proposed upstream diversions listed in Table 7-3 would have no effect on the volume of base flow reaching Prado Dam, although numerous reclamation projects are identified upstream of Prado Basin that could reduce the volume of base flow that would otherwise reach Prado Dam. Appendix D provides a water availability analysis that identifies the foreseeable reclamation volumes in the upper SAR watershed. As discussed in the analysis, base flow volumes are projected to increase even as water reuse opportunities are realized. OCWD will divert whatever volume of base flow reaches Prado Basin. No impacts are identified by diversion of future base flow. Therefore, no cumulative effects to base flow would result from the OCWD diversions combined with proposed upstream reclamation projects.

Storm Flow Diversions

As described in Chapter 4.2, storm water runoff is expected to increase due to the expanded impervious surface area in the watershed. The USACE has estimated substantial SAR flow increases in the future as a result of increasing storm flows (see Appendix D). The proposed upstream diversions would reduce the storm water volume that would otherwise flow through Prado Basin and on to the ocean during peak storm events. These upstream diversions combined with OCWD's diversions would cumulatively reduce water that would otherwise flow to the ocean.

The maximum diversion amounts requested by the upstream diverters (see Table 7-3) would only be available during years when the river flows at exceptionally high rates for long periods of time. In most years, substantially less water would be available for diversion upstream. Prolonged high flows would depend on the USACE's operation of Seven Oaks Dam and Prado Dam. During these periods of exceptionally high flow, upstream diverters have predicted that no measurable



[1] OCWD and ESA estimates (OCWD Water Rights Application DEIR, Appendix D).

[2] **2052:** Theoretical diversion of IEUA water rights approved since 1988 (27 TAF) plus net pending water rights (82 TAF). **1993:** Diversion of actual gaged flows in Chino and Cucamonga Creeks during WY 1993, which were less than 109 TAF.

[3] **1993**: Gaged Prado outflow for WY 1993 (571 TAF) minus net upstream diversions (31 TAF, 41 TAF, 71 TAF). **2052**: USACE 50-year projection for Prado Dam outflow for a wet year (847 TAF) minus proposed recycling projects (64 TAF), plus conservation projects (33 TAF), minus proposed upstream diversions (31 TAF, 41 TAF, 109 TAF).

[4] USACE estimate of inflow to the Santa Ana River between Prado Dam and OCWD Main River System (Prado Conservation Feasibility Study EIS, 2004).

[5] Flow volume based on USGS Gage No. 11077500 for Water Year 1992-1993. Urbanization will not affect future flows in Santiago Creek.

[6] This represents OCWD's estimate of diversions during a simulated WY 1993, based on daily flow rates below Prado Dam at USGS Gage No. 11074000. OCWD assumes that water is diverted when the river is flowing at less than 3000 cfs.

[7] This represents a theoretical diversion equal to the total water rights being requested from the SWRCB.

[8] Flow volume calculated as the difference between Prado (11074000), 5th Street (11078000), and Santiago Creek (11077500) gages and OCWD Diversions for Water Year 1992-1993. Urbanization will not affect future (2052) flows in this portion of the watershed.

[9] **1993:** Flow represents Prado gage No. 11074000 for WY 1993. **2052:** USACE estimate of flow into Prado Reservoir in 2052 accounting for urbanization in the watershed.

SOURCE: OCWD, ESA 2005.

Figure 7-2
Schematic of Santa Ana River Annual Flows and Diversions
Cumulative Effects of Proposed Projects (TAF / Year)
Actual Water Year 1993 Hydrology vs. Projected Water Year 2052 Hydrology

effects would be experienced at Prado Basin since tributaries downstream of the proposed diversion points would maintain high flows to Prado Basin. [4] Nonetheless, the volume of water diverted during these periods would reduce the amount of storm water that would otherwise reach Prado Basin.

During moderate and small storm flow events, the upstream diverters expect that proposed diversions could measurably reduce flows into Prado Basin.[5] Tributaries flowing into Prado Basin downstream of diversion points or from other sub-watersheds would continue to reach Prado Dam during large, moderate, and small storm events. Nonetheless, the amount of water diverted upstream during storm flows would reduce the total volume of water reaching Prado Basin.

Appendix D includes an assessment of future water availability that accounts for proposed upstream diversions. This cumulative watershed assessment concludes that over 527,000 afy could reach Prado Basin during a wet year, even when accounting for 100 percent of the proposed upstream diversions. Given the nature of storm flows in the watershed, the prolonged high flows needed to capture the total amounts requested by upstream diverters would be uncommon even among wet years. More likely, large storm events experienced during wet years would result in short periods of extremely high flows that would overwhelm diversion points and continue to the ocean.

During any year type (wet, average, or dry), OCWD will attempt to divert as much water as possible downstream of Prado Dam up to the total requested 505,000 afy. During some years, this may result in no storm water reaching the ocean. This scenario has occurred on several occasions in the past (e.g., 1989/1990, 1960/1961). The SAR Watermaster also has reported less than 5,000 afy reaching the ocean on 17 different years since 1955. When accounting for cumulative diversions in the watershed, annual volumes of SAR flow reaching the ocean would exhibit variability similar to existing conditions, depending on the nature of each storm event experienced in the season and the USACE's flood control operations.

The upstream diverters have identified significant impacts resulting from their diversions upstream of Prado Basin. OCWD's proposed diversions would not add to effects identified upstream of Prado Basin. However, downstream of Prado Basin, OCWD's diversions would add to the cumulative reduction of water that would otherwise reach the ocean. This impact is identified as a less than significant impact of the project in Chapter 4.2. This cumulative impact is also considered less than significant for the following reasons:

1) Peak flows will continue to reach the ocean during large storm events that could occur in dry, average, or wet years. Instantaneous peak flow rates would depend on operation of the two dams and the intensities of individual storms.

2) No biological resources or other beneficial uses downstream of OCWD's diversions would be affected by the reduction in annual volume that would otherwise flow to the ocean.

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4 Muni/Western Draft EIR, 2004.
5 *Ibid.*

3) Total flow reaching the ocean has increased over the last 30 years. A reduction in the total volume of water reaching the ocean would resemble pre-1970 conditions.

4) Anticipated increases in river flows will off-set the effects of the proposed diversions.

Biological Resources

As discussed in Chapter 4.3, OCWD's proposed diversions would not result in impacts to biological resources within the river channel. Upstream divertors have identified potentially significant impacts to biological resources within the river channel upstream of Prado Basin and have identified mitigation measures to minimize the impacts. OCWD's diversions would not contribute to these effects nor add to the overall regional effects on biological resources. Therefore, OCWD's project would not result in cumulatively significant impacts to biological resources.

Biological resources in the lower SAR are affected by flood control activities conducted by USACE and OCFCD. Flood control infrastructure downstream of the District's Main River System requires periodic maintenance, such as vegetation removal and dredging of the soft river bottom below Adams Avenue. These activities will continue regardless of the amount of water diverted by the District. USACE is currently in the process of completing projects within the SAR channel including stabilizing Norco Bluffs, raising the elevation of the Prado Dam, stabilizing Reach 9, and dredging the mouth of the river in Reach 1. OCWD has acknowledged its contribution to the existing condition of biological resources in the SAR under previous CEQA and NEPA assessments. (See Appendices C and F.) Since the proposed diversions would not alter existing conditions within the river channel, as discussed in Chapter 4.3, they would not result in a cumulative impact to biological resources downstream of Prado Dam.

Other Resources

Since the District's proposed appropriation would not adversely impact any resources downstream of Prado Basin (as discussed in Chapter 4), it would not result in significant cumulative impacts to environmental resources including land uses, water quality, regional aesthetics, air quality, noise, traffic, cultural resources or geologic resources.

Summary of SAR Diversion Cumulative Impact

Impact C-1: OCWD diversions would contribute to the cumulative diversions within the SAR watershed which would result in a reduction of the amount of water that would otherwise reach the ocean. This is a less than significant impact.

The proposed diversion from the SAR would not result in cumulatively significant effects to resources below Prado Dam. The District's diversion would not add to any environmental effects potentially caused by upstream diversions. Upstream diversions would not significantly reduce water reaching Prado Basin, and OCWD's proposed diversions would not limit proposed upstream diversions.

Conclusion of Significance: Less than significant.

7.5.2 Proposed Recharge Facilities and Storage Facilities

Recharge Facilities

Construction Impacts

Biology

Since new recharge basins would likely be constructed in previously developed portions of Orange County, no cumulatively significant impacts to biological resources would occur during construction.

Air Quality

Depending on the location of proposed near-term and long-term recharge projects, construction and operation of the facilities could add to a cumulatively significant impact to air quality. Cumulative impacts to air quality could be considered significant since air quality is already significantly affected by other activities in the region. Implementation of mitigation measures would minimize emissions. However, the cumulative impact would remain significant.

Noise

Construction activities would temporarily increase noise close to the construction sites. Due to the temporary nature of construction, no significant cumulative noise impacts would occur.

Land Use and Recreation

Construction activities would not substantially affect regional land uses or recreational facilities.

Aesthetics

Mitigation measures are identified for construction of individual recharge basins to minimize impacts to aesthetics. Due to the temporary nature of construction, no significant cumulative aesthetic impacts would occur.

Cultural Resources

Construction of recharge basins could result in discovery of previously unknown cultural resources. However, with implementation of project-level mitigation, no significant cumulative impacts would occur.

Geology and Soils

Construction of recharge basins would not substantially affect regional geology and soils.

Public Services, Utilities, Hazards

Construction of recharge basins would not substantially affect regional public services, utilities, or hazards.

Traffic

Construction of recharge basins would not add to a cumulatively significant traffic impact since construction would generate temporary trips. Due to the temporary nature of construction, no significant cumulative traffic impacts would occur.

Operational Impacts

SAR Hydrology

Construction of recharge basins would not affect river hydrology. Cumulative impacts of diversion are discussed above. No cumulatively significant impacts would result from construction of recharge basins.

Groundwater Quality

OCWD is currently constructing the Groundwater Replenishment System that will utilize Kraemer Basin and the seawater intrusion barrier to recharge highly treated water into the groundwater basin. The effects of this project would combine with the proposed recharge projects, substantially increasing the quantity of water recharging the basin. Excessive recharge could result in groundwater mounding that could adversely affect surface structures. In addition, impacts to groundwater quality could result depending on source water quality and on existing contamination in surface soils.

The District is responsible for management of the Orange County groundwater basin. The District's on-going water quality protection activities, such as the operation of the Prado Basin treatment wetlands and routine water quality monitoring, mitigate cumulative impacts to groundwater quality. Mitigation measures for individual recharge projects such as site assessments for new recharge locations and on-going groundwater modeling would reduce cumulative impacts of groundwater mounding and effects to surface structures. Cumulative impacts to groundwater quality would be less than significant.

Biology

Since recharge projects would generally occur within the urbanized areas of Orange County, substantial areas of high quality habitat would not be affected. Recharge basins would not be designed support habitat or sensitive species. Operating recharge facilities would have minimal effects to biological resources. Since the recharge basins would have little effect on biological resources, they would not significantly contribute to cumulative impacts to biological resources in the region.

Air Quality and Noise

Once constructed, recharge basins would not affect regional air quality or noise, since maintenance requirements would be minimal. Periodic basin cleaning would occur infrequently and would not result in air quality or noise violations.

Land Use and Recreation

Numerous recharge basins already exist in the City of Anaheim. Since the location of recharge basins is dependent on suitable soil conditions, siting additional recharge basins would add to the land already used for groundwater recharge in the area. This is not seen as a significant adverse impact since groundwater recharge is a regional goal, supported by General Plans of the overlying water users. Furthermore, constructing a recharge basin would require approval from local cities. Additional recharge basins would not result in cumulatively significant impacts to land uses or recreational facilities.

Aesthetics

Mitigation measures are identified for constructing individual recharge basins to minimize impacts to aesthetics. With implementation of landscaping plans, new recharge facilities would not result in significant cumulative impacts to local aesthetics.

Cultural Resources

Once constructed, recharge basins would have no effect on cultural resources. No cumulatively significant impacts would occur.

Geology and Soils

Construction of recharge basins could raise the moisture content of soils underlying structures and increase liquefaction hazards. Project-level mitigation would be required to ensure that surface structures are not affected. These project-level mitigation measures would ensure that the addition of recharge facilities would not result in a cumulatively significant impact.

Public Services, Utilities, Hazards

Recharge basins would not substantially affect the baseline condition for local public services, utilities, or hazards.

Traffic

Recharge basins would not add to a cumulatively significant traffic impact since recharge basins would generate few daily trips.

Summary of Impact

Impact C-2: Construction activities could contribute temporarily to cumulatively significant environmental impacts to air quality.

Conclusion of Significance: Significant and unavoidable.

Storage Facilities

Construction Impacts

Air Quality, Noise, Traffic

Storage facilities include off-river storm water surface storage reservoirs as well as the increased conservation pool behind Prado Dam. No construction would occur for raising the Prado Conservation Pool. However, construction of the proposed off-river storm water storage reservoirs could significantly add to cumulative impacts to regional air quality, noise, and regional traffic congestion.

Cultural Resources

No effects to cultural resources would result from raising the conservation pool. Construction of storage reservoirs could encounter previously unknown cultural resources. However, with implementation of project-level mitigation, no significant cumulative impacts would occur.

Geology and Soils

No effects to geology or soils would result from raising the conservation pool. Construction of off river storage reservoirs could significantly impact unique geologic features if located near rock outcroppings. However, this impact would not be considered cumulatively significant since few other projects of this size and scale would be occurring in the region.

Operational Impacts

Biological Resources

Storage reservoirs would reduce designated conservation lands and add to the cumulative degradation of biological resources in the region as development encroaches upon open space. This would be considered a potential cumulatively significant impact.

Increasing the Prado Dam conservation pool could result in inundation of least Bell's vireo and southwestern flycatcher habitat. Compensation lands provided as mitigation for these project level impacts would ensure that the project would not add to the cumulative reduction in habitat for these sensitive species in the watershed.

Land Use and Recreation

Raising the conservation pool would not significantly constrict future land uses or recreational facilities within Prado Basin that would result in a cumulatively significant effect. Land uses within the Basin will be managed through the USACE's land use master planning efforts. Off-river storage reservoirs may be located in areas currently designated as open space. Use of open space for reservoirs could add to the regional decline in open space as development encroaches in the region. This would be considered a cumulatively significant impact.

Aesthetics

Off-river storage reservoirs would add to the cumulative degradation of aesthetics in open space areas. Use of open space for reservoirs could add to the regional decline in open space as development encroaches in the region. This would be considered a cumulatively significant impact.

Public Services, Utilities, Hazards

Storage reservoirs would not substantially affect the baseline condition for local public services, utilities, or hazards.

Summary of Impact

Impact C-3: Construction of off-river storage facilities within open space could contribute to cumulatively significant impacts to air quality, noise, and traffic. Operations could add to cumulatively significant impacts to aesthetics, biological resources, and land use.

Conclusion of Significance: Significant and unavoidable.

7.5.3 Anaheim Lake Expansion and Santiago Creek Expanded Recharge Projects

The following sections evaluate the cumulative environmental impacts of two near-term projects that would increase the District's groundwater recharge capacity. To evaluate the cumulative impacts of these projects, the effects of proposed construction activities are compared with other general construction activities and groundwater recharge operations that could occur within the proximity of each project. The Cities of Orange and Anaheim approve development and maintenance projects within their boundaries. There are no approved development or maintenance projects in the vicinity of the two projects proposed by the District. The following sections evaluate potential cumulative effects of construction in the areas near Anaheim Lake and Santiago Creek.

Anaheim Lake Expansion

Hydrology

The Anaheim Lake Expansion project would occur entirely within the existing footprint of the lake. The expanded recharge capacity at Anaheim Lake would add to the cumulative recharge of the groundwater basin. As discussed in Chapter 3.2, operations of the recharge basin would not adversely affect the overall quality of groundwater or surface water or lead to groundwater mounding.

Construction could expose soil to storm water runoff at the perimeter of the lake. Storm water and urban runoff in the area drains to the Carbon Creek Diversion Channel leading to the SAR. Water quality in the channel and the river is affected cumulatively by urban development including construction activities. The RWQCB has not identified the lower reach of the SAR as an impaired water body. SWPPPs required for coverage under the state-wide general storm water NPDES permit would minimize the project's contribution to the cumulative adverse effect on SAR water quality. The project would not contribute substantially to a cumulatively significant water quality impact in the area.

Biological Resources

The proposed project would result in the removal of one dead tree that formerly was part of a double-crested cormorant rookery. The rookery is considered a sensitive biological resource, but removal of the tree would not lead to a cumulatively significant impact to the rookery, because most of the rookery would not be affected. The project would not affect the overall viability of the local double-crested cormorant population. Mitigation measures identified to minimize the impacts to the rookery would ensure no significant cumulative impact to the condition of the rookery.

Land Use

The proposed project would occur entirely within the existing footprint of the lake. Currently the islands to be removed are not used for any specific purpose. No conditional use permits would be needed to implement the project. The project would not conflict with the City of Anaheim General Plan or Zoning Code. There are no habitat conservation plans or natural community conservation plans applicable to the project site. No cumulatively significant impact is expected.

Aesthetics

The proposed project would occur within the existing footprint of the lake and would not alter regional views or contribute to cumulative aesthetic impacts.

Air Quality

The proposed project is located in the South Coast Air Basin (SCAB) which is in non-attainment for PM_{10} and ozone. The overall air quality in the SCAB results from cumulative sources of emissions. As discussed earlier in this document, construction emissions would not exceed thresholds of significance established by the SCAQMD for individual projects. In addition, the project would not result in an increase in trips to and from the project site following completion of construction. Therefore, no cumulatively considerable impact would result.

Cultural Resources

No historic structures would be affected by the proposed project. As noted in Chapter 4, previously unknown archaeological and paleontological resources could be encountered. The mitigation measures identified in Chapter 4 would minimize the potentially adverse effect of removing or destroying cultural resources. The cumulative regional effects of construction and excavation on cultural resources is assessed and managed through the State Historic Preservation Office. With implementation of the identified mitigation measures, the project's contribution to cumulative impacts to cultural resources would be less than significant.

Geology and Soils

The proposed project would reshape the bottom of Anaheim Lake. The project would be subject to seismic impacts consistent with existing conditions. However, the modification would not contribute to a cumulatively significant geologic impact.

Public Services, Utilities, Hazards

The project would not substantially affect the cumulative baseline condition for local public services, utilities, or hazards.

Noise

The proposed project would temporarily increase noise levels in the construction area. Following completion of construction, noise levels would return to existing levels. Given the temporary nature of the construction, this project would not contribute to cumulative noise impacts.

Traffic

The proposed project would not result in a permanent increase in traffic to and from the project site. Short-term increases in construction worker trips would not contribute to cumulative traffic impacts.

Santiago Creek Expanded Recharge

Hydrology

The Santiago Creek Expanded Recharge project would increase the cumulative capacity to recharge the groundwater basin. As discussed in Chapter 4.2, recharge operations would not adversely affect the overall quality of groundwater or surface water or lead to excessive groundwater mounding.

Construction could expose soil to storm water runoff. Local storm water and urban runoff drain into Santiago Creek and flow to the SAR. Water quality in the creek and the river is cumulatively affected by urban development including construction activities. The RWQCB has not identified the lower reach of the SAR as an impaired water body. As such, SWPPPs required for coverage under the state-wide general storm water NPDES permit would minimize the project's adverse effect on SAR water quality. The project would not contribute substantially to a cumulatively significant water quality impact in the area.

Biological Resources

The proposed project would beneficially affect riparian habitat along the creek. The project will double the flow volume in the creek, make flows more consistent, and extend flows downstream into the creek below the Hart Park parking lot. The range of native riparian vegetation is expected to increase into the creek bed and up and along the banks. This would similarly benefit the cumulative baseline condition.

Land Use

Implementation of the proposed by-pass pipeline would not conflict with the City of Orange General Plan or Zoning Ordinance. The project site is governed by the Coastal/Central Orange County NCCP. However, in accordance with the NCCP, implementation of the proposed project would increase stream flow in the creek and enhance riparian habitat. The project would result in long-term beneficial impacts. No cumulatively considerable adverse impact would result.

Aesthetics

Implementation of the by-pass pipeline would not result in a permanent change to the aesthetics of the park or parking lot. The proposed project would not alter regional viewsheds or cumulatively impact regional aesthetics.

Air Quality

The proposed project is located in the SCAB which is in non-attainment for PM_{10} and ozone. The overall air quality in the SCAB results from cumulative sources of emissions. As discussed earlier in this document, construction emissions would not exceed thresholds of significance established by the SCAQMD for individual projects. Following completion of construction, no air quality impacts would result. Operational air emissions would not increase emissions over current conditions. No cumulatively significant impact to air quality is expected.

Cultural Resources

As noted in Chapter 4, the proposed project could encounter historic resources and previously unknown archaeological and paleontological resources. The identified mitigation measures would minimize the potentially adverse effect of removing or destroying cultural resources. The cumulative effect of construction and excavation on cultural resources in the region is assessed and managed through the State Historic Preservation Office. With the identified mitigation measures implemented, the project's contribution to the regional cumulative impact to cultural resources would not be significant.

Geology and Soils

Santiago Creek is subject and would continue to be subject to seismic ground shaking. However, the by-pass pipeline would be constructed in accordance with the UBC. Compliance with existing regulations would ensure a less than significant impact. Thus, the project would not contribute to a cumulatively significant geologic impact.

Public Services, Utilities, Hazards

The proposed project would not substantially affect the cumulative baseline condition for local public services, utilities, or hazards.

Noise

The proposed project would temporarily increase local noise levels due to construction. Noise levels would return to existing levels following completion of construction. Therefore, this project would not contribute to permanent cumulative noise impacts.

Traffic

The proposed project would not result in increased traffic to the site and would not affect regional traffic. Project construction would not require soil to be removed from the site with haul trucks. The temporary impact to the Hart Park parking lot due to construction would not be considered cumulatively significant.

Summary of Impact

Impact C-4: Construction and operation of Santiago Creek Expanded Recharge and Anaheim Lake Expanded Recharge projects would not contribute to cumulatively significant environmental impacts.

Conclusion of Significance: Less than significant.

7.5.4 Summary of Cumulative Effects Identified for the SAR Watershed

As listed in Table 7-3, several applications for new SAR diversions have been submitted to the SWRCB. Each of the applicants has conducted an environmental analysis of its proposed diversions. Appendix J provides a summary table compiling the cumulative impact analysis conclusions of the applicants for each stretch of the river. The summary consists of four columns: the first three columns pertain to the segments of the river above Prado Basin (See Figure 4.2-4): headwaters to the RIX facility in San Bernardino County; RIX to Prado Basin; and the Chino Basin watershed. The cumulative impacts analyses summarized in these columns is duplicated from the Muni/Western EIR[6] and the Chino Basin Watermaster Optimum Basin Management Program EIR prepared by IEUA.[7] The District merely reproduces these analyses and makes no representation about their accuracy. The fourth column covers the segment of the river relevant to the District's application from Prado Basin (including the basin itself) to the Pacific Ocean. The cumulative impacts analysis in this column has been prepared on behalf of Orange County Water District (OCWD).[8]

Several cumulative effects are identified upstream of Prado Basin. OCWD's proposed diversions would not contribute to those upstream effects. Effects to the lower reach of the river below Prado Basin, which includes OCWD's potential cumulative impacts, are described in the Appendix J. The summary of potential cumulative impacts in Appendix J is provided for information purposes only.

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6 San Bernardino Valley Municipal Water District/Western Municipal Water District, Santa Ana River Water Right Application for Supplemental Water Supply Draft EIR, October 2004.

7 Inland Empire Utilities Agency Optimum Basin Management Plan Program EIR, 2001.

8 Orange County Water District Application to Appropriate Santa Ana River Water, Recirculated Draft Program EIR, March 2006.

CHAPTER 8
Project Alternatives

8.1 Introduction

CEQA Guidelines Section 15126.6 requires that an EIR assess a reasonable range of alternatives to a project that would meet most of the project objectives *and* avoid or substantially lessen any significant environmental impacts associated with the proposed project. Thus, the appropriate alternatives for EIR analysis are developed by reviewing the project impacts and trying to identify alternatives to the project that can both avoid or substantially lessen the project impacts and also meet most of the project objectives. If an alternative does not reduce or avoid the impacts of the project, then it does not meet the CEQA purpose for the alternatives analysis. If an alternative does not meet most of the project objectives to some degree, then it is not a viable alternative to the project. In addition, an alternative must be feasible – capable of being implemented from a technical, economic, schedule and institutional perspective. CEQA also requires that an EIR analyze a No Project Alternative, providing an assessment of what would reasonably be expected to occur if the project were not implemented.

Review of Project Objectives

CEQA guidance provides that the alternatives to the project that are appropriate for evaluation in the EIR meet at least most of the basic project objectives. As presented in Chapter 1, OCWD's project objectives include:

- Protect beneficial uses of the Orange County groundwater basin
- Improve the reliability of local groundwater supply to serve local water demands
- Ensure sustainable water supplies during drought periods
- Increase the sustainable yield of the Orange County groundwater basin in a cost effective manner to maximize the use of local water supplies to serve local water demands
- Reduce dependence on imported water
- Increase operational flexibility by increasing both recharge capacity and recharge location options to better manage groundwater basin conditions.

The Orange County Water District Act of 1933 gives OCWD the powers to manage the Orange County groundwater basin including replenishing, regulating, and protecting groundwater supplies. This includes powers to appropriate and acquire water rights, to conserve water and to regulate groundwater production to protect the basin.[1]

Summary of Project Impacts

CEQA guidance provides that the alternatives to the project that are appropriate for evaluation in the EIR should avoid or lessen the significant environmental effects associated with the project. Chapter 4 assesses potential impacts of proposed SAR diversion and construction and operation of two of the proposed near-term recharge projects included in OCWD's preferred project: Anaheim Lake Expanded Recharge and Santiago Creek Expanded Recharge. Chapter 5 evaluates the potential impacts associated with construction and operation of OCWD's other near-term projects and of its potential long-term projects for storage and groundwater recharge. The chief findings of the project impact analysis are summarized as follows.

Diversion of Increasing Santa Ana River Flows

No significant environmental impacts on river resources (including hydrology, aquatic or riparian habitat, wildlife, land uses, or beneficial uses of river water) or on groundwater resources would occur as a result of OCWD's proposed diversions.

Anaheim Lake Expanded Recharge and Santiago Creek Expanded Recharge

Construction: Construction of the Anaheim Lake Expanded Recharge Project and the Santiago Creek Expanded Recharge Project would result in less than significant impacts to:

- Air quality – dust and construction-related vehicle emissions
- Noise – construction equipment
- Storm water quality – construction could spill hazardous substances (e.g., fuels, oils)
- Hazardous materials – construction could encounter of hazardous soils
- Biological resources – disruption of nesting birds at Anaheim Lake
- Cultural resources – construction could encounter unknown resources
- Land Use – temporary disruption of recreational uses
- Aesthetics – temporary construction effect

Operation: Operation of the Anaheim Lake Expanded Recharge Project would result in no operational impacts. Operation of the Santiago Creek Expanded Recharge Project would result in less than significant impacts to:

- Groundwater quality – recharge water could affect neighboring extraction wells
- Biological resources – riparian habitat would be altered with increased water

[1] OCWD Act, Section 2.6.

Future Near-Term and Long-Term Recharge Projects

Construction: Construction of the proposed new recharge basins could potentially affect the following resources:

- Air quality – dust and construction-related vehicle emissions
- Noise – construction equipment
- Storm water quality – construction could spill hazardous substances (e.g., fuels, oils)
- Hazardous materials – construction could encounter of hazardous soils
- Biological resources – disruption of habitat
- Cultural resources – construction could encounter unknown resources
- Aesthetics – temporary construction effect

Operation: Operation of the proposed new recharge basins could potentially affect the following resources:

- Groundwater quality – recharge water quality and subsurface contamination
- Biological resources – alteration of habitat
- Land Use – potential neighboring incompatible uses

Future Near-Term and Long-Term Storage Projects

Increased Prado Dam Storage

Construction: No construction would be required to implement the increased water storage behind Prado Dam.

Operation: Operation of the increased water conservation storage at Prado Reservoir could result in significant environmental impacts in the following areas.

- Biological resources – inundation of habitat
- Land Use – existing land uses could be displaced and neighboring land uses could be incompatible

Off-River Storage Reservoirs

Construction: Construction of the new storage reservoirs could result in significant environmental impacts in the following areas:

- Air quality – dust and construction-related vehicle emissions
- Noise – construction equipment
- Storm water quality – construction could spill hazardous substances (e.g., fuels, oils)

- Hazardous materials – construction could encounter of hazardous soils
- Geologic resources – dam construction could affect local soils and geologic features
- Biological resources – disruption of nesting birds at Anaheim Lake
- Cultural resources – construction could encounter unknown resources
- Transportation – construction could temporarily impact local roadways
- Aesthetics – temporary construction effect

Operation: Operation of new storage reservoirs (in Gypsum Canyon and Aliso Canyon) could result in significant environmental impacts in the following areas.

- Biological resources – disruption of habitat
- Land Use – existing land uses could be displaced and neighboring land uses could be incompatible
- Geologic hazards – storage reservoirs would be subject to seismic hazards
- Aesthetics – storage reservoirs would alter visual character of the area

8.2 Alternatives Assessment

OCWD must build additional recharge facilities to make use of the increasing flows in the SAR and meet the basic objectives of its proposed program to protect the groundwater basin and reduce reliance of local water retailers on imported supplies. However, among the potential future facilities proposed by OCWD the storage reservoir projects – off-stream surface water storage reservoirs in local canyons (Gypsum and Aliso Canyons) are expected the have the more significant environmental impacts compared with development of additional recharge basins. For this programmatic CEQA analysis of these long-term projects, two alternatives have been identified—the Near-term Facilities Only Alternative and the No Storage Reservoirs Alternative—to provide for evaluation of alternatives that would avoid or minimize the environmental impacts associated with developing additional surface water storage as proposed by OCWD's project.

Alternatives evaluated in this Chapter include the following:

- No Project Alternative
- Near-Term Facilities Only Alternative
- No New Surface Water Storage Reservoirs Alternative

Table 8-1 summarizes the District's assumed recharge capacity under each alternative. The annual volumes reflect rough estimates. **Table 8-2** lists the projects listed in the Application that would be implemented under each alternative.

TABLE 8-1
SUMMARY OF RECHARGE CAPACITY UNDER EACH ALTERNATIVE

	Preferred Project	No Project Alternative	Near-Term Facilities Only	No Storage Reservoirs
Maximum Recharge Capacity (afy)	505,000	264,000	347,000	445,000*
Maximum New Storage (af)	162,000	1,000	11,000	50,600

* assumes that recharge capacity would be reduced 60,000 afy with no new off-river storage reservoirs.

TABLE 8-2
OCWD PROJECTS INCLUDED IN EACH ALTERNATIVE

	Preferred Project	No Project Alternative	Near-Term Facilities Only	No Storage Reservoirs
Near-Term Projects				
Santiago Creek Replenishment*	**Yes**	**Yes**	**Yes**	**Yes**
River Trails Recharge Basin*	**Yes**	**Yes**	**Yes**	**Yes**
La Jolla Recharge Basin	**Yes**	No	**Yes**	**Yes**
Mira Loma Recharge Basin	**Yes**	No	**Yes**	**Yes**
Santiago Creek Expanded Recharge	**Yes**	No	**Yes**	**Yes**
Anaheim Lake Expanded Recharge	**Yes**	No	**Yes**	**Yes**
Basin Cleaning Vehicles *	**Yes**	**Yes**	**Yes**	**Yes**
Prado Dam (Conservation elev. = 508)	**Yes**	No	**Yes**	**Yes**
Long-Term Projects				
Prado Dam (Conservation elev. = 514)	**Yes**	No	No	**Yes**
Fletcher Recharge Basin	**Yes**	No	No	**Yes**
Additional Recharge Basins	**Yes**	No	No	**Yes**
Basin Cleaning Vehicle	**Yes**	No	No	**Yes**
Subsurface Collection/ Recharge System (SCARS) – Multiple Sites	**Yes**	No	No	**Yes**
Deep Basin Filtration Recharge – 3 sites	**Yes**	No	No	**Yes**
Recharge Galleries – 2 sites	**Yes**	No	No	**Yes**
Gypsum Canyon Reservoir	**Yes**	No	No	No
Aliso Canyon Reservoir	**Yes**	No	No	No

* Projects already constructed and currently in use.

This Chapter describes each alternative and evaluates their ability to avoid or substantially lessen the identified program impacts while meeting at least the basic project objectives.

No Project Alternative

Description

Section 15126.6(e)(1) of the *CEQA Guidelines* provides that the No Project Alternative shall discuss the existing conditions at the time the notice of preparation is published as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services. The No Project Alternative assumes that no new recharge or storage projects would be approved or constructed and that the District would continue to divert and recharge at current levels. The existing maximum recharge capacity is approximately 264,000 afy. No new projects would be constructed to increase this recharge capacity. The District would continue to manage the groundwater basin with the objective of minimizing the need to purchase supplemental imported water.

Ability to Meet Project Objectives

The No Project Alternative would not meet any of the project objectives to increase SAR diversions to protect beneficial uses of the groundwater, improve the reliability of local groundwater supplies, ensure sustainable water supplies, increase the sustainable yield, reduce dependence on imports, or increase operational flexibility.

Impact Assessment

Under the No Project Alternative the identified impacts associated with constructing and operating the near-term projects and long-term projects would be avoided. Impacts associated with the near-term projects that would be avoided include construction effects to air quality, noise and traffic; land use effects from conversions and neighborhood compatibility; aesthetics; cultural resources; biological resources; hydrologic and geologic impacts; and hazardous materials. Potentially significant impacts associated with the long-term projects that would be avoided include effects to biological resources, hydrologic resources and water quality, traffic, air quality, noise, geologic resources, aesthetics, land use compatibility, cultural resources, and hazardous materials.

Under this alternative, bypass flows would increase as river flows surpass the District's ability to recharge the water into the groundwater basin. This could result in inundation of the Riverview Golf Course for longer periods. As described in Chapter 4.3, increased bypass flows would not be beneficial to downstream biological resources or designated beneficial uses. Since all dry-weather urban runoff is currently captured and treated downstream of the District's operations, bypass flows would either substantially increase the amount of water that would need to be diverted and treated, or would convey untreated urban runoff to the ocean, which could result in reducing water quality at the beaches.

Conservation efforts to reduce local water demand would continue by Metropolitan and MWDOC. OCWD's GWRS would also be implemented, further decreasing the need for imported water. Local water supply agencies including Metropolitan and MWDOC along with OCWD could augment water supplies with imported water or by supplying desalinated or recycled water. Imported water would be supplied by Metropolitan as indicated in Metropolitan's most recent Regional Urban Water Management Plan. New water supplies including desalination and reclamation are being developed by local water agencies to meet the increasing demand. Development of these alternative water supplies have a variety of environmental impacts associated with siting of new treatment and distribution facilities and well as the operational effects (e.g., energy consumption, brine disposal, water quality and public health considerations) not associated with diversion of SAR water.

Furthermore, under the No Project Alternative, the District would have reduced certainty for its SAR water supply. Other entities could attempt to divert, and may apply for appropriative rights to the increased base flows and storm flows in the river anticipated to reach Prado Dam in the future. This would jeopardize the District's mission to protect and manage the groundwater basin and provide a safe water supply for Orange County.

Near-Term Facilities Only Alternative

The Near-Term Facilities Only Alternative assumes that each of the near-term facilities would be constructed, but the long-term facilities would be abandoned. This would increase the District's recharge capacity to approximately 347,000 afy. As base flows and storm flows in the river increase in the future, the District would capture as much as possible with the proposed near-term facilities. Base flows in excess of the District's recharge capacity would bypass the diversion points and flow to the ocean.

Ability to Meet Project Objectives

The Near-Term Facilities Only Alternative would meet the project objectives, although to a lesser degree than the preferred project, to use increased water to protect beneficial uses of the groundwater, improve the reliability of local groundwater supplies, ensure sustainable water supplies, increase the sustainable yield, reduce dependence on imports, or increase operational flexibility.

Impact Assessment

Under the Near-Term Facilities Only Alternative, the identified impacts associated with constructing and operating the long-term projects would be avoided. Impacts associated with the near-term projects include construction effects to air quality, noise and traffic; land use effects from conversions and neighborhood compatibility; aesthetics; cultural resources; biological resources; hydrologic and geologic impacts; and hazardous materials. This alternative would avoid the potentially significant impacts associated with constructing off-river storage reservoirs in the Santa Ana Mountains and Chino Hills.

Under this alternative, up to 347,000 afy of SAR water could be diverted and recharged into the Orange County groundwater basin. Actual recharge volumes would depend on the total flows in the river each year and the duration a frequency of storm flows.

Under the Near-Term Facilities Only Alternative, demand pressures from overlying water producers would threaten to overdraft the groundwater basin similar to the No Project Alternative. Development of other water supplies to avoid this effect would potentially create significant impacts to air, noise, and biological resources. Conservation efforts to reduce local water demand would continue by Metropolitan and MWDOC. OCWD's GWRS would also be implemented, further decreasing the need for imported water.

No New Storage Reservoirs Alternative

The No Storage Reservoirs Alternative assumes that the off-river storm water storage reservoirs listed in the Application (Aliso Canyon and Gypsum Canyon) would not be constructed. Under this alternative, each of the near-term projects and the long-term recharge projects would remain under consideration. Without storm water storage reservoirs, diverting and recharging 505,000 afy would not be possible. For planning purposes, this analysis assumes that the maximum recharge capacity without off-river storage facilities would be reduced to approximately 445,000 afy. This is approximately 60,000 afy less than the preferred project. Additional analysis would be required to assess the District's actual recharge capacity without the use of off-river storm water storage reservoirs.

Ability to Meet Project Objectives

The No Storage Reservoirs Alternative would meet the project objectives, although to a lesser degree than the preferred project, to use increased water to protect beneficial uses of the groundwater, improve the reliability of local groundwater supplies, ensure sustainable water supplies, increase the sustainable yield, reduce dependence on imports, or increase operational flexibility.

Impact Assessment

Under the No Storage Reservoirs Alternative, the identified impacts associated with constructing and operating the storage reservoirs would be avoided. Impacts associated with the near-term projects include construction effects to air quality, noise and traffic; land use effects from conversions and neighborhood compatibility; aesthetics; cultural resources; biological resources; hydrologic and geologic impacts; and hazardous materials. This alternative would avoid the potentially significant impacts associated with constructing off-river storage reservoirs in the Santa Ana Mountains and Chino Hills.

Under this alternative, approximately 445,000 afy of SAR water could be diverted and recharged into the Orange County groundwater basin. Actual recharge volumes would depend on the total flows in the river each year and the duration and frequency of storm flows. This is approximately 60,000 afy less than the preferred project. Additional analysis would be required to assess the District's actual recharge capacity without the use of off-river storm water storage reservoirs.

Under the No Storage Reservoirs Alternative, demand pressures from overlying water producers would continue to threaten the groundwater basin similar to the No Project Alternative. Development of other water supplies to avoid this effect would potentially create significant impacts to air, noise, and biological resources. Conservation efforts to reduce local water demand would continue by Metropolitan and MWDOC. OCWD's GWRS would also be implemented, further decreasing the need for imported water.

Summary of Alternatives Analysis

Table 8-3 summarizes the alternatives analysis. As shown in **Table 8-3**, the two action alternatives would each provide more water than is currently being recharged into the ground and therefore would assist in meeting the project objectives, but to a lesser degree than the preferred project. The No Project Alternative does not meet the project objectives. The Near-Term Facilities Only Alternative would avoid construction impacts associated with the long term projects. The No Storage Reservoirs Alternative would avoid impacts associated with construction of the storage reservoirs.

TABLE 8-3
SUMMARY OF ALTERNATIVES ANALYSIS

	No Project Alternative	Near-Term Facilities Only	No Storage Reservoirs
Meets Project Objective	No	Yes, but to a lesser degree	Yes, but to a lesser degree
Avoids Impacts of Implementation			
• Construction and operational impacts associated with new recharge facilities (hydrology, water quality, biology, air quality, noise, aesthetics, geology, cultural resources, traffic, land use, hazards)	Yes	No	No
• Operation of Prado Dam for conservation (hydrology, biology, land use)			
Near term (508 feet asl)	Yes	No	No
Long term (514 feet asl)	Yes	Yes	No
• Construction and operational impacts associated with storage facilities (hydrology, water quality, biology, air quality, noise, aesthetics, geology, cultural resources, traffic, land use, hazards)	Yes	Yes	Yes

As discussed in Chapter 5, impacts associated with constructing storage reservoirs would be substantially greater than impacts caused by implementing recharge projects. The No Storage Reservoirs Alternative would avoid the significant impacts associated with the off-river storage reservoirs, while otherwise maximizing recharge capabilities.

8.3 Conservation and Reclamation Programs

Water demand within the OCWD service area is met through a combination of local and imported supplies. These supplies are augmented through conservation programs and reclamation efforts. Metropolitan and MWDOC have recently prepared UWMPs that outline water sources for the region. The Orange County groundwater basin managed by OCWD is considered the primary local source of water in Orange County. To reduce demand pressures on the groundwater basin and to reduce water imports, both agencies have implemented aggressive conservation programs that include specific demand management measures. Both agencies include the following Best Management Practices as the core of their conservation program.[2]

- Residential Water Surveys

[2] Metropolitan Water District, Draft Regional Urban Water Management Plan, 2005; Municipal Water District of Orange County, Draft Urban Water Management Plan, 2005.

- Residential Plumbing Retrofits
- System Water Audits, Leak Detection
- Metering and Commodity Rates
- Large Landscape Audits
- High Efficiency Washing Machines
- Public Information
- School Education
- Commercial, Industrial and Institutional
- Wholesale Agency Assistance
- Conservation Pricing
- Conservation Coordinator
- Water Waste Prohibition
- Residential Ultra-Low Flow Toilet Replacements

Metropolitan's conservation target for the year 2025 is 1.1 million afy. This assumes 1980 as the base year.

The UWMPs for both Metropolitan and MWDOC identify wastewater management and water recycling programs that reduce local demand for imported potable water. OCWD actively participates in several recycling programs including the seawater intrusion barrier and the Green Acres Project, which provides advanced treatment to wastewater that is then used for irrigation in local parks. OCWD is in the process of constructing the largest recycled water groundwater replenishment project in California (GWRS) that, in the first phase, will provide up to 70,000 afy of highly treated reclaimed water for groundwater recharge.

OCWD actively promotes water conservation and reclamation as a resource agency stakeholder in partnership with local water wholesalers including Metropolitan, MWDOC, Anaheim, Santa Ana, and Fullerton. Each Alternative assessed in this EIR (including the No Project Alternative) includes OCWD's continued participation in local conservation and reclamation programs.

8.4 Environmentally Superior Alternative

CEQA requires that an EIR identify the environmentally superior alternative of a project. Each of the alternatives evaluated in this PEIR would present environmental tradeoffs based on construction impacts associated with recharge and storage facilities. The proposed project would provide for the maximum use of SAR water to meet local water demand and would be the most favorable to groundwater resources since up to 505,000 af could be recharged in one wet year. Maximizing use of SAR water minimizes the impacts associated with providing new facilities and technologies to import, desalinate, or reclaim water to meet local demand. However, construction of facilities to recharge the additional water would present impacts to other environmental resources as discussed above. As shown in Chapter 5 of this document, potential impacts of constructing the off-river storage reservoirs could be significant. In contrast, impacts associated with constructing recharge facilities would be minimal. Both the Near-Term Facilities Only Alternative and the No Storage Reservoirs Alternative would avoid the significant impacts associated with off-river storage reservoirs while providing additional recharge capacity. Of these two alternatives, the No Storage Reservoirs Alternative would provide substantially greater recharge capacity with minimal impact while avoiding the significant impacts associated with constructing off-river storage projects. Based on this analysis, the No Storage Reservoirs Alternative is the environmentally superior alternative.

CHAPTER 9
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CHAPTER 10
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CHAPTER 11
Acronym List

ADT	Average Daily Trips
af	Acre-feet
afy	Acre-feet per Year
AGR	Agricultural Supply Beneficial Use
AQMP	Air Quality Management Plan
asl	Above Sea Level
BCV	Basin Cleaning Vehicle
BMPs	Best Management Practices
BP	Before Present
CAA	Clean Air Act
Caltrans	California Department of Transportation
CBC	California Building Code
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CDR	Center for Demographic Research
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	Cubic-feet per Second
CGS	California Geologic Service
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	Carbon Monoxide
CPP	Comprehensive Phasing Plan
CWA	Clean Water Act
dBA	A-weighted decibels
dB	Decibel

DHS	Department of Health Services
District	Orange County Water District
DOF	Department of Finance
DOT	Department of Transportation
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMWD	Eastern Municipal Water District
EPA	Environmental Protection Agency
FESA	Federal Endangered Species Act
GDM	General Design Memorandum
gpcd	Gallons per Capita per Day
GWRS	Groundwater Replenishment System
HCP	Habitat Conservation Plan
HGMP	High Groundwater Mitigation Project
HWCL	Hazardous Waste Control Law
I-15	Interstate 15
IEUA	Inland Empire Utility Agency
IWRP	Integrated Water Resource Plan
Ldn	Day-night Sound Level
Leq	Equivalent Sound Level
M&I	Municipal and Industrial
MAF	Million acre-feet
MBTA	Migratory Bird Treaty Act
Metropolitan	Metropolitan Water District of Southern California
mg/l	Milligrams per liter
mgd	Million gallons per day
MM	Maximum Moment
MPH	Miles per Hour
MUN	Municipal and Domestic Supply Beneficial Use
Muni	San Bernardino Valley Municipal Water District
MWD	Metropolitan Water District of Southern California
MWDOC	Municipal Water District of Orange County
NAAQS	National Ambient Air Quality Standards
NCCP	Natural Communities Conservation Plan
NEPA	National Environmental Policy Act
NO2	Nitrogen Dioxide

NPDES	National Pollution Discharge Elimination System
O3	Ozone
OCFCD	Orange County Flood Control District
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
Pb	Lead
PEIR	Program Environmental Impact Report
PM10	Particulate Matter
RARE	Rare, Threatened or Endangered Species Beneficial Use
RCPG	Regional Comprehensive Plan and Guide
RCRA	Resource Conservation and Recovery Act
REC1	Water Contact Recreation
REC2	Non-contact Water Recreation
RIX	Rapid Infiltration and Extraction Facility
RTP	Regional Transportation Program
RUWMP	Regional Urban Water Management Plan
RWQCB	Regional Water Quality Control Board
SAR	Santa Ana River
SARA	Superfund Amendment Reauthorization Act
SARWQCB	Santa Ana Regional Water Quality Control Board
SARWQH	Santa Ana Regional Water Quality & Health Study
SAWPA	Santa Ana Watershed Project Authority
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCARS	Subsurface Collection/Recharge System
SMARA	Surface Mining and Reclamation Act
SO2	Sulfur Dioxide
SR-22	State Route 22, Garden Grove Freeway
SR-55	State Route 55
SR-57	State Route 57
SR-91	State Route 91, Riverside Freeway
SWMPs	Storm Water Management Plans
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids

TMDLs	Total Maximum Daily Loads
TNC	The Nature Conservancy
UBC	Uniform Building Code
USACE	US Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geologic Survey
USTs	Underground Storage Tanks
UWMP	Urban Water Management Plan
WARM	Warm Freshwater Habitat Beneficial Use
Western	Western Municipal Water District
WILD	Wildlife Habitat Beneficial Use

Appendices

Appendix A
Notice of Preparation

Notice of Preparation

Date August 2, 2002
To: Interested Parties

Subject Notice of Preparation (NOP) of an Environmental Impact Report assessing the Orange County Water District Application to Appropriate Santa Ana River Water by Permit.

The Orange County Water District (District) is the Lead Agency under the California Environmental Quality Act (CEQA) for the preparation of a Program Environmental Impact Report (PEIR) to assess the Application to Appropriate Santa Ana River Water by Permit (Application) along with a program of near-term and long-term projects the District will implement as needed to expand and improve surface water diversion, storage and groundwater recharge. The Application has been submitted to the State Water Resources Control Board (SWRCB). The SWRCB is acting as a responsible agency under CEQA for the preparation of the PEIR.

The District is soliciting the views of interested persons and agencies as to the scope and content of the environmental information to be studied in the PEIR. In accordance with CEQA, agencies are requested to review the project description provided in this NOP and provide comments on environmental issues related to the statutory responsibilities of the agency. The PEIR will address comments submitted during this initial review period and will be used by the Lead Agency when considering the project and permit approval actions.

A scoping meeting will be held August 15, 2002 at 6:00 PM at the District's Board room:

Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708.

The meeting will provide an opportunity for agencies and the public to comment on the scope and content of the PEIR. A map to OCWD offices is attached.

In accordance with the time limits mandated by CEQA, responses to the NOP must be received by the District no later than 30 days after receipt of this notice. **We request that comments to this NOP be received no later than September 5, 2002.** Please send your comments to John Kennedy at the address shown below. Please include a return address and contact name with your comments.

Send Responses to:

OCWD Application to Appropriate Santa Ana River Water By Permit EIR
Orange County Water District
Attention: John Kennedy
10500 Ellis Avenue
Fountain Valley, CA 92708
(714) 378-3304

Signature: ______________________________

John Kennedy
Assistant General Manager
Orange County Water District

INTRODUCTION

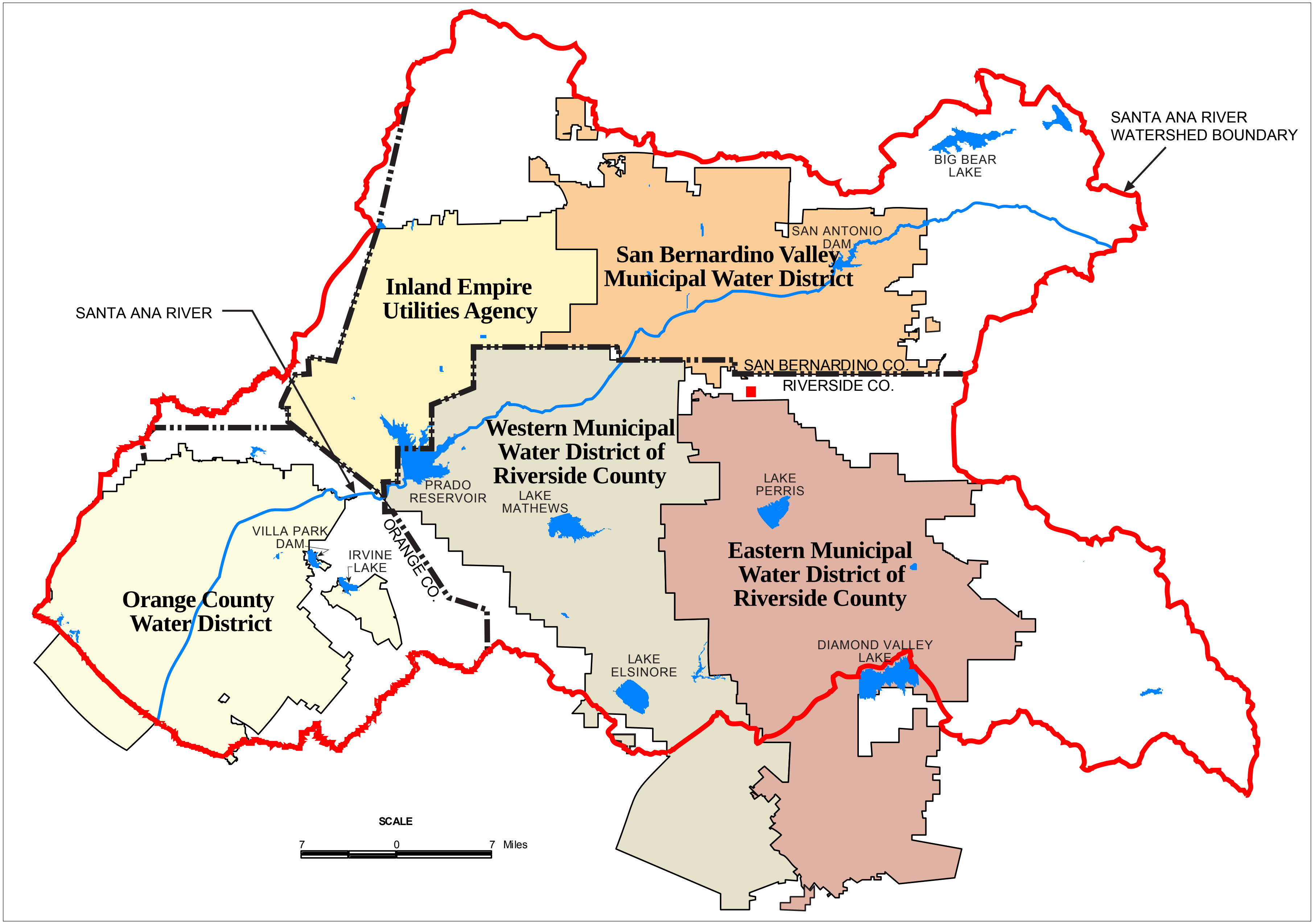
This Notice of Preparation (NOP) has been prepared pursuant to the California Environmental Quality Act (CEQA) to notify interested parties that the Orange County Water District (District) will direct the preparation of a Program Environmental Impact Report (PEIR) to assess potential impacts of their Application to Appropriate Santa Ana River Water by Permit (Application) along with a program of near-term and long-term projects the District will implement as needed to expand and improve surface water diversion, storage and groundwater recharge. The District has identified projects to improve and increase the District's capture and beneficial use of Santa Ana River flows, which will improve water supply reliability through effective conjunctive use and reduce reliance on outside sources of water. The Application has been submitted to the State Water Resources Control Board (SWRCB) to confirm the District's existing rights and to establish rights to utilize river flows reaching Prado Dam conforming with the 1969 stipulated court judgement between the District and upstream water districts. The District will be the Lead Agency for the project with the SWRCB acting as a responsible agency under CEQA.

PROJECT BACKGROUND

The Orange County Water District was formed in 1933 by the State Legislature and is responsible for managing and protecting the Orange County groundwater basin. The District encompasses over 229,000 acres of the lower watershed of the Santa Ana River (SAR) below Prado Dam. The Orange County groundwater basin provides water for over 2 million people. **Figure 1** shows the District's boundaries.

The District's water rights to the lower SAR were acquired from two irrigation districts with rights established in the mid-1800s. Since that time, the District has invested in water supply infrastructure in reliance on those rights; existing District facilities and operations are described in the following section. In 1969, the District entered into an agreement with upstream water users including San Bernardino Valley Municipal Water District (Muni), Inland Empire Utility Agency (IEUA) (formerly Chino Basin Municipal Water District), and the Western Municipal Water District of Riverside County (Western). The resulting "Stipulated Judgement" established a Watermaster and a physical solution to maximize beneficial uses of the river. The agreement provided to the District a minimum guaranteed base flow of 42,000 acre-feet per year (afy) plus all storm flows reaching Prado Dam. The agreement included water quality stipulations.

In 1989, the SAR was included in the Declaration of Fully Appropriated Streams (Order WR 89-25), concluding that no unappropriated water was available within the watershed. However, increased urbanization and other activity in the upper watershed has resulted in greater runoff reaching Prado Dam. A great deal of evidence, including the annual reports prepared by the SAR



SOURCE: Orange County Water District

OCWD / 202291

Figure 1

Major Water District Service Areas Within the Santa Ana Watershed

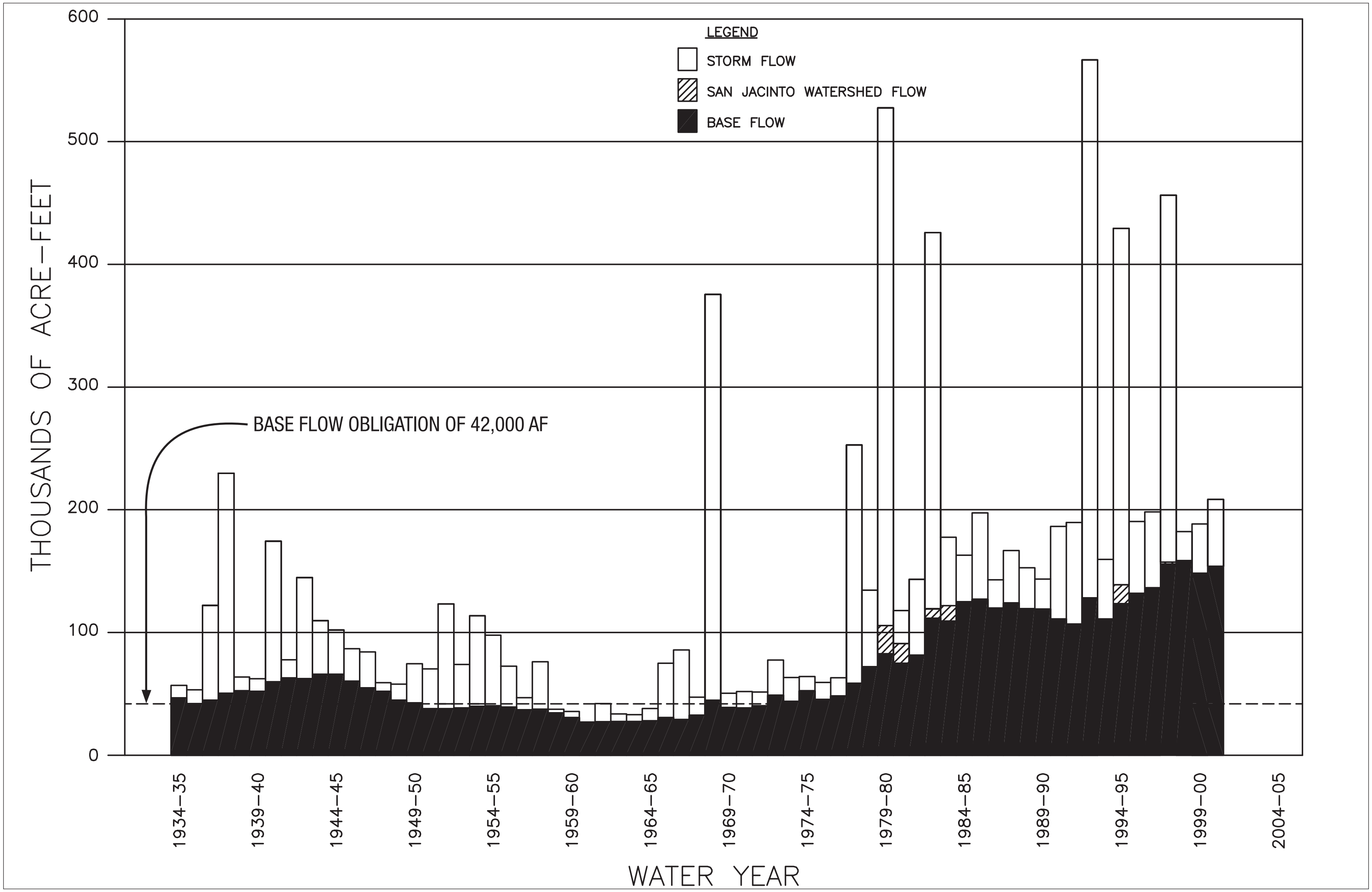
Watermaster, show that flows within the watershed have and will continue to increase. **Figure 2** shows base flows and storm flows at Prado Dam since 1934 as reported in the 2001 SAR Watermaster's Annual Report. As shown on this graph, since the mid-1980's both SAR base flow and storm flows reaching Prado Dam have increased notably. This trend is projected to continue in the future with increased urbanization in the watershed.

On the recommendation of the SWRCB, the District submitted an Application to the SWRCB Division of Water Rights in November 1992 for the purpose of confirming existing rights and establishing rights to the increased volumes of water reaching Prado Dam subject to the terms of the 1969 Stipulated Judgement. A Supplement to the Application was submitted in August 1998 at the request of SWRCB. The Supplement summarized recent hydrologic information demonstrating that current and projected flows in the lower reach of the Santa Ana River watershed have changed due to upstream urbanization and increased wastewater effluent from upstream sanitation districts. Although the 1969 Stipulated Judgement provided a court-ordered physical solution to surface water diversion from the river among upstream and downstream parties, it did not allocate water rights within the watershed in a manner recognized by the SWRCB. The Application to Appropriate SAR water was submitted to the SWRCB to confirm the District's rights to the 42,000 afy base flow plus any additional storm flows reaching Prado Dam in conformance with the 1969 Stipulated Judgement. The Application was also submitted to establish the rights to base flows in excess of the 42,000 afy that may reach Prado Dam.

In 1999, the District submitted to the SWRCB a Petition for Revision of the Declaration of Fully Appropriated Streams. Subsequently, SWRCB issued Order WR 2000-12 amending the Declaration of Fully Appropriated Streams and Directing the Division of Water Rights to proceed with processing the District's Application as well as other water rights applications for the SAR. In July 2002, the SWRCB confirmed that base flows in the SAR have increased as a result of increased urbanization in the upper watershed.

EXISTING FACILITIES AND OPERATIONS

Over the years, the District has constructed facilities for capturing river water to recharge into the groundwater basin such that virtually all river flows reaching Prado Dam are put to beneficial uses. Under existing conditions, only occasional peak storm flows reach the ocean.



SOURCE: SAR Watermaster Annual Reports

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Figure 2

Santa Ana River Flows at Prado Dam from 1934 to 2001

Table 1 summarizes the District's current and proposed facilities to divert or store SAR water. The District currently owns and operates roughly 1,500 acres of spreading facilities located in and adjacent to the SAR and Santiago Creek. There are four major components of the spreading grounds: the Main River System, the Off-River System, the Deep Basin System, and the Burris Pit/Santiago System. **Figure 3** illustrates the location of these existing facilities. Water enters the facilities downstream of Prado Dam and flow is controlled by the Imperial Highway Inflatable Dam and Bypass Structure located in the riverbed. From there, water flows by gravity between the basins by pipeline or overflow weir, with the exception of a few lift stations and de-watering pump stations.

The Main River System is comprised of the SAR Channel from Imperial Highway to Orangewood Avenue. Water percolates through the unlined sandy river bottom. Recharge is maximized by the construction of sand levees in the channel to increase the wetted surface area of the river bottom. These levees are eroded during flood conditions. The Off-River System is a shallow sandy bottom sheet-flow channel that runs parallel to the Main River System from the Imperial Highway Inflatable Dam down to the Carbon Creek Diversion Channel.

The Deep Basin System consists of the Warner Basin System, Anaheim Lake, Miller Basin, and Kraemer Basin. The basins range in depth from 10 to 60 feet with natural sandy portions of their sidewalls and bottoms that allow for infiltration. The Burris Pit/Santiago System is a series of shallow and deep recharge basins beginning at the confluence of the SAR and the Carbon Creek Channel and ending at the Santiago Basins in Orange. The system is comprised of four basins along the SAR, the Santiago Pits, and Santiago Creek.

As shown in Table 1, the existing facilities have the capacity of recharging 250,000 afy into the groundwater basin. **Figure 4** shows the annual volume recharged into the ground since 1990. As shown on this graph, the District has been nearing its existing recharge capacity in many of the last several years.

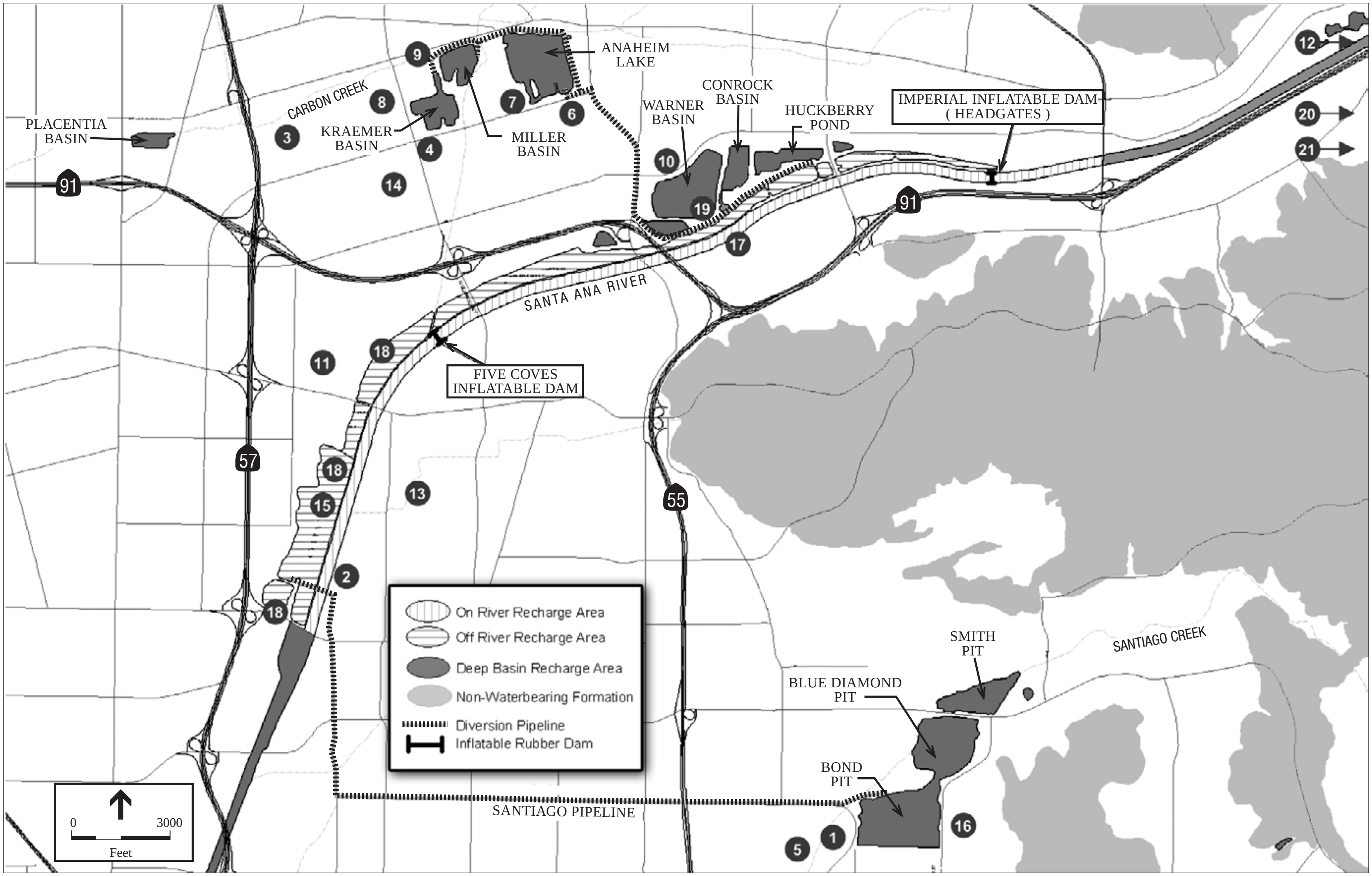
Table 1: Summary of Existing, Near-Term, and Long-Term Projects Proposed to Accommodate Santa Ana River Water

	Purpose of Use (Irrigation, Domestic, etc.)	Direct Diversion				Surface Storage		
		Quantity		Season of Diversion		Amount	Collection Season	
		Rate [2] (CFS)	Amount (AF/Y)	Beginning Date (Mo. & Day)	Ending Date (Mo. & Day)	AF per Annum	Beginning Date (Mo. & Day)	Ending Date (Mo. & Day)
	Current Conditions							
	Deep Basins [1,3]							
	Anaheim/Kraemer System	280	91,800	July 1	June 30	3,500		
	Burris/Santiago System	130	60,600	July 1	June 30	17,700		
	Warner System	70	16,200	July 1	June 30	4,400		
	Santa Ana River Groundwater Recharge	100	70,400	July 1	June 30			
	Off River System Groundwater Recharge	65	11,000	July 1	June 30			
	Wildlife/Water Quality Enhancement [4]	-	-	July 1	June 30			
	Prado Dam (Conservation elev. = 505) [6]					25,800	July 1	June 30
	Subtotal		250,000			51,400		
	Near Term Projects							
1	Santiago Basin Rehabilitation*		10,000					
2	River Trails Recharge Basin*		4,000	July 1	June 30	1,000	July 1	June 30
3	La Jolla Recharge Basin		9,000	July 1	June 30	2,000	July 1	June 30
4	Mira Loma Recharge Basin		10,000	July 1	June 30	2,000	July 1	June 30
5	Santiago Creek Expanded Recharge		3,000	July 1	June 30			
6	Anaheim Lake Expanded Recharge		2,000	July 1	June 30			
	Basin Cleaning Vehicles [5] [BCV]							
7	Anaheim Basin		18,000	July 1	June 30			

	Purpose of Use (Irrigation, Domestic, etc.)	Direct Diversion				Surface Storage		
		Quantity		Season of Diversion		Amount	Collection Season	
		Rate [2] (CFS)	Amount (AF/Y)	Beginning Date (Mo. & Day)	Ending Date (Mo. & Day)	AF per Annum	Beginning Date (Mo. & Day)	Ending Date (Mo. & Day)
8	Kraemer Basin		18,000	July 1	June 30			
9	Miller Basin		7,000	July 1	June 30			
10	Warner Basin		8,000	July 1	June 30			
11	Five Coves		8,000	July 1	June 30			
12	Prado Dam (Conservation elev. = 508) [6]					7,000	July 1	June 30
	Subtotal		97,000			12,000		
	Long-Term Projects							
	Prado Dam (Conservation elev. = 514) [6]					23,600	July 1	June 30
13	Fletcher Recharge Basin		1,000	July 1	June 30		July 1	June 30
14	Additional recharge Basins [7]		77,000	July 1	June 30	15,000	July 1	June 30
	BCV							
15	Burris Pit		15,000	July 1	June 30			
16	Bond Pit		10,000	July 1	June 30			
17	Subsurface Collection/ Recharge System (SCARS) – Multiple Sites		10,000	July 1	June 30			
18	Deep Basin Filtration Recharge – 3 sites		25,000	July 1	June 30			
19	Recharge Galleries – 2 sites		20,000	July 1	June 30			
20	Gypsum Canyon Reservoir [6]					30,000	July 1	June 30
21	Aliso Canyon Reservoir [6]					30,000	July 1	June 30
	Subtotal		158,000			98,600		
	Total		**505,000**			**162,000**		

1. The Purpose of Use for all diversions and storage is for groundwater replenishment for future domestic and irrigation. Irrigation use is approximately 3% of domestic use.
2. The Direct Diversion rate shown is a sustainable annualized flow rate. The instantaneous diversion rate for the Deep Basins is 1,000 CFS, but this rate is sustainable for only brief periods.
3. The Deep Basins recharge diverted SAR flows to the groundwater basin.
4. Not included in total Direct Diversions because flows are returned to SAR after treatment.
5. Deep Basin continuous cleaning device will increase percolation rates.
6. Storm flows captured for later release to the SAR for diversion downstream at recharge facilities when capacity becomes available.
7. 150 acres total – multiple sites

* Completed separate CEQA review.

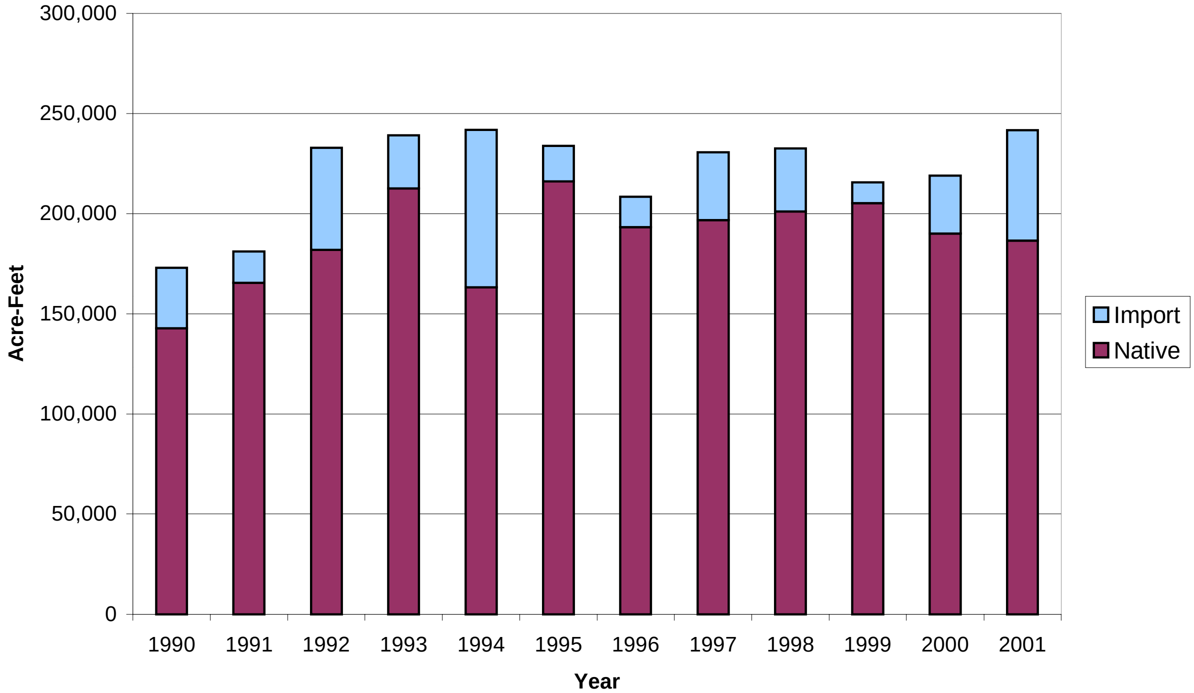


SOURCE: Orange County Water District

OCWD / 202291 ■

Figure 3
Existing Reacharge Facilities

Figure 4: Annual Water Recharged by Orange County Water District 1990-2001



PROPOSED FUTURE WATER DIVERSION AND STORAGE FACILITIES

The District has identified several projects to increase recharge and storage capacity in order to accommodate projected increased river flows. The increased flows are a result of increased base flows from urbanization, channelization, new development, and storm flows. Table 1 summarizes potential future facilities the District is considering. Future projects are proposed to provide up to an additional 255,000 afy of diversion capacity, such that in combination with the existing facilities, the District can accommodate up to 505,000 afy of diversion.

The near-term projects include percolation basin cleaning devices, additional recharge facilities, and the modifying of the Prado Dam to increase the conservation pool from an elevation of 505 feet above sea level (asl) to 508 feet asl. The District proposes to implement each of these near-term projects. The raising of Prado Dam is a Corps of Engineers project, described below. As shown on Table 1, near-term projects would provide up to 99,000 afy of additional diversion capacity directly to groundwater recharge facilities and up to 12,000 af of surface water storage. Long-term projects under consideration include raising the Prado Dam an additional six feet to an elevation of 514 feet asl, constructing more recharge facilities, and providing for off-river storage in reservoirs. The District may not implement all of the potential long-term projects listed on Table 1; it will evaluate projects on this list in the future as the need for additional diversion and storage capacity arises.

NEAR-TERM PROJECTS

BASIN CLEANING VEHICLES

Clogging of the recharge basins due to fine silt and clay particles, biological growth, and compaction significantly reduces percolation rates. Clogging affects mainly the upper two to three inches of sediment. Currently, each basin is emptied twice per year using submersible pumps, and the silt layer is removed by heavy equipment. While one basin is being cleaned, the supply to other basins is maintained by means of bypass pipelines. A twice-yearly cleaning cycle increases percolation by as much as 40 percent. However, during cleaning, the basin is unable to percolate water, which reduces the capacity of the District's recharge facilities to capture and store water supplies.

Since 1994, three Basin Cleaning Vehicle (BCV) prototypes have been developed and tested. The BCVs utilize a mechanical means of breaking up the clogging sediment layer, allowing the basins to be cleaned while they still contain water. The silt-sand water suspension is captured under a suction hood where the sand drops back onto the bottom while silt-laden water is pumped to shore for dewatering and disposal. BCVs are proposed for use in five of the District's existing recharge basins to increase annual recharge capacity.

ADDITIONAL RECHARGE BASINS

The District is proposing to increase diversion capacity in the near-term through the development of several new recharge basins including the River Trails Basin, La Jolla Basin, and Mira Loma Basin. Implementation of these recharge facilities would require acquiring and clearing the property, constructing the recharge basins, and installing a conveyance system from the existing Anaheim Lakes. Construction of the recharge basins would consist primarily of establishing engineered berms. The conveyance system would include pump stations and pipelines installed underground through city streets. The proposed basins are each located in Anaheim, close to the existing facilities. Other near-term projects include constructing a pump system to the Santiago Basin system and expanding the creek recharge area.

PRADO DAM

The US Army Corps of Engineers (ACOE) is considering modifying the Prado Dam to increase the conservation pool elevation from the existing 505 feet asl to 508 feet asl. This would substantially increase the storage capacity behind the dam. The increased storage capacity would allow for capture and recharge of more storm water. The ACOE completed an Environmental Impact Statement (EIS) in 2001 assessing the water conservation aspects of raising of Prado Dam conservation pool. The EIS has not yet been approved by the ACOE.

LONG-TERM PROJECTS

Numerous diversion, storage, and recharge projects have been identified in a conceptual manner to accommodate diversion of increased river flows over the long-term. The list of long-term projects was developed as a range of possibilities consisting of constructing additional recharge basins, raising Prado Dam conservation pool to an elevation of 514 feet asl, and constructing surface reservoirs. Prospective reservoir sites include Aliso Canyon and Gypsum Canyon in the Santa Ana Mountains.

CEQA ENVIRONMENTAL IMPACT ANALYSIS

The PEIR will provide a description of the District's existing storage and recharge facilities and will summarize previous environmental analysis and project approvals. The existing hydrology within the river will be described to determine baseline conditions. The PEIR will address the impacts of the following three elements of the District's proposed program: a) diversion of future increases in Santa River flows reaching Prado Dam; b) construction and operation of proposed near-term projects to divert, store and/or recharge additional surface water to the groundwater basin; and c) construction and operation of potential long-terms projects to divert, storage and/or recharge additional surface water to the groundwater basin.

The PEIR will assess the proposed near-term projects at a detailed, project-level, with the intent that no further CEQA documentation will be required prior to District approval and implementation of these near-term projects. The potential long-term projects proposed to capture future flows will be addressed only at a programmatic level in accordance with the conceptual level of project description information available for these longer-term options. Thus, the prospective long-term projects may require additional CEQA environmental review and documentation prior to implementation.

NEAR-TERM PROJECTS

Implementation of the near-term projects could create significant impacts primarily with respect to land use and construction effects. Construction and operations of new spreading basins would require clearing large areas and could impact local aesthetics, air quality, noise, and traffic. Acquisition of new lands for recharge areas could require modifications to designated land uses. In addition, new recharge areas could alter the groundwater flow and could transport surface contaminants to the groundwater depending on local shallow surface soils.

The environmental effects of raising the conservation pool elevation behind Prado Dam have been assessed by the ACOE in the EIS circulated for public review in 2001. The PEIR will summarize the findings in the EIS with respect to significant impacts of the increased storage capacity.

Implementation of the BCVs is not expected to result in significant environmental impacts. The BCVs are expected to be more efficient than existing methods and would reduce the amount of material transported off site for disposal. Since the basins would not need to be drained for routine maintenance, dust emissions would be reduced, and system efficiency would increase.

LONG-TERM PROJECTS

Implementation of the identified long-term projects could create significant unavoidable impacts. Raising the Prado Dam and creating new recharge basins would create impacts similar to those identified for the near-term projects. Creation of new surface water reservoirs could create significant unavoidable impacts to biological resources, land uses, air quality, noise, traffic, geology, hydrology, cultural resources, paleontological resources, and aesthetics. The PEIR would assess potential long-term projects at a programmatic level.

ENVIRONMENTAL RESOURCES TO BE ASSESSED

The PEIR will provide an assessment of all environmental issue areas identified in the CEQA environmental checklist noted below. The key environmental issues expected to associated with the proposed projects are: land use affects of siting new recharge and storage basins, and construction impacts (noise, dust, traffic and land use disruption). The following provides a summary of the anticipated issues associated with both the near-term and the long-term projects and then reviews the nature of potential impacts anticipated in key environmental issue areas.

✔ Land Use and Planning	✔ Transportation/Circulation	✔ Public Services
✔ Agricultural Resources	✔ Biological Resources	✔ Utilities
✔ Population and Housing	✔ Mineral Resources	✔ Aesthetics
✔ Geology and Soils	✔ Air Quality	✔ Noise
✔ Hydrology and Water Quality	✔ Cultural Resources	✔ Recreation
✔ Hazards / Hazardous Materials	✔ Mandatory Findings of Significance	

AESTHETICS

As the District implements projects to capture increased river flows, aesthetic considerations may arise. The long-term projects including the reservoir storage projects would impact scenic vistas in the Santa Ana Mountains. Near-term projects including the creation of additional recharge facilities could impact the visual character of local project sites. The PEIR will assess visual impacts of routine operations at the spreading basins and within the river channel. In addition, the PEIR will assess potential visual impacts of operations at Prado Dam and within the wetlands.

AIR QUALITY

The District currently maintains large spreading basins and recharge areas within the banks of the SAR. Air emissions estimates will be calculated for routine operations to determine the District's baseline emissions. Construction of recharge basins could increase temporary dust emissions. The PEIR will evaluate construction activities and calculate air emissions for construction and operational activities.

BIOLOGICAL RESOURCES

The proposed capture of future increases in SAR flows reaching Prado Dam is not expected to significantly impact existing biological resources. The SAR consists of a concrete-lined channel bottom and/or channel through most of Orange County. No riparian habitat exists within the channel. With existing facilities, the District currently captures for beneficial use all SAR base flow reaching the Prado Dam as well as much of the storm flows. Under existing conditions only occasional peak storm flows reach the ocean. With implementation of the proposed near-term and long-term projects, the District would maintain this existing situation: the District would continue to capture all future river base flow reaching Prado Dam, and most of the storm flows.

No impact to upstream riparian habitats or wildlife would occur as a result of this project nor would significant impact to existing downstream biological resources occur. The PEIR will assess the potential impacts of maintaining the current condition of the river, including potential effects on sensitive species such as the Santa Ana Sucker. Future increases in SAR flow would be captured and would not reach river segments downstream of the District's diversion points.

The PEIR will also summarize the information compiled in the EIS prepared by the ACOE in 2001 regarding the raising of the Prado Dam conservation pool elevation to 508 feet asl. Long-term projects could impact biological species significantly, particularly if storage reservoirs are constructed. The PEIR will evaluate, on a programmatic level, potential impacts to biological resources in mountain reservoir locations.

HYDROLOGY

The hydrology of the SAR is summarized annually in the SAR Watermaster Report. The PEIR will assess the hydrology of the SAR with respect to historic and projected flows using the Watermaster reports and upstream wastewater discharge projections. The proposed project would not alter the existing conditions of the lower SAR. Some of the near-term projects proposed involve construction of recharge facilities to capture peak storm flows. The PEIR will assess the impacts of this increased storage and recharge capacity on flooding in the lower SAR.

The PEIR will also assess potential water quality impacts as the water in the river becomes more dependant on wastewater discharges. The efforts of the Santa Ana Watershed Project Authority (SAWPA) regarding water quality will be summarized.

NOISE

Construction activities for near-term and long-term projects would temporarily increase noise levels in localized areas. The PEIR will evaluate potential construction area locations and impacts to sensitive receptors. Operation of the proposed projects is not expected to create substantial noise effects but this will be confirmed in the analysis.

LAND USE

The proposed near-term and long-term projects including recharge basins and surface reservoirs could displace existing land uses and/or pre-empt development of other designated land uses identified in local land use plans. Although the proposed recharge basins would likely be site in close proximity to existing recharge basin facilities and thus, not change the land use character of the area significantly, the PEIR will analyzed specific project sites for proposed facilities to determine potential land use impacts. With respect to consistency with other potential plans and policies, the proposed project areas could be located in previously undeveloped areas within the boundaries of the designated Southern California Natural Communities Conservation Plan (NCCP). The PEIR will evaluate potential impacts of storage reservoirs and recharge basins within the NCCP.

POPULATION AND HOUSING/GROWTH INDUCEMENT

The proposed project would not directly impact population and housing in Orange County. However, the increased water supply could indirectly act as an inducement to growth by reducing concerns about future water supply reliability as an obstacle to growth. The increased river diversions and storage / recharge capacity could be considered a new water supply that would lessen water supply limitations as an obstacle to growth in the region. The District has no land use planning or development approval authority, thus it has no direct role in the planning or approval of additional development within its service area. The District reviews the land use plans and water supply plans of the local city and county jurisdictions and the retail water agencies within its service area in order to develop water supply management and groundwater protection programs that support the planned land uses within the area. It is the local city and county land use jurisdictions that adopt land use plans and approve development with the area. The PEIR will review the CEQA documentation completed by the local city and county land use jurisdictions to review land use plans and summarize the impact assessments and mitigation measures adopted to address the secondary effects of planned growth. The secondary effects of growth include impacts to air quality, noise, traffic, biological resources, water quality, cultural resources, population and housing, land uses, utilities, and public services.

Appendix B
Responses to Notice of Preparation

Office of the
City Attorney
City of Redlands

Daniel J. McHugh, Esq.
City Attorney

Leslie E. Murad, II, Esq.
Assistant City Attorney

August 12, 2002

VIA FACSIMILE AND U.S. MAIL

John C. Kennedy
Assistant General Manager
Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708

Re: Notice of Preparation of Draft Environmental Impact Report

Ladies and Gentlemen:

The City of Redlands has received a copy of the Notice of Preparation of an Environmental Impact Report assessing the Orange County Water District's ("District") Application to Appropriate Santa Ana River Water by Permit in connection with the District's pending application to obtain an appropriative license from the State Water Resources Control Board ("SWRCB") for the Santa Ana River. This is the City's preliminary response to that document and the environmental issues raised therein, and should be entered into the District's record of proceedings for its "scoping" obligations and all other environmental proceedings undertaken by the District related to this matter.

At this time, the City has insufficient information to adequately comment on the environmental impacts of the District's proposed diversion from the Santa Ana River. In addition, Redlands also believes that the District has improperly designated itself as "lead agency" for a project for which the SWRCB is properly the lead agency.

The District has identified the project as simply confirming the "District's existing rights and to establish rights to utilize river flows reaching Prado Dam conforming with the 1969 judgment between the District and upstream water districts." Redlands asserts that this description improperly mischaracterizes and segments the actual project which should include all of the applications pending before the SWRCD associated with appropriations from the Santa Ana River and its tributaries.

The CEQA Guidelines define the term "project" as the "whole of an action" which may result in a direct or reasonably foreseeable indirect impact. 14 Cal. Code Regs. § 15378(a). CEQA requires that environmental considerations not be concealed by separately focusing on isolated parts of a project and overlooking the cumulative effect of the whole action. *Bozung v. LAFCO* (1975) 13 Cal.3d 263, 283. CEQA's broad reach of the term "project" requires the District, and in this case the

P.O. Box 3005, Redlands, CA 92373-1505 • (909) 798-7595 • FAX (909) 798-7503

SWRCB, to consider all of the activities associated with the pending applications before the SWRCB to determine whether those applications may cause immediate and direct environmental impacts, and cumulative impacts. For example, the San Bernardino Valley Municipal Water District and the Western Municipal Water District ("SBVMWD/Western") recently issued their "Notice of Preparation" of an EIR assessing the two agencies' pending application to appropriate water from the Santa Ana River. In their "Notice of Preparation," those agencies also claim they are "co-lead agencies" to assess the impacts of diverting and storing Santa Ana River water, and suggest they will prepare a "Program EIR." The District's "project" fails to properly include the SBVMWD/Western appropriation application within its description.

In addition to the District's and the SBVMWD/Western requests for appropriative licenses to divert water, appropriative licenses are concurrently being sought, or may soon be filed in connection with their requests to revise the "Fully Appropriate Stream" status of the Santa Ana River, by the San Bernardino Valley Water Conservation District, the City of Riverside and the Chino Basin Watermaster. Each of these other entities is seeking water rights and diversions of the same stream system affected by the District's application. Redlands believes the individual environmental impacts of these applications and their cumulative direct and indirect impacts must all be assessed in one comprehensive environmental impact report ("EIR").

The EIR proposed to be prepared by the District fails to take into account the individual impacts and the cumulative effects of all of these competing water rights applications. Accordingly, the City reserves its right to submit substantive comments on the environmental impacts on the District's application after the SWRCB prepares a draft EIR on the diversion project described in the application, and all other pending diversion and storage applicants, in accordance with the California Environmental Quality Act ("CEQA").

The SWRCB has recognized the important role environmental compliance has in the processing of all of the applications that are proposed or pending to appropriate water from the Santa Ana River:

> "Prior to any potential approval or decision to proceed with a proposed project, these eight persons and entities and the SWRCB must fulfill their obligations under the California Environmental Quality Act ('CEQA,' Public Resources Code section 21000 et seq.) In addition to meeting statutory responsibilities under CEQA, the SWRCB will comply with its obligations to consider environmental and public interest issues under the Water Code and the public trust doctrine in the context of processing the water right applications submitted by the petitioners."
> SWRCB Order WRO 2002-006, p. 5-6.

The SWRCB cannot avoid its CEQA obligation to serve as lead agency for these water rights applications by delegating that authority to the District, or others, to undertake environmental review on a "piece-meal" basis. CEQA constitutes a comprehensive scheme to evaluate potential adverse environmental effects of discretionary projects proposed to be carried out or approved by public agencies. Pub. Resources Code, § 21080(a); *Citizens for Quality Growth v. City of Mt. Shasta* (1988) 198 Cal.App.3d 433, 437. Under CEQA, the "lead agency" is responsible for determining whether an EIR is required for a project and, if so, for preparing the EIR and including it in any report on the project. *Friends of Cuyamaca Valley v. Lake Cuyamaca Recreation & Park Dist.* (1994) 28 Cal.App.4th 419, 426.

CEQA defines a lead agency as "the public agency which has the principal responsibility for carrying out or approving a project which may have a significant effect upon the environment." Pub. Resources Code, § 21067[1]. Here, the SWRCB, rather than the District, is the agency that must review the pending applications to appropriate water from the Santa Ana River and its tributaries. Because the SWRCB is the agency responsible for issuing permits to appropriate water from the Santa Ana River and its tributaries, CEQA requires that the SWRCB serve as the lead agency for environmental review of the storage and diversion projects contemplated by all of the pending applications. Only by acting as the lead agency under CEQA will the SWRCB be able to "comply with its obligations to consider environmental and public interest issues under the Water Code and the public trust doctrine in the context of processing the water right applications submitted by the petitioners." SWRCB Order WRO 2002-0006, p. 6.

The SWRCB, not the District or any other entity, is the public agency that "will act first on the project in question [and] shall be the lead agency." CEQA Guidelines § 15051, subd. (c). This is consistent with the legislative goal of assuring environmental impact assessment in governmental planning at the earliest possible time. *Citizens Task Force on Sohio v. Board of Harbor Comrs.* (1979) 23 Cal.3d 812, 814. In accordance with the State's CEQA Guidelines, the SWRCB must serve as the lead agency for those proposed appropriations by nongovernmental entities. CEQA Guidelines § 15051(b), (the lead agency will normally be the public agency "with the greatest responsibility for supervising or approving the project as a whole.") For those applications filed by nongovernmental entities and persons, no other agency but the SWRCB can act as the lead agency.

Further, as to the applications filed by the District, the Chino Basin Watermaster, the City of Riverside and SBVMWD/Western, the SWRCB (rather than the District) is ideally situated to assess the potential cumulative significant impacts[2] on water and environmental resources from these applications and other past, present and reasonably foreseeable future water diversion projects within the Santa Ana River watershed.

The importance of the lead agency throughout the environmental review process was highlighted in *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692. "The lead agency must independently participate, review, analyze and discuss the alternatives in good faith." *Id.* at p. 736. Moreover, the lead agency's opinion on matters within its expertise is of particular value. *Id.* As the process continues, "the lead agency may determine an environmentally superior alternative is more desirable or mitigation measures must be adopted." *Id.* at p.737. In sum,

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1/ Lead agency is to be distinguished from "responsible agency," which "means a public agency, other than the lead agency, which has responsibility for carrying out or approving a project." Pub. Resources Code, §21069. The CEQA Guidelines provide: "Where a project is to be carried out or approved by more than one public agency, one public agency shall be responsible for preparing an EIR or negative declaration for the project. This agency shall be called the lead agency." Cal. Code Regs., tit. 14, § 15050, subd. (a)..

2/ The State of California CEQA guidelines define cumulative impacts as:

> "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. The individual effects may be changes resulting from a single project or a number of separate projects. The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects."

the lead agency plays a pivotal role in defining the scope of environmental review, lending its expertise in areas within its particular domain, and in ultimately recommending the most environmentally sound alternative.

Redlands suggests it is inappropriate for the District to take direction from the SWRCB and initiate environmental review for its application. Attempts such as this to delegate or assign lead agency status under CEQA have been rejected by the courts. In *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892, the Court of Appeal held a State Water Project contractor was improperly designated the lead agency for the purpose of preparing an EIR for the implementation of the Monterey Agreement. Rather, the Department of Water Resources should have prepared the EIR as the lead agency because it has a statewide perspective and expertise on how allocation of water to another part of the state has implications for distribution throughout the State Water Project system. 83 Cal.App.4th at pp. 903-907[3].

In contrast to the District, the SWRCB has a statewide perspective and expertise to assess the pending applications to appropriate water from the Santa Ana River. The approval of any one of the pending applications will implicate, if not compound, the adverse environmental impacts from the approval of any other pending application. The SWRCB will be most familiar, through the permitting process, of the isolated and cumulative impacts that each potential additional diversion will have on water, environmental and public trust resources within the Santa Ana River watershed.

Any continued processing of environmental documents by the District for its application is subject to review by the courts. In *City of Sacramento v. State Water Resources Control Bd.* (1992) 2 Cal.App.4th 960, the appointment of the wrong lead agency required reversal by the court of appeal. There, the court held:

> "Despite plaintiffs' contention that [the Department of Food and Agriculture's] responsibility over pesticide regulation does not extend to regulating discharges into state waters, the statutory scheme described above establishes concomitant responsibility in DFA and the Regional Board for protecting state waters from pesticide pollution. The Regional Board's responsibility is to protect state waters from *all* forms of pollution, while DFA's responsibility is limited to pesticide pollution. However, DFA's responsibility extends beyond water pollution to include the total environment. Thus, because the underlying purpose of an EIR is to analyze and inform regarding adverse effects to the environment as a whole (Pub. Resources Code, § 21061), DFA is in the best position to make such an assessment."

Id. at p. 973. As in *City of Sacramento,* the SWRCB is the "logical choice for lead agency" because it has principal responsibility for monitoring and mitigating the environmental impacts of prospective appropriations throughout the Santa Ana River watershed.

So significant is the role of the lead agency that CEQA proscribes delegation. This

---

[3]/ The court ruled that under Public Resources Code section 21067, the designation of the lead agency should be:

> "the public agency <u>which has the principal responsibility for carrying out or approving</u> a project which may have a significant effect upon the environment."
> (Emphasis added.)

prohibition was articulated in *Kleist v. City of Glendale* (1976) 56 Cal.App.3d 770, 779:

> "Neither the CEQA nor the state guidelines authorize the city council to delegate its review and consideration function to another body. Delegation is inconsistent with the purpose of the review and consideration function since it insulates the members of the council from public awareness and possible reaction to the individual members' environmental and economic values. Delegation is inconsistent with the purposes of the EIR itself."

In summary, the District is not the appropriate lead agency for this project. By law, the SWRCB should be designated as the lead agency for all of the pending applications to appropriate water from the Santa Ana River and its tributaries. The SWRCB has the principal responsibility for approving the applications to appropriate water from the Santa Ana River. No individual applicant, including the public agencies who have filed applications with the SWRCB, is better situated than the SWRCB to assess the potential impacts on water, environmental and public trust resources – whether individually or cumulatively – from the storage and diversion projects contemplated by the pending applications to appropriate water from the Santa Ana River watershed.

Redlands contends that the District is failing to properly assess the adverse environmental effects that may occur from their "project" when considered in light of the other pending applications to appropriate water from the Santa Ana River. Because the cumulative effects of all of these applications must be considered in one comprehensive environmental impact report, the SWRCB is the appropriate lead agency, not the District.

Sincerely,

Daniel J. McHugh
City Attorney

cc: John Davidson

South Coast
Air Quality Management District
21865 E. Copley Drive, Diamond Bar, CA 91765-4182
(909) 396-2000 · http://www.aqmd.gov

August 21, 2002

Mr. John Kennedy
Orange County Water District
P.O. Box 8300
Fountain Valley, CA 92728-8300

Dear Mr. Kennedy:

Notice of Preparation of an Environmental Impact Report for Orange County Water District Application to Appropriate Santa Ana River Water by Permit

The South Coast Air Quality Management District (AQMD) appreciates the opportunity to comment on the above-mentioned document. The AQMD's comments are recommendations regarding the analysis of potential air quality impacts from the proposed project that should be included in the Draft Environmental Impact Report (EIR).

Air Quality Analysis

The AQMD adopted its California Environmental Quality Act (CEQA) Air Quality Handbook in 1993 to assist other public agencies with the preparation of air quality analyses. The AQMD recommends that the Lead Agency use this Handbook as guidance when preparing its air quality analysis. Copies of the Handbook are available from the AQMD's Subscription Services Department by calling (909) 396-3720.

The Lead Agency should identify any potential adverse air quality impacts that could occur from all phases of the project and all air pollutant sources related to the project. Air quality impacts from both construction and operations should be considered. Construction-related air quality impacts typically include, but are not limited to, emissions from the use of heavy-duty equipment from grading, earth-loading/unloading, paving, architectural coatings, off-road mobile sources (e.g., heavy-duty construction equipment) and on-road mobile sources (e.g., construction worker vehicle trips, material transport trips). Operation-related air quality impacts may include, but are not limited to, emissions from stationary sources (e.g., boilers), area sources (e.g., solvents and coatings), and vehicular trips (e.g., on- and off-road tailpipe emissions and entrained dust). Air quality impacts from indirect sources, that is, sources that generate or attract vehicular trips should be included in the evaluation. An analysis of all toxic air contaminant impacts due to the decommissioning or use of equipment potentially generating such air pollutants should also be included.

Mitigation Measures
In the event that the project generates significant adverse air quality impacts, CEQA requires that all feasible mitigation measures be utilized during project construction and operation to minimize or eliminate significant adverse air quality impacts. To assist the Lead Agency with identifying possible mitigation measures for the project, please refer to Chapter 11 of the AQMD CEQA Air Quality Handbook for sample air quality mitigation measures. Additionally, AQMD's Rule 403 – Fugitive Dust, and the Implementation Handbook contain numerous measures for controlling construction-related emissions that should be considered for use as CEQA mitigation if not otherwise required. Pursuant to state CEQA Guidelines §15126.4 (a)(1)(D), any impacts resulting from mitigation measures must also be discussed.

Data Sources
AQMD rules and relevant air quality reports and data are available by calling the AQMD's Public Information Center at (909) 396-2039. Much of the information available through the Public Information Center is also available via the AQMD's World Wide Web Homepage (http://www.aqmd.gov).

The AQMD is willing to work with the Lead Agency to ensure that project-related emissions are accurately identified, categorized, and evaluated. Please call Dr. Charles Blankson, Transportation Specialist, CEQA Section, at (909) 396-3304 if you have any questions regarding this letter.

Sincerely,

Steve Smith

Steve Smith, Ph.D.
Program Supervisor, CEQA Section
Planning, Rule Development and Area Sources

SS:CB:li

ORC020815-03LI
Control Number

DEPARTMENT OF TRANSPORTATION
DISTRICT 12
3337 MICHELSON DRIVE, SUITE 380
IRVINE, CA 92612-8894

Flex your power!
Be energy efficient!

August 22, 2002

Mr. John Kennedy
Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA. 92728-8300

File: IGR/CEQA
SCH# 2002081024
LOG# 1114
SR# 91

Subject: Notice of Preparation Appropriate Santa Ana River Water by Permit

Dear Mr. Kennedy,

Thank you for the opportunity to review and comment on the **Notice of Preparation to Appropriate Santa Ana River Water by Permit.** The proposed project is to assess the Application to Appropriate Santa Ana River Water by Permit along with a program of near-term and long-term projects to expand and improve surface water diversion, storage and groundwater recharge.

Caltrans District 12 is a responsible agency on this project, and has the following comments for your consideration.

1. Post project discharges into the state transportation drainage facilities should be less than or equal to the pre- project conditions
2. Encroachment permit from Caltrans wil be required if any activities encroach on Caltrans Right of Way.
3. All work within the State Right of Way must conform to Caltrans Standard Plans and Standard Specifications for Water Pollution Control, including production of a Water Pollution Control Program (WPCP) or Storm Water Pollution Prevention Plan (SWPPP) as required. Any runoff draining into Caltrans right-of-way from construction operations, or from the resulting project, cannot be approved by District 12 Environmental Planning. Measures must be incorporated to contain all vehicle loads and avoid any tracking of materials, which may fall or blow onto Caltrans roadways or facilities. **(See Attachment: *Water Pollution Control Provisions*)**

We appreciate the opportunity to comment on this document. If you have any questions or need to contact us, please do not hesitate to call Aileen Kennedy at (949) 724-2239.

Sincerely,

Robert F. Joseph

Robert F. Joseph, Chief
Advance Planning Branch

C: Terry Roberts, Office of Planning and Research
Ron Helgelson, Caltrans HQ IGR/Community Planning
Grace Pina-Garrett, NPDES
Roger Kao, Hydraulics

ATTACHMENT
CALTRANS DISTRICT 12

WATER POLLUTION CONTROL PROVISIONS

Any runoff draining into Caltrans Right of Way must fully conform to the current discharge requirements of the Regional Water Quality Control Board (RWQCB) to avoid impacting water quality. Permittee shall fully conform to the requirements of the Caltrans Statewide National Pollutant Discharge Elimination System (NPDES) Storm Water Permit, Order No. 99-06-DWQ, NPDES No. CAS000003, adopted by the State Water Resources Control Board (SWRCB) on July 15, 1999, in addition to the BMPs specified in the Caltrans Storm Water Management Plan (SWMP). When applicable, the Permittee will also conform to the requirements of the General NPDES Permit for Construction Activities, Order No. 99-08-DWQ, NPDES No. CAS000002, and any subsequent General Permit in effect at the time of issuance of this Encroachment Permit. These permits regulate storm water and non-storm water discharges associated with year-round construction activities.

Please note that project activities should pay extra attention to storm water pollution control during the "Rainy Season" (October 1st – May 1st) and follow the Water Pollution Control BMPs to minimize impact to receiving waters. Measures must be incorporated to contain all vehicle loads and avoid any tracking of materials, which may fall or blow onto Caltrans Right of Way.

For all projects resulting in 2 hectares (5 acres) or more of soil disturbance or otherwise subject to the NPDES program, the Contractor will develop, implement, and maintain a Storm Water Pollution Prevention Plan (SWPPP) conforming to the requirements of the Caltrans Specification Section 7-1.01G "Water Pollution Control", Caltrans Statewide NPDES Permit, the General NPDES Permit for Construction Activities, and the Caltrans Storm Water Quality Handbooks "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual", and "Construction Site Best Management Practices (BMPs) Manual" effective November 2000, and subsequent revisions. In addition, the SWPPP must conform to the requirements of the SWRCB Resolution No. 2001-046, the Sampling and Analytical Procedures (SAP) Plan.

For all projects resulting in less than 2 hectares (5 acres) of soil disturbance or not otherwise subject to the requirements of the NPDES program, the Contractor will develop, implement, and maintain a Water Pollution Control Program (WPCP) conforming to the requirements of Caltrans Specifications Section 7-1-.01G, "Water Pollution Control", and the Caltrans Storm Water Quality Handbooks "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual", and "Construction Site Best Management Practices (BMPs) Manual" effective November 2000, and subsequent revisions.

Copies of the Permits and the Construction Contractor's Guide and Specifications of the Caltrans Storm Water Quality Handbook may be obtained from the Department of Transportation, Material Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520. Copies of the Permits and Handbook are also available for review at Caltrans District 12, 3347 Michelson Drive, Suite 100, Irvine, California 92612, Telephone: (949) 724-2260. Electronic copies can be found at http://www.dot.ca.gov/hq/construc/stormwater.html

BRUNICK, BATTERSBY, McELHANEY & BECKETT

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P. O. BOX 1320
REDLANDS, CALIFORNIA 92373
TELEPHONE (909) 793-0818

PLEASE REFER TO

August 23, 2002

VIA FAX AND MAIL

OCWD Application to Appropriate Santa Ana River Water By Permit EIR
Orange County Water District
Attention: John C. Kennedy, Assistant General Manager
10500 Ellis Avenue
Fountain Valley, CA 92798

Re: Notice of Preparation of an Environmental Impact Report assessing the Orange County Water District Application to Appropriate Santa Ana River Water by Permit

Dear Mr. Kennedy:

This office serves as General Counsel to the East Valley Water District ("EVWD").

Pursuant to the authority provided in the California Environmental Quality Act ("CEQA"), Public Resources Code ("PRC") Section 21000 et seq., and the Guidelines adopted thereunder, California Code of Regulations ("CCR") Section 15000 et seq., EVWD submits the following comments to the Notice of Preparation ("NOP") issued by Orange County Water District ("OCWD") on August 1, 2002, in connection with the above-referenced matter.

In this regard, CEQA requires that the preparation and review of an environmental impact report ("EIR") "should be coordinated in a timely fashion with the existing planning, review, and project approval process being used by each public agency." CCR Section 15004(c). To help facilitate inter-agency coordination, PRC Section 21080.3(a) requires that the lead agency consult with all responsible agencies and trustee agencies before preparation of an EIR.

The NOP is the procedural device used to initiate such interagency dialogue. PRC Sections 21080.4, 21092.2, 21092.3; CCR Section 15082(a). The NOP must be written so as to provide the agencies with sufficient information to enable them to make meaningful responses. At a minimum, the NOP must include a description of the project, its location on a map, and a statement of the project's probable environmental effects. CCR Section 15082(a)(1).

SOUTHERN CALIFORNIA

ASSOCIATION of GOVERNMENTS

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August 28, 2002

Mr. John Kennedy
Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708

RE: **Comments on the Notice of Preparation for a Draft Environmental Impact Report for the Orange County Water District Application to Appropriate Santa Ana River Water by Permit – SCAG No. I 20020424**

Dear Mr. Kennedy:

Thank you for submitting the **Notice of Preparation for a Draft Environmental Impact Report for the Orange County Water District Application to Appropriate Santa Ana River Water by Permit** to SCAG for review and comment. As areawide clearinghouse for regionally significant projects, SCAG reviews the consistency of local plans, projects, and programs with regional plans. This activity is based on SCAG's responsibilities as a regional planning organization pursuant to state and federal laws and regulations. Guidance provided by these reviews is intended to assist local agencies and project sponsors to take actions that contribute to the attainment of regional goals and policies.

We have reviewed the **Notice of Preparation** and have determined that the proposed Project is regionally significant per SCAG mandates for regionally significant projects that directly relate to policies and strategies contained in the Regional Comprehensive Plan and Guide (RCPG) and Regional Transportation Plan (RTP). The proposed Project considers the implementation of a regional water management plan. CEQA requires that EIRs discuss any inconsistencies between the proposed project and applicable general plans and **regional plans (Section 15125 [d])**. If there are inconsistencies, an explanation and rationalization for such inconsistencies should be provided.

Policies of SCAG's Regional Comprehensive Plan and Guide and Regional Transportation Plan, which may be applicable to your project, are outlined in the attachment. **We expect the Draft EIR to specifically cite the appropriate SCAG policies and address the manner in which the Project is consistent with applicable core policies or supportive of applicable ancillary policies. Please use our policy numbers to refer to them in your Draft EIR. Also, we would encourage you to use a side-by-side comparison of SCAG policies with a discussion of the consistency or support of the policy with the Proposed Project.**

Please provide a minimum of 45 days for SCAG to review the Draft EIR when this document is available. If you have any questions regarding the attached comments, please contact me at (213) 236-1867. Thank you.

Sincerely,

JEFFREY M. SMITH, AICP
Senior Planner
Intergovernmental Review

COMMENTS ON THE PROPOSAL TO DEVELOP A DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE ORANGE COUNTY WATER DISTRICT APPLICATION TO APPROPRIATE SANTA ANA WATER BY PERMIT SCAG NO. I 20020424

PROJECT DESCRIPTION

The proposed Project considers the appropriation of water by permit.

CONSISTENCY WITH REGIONAL COMPREHENSIVE PLAN AND GUIDE POLICIES

The **Growth Management Chapter (GMC)** of the Regional Comprehensive Plan and Guide (RCPG) contains the following policies that are particularly applicable and should be addressed in the Draft EIR for the proposed Project.

3.03 *The timing, financing, and location of public facilities, utility systems, and transportation systems shall be used by SCAG to implement the region's growth policies.*

GMC POLICIES RELATED TO THE RCPG GOAL TO IMPROVE THE REGIONAL STANDARD OF LIVING

The Growth Management goals to develop urban forms that enable individuals to spend less income on housing cost, that minimize public and private development costs, and that enable firms to be more competitive, strengthen the regional strategic goal to stimulate the regional economy. The evaluation of the proposed project in relation to the following policies would be intended to guide efforts toward achievement of such goals and does not infer regional interference with local land use powers.

3.05 *Encourage patterns of urban development and land use, which reduce costs on infrastructure construction and make better use of existing facilities.*

GMC POLICIES RELATED TO THE RCPG GOAL TO IMPROVE THE REGIONAL QUALITY OF LIFE

The Growth Management goals to attain mobility and clean air goals and to develop urban forms that enhance quality of life, that accommodate a diversity of life styles, that preserve open space and natural resources, and that are aesthetically pleasing and preserve the character of communities, enhance the regional strategic goal of maintaining the regional quality of life. The evaluation of the proposed project in relation to the following policies would be intended to provide direction for plan implementation, and does not allude to regional mandates.

3.18 Encourage planned development in locations least likely to cause environmental impact.

3.20 Support the protection of vital resources such as wetlands, groundwater recharge areas, woodlands, production lands, and land containing unique and endangered plants and animals.

3.21 Encourage the implementation of measures aimed at the preservation and protection of recorded and unrecorded cultural resources and archaeological sites.

3.22 Discourage development, or encourage the use of special design requirements, in areas with steep slopes, high fire, flood, and seismic hazards.

3.23 Encourage mitigation measures that reduce noise in certain locations, measures aimed at preservation of biological and ecological resources, measures that would reduce exposure to seismic hazards, minimize earthquake damage, and to develop emergency response and recovery plans.

GMC POLICIES RELATED TO THE RCPG GOAL TO PROVIDE SOCIAL, POLITICAL, AND CULTURAL EQUITY

The Growth Management Goal to develop urban forms that avoid economic and social polarization promotes the regional strategic goal of minimizing social and geographic disparities and of reaching equity among all segments of society. The evaluation of the proposed project in relation to the policy stated below is intended guide direction for the accomplishment of this goal, and does not infer regional mandates and interference with local land use powers.

3.27 Support local jurisdictions and other service providers in their efforts to develop sustainable communities and provide, equally to all members of society, accessible and effective services such as: public education, housing, health care, social services, recreational facilities, law enforcement, and fire protection.

REGIONAL TRANSPORTATION PLAN

The **Regional Transportation Plan (RTP)** also has goals, objectives, policies and actions pertinent to this proposed project. This RTP links the goal of sustaining mobility with the goals of fostering economic development, enhancing the environment, reducing energy consumption, promoting transportation-friendly development patterns, and encouraging fair and equitable access to residents affected by socio-economic, geographic and commercial limitations. Among the relevant goals, objectives, policies and actions of the RTP are the following:

Core Regional Transportation Plan Policies

4.02 Transportation investments shall mitigate environmental impacts to an acceptable level.

4.04 Transportation Control Measures shall be a priority.

4.16 Maintaining and operating the existing transportation system will be a priority over expanding capacity.

AIR QUALITY CHAPTER CORE ACTIONS

The **Air Quality Chapter** core actions related to the proposed project includes:

5.07 Determine specific programs and associated actions needed (e.g., indirect source rules, enhanced use of telecommunications, provision of community based shuttle services, provision of demand management based programs, or vehicle-miles-traveled/emission fees) so that options to command and control regulations can be assessed.

5.11 Through the environmental document review process, ensure that plans at all levels of government (regional, air basin, county, subregional and local) consider air quality, land use, transportation and economic relationships to ensure consistency and minimize conflicts.

WATER QUALITY CHAPTER RECOMMENDATIONS AND POLICY OPTIONS

The **Water Quality Chapter** core recommendations and policy options relate to the two water quality goals: to restore and maintain the chemical, physical and biological integrity of the nation's water; and, to achieve and maintain water quality objectives that are necessary to protect all beneficial uses of all waters.

11.02 Encourage "watershed management" programs and strategies, recognizing the primary role of local governments in such efforts.

11.05 Support regional efforts to identify and cooperatively plan for wetlands to facilitate both sustaining the amount and quality of wetlands in the region and expediting the process for obtaining wetlands permits.

11.06 Clean up the contamination in the region's major groundwater aquifers since its water supply is critical to the long-term economic and environmental health of the region. The financing of such clean-ups should leverage state and federal resources and minimize significant impacts on the local economy.

11.07 Encourage water reclamation throughout the region where it is cost-effective, feasible, and appropriate to reduce reliance on imported water and wastewater discharges. Current administrative impediments to increased use of wastewater should be addressed.

OPEN SPACE CHAPTER ANCILLARY GOALS

Public Health and Safety

9.04 Maintain open space for adequate protection of lives and properties against natural and man-made hazards.

9.05 Minimize potentially hazardous developments in hillsides, canyons, areas susceptible to flooding, earthquakes, wildfire and other known hazards, and areas with limited access for emergency equipment.

9.06 Minimize public expenditure for infrastructure and facilities to support urban type uses in areas where public health and safety could not be guaranteed.

Resource Protection

9.08 Develop well-managed viable ecosystems or known habitats of rare, threatened and endangered species, including wetlands.

CONCLUSIONS

All feasible measures needed to mitigate any potentially negative regional impacts associated with the proposed project should be implemented and monitored, as required by CEQA.

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

Roles and Authorities

THE SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS (SCAG) is a ***Joint Powers Agency*** established under California Government Code Section 6502 et seq. Under federal and state law, SCAG is designated as a Council of Governments (COG), a Regional Transportation Planning Agency (RTPA), and a Metropolitan Planning Organization (MPO). SCAG's mandated roles and responsibilities include the following:

SCAG is designated by the federal government as the Region's ***Metropolitan Planning Organization*** and mandated to maintain a continuing, cooperative, and comprehensive transportation planning process resulting in a Regional Transportation Plan and a Regional Transportation Improvement Program pursuant to 23 U.S.C. '134, 49 U.S.C. '5301 et seq., 23 C.F.R. '450, and 49 C.F.R. '613. SCAG is also the designated ***Regional Transportation Planning Agency,*** and as such is responsible for both preparation of the Regional Transportation Plan (RTP) and Regional Transportation Improvement Program (RTIP) under California Government Code Section 65080 and 65082 respectively.

SCAG is responsible for developing the demographic projections and the integrated land use, housing, employment, and transportation programs, measures, and strategies portions of the ***South Coast Air Quality Management Plan,*** pursuant to California Health and Safety Code Section 40460(b)-(c). SCAG is also designated under 42 U.S.C. '7504(a) as a ***Co-Lead Agency*** for air quality planning for the Central Coast and Southeast Desert Air Basin District.

SCAG is responsible under the Federal Clean Air Act for determining ***Conformity*** of Projects, Plans and Programs to the State Implementation Plan, pursuant to 42 U.S.C. '7506.

Pursuant to California Government Code Section 65089.2, SCAG is responsible for ***reviewing all Congestion Management Plans (CMPs) for consistency with regional transportation plans*** required by Section 65080 of the Government Code. SCAG must also evaluate the consistency and compatibility of such programs within the region.

SCAG is the authorized regional agency for ***Inter-Governmental Review*** of Programs proposed for federal financial assistance and direct development activities, pursuant to Presidential Executive Order 12,372 (replacing A-95 Review).

SCAG reviews, pursuant to Public Resources Code Sections 21083 and 21087, Environmental Impacts Reports of projects of regional significance for consistency with regional plans [California Environmental Quality Act Guidelines Sections 15206 and 15125(b)].

Pursuant to 33 U.S.C. '1288(a)(2) (Section 208 of the Federal Water Pollution Control Act), SCAG is the authorized ***Areawide Waste Treatment Management Planning Agency.***

SCAG is responsible for preparation of the ***Regional Housing Needs Assessment,*** pursuant to California Government Code Section 65584(a).

SCAG is responsible (with the Association of Bay Area Governments, the Sacramento Area Council of Governments, and the Association of Monterey Bay Area Governments) for preparing the ***Southern California Hazardous Waste Management Plan*** pursuant to California Health and Safety Code Section 25135.3.

Revised July 2001

ORANGE COUNTY FIRE AUTHORITY
P.O. Box 86, Orange, CA 92856-0086 • 145 South Water St., Orange, CA 92866
Chip Prather, Fire Chief (714) 744-0400

September 4, 2002

OCWD Application to Appropriate Santa Ana Rive Water
Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708
Attn: John Kennedy, Asst. General Manager

SUBJECT: NOP for Santa Ana Rive Water Project

Dear Mr. Kennedy:

Thank you for the opportunity to review the subject document. Given the nature of the project, the impacts to the OCFA are not significant. While no additional public safety resources are anticipated as a result of this project, all standard conditions and guidelines will be applied to the project during the normal plan review process. We do have a couple of comments on the overall project(s). Please make every effort to keep or develop safe points of access for the fire department in the event of a water rescue in these areas. This includes the width, nature and method of securing the access point. Please have your design professionals work with our Fire Prevention section to make sure that we can get rapid access to the appropriate points when someone is in need of help. It would be helpful if your design professionals kept in mind that we are most likely to access these areas during the rainy season and very often in the dark or poor light.

Thank you for providing us with this information. Please contact me at 714-744-0484 if you have any questions.

Sincerely,

Gene F. Begnell
Battalion Chief, Strategic Services

California Regional Water Quality Control Board
Santa Ana Region

Winston H. Hickox
Secretary for Environmental Protection

Internet Address: http://www.swrcb.ca.gov
3737 Main Street, Suite 500, Riverside, California 92501-3339
Phone (909) 782-4130 3 FAX (909) 781-6288

Gray Davis
Governor

September 4, 2002

John Kennedy
Orange County Water District
10500 Ellis Avenue
P.O. Box 8300
Fountain Valley, CA 92728-8300

NOTICE OF PREPARATION ORANGE COUNTY WATER DISTRICT APPLICATION TO APPRORIATE SANTA ANA RIVER WATER BY PERMIT / STATE CLEARING HOUSE NUMBER 2002081024

Dear Mr. Kennedy:

Staff of the Regional Water Quality Control Board, Santa Ana Region (RWQCB), has reviewed the Notice of Preparation for the above referenced project. The project is a proposal to appropriate Santa Ana River water by permit and to develop projects to expand and improve surface water diversion, storage and groundwater recharge.

We have the following comments concerning the Draft Initial Study for the project referenced above:

Page 14, Top of Page, Potential Water Quality Impacts

Increasing water stored behind Prado Dam by increasing the height of the conservation pool to an elevation of 508 or 514 feet will probably lengthen the time water is held in storage. Since this water in storage is the result of storm runoff from the dairy area plus flow from upstream treatment plants it could be high in nutrients. The additional time in storage could cause additional algal growth and possible nuisance conditions. This should be examined in the Environmental Impact report for this project.

If you should have any questions, please call Robert Nicklen at (909) 782-4492, myself at (909) 782-7960, or Mark Adelson at (909) 782-4492.

Sincerely,

David G. Woelfel

David G. Woelfel
Regional Planning Section

cc: Scott Morgan- State Clearinghouse

San Bernardino Valley Municipal Water District

1350 SOUTH "E" STREET - P. O. BOX 5906 - SAN BERNARDINO, CALIFORNIA 92412-5906 -(909) 387-9200
FAX (909) 387-9247

September 5, 2002

Orange County Water District
Attention: John Kennedy
10500 Ellis Avenue
Fountain Valley, CA 92708-6921

RE: Comments on the Notice of Preparation for OCWD's Application to Appropriate Water from the Santa Ana River

Dear Mr. Kennedy:

The San Bernardino Valley Municipal Water District and Western Municipal Water District of Riverside County (Muni/Western) have received and reviewed the Notice of Preparation (NOP) issued by the Orange County Water District (OCWD) for OCWD's Application to Appropriate Santa Ana River by Permit EIR (OCWD Application).

Muni/Western appreciate the ongoing cooperation between Muni/Western and OCWD regarding our respective applications to appropriate water from the Santa Ana River pending before the State Water Resources Control Board. Muni/Western also appreciate OCWD's continuing commitment that the OCWD Application is consistent with all provisions of the stipulated judgment in *Orange County Water District v. City of Chino et al.*, Superior Court of Orange County, Case No. 117628 (April 17, 1969) and with the December 1, 1999 Memorandum of Understanding To Affirm and Preserve Existing Rights in the Santa Ana River Watershed.

Please feel free to call if you have any questions.

Sincerely,

Robert L. Reiter

Robert L. Reiter
General Manager
and Chief Engineer

cc: Donald Harriger

#466806.2

Vicki L. Wilson, Director

COUNTY OF ORANGE

PUBLIC FACILITIES & RESOURCES DEPARTMENT

Kenneth R. Smith
Director of Public Works
Chief Engineer

300 N. Flower Street
Santa Ana, CA

P.O. Box 4048
Santa Ana, CA 92702-4048

Telephone: (714) 834-5447
Fax: (714) 834-2395

September 5, 2002

John Kennedy
Assistant General Manager
Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708

Subject: NOP of EIR for Proposed Use of Santa Ana River from Prado Dam for Water Conservation Plan

Dear Mr. Kennedy:

Thank you for the opportunity to review and comment on the subject NOP. The following comments are provided regarding the NOP in relation to the Prado Dam Project.

1. The Prado Dam Project (Project) includes raising the dam embankment by 28.6 feet, installing new gates to increase controlled outlet capability to 30,000 cfs, raising the spillway, and expanding the reservoir land area behind the dam up to an elevation of 566 feet NGVD – in order to improve flood control operations along the Santa Ana River. Statements in the NOP (see pages 9 to 11) imply that modifications to Prado Dam are being planned to increase water conservation capability. To our knowledge however, the U.S. Army Corps of Engineers (Corps) has consistently advised that the Project is for flood control purposes only. The Corps recently reiterated this position in Section 7 consultation with the U.S. Fish and Wildlife Service regarding the updated Biological Assessment and FSEIR/EIR for the Project. It is also our understanding that the Corps will consider any modification to dam operation intended for water conservation purposes to be a separate 'project' with accompanying separate environmental impact analysis, regardless of whether conservation operations would be feasible as a result of modifications constructed through the Project.

2. A proposed Prado Dam Project Cooperation Agreement (PCA) between the Corps and the Orange County flood Control District (OCFCD), to implement and cost share the Project, is expected to be approved within a few months. Construction on the

John Kennedy
Page 2

dam embankment/outlet works is anticipated to start shortly thereafter. Currently, the Corps (Federal Government) is solely responsible for dam/reservoir operation and maintenance, and related costs. However, as specified in the PCA, upon Project completion, the Corps and the OCFCD will share responsibility and costs for ongoing operation, maintenance, repair, rehabilitation and restoration (OMRR&R) of the dam, related structures and the reservoir.

3. Due to the OCFCD's future responsibilities and the change in the Corps' responsibilities, as specified in the PCA, potential modification to the current water conservation program at Prado Dam needs to be further evaluated by both the Corps and the OCFCD. OCFCD will be a responsible agency under CEQA for review of the project identified in the NOP, and appropriate access and operation agreements with OCFCD will be required. Statements in the NOP are confusing as to the extent of the Corps' evaluation to date, and further explanation is warranted. To our knowledge, and contrary to statements in the NOP, the Corps has not completed a feasibility study, nor has it released an EIS/EIR for public review.

4. Other issues requiring additional evaluation and analysis include: 1) potential long term OMRR&R impacts to dam facilities; 2) effects upon land use; 3) associated potential environmental impacts to reservoir and downstream habitat and; 4) cost sharing for water conservation related OMRR&R costs. While the proposed EIR may not be the appropriate mechanism to address all of these issues, we believe that agreement between the Corps, the OCFCD and the OCWD on such matters is necessary, prior to implementing any changes in Prado Dam operation for water conservation purposes.

If you have any questions, please contact Ahmad Olomi at (714) 834-2968 or Matthew Blintstrub at (714) 2886.

Sincerely,

KR Smith

Kenneth R. Smith
Director Public Works/Chief Engineer

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County of Orange
Planning & Development Services Department

THOMAS B. MATHEWS
DIRECTOR

300 N. FLOWER ST.
SANTA ANA, CALIFORNIA

MAILING ADDRESS:
P.O. BOX 4048
SANTA ANA, CA 92702-4048

NCL 02-95

September 5, 2002

John Kennedy
Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708

SUBJECT: NOP for the Application to Appropriate Santa Ana River Water by Permit

Dear Mr. Kennedy:

Thank you for the opportunity to respond to the above referenced project. The County of Orange has reviewed the Notice of Preparation (NOP) of a Draft Environmental Impact Report (DEIR) and has no comment at this time. However, we would appreciate being sent one complete set of the DEIR when it becomes available. If you have any questions, please contact Charlotte Harryman at (714) 834-2522.

Sincerely,

for

Timothy Neely, Manager
Environmental Planning Services Division

ch

CITY OF SAN BERNARDINO
MUNICIPAL WATER DEPARTMENT

September 5, 2002

OCWD Application to Appropriate Santa Ana River Water
By Permit EIR
Orange County Water District
Attention: John Kennedy
10500 Ellis Avenue
Fountain Valley, CA 92708

Re: City of San Bernardino Municipal Water Department's Comments on NOP

Dear Mr. Kennedy:

The City of San Bernardino Municipal Water Department (SBMWD) appreciates the opportunity to comment on Orange County Water District's (OCWD's) Notice of Preparation (NOP) of an Environmental Impact Report assessing the OCWD Application to Appropriate Santa Ana River Water by Permit.

First, SBMWD incorporates by reference its protest to OCWD's application number 31174, as though set forth in full herein. In responding to the NOP, SBMWD does not waive or retract any of the arguments raised in its protest.

Additionally, SBMWD incorporates by reference the comments made by Michael Fife, attorney representing the Chino Basin Watermaster, at the scoping hearing on the NOP held at OCWD on August 15, 2002. Mr. Fife pointed out, in part, that to the extent the application for appropriation seeks merely to protect OCWD's rights as against other lower basin users and as established in the judgment, the application is consistent with the 1969 judgment entered in Orange County Water District vs. City of Chino, et al., Orange County Superior Court Case No. 117628 (Orange County judgment). However, the State Water Resources Control Board cannot grant additional appropriative rights to the Santa Ana River as against the upper basin users, because the Orange County judgment precludes such an action.

300 North "D" Street, San Bernardino, California 92418 P.O. Box 710, 92402 Phone: (909) 384-5141
FACSIMILE NUMBERS: Administration: (909) 384-5215 Engineering: (909) 384-5532 Customer Service: (909) 384-7211
Corporate Yards: (909) 384-5260 Water Reclamation Plant: (909) 384-5258

The NOP provided reflects a very narrow scope of assessment. OCWD identifies future near- and long-term water diversion and storage facilities intended to "increase recharge and storage capacity in order to accommodate increased river flows." The NOP further states that "[f]uture projects are proposed to provide up to an additional 255,000 afy of diversion capacity, such that in combination with the existing facilities, the District can accommodate up to 505,000 afy of diversion." This represents a near doubling of recharge and storage capacity.

Assessment of "Baseline Condition"

The NOP states that the CEQA environmental impact analysis will include an assessment of existing hydrology within the river to determine "baseline conditions." To the extent that the "baseline conditions" include water that has been recharged historically, but which was not appropriated by permit or granted under the Orange County judgment, the assessment would be fatally flawed. OCWD may not assume a baseline condition of permissible recharge of water that has not been appropriated by permit or granted by way of an adjudication.

Instead, OCWD must assume a baseline condition consistent with the rights granted in the Orange County judgment, or 42,000 acre feet per year. Any flows in excess of this amount have not been granted, and could not have been relied upon reasonably by OCWD.

Assessment of Water Quality Impacts

The NOP indicates that "[t]he PEIR will also assess potential water quality impacts as the water in the river becomes more dependant [sic] on wastewater discharges." In the opinion of the SBMWD, this analysis is critical to an adequate environmental document. If, as the ESA representative stated at the NOP scoping meeting, OCWD anticipates no "significant avoidable impacts," then it is privy to information that has not been provided by OCWD as of yet.

It is the understanding of SBMWD that OCWD has never been subjected to regulatory approvals from either the California Department of Health Services (DHS) or the California Regional Water Quality Control Board (RWQCB) for its recharge activities. Despite the fact that OCWD acknowledges that the increases to base flow in the Santa Ana River have a direct correlation to increases in wastewater discharges (Orange County Water District Master Plan Report, Chapter 5, Section 5-3), the recharge activities undertaken by OCWD have been characterized historically as "unplanned" or "incidental."

Specifically, OCWD has never undertaken to show that its recharge activities have no significant effect on water quality in the basins being recharged by what it admits is primarily tertiary treated wastewater discharges.

Now, OCWD intends to double its recharge and storage capacity, potentially doubling (at least) the impacts to water quality. That OCWD has somehow managed to convince DHS and the RWQCB its recharge activities consist of unplanned, incidental recharge of "natural" waters should not obviate its clear duty to examine the water quality impacts of such activity and, if necessary, to implement mitigation measures.

Although SBMWD believes that OCWD can demonstrate that properly managed recharge of high-quality treated wastewater flows will not adversely affect water quality, that demonstration is absolutely necessary because of the potential for adverse impacts.

Biological Resources

SBMWD is encouraged by the statements in the NOP to the effect that the PEIR will assess the potential impact to existing downstream biological resources. Particular attention should be paid to the listed species, the Santa Ana Sucker. Additionally, and as discussed in SBMWD's protest to OCWD's application, the potential impacts to the Least Bell's Vireo and its habitat should also be analyzed, in light of the modification to the conservation pool elevation (both the stated 505 feet asl to 508 feet asl and the future proposed 514 asl).

If you would like to discuss our concerns, please feel free to contact me at (909) 384-7210, or Bernard Kersey at (909) 384-5091.

Very truly yours,

City of San Bernardino
Municipal Water Department

April Sanchez

for Stacey R. Aldstadt
Deputy General Manager

cc: Bernard C. Kersey
Joel Moskowitz
File

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ERIC L. GARNER
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FILE NO. 24353.00000

September 12, 2002

VIA FACSIMILE AND MAIL

Mr. John Kennedy, Assistant General Manager
Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708

Re: Notice of Preparation of an Environmental Impact Report Assessing the Orange County Water District Application to Appropriate Santa Ana River Water by Permit

Dear Mr. Kennedy:

The City of Riverside ("City") has asked us to review and comment on the above-referenced Notice of Preparation ("NOP"). As you know, the City has also filed an application to appropriate water from the Santa Ana River. We appreciate the opportunity to raise the following issues regarding the above-referenced NOP.

As an initial matter, the City believes that Orange County Water District ("OCWD") has not adequately defined the scope of the proposed Project. The NOP states that OCWD's application to appropriate water from the Santa Ana River was submitted (1) to confirm OCWD's rights to the 42,000 afy base flow plus any additional storm flows reaching Prado Dam in conformance with the 1969 Judgment; and (2) to establish the rights to base flows in excess of the 42,000 afy that may reach Prado Dam. (NOP at 3.) It is not clear, based on the NOP, the extent to which OCWD seeks to establish additional rights beyond those provided in the 1969 Judgment, and whether any such rights would be consistent with the terms and conditions of the Judgment. As you know, the 1969 Judgment is binding on all parties involved and cannot be altered by the State Water Resources Control Board ("SWRCB").[1] Regardless of whether the 1969 Judgment "allocate[d]

[1] Indeed, in WR 2000-12, the SWRCB noted that parties to the proceedings before the SWRCB (including OCWD) "submitted a Memorandum of Understanding with the Inland Empire Utilities Association in which they acknowledge that they are bound by the provisions of (continued...)

water rights within the watershed in a manner recognized by the SWRCB" (NOP at 3), the SWRCB, as well as OCWD, are limited by the terms of the Judgment.

Among other things, the 1969 Judgment provides that "[i]n the aggregate, water users and other entities in Lower Area have rights, as against all Upper Area claimants, to receive an average annual supply of 42,000 acre feet of Base Flow at Prado, together with the right to all Storm Flow reaching Prado Reservoir." (April 17, 1969 Judgment at 10.) The 1969 Judgment also provides that "[w]ater users and other entities in Upper Area have rights in the aggregate, as against all Lower Area claimants, to divert, pump, extract, conserve, store and use all surface and ground water supplies originating within the Upper Area without interference or restraint by Lower Area claimants, so long as Lower Area receives the water to which it is entitled under this Judgment . . . ." (Ibid.) Thus, pursuant to the 1969 Judgment, upstream users, including the City, have the right to pump or divert water for their reasonable and beneficial uses without any interference or restraint by Lower Area claimants, such as OCWD, as long as OCWD receives 42,000 afy of base flow.

When the EIR is prepared, the Project description, as well as the description of the physical environmental conditions in the vicinity of the Project, should reflect the facts that (1) the SWRCB accepted OCWD's application to determine OCWD's rights with respect to other users in the lower basin; (2) OCWD's rights as against upstream users will remain unchanged; and (3) the Project as a whole is designed to be consistent with the terms and conditions of the 1969 Judgment. The Project description and the description of the environmental setting must be accurate in order for OCWD's analysis of the environmental effects of the proposed Project to have any meaning.

In addition, based on the NOP, it appears that much of OCWD's environmental analysis is focused on the construction and operation of proposed near-term and long-term projects to divert, store and/or recharge additional surface water to the groundwater basin. (See NOP at 11.) To the extent that OCWD seeks to establish the right to divert additional water reaching the Prado Dam, OCWD's environmental analysis must also include an assessment of the environmental impacts such diversions will have. In particular, the EIR should address the potential growth-inducing impacts, the potential impacts on the water supply and biological resources along the Santa Ana River, and the potential cumulative impacts of the proposed diversions.

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[1](...continued)
the 1969 *Orange County Water District* judgment and that any additional water right which they obtain from the SWRCB must be consistent with the restrictions imposed by that judgment."

Thank you for this opportunity to provide comments on the Notice of Preparation for the proposed Project. Please feel free to contact me at (909) 686-1450 if you have any questions about the City's position.

Sincerely,

Eric L. Garner
Jill N. Willis
of BEST BEST & KRIEGER LLP
for the City of Riverside

ELG/JNW/tgl

cc: Susan D. Wilson, Deputy City Attorney
City of Riverside

GRAY DAVIS, *Governor*

STATE OF CALIFORNIA - THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME
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San Diego, CA 92123
(858) 467-4201

Flex your Power

September 12, 2002

Mr. John Kennedy
Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708

Notice of Preparation (NOP) of a draft Program Environmental Impact Report (PEIR) Assessing the Orange County Water District (OCWD) Application to Appropriate Santa Ana River Water by Permit

Dear Mr. Kennedy:

The Department of Fish and Game (Department) appreciates this opportunity to comment on the above-referenced project with regards to impacts to biological resources. The proposed project includes near-term and long-term projects to expand surface water diversion, storage and groundwater recharge. The projects are located at multiple sites within the Santa Ana River watershed, in Orange County, California.

The Department is responding as a Trustee Agency for fish and wildlife resources [Fish and Game Code sections 711.7 and 1802 and the California Environmental Quality Act Guidelines (CEQA) section 15386] and as a Responsible Agency regarding any discretionary actions (CEQA Guidelines section 15381), such as a Lake or Streambed Alteration Agreement or an Incidental Take Permit, pursuant to the California Endangered Species Act (CESA).

A review of records from the California Natural Diversity Database and other area resources indicate that the following sensitive species and habitat types occur in the project vicinity and may be affected by the proposed project: <u>Invertebrates:</u> San Diego fairy shrimp; <u>Fishes:</u> Santa Ana sucker, Santa Ana speckled dace and arroyo chub; <u>Amphibians:</u> arroyo toad, western spadefoot toad, Pacific slender salamander, California toad, California tree frog and Pacific tree frog; <u>Reptiles:</u> southwestern pond turtle, coastal western whiptail, orange-throated whiptail, San Diego horned lizard, Pacific rattlesnake, western fence lizard, side-blotched lizard, western skink, San Diego gopher snake, common kingsnake, red racer, striped racer, and two-striped garter snake; <u>Birds:</u> western yellow-billed cuckoo, least Bell's vireo, southwestern willow flycatcher, California gnatcatcher, Belding's savannah sparrow, California least tern, snowy plover, song sparrow, white-crowned sparrow, house wren, Bewick's wren, spotted towhee, common yellowthroat, house wren, downy woodpecker, bushtit, tri-colored blackbird, black phoebe, yellow-rumped warbler, orange-crowned warbler, yellow-breasted chat, house finch, black-headed grosbeak, ruby-crowned kinglet, cliff swallows, rough-winged swallows, white-faced ibis, red-shouldered hawk, white-tailed kite, Swainson's hawk, ferruginous hawk, red-tailed hawk, bald eagle, American kestrel, owls, and hummingbirds; Mammals: bobcat, desert cottontail rabbit, black-tailed jackrabbit, raccoon, opossum, striped skunk, coyote, California ground squirrel, ring-tail cat, Botta pocket gopher, broad-handed mole, mice (southern grasshopper, western harvest, deer, and Los Angeles little pocket mouse), and several species of bats; Plants: Santa Ana River woollystar, Braunton's milk-vetch, many-stemmed dudleya, intermediate mariposa lily, southern tar plant, and prostrate navarretia; and all other fish and wildlife resources, including that riparian vegetation (i.e. cottonwood, willows, mulefat, western sycamore, and coast live oak) which provides habitat for such species, in the area. The Department recommends that the potential direct and indirect impacts to the above-mentioned species be analyzed in the draft PEIR.

The document should address the following questions and comments:

- What safe guards and guarantees does OCWD propose to ensure adequate water for fish and wildlife resources including, but not limited to, Santa Ana sucker, least Bell's vireo, southwestern willow flycatcher, pond turtle, etc.

- The locations of the diversions are not identified in the document. The draft PEIR should clearly identify where the points of diversion are located and the amount of water that will be discharged at each point.

- Identify flow amounts – current and future, and potential species impacts to resources within the watershed.

- Will separate projects such as the water conservation plan behind Prado be fully analyzed in this CEQA document or separately? Any water conservation behind Prado will likely result in the take of least Bell's vireo and southwestern willow flycatcher through flooding, and OCWD will need to consult with both the U.S. Fish and Wildlife Service and the Department for incidental take permits.

- It is not appropriate to only analyze the baseline using amounts of water that are currently being diverted beyond permit levels. Evaluate the impacts to resources based on the amount of water that the existing permit specifies, the amount of water actually currently being diverted, and proposed future diversion amounts.

- There are several pending appropriations for the Santa Ana River. The cumulative effects section needs to specifically address these applications, and the potential impacts that each of these applications present to the Santa Ana River resources. It is necessary and important for the PEIR to fully identify and analyze those project effects in addition to this project's effects.

- Fig. 3 is inaccurately labeled. It actually shows future projects.

This particular project has the potential to have significant environmental impacts on sensitive fauna resources, including State and/or Federally listed threatened or endangered species. Therefore, critical aspects of the draft PEIR should include an alternatives analysis which focuses on environmental resources and in-kind mitigation measures for impacts identified as significant. To enable Department staff to adequately review and comment on the proposed project, we suggest that updated biological studies be conducted prior to any environmental or discretionary approvals. The following information should be included in any focused biological report or supplemental environmental report:

1. A complete assessment of the flora and fauna within and adjacent to the project area, with particular emphasis upon identifying endangered, threatened, and sensitive species and sensitive habitats.

   a. Conduct an updated (within the last 2 years) general biological study of the project area to determine if any sensitive species or habitat (including those mentioned above) may be potentially impacted by the proposed project. A complete assessment of sensitive fish, wildlife, reptile, and amphibian species should be included in the draft PEIR. Seasonal variations in use of the project area should also be addressed;

   b. If appropriate habitat for any listed species occurs on the site, have a qualified biologist conduct focused surveys according to U.S. Fish and Wildlife Service (USFWS) and/or Department protocol;

   c. Have a qualified botanist conduct a focused rare plant survey during the appropriate time of year following USFWS and/or Department protocols;

   d. The Department's California Natural Diversity Data Base in Sacramento should be contacted at (916) 327-5960 to obtain current information on any previously reported sensitive species and habitat, including Significant Natural Areas identified under Chapter 12 of the Fish and Game Code.

   e. If any listed species will potentially be impacted by the proposed project, consultation with the Department and/or the USFWS will be required to establish appropriate avoidance, minimization, and mitigation measures. An incidental take permit may be required pursuant to Fish and Game Code Section 2080 *et seq* and/or Section 7 or 10 of the Federal Endangered Species Act (ESA). Early consultation with the Department is recommended, since modification of the proposed project may be required to avoid or reduce impacts to listed species. Please refer to Item 4 below for more detailed information regarding compliance with the California Endangered Species Act.

   f. The Department requests that impacts to State- and Federally-listed species and potential avoidance, alternative and mitigation measures be addressed in the CEQA document and not solely in subsequent negotiations between the applicant and the agencies.

2. A thorough discussion of direct, indirect, and cumulative impacts expected to adversely affect biological resources, with specific measures to offset such impacts.

   a. CEQA Guidelines, 15125(a), direct that knowledge of the regional setting is critical to an assessment of environmental impacts and that special emphasis should be placed on resources that are rare or unique to the region.

b. Project impacts should be analyzed relative to their effects on off-site habitats. Specifically, this should include nearby river, streams, or lakes located downstream of the project, public lands, open space, adjacent natural habitats, and riparian ecosystems. Impacts to and maintenance of wildlife corridor/movement areas, including access to undisturbed habitat in adjacent areas, should be fully evaluated and provided.

c. A cumulative effects analysis should be developed as described under CEQA Guidelines, 15130. General and specific plans, as well as past, present, and anticipated future projects, should be analyzed relative to their impacts on similar plant communities and wildlife habitats.

d. The DEIR should include an analysis of the effect that the project may have on completion and implementation of regional and/or subregional conservation programs. Under 2800-2840 of the Fish and Game Code, the Department, through the Natural Communities Conservation Planning (NCCP) program is coordinating with local jurisdictions, landowners, and the Federal Government to preserve local and regional biological diversity. Coastal sage scrub is the first natural community to be planned for under the NCCP program. The Department recommends that the lead agency ensure that the development of this and other proposed projects do not preclude long-term preserve planning options and that projects conform to other requirements of the NCCP program. Jurisdictions participating in the NCCP should assess specific projects for consistency with the NCCP Conservation Guidelines.

3. A range of alternatives should be analyzed to ensure that alternatives to the proposed project are fully considered and evaluated. A range of alternatives which avoid or otherwise minimize impacts to sensitive biological resources should be included. Specific alternative locations should also be evaluated in areas with lower resource sensitivity where appropriate.

a. Mitigation measures for project impacts to sensitive plants, animals, and habitats should emphasize evaluation and selection of alternatives which avoid or otherwise minimize project impacts. Off-site compensation for unavoidable impacts through acquisition and protection of high-quality habitat elsewhere should be addressed.

b. The Department considers Rare Natural Communities as threatened habitats having both regional and local significance. Thus, these communities should be fully avoided and otherwise protected from project-related impacts.

c. The Department generally does not support the use of relocation, salvage, and/or transplantation as mitigation for impacts to rare, threatened, or endangered species. Department studies have shown that these efforts are experimental in nature and largely unsuccessful.

d. A California Endangered Species Act (CESA) Incidental Take Permit must be obtained, if the project has the potential to result in "take" of species of plants or animals listed under CESA, either during construction or over the life of the project. CESA Permits are issued to conserve, protect, enhance, and restore State-listed threatened or endangered species and their habitats. Early consultation is encouraged, as significant modification to the proposed project and mitigation measures may be required in order to obtain a CESA Permit. Revisions to the Fish and Game Code, effective January 1998, require that the Department issue a separate CEQA document for the issuance of a CESA permit unless the project CEQA document addresses all project impacts to listed species and specifies a mitigation monitoring and reporting program that will meet the requirements of a CESA permit. For these reasons, the Department recommends including the following information:

a. Biological mitigation monitoring and reporting proposals should be of sufficient detail and resolution to satisfy the requirements for a CESA Permit.

b. A Department-approved Mitigation Agreement and Mitigation Plan are required for plants listed as rare under the Native Plant Protection Act.

5. Under Section 1600 *et seq* of the Fish and Game Code, the Department requires the project applicant to notify the Department of any activity that will divert, obstruct or change the natural flow or the bed, channel, or bank (which includes associated riparian resources) of a river, stream or lake, or use material from a streambed prior to the applicant's commencement of the activity. Streams include, but are not limited to, intermittent and ephemeral streams, rivers, creeks, dry washes, sloughs, blue-line streams, and watercourses with subsurface flow. The Department's issuance of a Lake and Streambed Alteration Agreement for a project that is subject to CEQA will require CEQA compliance actions by the Department as a responsible agency. The Department, as a responsible agency under CEQA, may consider the local jurisdiction's (lead agency) Negative Declaration or EIR for the project. However, if the CEQA document does not fully identify potential impacts to lakes, streams, and associated resources (including, but not limited to, riparian and alluvial fan sage scrub habitat) and provide adequate avoidance, mitigation, monitoring and reporting commitments, additional CEQA documentation will be required prior to execution (signing) of the Streambed Alteration Agreement. In order to avoid delays or repetition of the CEQA process, potential impacts to a lake or stream, as well as avoidance and mitigation measures need to be discussed within this CEQA document. The Department recommends the following measures to avoid subsequent CEQA documentation and project delays:

a. Incorporate all information regarding impacts to lakes, streams and associated habitat within the draft PEIR. Information that needs to be included within this document includes: (1) a delineation pursuant to the U. S. Fish and Wildlife Service wetland definition[1] adopted by the Department of lakes, streams, and associated habitat that will be directly or indirectly impacted by the proposed project; (2) details on the biological resources (flora and fauna) associated with the lakes and/or streams; (3) identification of the presence or absence of sensitive plants, animals, or natural communities; (4) a discussion of environmental alternatives; (5) a discussion of avoidance measures to reduce project impacts; and (6) a discussion of potential mitigation measures required to reduce the project impacts to a level of insignificance. The applicant and lead agency should keep in mind that the State also has a policy of no net loss of wetlands.

[1] jurisdictional wetlands delineation should be conduct pursuant to Cowardin, Lewis M., et al. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service.

b. Include in the PEIR a discussion of potential adverse impacts from any increased inundation and/or decreased surface flows, on streams and watercourses and associated resources within the watershed of the proposed project. Mitigation measures proposed to alleviate such impacts must also be included.

c. The Department recommends that the project applicant and/or lead agency consult with the Department to discuss potential project impacts and avoidance and mitigation measures. Early consultation with the Department is recommended, since modification of the proposed project may be required to avoid or reduce impacts to fish and wildlife resources.

Thank you for this opportunity to comment. Questions regarding this letter and further coordination on these issues should be directed to Terri Dickerson, Staff Environmental Scientist, at (949) 363-7538.

Sincerely,

for Bill Tippets
Environmental Program Manager
South Coast Region

cc: State Clearinghouse, Sacramento
C. F. Raysbrook, Regional Manager, R5
Terri Dickerson, Staff Environmental Scientist, R5-HCP
Don Chadwick, Environmental Scientist Supervisor, R5-HCP
Laura Crum, Environmental Scientist, R5-HCP
Terry Foreman, R6-Wildlife and Inland Fisheries
Leslie MacNair, Staff Environmental Scientist, R6-HCP
Nancee Murray, Staff Legal Counsel, HQ
Lucy Caskey, USFWS

Responses to Notice of Preparation of a Draft Environmental Impact Report assessing the Orange County Water District Application to Appropriate Santa Ana River Water by Permit (continued)

United States Fish and Wildlife Services (September 12th, 2002)

- Site specific locations of proposed projects were not included in the NOP, while the potential impacts of the project could impact endangered species in the Santa Ana watershed.
- Fish and Wildlife is particularly concerned with removal of water from riparian habitats which host sensitive species. A full summary and evaluation of the potential impacts of water withdrawal on species should be included in the EIR.
- Fish and Wildlife suggest that the following are included in the EIR:
    - A complete need and description of the project.
    - Specific acreages and descriptions of the sensitive habitats to be affected.
    - A description of the biological resources associated with each habitat type.
    - Assessment of direct, indirect, and cumulative impacts to fish and wildlife.
    - Specific plans to avoid, minimize, and fully offset impacts.
    - Address potential impacts to wetlands and federal water bodies.
    - Address potential adverse impacts from changing surface flows.
    - Analysis of growth and development from project impacts.
    - Identification of methods to avoid discharge and disposal of toxic substances into water bodies.
    - Impacts to sensitive species from noise, lighting, pollution, etc., and mitigation to avoid these impacts.
- Raising the conservation pool at Prado requires reinitiation with the Corps.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
2730 Loker Avenue West
Carlsbad, California 92008

In Reply Refer To:
FWS-OR-3094.1

SEP 12 2002

Mr. John C. Kennedy
Assistant General Manager
Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708

Re: Notice of Preparation (NOP) of a Draft Programmatic Environmental Impact Report (DPEIR) Assessing the Orange County Water District Application to Appropriate Santa Ana River Water By Permit, Orange, Riverside and San Bernardino Counties, California

Dear Mr. Kennedy:

We have reviewed the above referenced NOP which we received on August 2, 2002. The proposed project involves the application for diversion, when available, of water from the Santa Ana River. Such diversions will be made possible by near-term projects that include the addition of percolation basin cleaning devices, additional recharge facilities, and modifying the Prado Dam to increase the conservation pool from an elevation of 505 feet above sea level (asl) to 508 feet asl. Long-term projects to increase diversion capacity include raising Prado Dam an additional six feet to an elevation of 514 feet asl, constructing more recharge facilities, and providing for off-river storage in reservoirs. Site specific locations of proposed projects were not included in the NOP, however, diversions and construction of structures in or adjacent to the Santa Ana River have the potential to affect the federally endangered least Bell's vireo (*Vireo bellii pusillus*), southwestern willow flycatcher (*Empidonax traillii extimus*), San Bernardino kangaroo rat (*Dipodomys merriami parvus*) and its designated critical habitat, and the federally threatened Santa Ana sucker (*Catostomus santaanae*), and candidate western yellow-billed cuckoo (*Coccyzus americanus*).

We are particularly concerned about the effects of additional water removal on the existing riparian habitats and streambed ecosystem and federally listed and other sensitive species dependent upon these habitats. For example, water diversions have divided stream habitat in the past, fragmenting otherwise contiguous populations of the Santa Ana sucker. Additionally, we are concerned about the availability of water for fish and wildlife resources. Therefore, we recommend that the DPEIR include a full summary and evaluation of the potential impacts of water withdrawal on the federally protected species that could potentially be affected by project implementation.

To facilitate the evaluation of the proposed project on fish and wildlife resources, including federally listed species, we request that the DPEIR contain the following specific information:

1. A complete description of the purpose and need of the proposed project, including all practicable alternatives that have been considered to reduce project impacts to federally listed and other sensitive species and vegetation types (e.g., riparian). Project alternatives should include development proposals with reduced footprints that would further minimize and avoid impacts to federally listed species onsite.

2. Specific acreages and descriptions of the types of sensitive habitats that may be affected by the proposed project or project alternatives. Maps and tables should be included to summarize such information.

3. A description of the biological resources associated with each habitat type. These descriptions should include both qualitative and quantitative assessments of the resources present and potentially occurring on the proposed project site and alternatives. The description should also include complete species lists for all sensitive/rare biological resources onsite. We recommend that protocol or focused surveys be conducted prior to the issuance of the DPEIR to adequately assess impacts to Federal and State-listed species and other natural resources.

4. An assessment of direct, indirect, and cumulative impacts from the proposed project to fish and wildlife species and associated habitats. Direct impacts are the immediate effects of the project on the species or its habitat, and include the effects of interrelated and interdependent actions that would not occur but for the proposed project. All facets of the project (e.g., construction, implementation, operation, night lighting, etc.) should be included in this assessment. Indirect impacts are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. These impacts may occur outside of the area directly affected by the proposed project. We recommend that you make your cumulative impacts analysis broad enough to include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the area affected by your project.

5. Specific plans should be developed to avoid, minimize, and fully offset project-related impacts, including proposals for mitigating the cumulative impacts of direct and indirect habitat loss, degradation, or modification. These plans should be prepared by persons with specific expertise on southern California wildlife, native plants, and ecosystems. Each plan should include a detailed monitoring program with provisions for assessing the success of restoration efforts and contingency plans to be implemented if initial efforts are unsuccessful. The plan should also discuss funding assurances and responsible parties that will guarantee the successful implementation of monitoring programs and ensure the protection in perpetuity of conservation sites. Issues that should be addressed include restrictions on vehicle and people access, proposed land dedications, monitoring and management programs, control of illegal dumping, and restrictions on lighting near the conservation areas.

6. An assessment of potential impacts to wetlands and jurisdictional waters of the United States. Section 404 of the Clean Water Act prohibits the unauthorized discharge of dredged or fill material into such waters, including wetlands. This section also provides that the

Army Corps of Engineers (Corps) may issue permits for discharges of dredged or fill material into jurisdictional waters and wetlands. Potential areas of Corps jurisdiction should be evaluated and wetlands should be delineated using the methodology set forth in the Corps' Wetland Delineation Manual (Environmental Laboratory, 1987). The DPEIR should disclose all impacts to jurisdictional waters and wetlands, and propose measures to be taken to avoid and minimize impacts, and mitigate unavoidable impacts. If it is determined that wetlands or jurisdictional waters of the United States will be affected by the proposed project, then a section 404 permit from the Corps and/or a 1600 permit from the California Department of Fish and Game may be required.

7. Include in the DPEIR a discussion of potential adverse impacts from any increased inundation and/or decreased surface flows on streams and watercourses and associated resources within the watershed of the proposed project.

8. An analysis of how implementation of water diversion, storage and groundwater recharge plans will facilitate additional development and growth in nearby areas, and information about how this project will tie in specifically with adjacent planned developments.

9. Identification of methods to be employed to prevent the discharge and disposal of toxic and/or caustic substances, including oil and gasoline, on the project site especially during construction.

10. An analysis of impacts to listed and other sensitive species from expected noise, pollution, night lighting, erosion, sedimentation, roads, and measures to be taken to minimize any of these adverse impacts.

The proposed raising of the conservation pool at Prado Dam would require reinitiation of consultation with the Corps on the biological opinion that was issued on July 1, 2002, regarding water conservation within Prado Basin (FWS-WRIV-2102.3).

We appreciate the opportunity to comment on the referenced NOP. We are available to work with project proponent(s) to avoid, minimize, and/or offset impacts to federally listed and sensitive species and their habitats. If you have any questions or comments regarding this letter, please contact Lucy Caskey of my staff at (760) 431-9440.

Sincerely,

Jill Terp
for

Karen A. Evans
Assistant Field Supervisor

cc: Jeff Drongesen (CDFG, Chino Hills)
Alex Watt (Corps, Los Angeles District)

Appendix C
History of CEQA Review of OCWD Recharge Projects on the SAR

APPENDIX C

HISTORY OF CEQA REVIEW OF ORANGE COUNTY WATER DISTRICT RECHARGE PROJECTS ON THE SAR

INTRODUCTION

This appendix summarizes the results of environmental assessments already certified pursuant to the California Environmental Quality Act (CEQA) by the Orange County Water District (OCWD) for Santa Ana River (SAR) water recharge facilities. This summary provides information on identified impacts and mitigation commitments implemented by OCWD for facilities currently used to recharge SAR water. These facilities will continue to be used as SAR water diversions increase. **Table C-1** lists OCWD's recharge facilities and identifies the dates of the corresponding CEQA documents prepared for each facility. The following sections describe each facility and summarize the environmental assessments. Copies of each CEQA document are included in **Appendix L**.

EXISTING FACILITIES

PRE-CEQA FACILITIES

OCWD has engaged in water conservation and groundwater recharge activities on the SAR since 1933. CEQA was enacted in 1970. Consequently, many of OCWD's existing recharge facilities including diversion structures, in-stream recharge activities, and many off-channel spreading basins such as Conrock Basin, Huckleberry Pond, Anaheim Lake, Miller Basin, and Warner Basin were approved and in operation prior to the enactment of CEQA in 1970. **Figure C-1** provides successive historical photographs of the SAR at the OCWD spreading area in approximately fifteen year increments. In the 1970 photograph, in-stream earthen levees and the off-river recharge basins are clearly evident. The properties that today are occupied by Anaheim Lake, Miller Basin, and Warner Basin all were purchased by 1966, with projects initiated, in progress, or completed between 1968 and 1970. All three recharge basins were completed prior to 1972.[1] No analysis pursuant to CEQA has been conducted for these facilities.

IN-STREAM LEVEES

In 1972, OCWD prepared an EIR for the implementation of a joint OCWD/Orange County Flood Control District (OCFCD) project to construct rock revetted levees in the SAR between

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1 OCFCD, 1972.

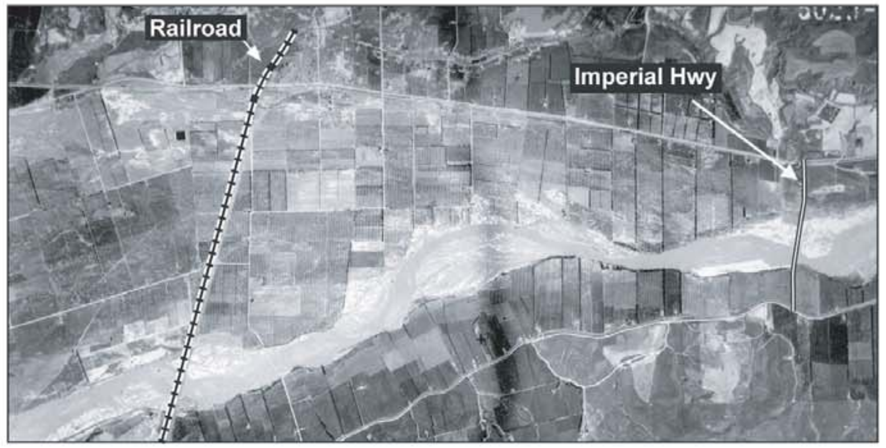
TABLE C-1
SUMMARY OF OCWD SAR RECHARGE FACILITY CERTIFIED CEQA DOCUMENTS

Property, Facility, or Project	Acquired or In Use	CEQA/NEPA document	CEQA Date
SAR channel from Imperial Hwy to Ball Road	1933	NA	
Anaheim Lake, Miller Basin, Conrock Basin, Huckleberry Pond; Pipeline; and Diversion Structures	1957	NA	
Warner Basin and Diversion Structure	1966	NA	
In-stream rock levees and spreading operations	1972	EIR for Santa Ana River between Ball Road and Imperial Highway	1972
Kraemer Basin and Pipeline	1976	EIR for OCWD's Proposed Acquisition of Land for Development of Additional Off-channel Water Spreading Grounds	1975
Burris Pit and Diversion Structure	1976	EIR for Burris Pit Water Conservation Facility	1976
Santiago Pits: Bond, Blue Diamond, Smith Pits; Diversion Structure; and Pipeline	1983	Initial Study for Santiago Creek Replenishment Program Pump Station and Pipeline	1986
Prado Dam Water Control Manual	1992	EIS for Prado Dam Operation for Water Conservation	1992
SAR Rubber Dam and Diversion Structure	1991	Negative Declaration	1991
Santiago Creek Recharge Turnout	2003	Negative Declaration	2000
Santiago Pits Pump Station	2003	Negative Declaration	2001
River Trails Recharge Basin	Not yet constructed	Mitigated Negative Declaration	2001
Re-operation of Prado Dam to increase conservation pool	Not yet approved	EIS/EIR Prado Basin Water Conservation Feasibility Study	Draft EIS published 2004.

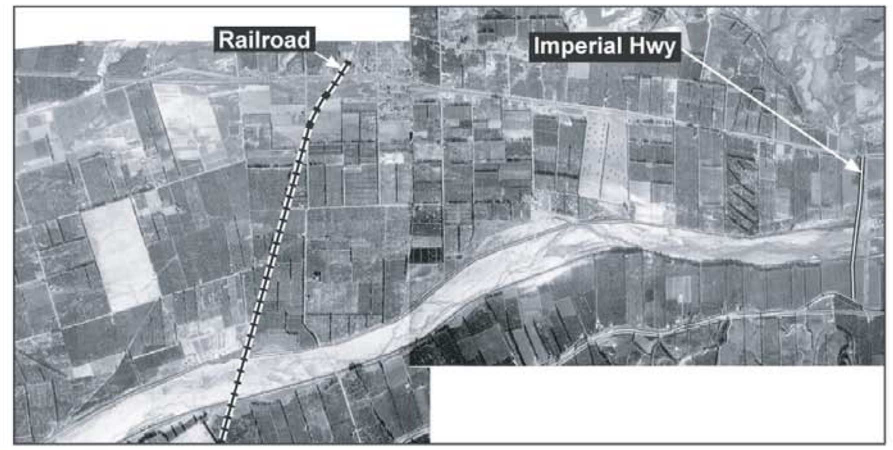
NA = Not Applicable, Pre-CEQA

Imperial Highway and Ball Road.[2] This document is provided in **Appendix L-1**. The rock levees were part of an improvement plan to provide flood control and facilitate groundwater recharge along the SAR. OCWD's in-stream temporary earthen berms were described and evaluated in this EIR due to the simultaneous project objectives of flood control and groundwater replenishment. The EIR also described and evaluated the recharge basins at the edge of the river (Warner Basin, Huckleberry Pond, and Conrock Basin).

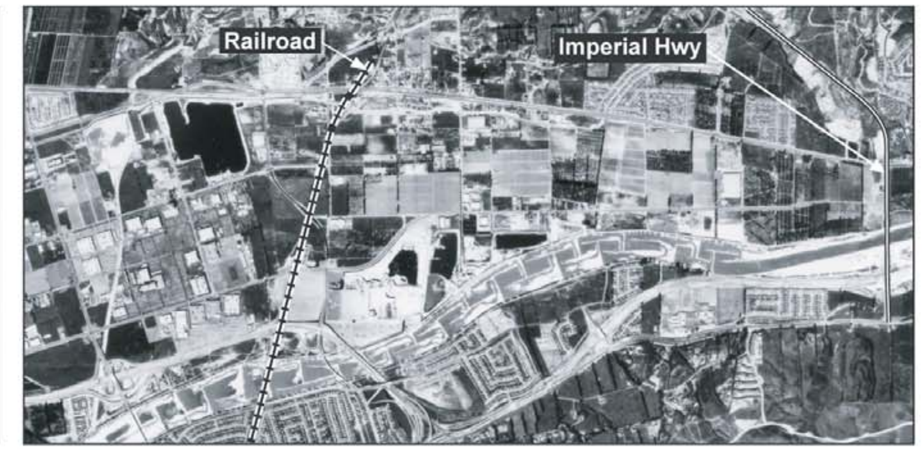
[2] OCFCD. 1972. Santa Ana River between Ball Road and Imperial Highway. Environmental Impact Report, May 1972.



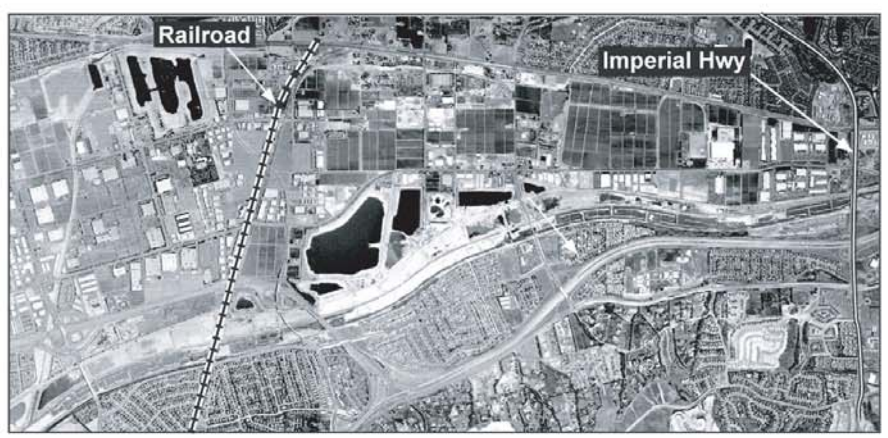
1938
No substantial side levees or in-river improvements visible.



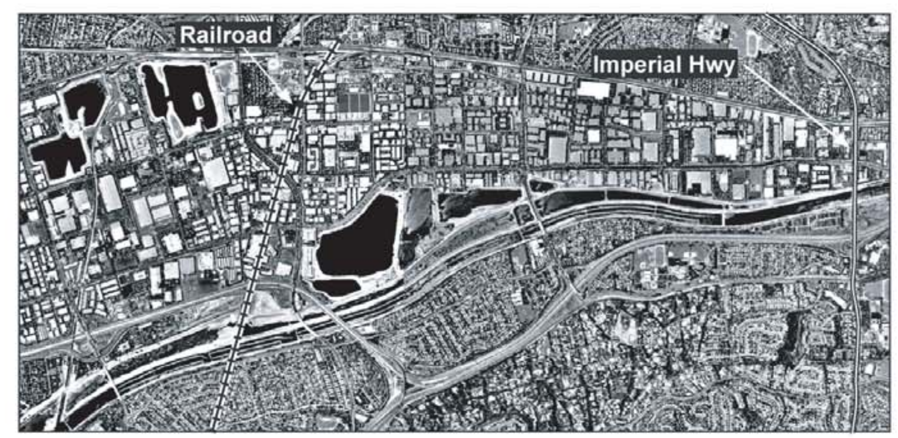
1953
Side levees visible. Some in-river grading may be occurring.



1970
Improved channel levees. In-river levees visible to slow base flow. Off-river recharge basins (Conrock Basin and Huckberry Pond) visible as either operating or in construction.



1977
Off-river recharge system paralleling main river channel is apparent. River channel is groomed with "T and L" levees. Miller Basin, Anaheim Lake, Warner Basin, Conrock Basin, Huckberry Pond are clearly visible.



2002
Similar to existing condition with in-river and off-river recharge facilities. Well defined side levees. Well defined in-river "T and L" levees.

SOURCE: Water Resources Institute at Cal State San Bernardino Data Resources Inc., 1953, 1977; Continental Aerial Inc.,1970; OCWD, 2002

Figure C-1
Historical Aerials

The EIR describes OCWD's spreading operations including the use of erodible sand embankments to form holding ponds in the river channel to facilitate infiltration, and the use of earthen dikes that extend from flood control levees to divert water into spreading basins adjacent to the river channel. The EIR identified short-term and long-term impacts of levee construction and recharge operations. Impacts included increases in dust and noise, disruptions to water fowl and wading birds, disruptions to native vegetation communities, and increases in water turbidity during construction. The EIR suggested mitigating these impacts by enforcing local laws and ordinances pertaining to noise and planting trees and shrubs as noise and dust screens.

Biological surveys of the flora and fauna were conducted between Imperial Highway and Ball Road in 1972.[3,4] No plant, amphibian, reptile, fish, or mammal species that are considered sensitive species at the federal or state level today were found in the project area at that time. However, two bird species that *are* federal species of concern today were found, Belding's savannah sparrow and tricolored blackbird. The sparrow is considered endangered and the blackbird is considered a species of special concern in the State of California, as well (see **Table 4.3-2** in the Biological Resources section).

Project alternatives were considered, and the preferred project was selected to minimize the deposition of sediment within the river channel while maximizing flood protection and groundwater recharge. A no-project alternative was rejected due to the potential for damages and endangerment of public safety from floods and the necessity of replenishing the groundwater aquifer for municipal water supply. Relying on imported water to satisfy potable water demand in the future was found to be a significant impact of the no project alternative. Alternatives to recharging groundwater with spreading facilities were evaluated, such as using injection wells, imported water, or constructing wastewater reclamation plants, but were determined to be more expensive than the spreading project. The EIR suggested conducting an economic study of inflatable rubber dams for use as diversion structures in the SAR. Inflatable dams would capture storm flows when sand embankments were washed out.

This EIR was written shortly after the passage of CEQA and, lacking the structure of today's impact analyses, did not contain many mitigation suggestions. Overall, the EIR determined the project would have short-term and long-term net beneficial impacts when considering public safety, water supply, and recreational opportunities. **Table C-2** details the impacts and mitigation measures outlined in the EIR.

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[3] *Ibid.*

[4] Gordon Marsh and Kenneth Abbott. 1972. Plants and Animals of the Santa Ana River in Orange County.

TABLE C-2
SUMMARY OF IMPACTS AND MITIGATION OF CEQA REVIEW DOCUMENTATION OF ORANGE COUNTY WATER DISTRICT PROJECTS ON THE SAR

Impacts	Mitigation
Santa Ana River between Ball Road and Imperial Highway EIR (OCFCD, 1972)	
Unavoidable Adverse	
1. Adjustment of residents along the riverbank to increased activity	Theft, vandalism, noise, and street traffic could be minimized by enforcement of local laws, regulations, and ordinances controlling the operation of the recreational features.
2. Possible depreciation of property value	
3. Theft and vandalism may increase	
4. Once open to public use, the regional and local street traffic may cause “considerable problems”	
5. Muddy or dry lakes during drainage cycles would not be aesthetically appealing nor contribute significantly to recreational use	Use of trees and shrubs for screening to form a dust, sound, and sight barrier will aid in dust abatement and aesthetics. Dust can be further alleviated by use of water trucks.
6. Fugitive dust would be a problem during the construction and operational phases	
7. Slow-moving vehicles going to recreational areas and construction equipment would increase air pollution	None. These are considered temporary impacts.
8. Noise pollution would occur during construction phase	
9. Water quality in SAR and adjacent waters would be affected during construction by the increased turbidity	
10. Noise pollution would occur during construction phase	
OCWD’s Proposed Acquisition of Land for Development of Additional Off-Channel Water Spreading Grounds DEIR (OCWD, 1975)	
Purchase of the Land	
1. Purchase of the Kraemer Basin property would result in loss of 37 acres of agricultural land	OCWD proposes to continue the present use of the site for 5 to 10 years, during which the land will remain productive and jobs will be maintained. The 5 to 10 year period will allow residents to relocate and workers to find new jobs.
2. Cause the relocation of two families who presently reside on the property	
3. Loss of 90,000 hours (or 45 man-years) of employment growing strawberries in the parcel	
4. Loss of approximately $24,000 annually in property taxes to the city and county	OCWD will “attempt” to negotiate purchase in a manner that will assure that property taxes will continue to be paid during the next 5 years.
5. Eventual loss of the Anaheim Eucalyptus Well, which is used for surrounding agricultural uses (but would continue to be used for landscaping)	None. This impact cannot be avoided or mitigated.
Future Project Consideration	
6. Construction related noise, dust, and traffic impacts generated during construction of the basin	As the pit is deepened, the noise impacts will “decrease in importance.” “Precautions” should be taken to avoid raising dust when the Santa Ana winds occur. Truck haul routes should be routed to cause minimal disruption of existing traffic patterns.
7. Reduction of sand transport to ocean beaches	None. This impact cannot be avoided or mitigated.

TABLE C-2
SUMMARY OF IMPACTS AND MITIGATION OF CEQA REVIEW DOCUMENTATION OF ORANGE COUNTY WATER DISTRICT PROJECTS ON THE SAR

Impacts	Mitigation
8. Could cause increase in midge flies	Construction of deep basins rather than shallow ones could help curb midge fly counts.
9. Removal of topsoil, sand, and gravel	Reuse removed topsoil at another location in Orange County.
10. Reduce energy consumption by reducing need for imported Colorado River water or State Project water, which requires energy to actively pump into Orange County	None. This is a beneficial impact.
11. Contribute to the maintenance of an adequate Orange County groundwater basin water supply	
Burris Pit Water Conservation Facility FEIR (OCWD, 1976)	
General Short-Term	
1. Dust may be created during excavation and construction	The potential dust impacts can be avoided by employment of dust control measures such as regular watering of construction areas.
2. Excavation and construction activities would increase noise levels	Equipment should be muffled and construction activities would be limited to daylight hours, would utilize noise barriers (i.e., landscaped berm).
3. Would increase litter and human waste due to construction workers	Provide sanitary facilities and litter containers for workers.
4. Would create safety hazards	Excavation and construction activities should be conducted in conformance with approved safety procedures and closed to general public during such activities.
5. Would create material for disposal	Excess excavated materials would be sold through a contract for the removal of sand and gravel or stockpiled at site for later use.
6. Would displace wildlife	None. Cannot be avoided or mitigated, but the site is not a “key” area for any wildlife species and no rare or endangered species were found on the site.
7. Would curtail some spreading operations	None. This impact cannot be avoided or mitigated.
8. Would increase air emissions	Use proper wetting procedures to decrease the generation and circulation of dust.
9. Would increase local traffic	Adequate traffic control and warning signs should be used at the appropriate locations.
General Long-Term	
10. The creation of the lake and inlet facilities may pose a potential safety hazard	Design of the final recreational facilities and slopes will provide adequate safety measures, along with fencing.
11. Development of a recreational facility would increase local noise levels	Noise level increases at the recreational facility can be minimized with noise barriers.
12. Development of a recreational facility would increase litter and human waste	Furbish permanent, adequate, and convenient toilets and litter receptacles at the site.
13. Development of a recreational facility may cause a parking nuisance in local residential areas	Provide ample parking in the design of the proposed facility.
14. Excavation and construction may affect biological resources	None. Cannot be avoided or mitigated, but the site is not a “key” area for any wildlife species and no rare or endangered species were found on the site.

TABLE C-2
SUMMARY OF IMPACTS AND MITIGATION OF CEQA REVIEW DOCUMENTATION OF ORANGE COUNTY WATER DISTRICT PROJECTS ON THE SAR

Impacts	Mitigation
15. Operation of the inlet may require the intermittent use of electrical energy	None. Cannot be avoided or mitigated, but considered a "minimal" impact.
16. Construction of the facilities would require the long-term commitment of land	None. These impacts cannot be avoided or mitigated.
17. Would affect the percolation function of the soil	
18. Would change the appearance of the area	
19. May alter the meteorology of the area	
20. Construction of the facilities would alleviate the damage potential to adjacent homes	None. These are beneficial impacts.
21. Would increase the total area available for groundwater recharge facilities	Design of the final recreational facilities and slopes will provide adequate safety measures, along with fencing.
22. Would provide a greater capacity for storm water conservation	Noise level increases at the recreational facility can be minimized with noise barriers.
Prado Dam Operation for Water Conservation FEIS (USACE, 1992)	
Biological Habitat	
1. Would inundate grasslands and areas of agricultural land use above 505 feet elevation and would raise groundwater levels	100 percent replacement (1:1 ratio) of riparian habitat value based on Habitat Based Evaluation (HBE) with habitat of equal or greater value, but necessarily replaced in kind.
2. Would increasingly attract birds due to increased surface water area	
3. Inundate understory vegetation in spring, which would bird breeding and nesting and result in loss of habitat value	
4. Would result in increase in wetland habitat, but would not offset loss of woodland habitat values	
5. Anticipated impact to willow woodland	
Endangered and Threatened Species	
6. Impact to least Bell's vireo due to loss of edge habitat (i.e., approximately 196 acres of habitat with shrubby understory and willow canopy	Execution of a habitat management plan to enhance populations of least Bell's vireo and other birds mentioned, which will include replacement of in-kind vireo habitat (1:1 ratio). Also, a payment of fees into a vireo habitat management program and into a monitoring program.
7. Would affect the tri-colored blackbird, white-faced ibis, southwestern willow flycatcher, and the western yellow-billed cuckoo	
Cultural Resources	
8. Water conservation above 500 feet elevation would adversely affect on National Register eligible archaeological site [Rincon Townsite (PB-102)]	A program of recordation, data recovery, and relocation will be implemented.
9. At the 505 foot elevation, three additional sites would be adversely affected by inundation [Aros-Serrano	

TABLE C-2
SUMMARY OF IMPACTS AND MITIGATION OF CEQA REVIEW DOCUMENTATION OF ORANGE COUNTY WATER DISTRICT PROJECTS ON THE SAR

Impacts	Mitigation
Adobe (CA-Riv-2778); another adobe site (CA-Riv -2802); and a prehistoric archaeological site (CA-Riv-2804)]	
Water Quality	
10. Water conservation would improve the water quality of the reservoir outflow by reducing TDS	None. These are beneficial impacts.
11. Presence of the pool for longer time periods would facilitate particular chemical reactions and higher temperatures, which could promote anaerobic and encourage high iron and manganese values (already observed) during storage	
12. Increase deposition of fine sediment	
Groundwater	
13. The Prado Basin may experience a small rise in groundwater table	None. This impact is considered less than adverse.
Recreation and Land Use	
14. Could adversely affect The Prado Recreation Inc. facilities (dog training facilities), city and county recreational leases, agricultural leases, Prado Petroleum Company oil wells, Raahauge's Hunting Club, and Splatter S. Duck Club	None.
Geotechnical	
15. Project located in area of high seismic potential	None. Potential dam rupture considered remote due to the apparent absence of major faulting underneath the existing structure.
Vector Control	
16. Could increase the number of mosquitoes within the basin	Establish a fund to cover the cost of incremental increase in abatement.
River Trail Recharge Basin IS/MND (OCWD, 2001)	
Air Quality	
1. Construction activities could exceed the SCAQMD threshold for PM-10	During construction, the contractor will control fugitive dust emissions by regular watering and other dust-preventative measures detailed in the document.
Cultural Resources	
2. The site includes a low potential of encountering significant vertebrate fossils in the alluvium	A qualified paleontologist will attend the pre-grade meeting and develop a program for monitoring excavations into older alluvium. Construction would be halted in the event that a fossil is exposed. The paleontologist will assess the find and remove the resource and will submit a report within 30 days of the completion of the monitoring program.

TABLE C-2
SUMMARY OF IMPACTS AND MITIGATION OF CEQA REVIEW DOCUMENTATION OF ORANGE COUNTY WATER DISTRICT PROJECTS ON THE SAR

Impacts	Mitigation
Geology and Soils	
3. The site is known to possess liquefiable soils	The contractor will be required to provide adequate shoring, bracing, and protective equipment to prevent trench wall collapse. A certified materials testing firm will be retained to analyze existing soils to ensure that the access roads are designed to withstand subsidence. If unstable or expansive soils are found, they will be replaced with suitable materials.
4. The pipeline, roadways, or staging areas could be located on expansive soils	
Hazards and Hazardous Materials	
5. Diesel fuel would be used at the project site, and if spilled, would create a hazard to the environment	The project will comply with state regulations for the transport of diesel fuels and OCWD will employ BMPs for spill control and prevention.
Basin Water Conservation Feasibility Study DEIS/DEIR (USACE, 2004)	
Biological Habitat	
1. Alteration in the amounts and distribution of riparian habitat in the Prado basin	100 percent (1:1 ratio) replacement of lost habitat values through a combination of land acquisition for habitat replacement and a cash contribution to the Santa Ana River Conservation Trust Fund to support continuing *Arundo* removal and cowbird trapping programs.
2. Potential flooding of least Bell's vireo and southwestern willow flycatcher habitat following a major storm event late in the season	
3. Environmental consequences downstream due to increased frequency of higher flow releases	
Endangered and Threatened Species	
4. Could impact least Bell's vireo and southwestern willow flycatcher due to loss of riparian habitat	Continue to coordinate with USFWS (through the July 2002 Biological Opinion) and other resource agencies on the implementation of management strategies to reduce or eliminate potential impacts.
5. Could affect Santa Ana sucker, yellow warbler, yellow-breasted chat, white-faced ibis, other waterfowl, and reptiles downstream	
Cultural Resources	
6. Depending on alternative, there is the potential to affect four known National Register-eligible archaeological sites and to unearth previously unknown sites.	Specific mitigation measures would be developed in accordance with 36 CFR 800 in consultation with SHPO and ACHP. Also, test excavation will be required to determine the significance of the four known sites; if determined significant, then measures will be developed in accordance with 36 CFR 800.
Water Quality	
7. May result in indirect and potentially significant impacts due to periodic maintenance activities, which may release oil products, fuels, and chemicals (including lime) from maintenance equipment into surface waters	The maintenance contractor would be required to properly maintain vehicles and implement "good housekeeping practices, requirements, and procedures for controlling surface liquids.
Air Quality	
8. Long-term maintenance may temporarily affect air quality due to vehicle emissions	None. Impacts are considered temporary and intermittent.

TABLE C-2
SUMMARY OF IMPACTS AND MITIGATION OF CEQA REVIEW DOCUMENTATION OF ORANGE COUNTY WATER DISTRICT PROJECTS ON THE SAR

Impacts	Mitigation
Hazardous, Toxic, and Radioactive Waste	
9. Adjacent oil wells owned by the Prado Petroleum Company have spilled on at least two previous occasions and entered into surface waters, but have since been capped and abandoned in 1996	None. Neither USACE nor OCWD has the authority to implement any recommendations or mitigation measures.
10. An oil pipeline near the southwest corner of the basin spilled into a basin tributary, but is no longer in service	
11. Animal waste from adjacent dairy farms runs off into the basin during storm events, but modern regulations require containment of surface flow onsite	
12. Occasional illegal dumping occurs onsite, but is cleaned up by USACE when found and reported to local authorities	
Recreation	
13. Areas or recreation would be incrementally lost depending on alternative for varying time periods	Following inundation of recreational and other uses within the Prado Basin, maintenance activities to restore these uses to their preinundation condition will be required for existing and future uses.
14. The Prado Petroleum Company, agricultural leases, Raahauge's Hunting Club, the Flyway Foundation, Wilderness Unlimited, and Richardson's Dog Training facility upstream would experience significantly more inundation during flood events than the current condition, which could degrade these facilities	
15. Depending on alternative, the Green River Golf Club, Featherly Regional Park, and River View Golf Course downstream could be significantly degraded with maximum release of water from the Prado dam	
16. Planned future recreational uses upstream could be directly degraded	
Public Health and Safety	
17. Increased inundation could increase the number of mosquitoes and pose a health risk	Establish a fund to cover the incremental cost of abatement.
Noise	
18. Long-term maintenance could cause significant noise impacts	None. The nearest sensitive receptors are over 0.5 mile away and maintenance activities will adhere to all applicable noise ordinances.
Water Rights	
19. Currently OCWD owns all rights, title, and interest in any and all waters flowing from SAR into the Prado Basin	None. But, it is recommended that OCWD submit to the SWRCB an application confirming the existing water rights and establishing rights to the proposed increased volumes.

SOURCES: *OCFCD, 1972; OCWD, 1976; USACE, 1992; OCWD, 2001; USACE, 2004.*

KRAEMER BASIN

OCWD acquired the property for Kraemer Basin in 1976. Construction and operation of the Kraemer Recharge Basin was evaluated pursuant to CEQA in 1975.[5] The Kraemer Basin EIR is provided in **Appendix L-2**. The Orange County groundwater basin was substantially depleted at this time, and OCWD was exploring multiple locations for new spreading grounds to increase OCWD's recharge capacity. OCWD assumed that imported water could not be relied upon to meet future water demand. The construction of Kraemer Basin displaced a 37-acre strawberry farm and two residences. The unavoidable impacts of developing Kraemer Basin included loss of agricultural productivity, dislocation of residences, loss of agriculture-related jobs, construction impacts and reduction in sand transport to ocean beaches. However, the project benefits included long-term maintenance of the Orange County groundwater basin and energy conservation due to reduced future dependence on imported water.

A summary of the impacts and mitigation outlined in OCWD's Proposed Acquisition of Land for Development of Additional Off-Channel Water Spreading Grounds EIR can be found in **Table C-2**.

BURRIS PIT

A project EIR for the Burris Pit Water Conservation Facility was conducted pursuant to CEQA in 1976.[6] Burris Pit, a former sand and gravel pit, was acquired in the same year after the EIR was completed. The Burris Pit EIR is included in **Appendix L-3**. The project involved conversion of Burris Pit into a percolation basin, which required much excavation, rehabilitation, and slope stabilization within the basin. The project resulted in short-term environmental impacts as determined by the EIR. Impacts included dust emissions, noise, traffic congestion, litter, safety hazards, and air pollutant emissions. The EIR determined that the project would have a net positive environmental impact because the long-term benefit of groundwater conservation outweighed the short-term, adverse negative impacts. Plus, the new water basin provided opportunities for additional recreational development in the area. **Table C-2** details the impacts and mitigation measures outlined in the Burris Pit Water Conservation Facility FEIR.

SANTIAGO CREEK PITS

OCWD developed the Santiago Creek Replenishment Program to enhance groundwater recharge capacity. The primary goal of the Replenishment Program was to increase groundwater recharge by capturing excess SAR storm flow for transport to new off-river percolation basins. The basins could also be filled with imported water and used for compatible recreational activities. The Replenishment Program involved the acquisition of three sand and gravel pits along Santiago Creek near the City of Orange: Smith, Blue Diamond, and Bond Pits. OCWD published an Initial Study and adopted a Negative Declaration for the Santiago Creek Replenishment Program Pump Station and Pipeline in January 1986. This document is provided in **Appendix L-4.**

5 OCWD. 1975. Proposed Acquisition of Land for Development of Additional Off-Channel Water Spreading Grounds, Draft Environmental Impact Report, September 1975.
6 OCWD. 1976. Buris Pit Water Conservation Facility, Final Environmental Impact Report, February 1976.

SANTA ANA RIVER RUBBER DAMS

The objective of the Santa Ana Rubber Dam and Bypass Project was to improve the control and capture of SAR flows for diversion and percolation, thus increasing the District's capacity to replenish the groundwater basin. The project included the installation of three inflatable and deflatable rubber dams and bypass facilities within the main river channel. The seven-foot high rubber dams spanned the entire length of the river channel and replaced the earthen diversion dikes previously used by the District. The inflatable dams enabled the District to more quickly retain water after a storm event and divert it to off-channel spreading basins. The District also could quickly deflate the dams, allowing the river to flow unimpeded during periods of high flows. The project included bypass structures around each dam to return water not sent to spreading basins back to the river channel. The District expected the rubber dams to reduce the amount of storm water lost to the ocean, thereby increasing its groundwater recharge capacity by approximately 5,000 afy. The District published an Initial Study and Negative Declaration in September 1991. This document is provided in **Appendix L-5.** The Negative Declaration included a list of measures incorporated into the project that would avoid potentially significant effects of construction activities. These measures addressed temporary impacts to air quality (fugitive dust, air emissions, odors), energy use (electrical power), recreational resources (bike paths), and noise levels. In addition, the District needed to obtain the following permits and approvals: an encroachment permit from the County of Orange; a Clean Water Act Section 404 permit from the USACE; and a Streambed Alteration Agreement from CDFG.

NEAR-TERM RECHARGE PROJECTS

SANTIAGO CREEK RECHARGE TURNOUT PROJECT

The Santiago Creek Recharge Turnout proposed connecting a new pipeline from Santiago Creek to the existing Santiago Pits. The project proposed diverting up to 15 cubic feet per second of additional river water into Santiago Creek where it would flow for about two miles before percolating into the ground completely. OCWD published an Initial Study for the Turnout project in February 2000. The OCWD Board of Directors adopted the Negative Declaration for the project on April 5, 2000. This document is provided in **Appendix L-7.** There were no mitigation measures outlined in the Santiago Creek Recharge Turnout Project IS/ND, as all impacts were determined to be less than significant. This project has been fully implemented.[7]

SANTIAGO PITS PUMP STATION PROJECT

OCWD proposed installing pump stations in the Santiago Pits to allow periodic draining of Bond, Blue Diamond, and Smith Pits in order to clean the basin floors. The cleaning process would enhance percolation rates and maintain basin recharge capacity. The District published an Initial Study for the Santiago Pits Pump Station on November 21, 2001. The Initial Study found no potentially significant impacts of the project that would require implementation of mitigation

7 The Santiago Creek Recharge Turnout Project and Santiago Pits Pump Station Project were fully implemented as of 2003. Personal communication, Shivaji Deshmukh, P.E., Assistant Director of Engineering, Orange County Water District, June 1, 2005.

measures. The public review period ended on December 21, 2001. The OCWD Board of Directors adopted the Negative Declaration for the project on January 16, 2002. This document is provided in **Appendix L-9.** There were no mitigation measures outlined in the Santiago Pits Pump Station IS/ND, as all impacts were determined to be less than significant. This project has been fully implemented.[8]

RIVER TRAILS RECHARGE BASIN

OCWD proposed construction of a new recharge basin adjacent to the SAR on land already owned by the District. The River Trails Recharge Basin would be supplied with river water via the Santiago Pipeline and contribute additional recharge capacity of 3,500 acre-feet per year. The District published the Initial Study for the River Trails Recharge Basin on September 7, 2001. This document is provided in **Appendix L-8.** A summary of the impacts and mitigation outlined in the River Trail Recharge Basin IS/MND can be found in **Table C-2**.

PRADO DAM WATER CONSERVATION

1992 PRADO DAM OPERATION FOR WATER CONSERVATION

OCWD was the local sponsor of an EIS prepared by the USACE that considered raising the non-flood season (March 1 to September 30) elevation of the Prado Dam debris and buffer pools from a maximum of 494 feet NGVD to 505 feet NGVD. The Executive Summary of the EIS is provided in **Appendix L-6-1.** Capturing more water behind the dam would allow for more consistent releases during the dry season, allowing OCWD to capture and divert the water downstream.

The major impacts of raising the conservation pool to 505 feet NGVD identified in the EIS included additional operation and maintenance costs incurred by the federal government and extended spring inundation of least Bell’s vireo habitat in Prado Basin. Between elevations of 494 feet and 505 feet, 228 acres of nesting vireo habitat (riparian woodlands) and 278 acres of wildlife habitat would be inundated, requiring mitigation of 100% replacement before the project could begin. Pursuant to Section 7 of the federal Endangered Species Act, the USACE prepared a Biological Assessment evaluating the project’s effects on the listed least Bell’s vireo. The US Fish and Wildlife Service (USFWS) subsequently prepared a Biological Opinion (BO) that found that the project would not jeopardize the viability of the species when certain conditions were met. The following section summarizes the BO.

SUMMARY OF THE BIOLOGICAL OPINION

Mitigation commitments for increasing the conservation pool were approved by the USFWS. The Biological Opinion is provided in **Appendix L-6-2**. Assuming the preferred project was adopted, prior to the initiation of water conservation the USACE and the District were required to (1) fund habitat restoration/creation programs; (2) contribute funds to ongoing vireo management efforts for the life of the project; and (3) create 228 acres of vireo habitat and 278 acres of wildlife

[8] *Ibid*.

habitat. Prior to this study, in 1991, OCWD contributed $450,000 to the existing vireo management program and $450,000 to the Nature Conservancy for vireo habitat restoration as mitigation for emergency water conservation behind Prado Dam in response to 5-year drought conditions. In addition, OCWD had converted 122 acres to natural ground cover for vireo habitat and removed 40 acres of the invasive *Arundo donax* plant on OCWD property. These mitigation measures were credited toward the required mitigation for raising the conservation pool. A summary of the impacts and mitigation outlined in the River Prado Dam Operation for Water Conservation Final Report and FEIS can be found in **Table C-2**.

2004 PRADO BASIN WATER CONSERVATION FEASIBILITY STUDY

A preliminary Feasibility Study and EIS for increasing the conservation pool at Prado Dam was published in July 2004.[9] OCWD was the local sponsor since the general objective of the study was to increase the amount of water delivered to OCWD's groundwater recharge basin below Prado Dam. A copy of the Feasibility Study Syllabus is provided in **Appendix L-10-1**.

The Feasibility Study assesses five alternative scenarios to increase the Prado Basin conservation pool. The five alternatives range from the no-project condition of 494 feet during flood season (October through February) and 505 feet during the non-flood season (March through September) to 508 feet year round. Of the five alternatives, the preferred project would increase the conservation pool to an elevation of 498/505 feet during flood/non-flood seasons. This operation plan would increase the annual water conservation yield from 238,000 acre-feet to 318,000 acre-feet in the year 2053. This operation alternative also yields the highest benefit/cost ratio. In **Table C-2**, the impacts and mitigation summary is based on the 508 feet year around alternative; all other alternatives would have similar or less impacts and would require similar mitigation.

USACE and OCWD coordinated with the USFWS during this Feasibility Study, pursuant to the Fish and Wildlife Coordination Act. The USFWS provided a Draft Coordination Act Report in November 1999 and a Biological Opinion in July 2002, both of which evaluated the effects of the five operation alternatives. The Biological Opinion is included here in **Appendix L-10-2**. The Draft EIS was published in July 2004. The Final EIS has not yet been adopted by the USACE.

SUMMARY OF THE BIOLOGICAL OPINION

This BO (FWS-WRIV-2102.3) addresses "the incremental effects from additional water conservation during the flood season for [least Bell's] vireo and [southwestern willow] flycatcher and the full project effects on the [Santa Ana] sucker" (p. 3). The Feasibility Study determined that 37.2 acres of riparian habitat would be affected by the preferred project—15.2 acres in Prado Basin plus 22 acres downstream of Prado Dam. Mitigation measures were proposed to compensate for the effects of lost riparian habitat on the vireo, flycatcher, and sucker. The USACE and/or OCWD proposed to (1) acquire and protect 37.2 acres of riparian habitat in the Prado Basin in perpetuity; (2) monitor vireo territories with the 498 and 505 foot elevation in Prado Basin for five years, (3) monitor vireo and flycatcher populations in the basin for the life of

9 USACE. 2004. Prado Basin Water Conservation Feasibility Study, Main Report and Draft EIS/EIR, July 2004.

the project, and (4) develop a program to eradicate exotic, invasive animals that compete or prey upon the Santa Ana sucker.

The BO determined that the proposed project was “not likely to jeopardize the continued existence of the vireo, flycatcher, or sucker or adversely modify critical habitat for the vireo,” given the conservation measures implemented as required by past Section 7 consultations and the conservation measures proposed for the current project. A summary of the impacts and mitigation outlined in the Prado Basin Water Conservation Feasibility Study, Main Report and DEIS/DEIR can be found in **Table C-2**.

Appendix D

Assessment of Future Santa Ana River Flows Below Prado Dam

APPENDIX D
Assessment of Future Santa Ana River Flows Below Prado Dam

Summary

Orange County Water District (OCWD or District) is applying for a permit to divert a wet-year maximum of 505,000 acre-feet per year (afy)[1] of water from the Santa Ana River (SAR) at its diversion facilities below Prado Dam. The State Water Resources Control Board (SWRCB) has requested a water availability assessment to confirm that the volume of water requested in OCWD's application will be available in the future. This assessment of water availability provides flow data collected by the SAR Watermaster showing that more than 505,000 acre-feet (af) of water has been recorded in the lower SAR in the recent past. The assessment goes on to provide future wet-year flow estimates, subtracting planned upstream diversions, to end up with a conservative future wet-year SAR flow estimate below Prado Dam. The assessment concludes that the 505,000 afy requested in OCWD's application is reasonably foreseeable in future wet years downstream of Prado Dam.[2]

This conclusion is supported by data from the U.S. Army Corps of Engineers (USACE) and the Santa Ana Watershed Project Authority (SAWPA). The USACE estimates potential future flow at Prado Dam for conditions in the year 2052 to be approximately 847,000 af during a wet year. While the USACE accounts for existing upstream diversions and water recycling efforts, future upstream diversion projects could decrease USACE's estimate. This water availability assessment shows that after other planned upstream diversions are accounted for, 505,000 afy is reasonably foreseeable during a future wet year at OCWD's Main River System diversion points. The assessment provides an estimate of minimum wet-year flow volume, assuming that 100 percent of diversions proposed upstream are actually implemented.

In order to divert 100 percent of the proposed upstream diversions, maximum diversion rates need to occur for a period of several months. Since the river responds to episodic storm events, long periods of high flows are rare. More commonly, peak flows occur during storm events then decrease rapidly. During peak flow periods, the river flow rates exceed the diversion capacity of existing and proposed facilities. Therefore, it is likely that in most years, substantial volumes of

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1 One acre-foot is the amount of water that would cover one acre of land – about a football field – one foot deep (326,000 gallons). It takes about one acre-foot of water to meet the needs of two families of four each year (and that assumes they are practicing good water conservation).

2 Due to the annual variability of flows in the SAR, 505,000 acre-feet (af) will not be available in every year. Every year differs depending on the amount of precipitation experienced in the region.

storm flow would bypass diversion points and ultimately reach Prado Dam and the Pacific Ocean in quantities greater than predicted in this water availability assessment.

Furthermore, depending on the proposed uses of recycled water, some fraction of the recycled water would return to the SAR, increasing the amount of water reaching Prado Dam in greater quantities than predicted in this water availability assessment.

Data Sources

This assessment of future SAR flows is based on future SAR flow projections from USACE and SAWPA. Future estimates of upstream water recycling (from SAWPA estimates) and proposed diversions (from pending applications) are subtracted from the USACE estimates of future flow to describe the minimum future SAR flow reaching Prado Dam and OCWD's Main River System during a wet year. This minimum wet-year flow represents the cumulative effect of reasonably foreseeable diversion projects on SAR hydrology.

This analysis incorporates information from the following data sources:

- SAR flow estimates prepared by USACE[3] (see Appendix K-1),
- SAR flow estimates prepared by SAWPA[4] (see Appendix K-2),
- Actual flow data from the 2003 SAR Watermaster[5] Annual Report (includes US Geological Survey [USGS] river flow gage data), and
- Hydrologic analyses prepared for the San Bernardino Valley Municipal Water District and the Western Municipal Water District SAR Water Rights Application Environmental Impact Report

Background

The District currently diverts water from the SAR to recharge the Orange County groundwater basin, which provides approximately 50 percent of Orange County's water supply. As urbanization continues in the upper SAR watershed, river flows increase. As such, USACE and SAWPA project that flows in the river will continue to increase.

The SAR is the largest river system in Southern California, originating in the San Bernardino Mountains and flowing over 100 miles southwesterly, reaching the Pacific Ocean between the

[3] The United States Army Corps of Engineers (USACE) Prado Basin Water Supply Feasibility Study Main Report and Draft Environmental Impact Statement, 2004. The USACE operates Prado Dam and has estimated future SAR flows to assist in evaluating flood control and water conservation capabilities of the dam.

[4] Santa Ana River Projected Flow Impacts Report, the Santa Ana Watershed Project Authority (SAWPA), March 2004. SAWPA is a Joint Powers Authority that was created in 1969 to assist in regional water planning efforts and to participate in building facilities to protect water quality in the watershed.

[5] The Santa Ana River Watermaster annually compiles the basic hydrologic and water quality data necessary to determine compliance with the provisions of the Stipulated Judgment, which became effective in 1970 in the case Orange County Water District vs. City of Chino et al.

cities of Newport Beach and Huntington Beach. As shown in **Figure 1**, the watershed encompasses 2,650 square miles in San Bernardino, Riverside and Orange Counties.

The river flows through a gap in the Santa Ana Mountains that separates the upper and lower watersheds. The OCWD encompasses the lower watershed on the coastal side of the Santa Ana Mountains.

Existing Flows at Prado Dam

The SAR Watermaster divides SAR flows reaching Prado Dam into three categories: "base flow, storm flow, and non-tributary flow." Base flow in the SAR is maintained almost entirely by discharges of treated municipal wastewater upstream of Prado Basin (Burton et al., 1998). Storm flow results from runoff after winter storm events. Non-tributary flow is comprised primarily of water originating outside of the SAR watershed that is purchased by OCWD for groundwater recharge.

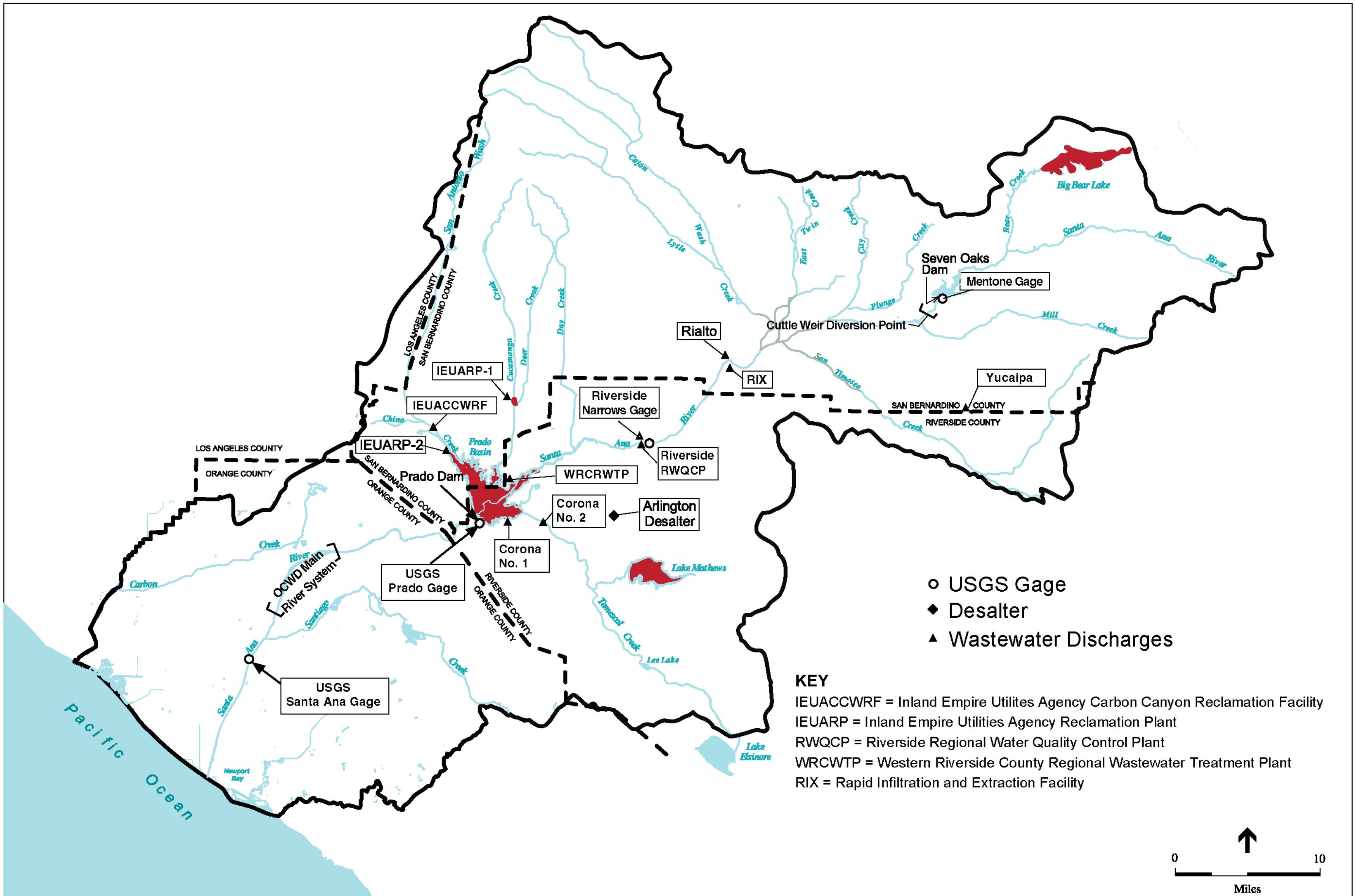
The U.S. Geological Survey (USGS) maintains a river flow gage just downstream of Prado Dam (USGS Gage no. 11074000; see Figure 1). This gage provides information on the character, rate, and volume of flow entering the OCWD operations area, which is below the gage, downstream of Imperial Highway. **Table 1** presents the annual volumes of the components of SAR flow downstream of Prado Dam from 1990 through 2003 as determined by the SAR Watermaster.

TABLE 1
COMPONENTS OF ANNUAL SAR FLOW AT PRADO DAM (WY 1990 TO 2003)

Water Year	Rainfall (in)	Base Flow[a] (ac-ft)	Storm Flow[c] (ac-ft)	Total Flow[b] (ac-ft)
1989-90	8.53	119,149	25,668	144,817
1990-91	15.48	111,151	84,034	195,185
1991-92	16.54	106,948	91,332	198,280
1992-93	30.92	128,068	443,070	571,138
1993-94	11.62	111,186	48,374	159,560
1994-95	25.14	123,468	305,801	429,269
1995-96	11.92	131,861	85,299	217,160
1996-97	18.64	136,676	113,009	249,685
1997-98	33.41	155,711	306,935	462,646
1998-99	8.02	158,637	27,125	185,762
1999-00	11.09	148,269	59,581	207,850
2000-01	16.13	153,914	68,645	222,559
2001-02	5.08	145,981	28,987	174,968
2002-03	16.22	146,113	110,044	256,157

SOURCE:

[a] SAR Watermaster, 2004;
[b] USGS Gage No. 11074000;
[c] Calculated difference between Total Flow and Base Flow.



KEY

IEUACCWRF = Inland Empire Utilites Agency Carbon Canyon Reclamation Facility
IEUARP = Inland Empire Utilities Agency Reclamation Plant
RWQCP = Riverside Regional Water Quality Control Plant
WRCWTP = Western Riverside County Regional Wastewater Treatment Plant
RIX = Rapid Infiltration and Extraction Facility

SOURCE: Santa Ana River Watermaster, 2005

OCWD . 202291

Figure 1
Appendix D-Diversion Points on SAR

As shown in **Table 1**, the maximum flow volume between 1990 and 2003 occurred in 1993 when the USGS gage below Prado Dam recorded 571,138 afy. Base flow for the fourteen-year period averaged 134,081 afy, trending upward for the period as a whole. Total annual flow varied year to year largely based on fluctuations in storm flows and annual precipitation in the watershed.

Projected Wet Year Flow Below Prado Dam

The SWRCB has requested a water availability assessment to confirm that the volume of water (505,000 afy) requested by OCWD will be available in the future. This section explains the calculation of future water availability at OCWD's Main River System downstream of Prado Dam. Flow projections by the USACE and SAWPA are summarized and then adjusted to account for future cumulative conditions in the watershed. Future cumulative upstream conditions include existing water diversions, future diversions associated with water rights applications pending before the SWRCB, and planned recycled water and conservation programs. The conclusion of this assessment is that during wet years, 505,000 afy is reasonably foreseeable at the OCWD Main River System points of diversion.

USACE SAR Flow Estimates

In 2004, the USACE conducted a Feasibility Study to investigate the potential for additional water conservation at Prado Dam. As part of its study, the USACE predicted future annual flow variability at Prado Dam and at OCWD's operations area about nine miles below Prado Dam at Imperial Highway in the city of Anaheim (see Appendix K-1). A 39-year hydrologic base period (Water Year 1950 to 1988) was chosen as the basis for its projections. The total annual flow in the SAR at USGS gage 11074000 just below Prado Dam for each year of the hydrologic base period is shown in **Figure 2**. These total annual flow volumes include non-tributary flows. The maximum flow during this base period, which occurred in 1980, is similar to the recent peak flow that occurred during Water Year 1992-93.

USACE estimated annual flow volume at Prado Dam and at OCWD's operations area for projected watershed conditions in 2052 (USACE Future). To predict future wet year and average year flow, the mean daily flow was adjusted for USACE Present conditions and USACE Future conditions. Under USACE Future conditions, storm water runoff and wastewater effluent volumes were adjusted as described below:

- <u>Storm Water</u>. Adjustments were made to storm water runoff estimates according to the predicted increase in urbanization and its effect on runoff. This method involved tabulation of Riverside and San Bernardino County population projections for the year 2052, and then estimating the change in impervious cover based on future population growth.

- <u>Wastewater Effluent</u>. Daily contributions of wastewater from the major upstream dischargers (cities of San Bernardino and Colton RIX, City of Rialto WWTP, the Riverside RWQCP, IEUA, Western Riverside Regional WWTP, and City of Corona WWTP) were compiled for the base period. Increases were made to the effluent values based on year 2052 population estimates.

Figure 2 compares the projected annual flow variability expected under the USACE Future scenario (2052) at OCWD's Main River System to the historic flows recorded at the USGS gage no. 11074000 over the 39-year hydrologic base period. The figure demonstrates that in the year 2052, future flows will be greater than historic flows during each type of wet and dry year. The USACE projects that future annual flow at the District's operations area will fluctuate between approximately 300,000 afy and 868,000 afy. The modeled estimated peak annual flow of 868,000 afy was actually attained twice within the period of record. These projections include a net contribution of 21,000 afy from the nine miles of the SAR between Prado Dam and Imperial Highway. **Table H** in **Attachment A** summarizes the USACE flow projection calculations.

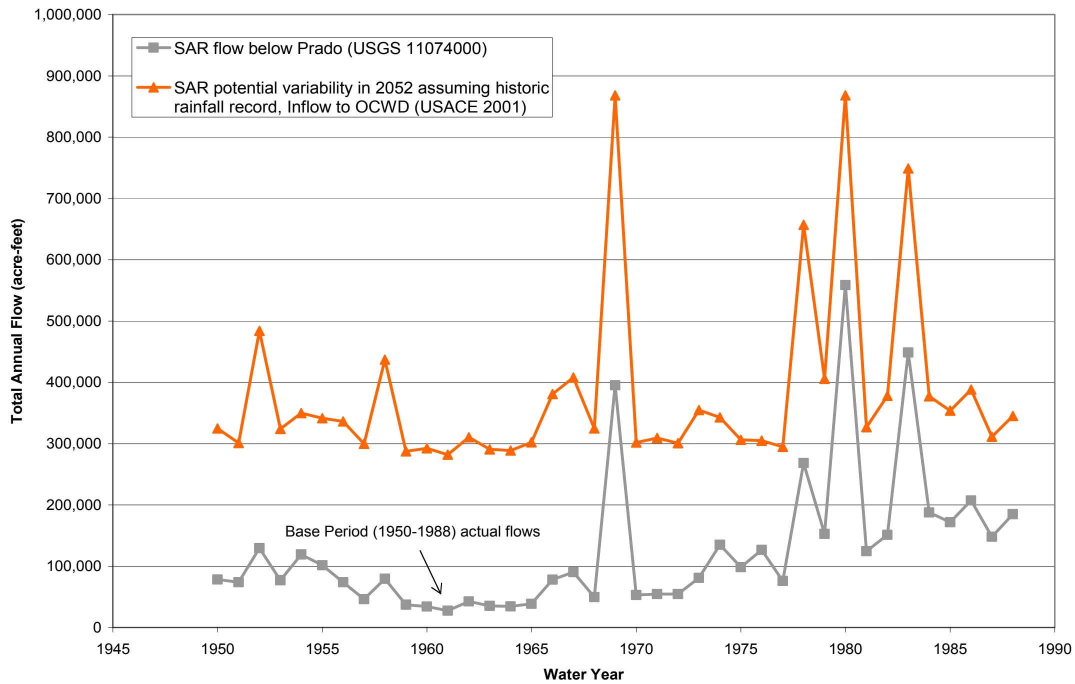


Figure 2: SAR Flow Variability for Historical Base Period and as Adjusted by the USACE for 2052 Conditions

SAWPA SAR Flow Estimates

SAWPA has produced independent estimates of future SAR flows at Prado Dam for the years 2010 and 2025 (see Appendix K-2). The estimates include base flow and storm flow for dry, average, and wet years. **Table 2** summarizes the SAWPA flow estimates for the year 2025. Unlike the USACE estimates, SAWPA does not account for the effects of urbanization on storm flow, but rather assumes a storm flow volume based on the average historic peaks ranging from a low of 18,300 afy to a high of 340,300 afy. The SAWPA estimates include wastewater discharges to the river, but unlike the USACE projections, reclaimed water volumes are already subtracted

TABLE 2
COMPONENTS OF 2025 SANTA ANA RIVER FLOW AS ESTIMATED BY SAWPA

Components of Santa Ana River Flow	Flows at Prado Dam (afy) Dry	Average	Wet
Municipal Discharges (including evaporation losses, infiltration losses, and recycled water diversions)	189,200	189,200	189,200
High Groundwater Mitigation Project	--	2,500	24,500
Arundo Removal	8,300	8,300	8,300
Total Base Flow Projections	**197,500**	**200,000**	**222,000**
Storm Flow	18,300	65,400	340,300
Total Base Flow and Storm Flow	**215,800**	**265,400**	**562,300**

SOURCE: SAWPA 2004.

from SAWPA's estimated future base flow. In addition, unlike the USACE, the SAWPA estimates account for additional flow contributions from: 1) the High Groundwater Mitigation Project and 2) the program for Arundo removal.

Summary of USACE and SAWPA SAR Flow Estimates

Table 3 and **Figure 3** summarize the existing and projected flow volumes in the SAR at Prado Dam. Existing flow is derived from USGS Gage no. 11074000; projected flow is estimated from SAWPA and USACE. It is assumed that estimated future flows include existing diversions of storm flow and base flow within the watershed upstream of Prado Dam.

TABLE 3
SUMMARY OF HISTORIC AND PROJECTED FUTURE AVERAGE ANNUAL SAR FLOW REACHING PRADO DAM

Water Years /Time Period	SAR flow at Prado Dam (afy) Average	Wet Year[d]
USGS Gage 1950-1988[a]	**120,257**	**536,174**
USGS Gage 1989-2003[a]	**255,646**	**571,138**
SAWPA Estimates 2025[b]	**265,400**	**562,300**
USACE Estimates 2052[c]	**374,436**	**847,000**

SOURCE:
a USGS Gage no. 11074000. See Attachment A for calculations.
b SAWPA (2004)
c USACE (2004)
d Flow value is a maximum annual total over the indicated period.

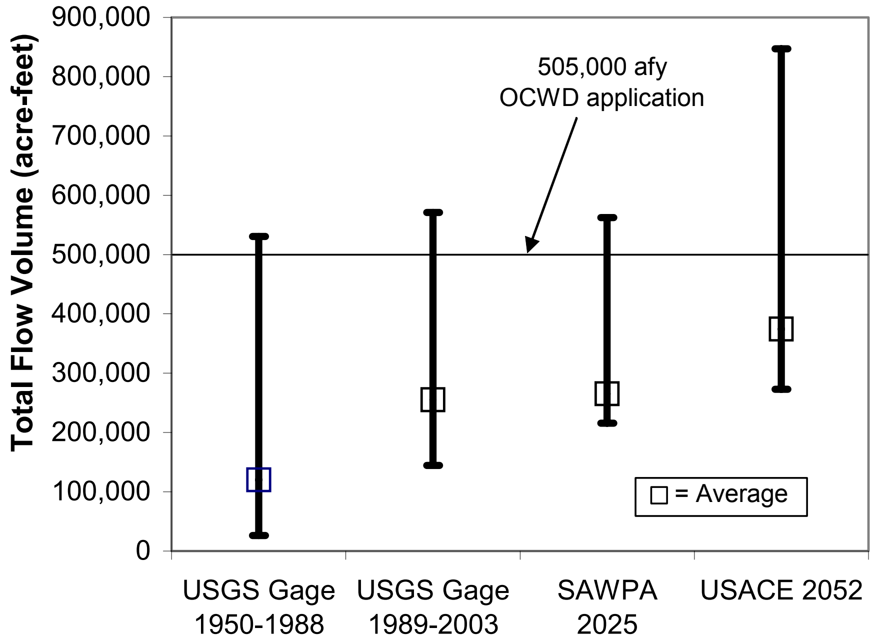


Figure 3. Actual and Estimated Range of Dry-Year and Wet-Year SAR Flow

The future SAWPA estimates are lower than the USACE estimates and project a future average flow similar to existing conditions for the following reasons: 1) they do not account for increased storm water flows during wet years caused by future upstream urbanization, 2) they subtract essentially all upstream wastewater recycling goals, and 3) they have projected for the year 2025 rather than 2052.

Pending Upstream Diversions

The USACE estimated future flow in the SAR based on USGS data that spanned a 39-year hydrologic period (1950-1988). Water diversions in the upper SAR that occurred during the base period are thus accounted for in the USGS data and also are reflected in future flow estimates determined from this base period. However, diversions approved since 1988 and pending applications for additional appropriations are not reflected in USACE's projected flows in the SAR. To conservatively assess future flow volume at Prado Dam and OCWD's operations area, all existing and potential appropriations approved by and pending before the SWRCB since 1988 should be subtracted from USACE flow estimates. Some pending applications, however, are for rights to water already being diverted from the river. These existing appropriations are accounted for in the USACE flow estimates and should not be subtracted.

The following water rights were granted after 1988.

- Chino Basin Watermaster water right permit (no. 020753) for 27,000 acre-feet of water per year, issued in 1994.

- Elsinore Valley Municipal Water District water right permit (no. 021165) for 11,200 acre-feet of water per year, issued in 2004.

The following water rights applications are pending before the SWRCB for diversions upstream of Prado Dam.

- Western Municipal Water District and San Bernardino Valley Municipal Water District (Muni/Western) joint application (no. A031165 and A031370) for 200,000 acre-feet of water per year. The highest wet year flow recorded at the USGS Mentone Gage (no. 11051499) was 204,812 afy (SBVMWD 2004).[6] This substantiates the availability of the requested 200,000 afy.

- San Bernardino Valley Water Conservation District (SBVWCD) application (no. A031371) for 55,464 acre-feet of water per year from the Santa Ana River and the Mill Creek tributary. This application is for clarification of rights to water that the District is already diverting—a maximum of 41,772 afy from the Santa Ana River and a maximum of 19,800 afy from Mill Creek. For purposes of this analysis, it is assumed that the proposed appropriation is in direct competition with the Muni/Western applications for 200,000 afy, since the maximum flow at the proposed diversion location is assumed to be approximately 200,000 afy based on the historical maximum flow.

- City of Riverside application (no. A031372) for 41,400 acre-feet of water per year. This application is for the right to divert, and appropriate, treated effluent that currently flows into the SAR just downstream of Riverside Narrows (Muni/Western 2004).

- Chino Basin Watermaster application (no. A031369) for 97,000 acre-feet of water per year. This application is for the right to divert flows from Deer Creek, Day Creek, Etiwanda Creek, San Sevaine Creek, Chino Creek, San Antonio Creek, and Cucamonga Creek, all of which are tributary to Prado reservoir and the SAR near Prado reservoir (Muni/Western 2004). The Chino Basin Watermaster already has a water rights permit issued by SWRCB in 1986 for 15,000 afy. Therefore, they would divert net additional flows of 82,000 afy.

Table 4 summarizes post-1988 existing and pending water rights applications with their associated diversion volumes. Figure 1 indicates existing points of diversion along the entire SAR.

The total volume of water associated with pending water rights applications in the upper watershed is 432,226 afy as shown in Table 4. However, this does not account for existing diversions. SBVWCD is already diverting the 55,464 afy of water for which it is applying, and Chino Basin Watermaster already has rights to 15,000 afy of the 97,000 afy for which it is applying. Since these are not new diversions, they are accounted for in the USACE projections (which are based on historic river gauge readings) and therefore should not be subtracted as new diversions.

[6] SBVMWD. 2004. Santa Ana River Water Right Applications for Supplemental Water Supply Draft EIR. Appendix A: Surface Water Hydrology. Page A-2-3.

TABLE 4
SUMMARY OF PENDING WATER RIGHTS APPLICATIONS

Water Rights Approved Since 1988	Total Pending New Diversion Rights (afy)	Net Pending Wet Year Diversions (afy)
Chino Basin Watermaster	27,000	27,000
Ganahl (private)	81	81
Gunnoe (private)	30	30
Elsinore Valley Municipal Water District	11,200	0[1]
Pending Water Rights Applications		
Kirtley (private)	25	25
Quiroz (private)	26	26
San Bernardino Valley Water Conservation District (SBVWCD)	55,464[2]	0[3]
San Bernardino Valley Municipal Water District/ Western Municipal Water District (Muni/Western)	200,000[2]	31,000[3]
Chino Basin Watermaster	97,000	82,000[4]
City of Riverside	41,400	41,400
Total	**432,226**	**181,562**

SOURCE: California Water Rights Information Management System, http://www.waterrights.ca.gov/

1 The total also does not include 11,200 afy for Elsinore Valley Municipal Water District because contributions from the San Jacinto watershed to the SAR are infrequent and would not affect projected wet year flow at Prado Dam significantly.

2 SBVWCD and Muni/Western would be in competition for diversions at a common point on the river, below Mentone Gage. The combined total of these two applications is 200,000 af.

3 According to Muni/Western, during a future wet year similar to 1992-1993, one of the wettest years on record since 1950, the effect of both Muni/Western and SBVWCD diversions would result in total diversions of 125,000 afy, resulting in a total net loss of 31,000 afy at Riverside Narrows. See Figure 2 and Muni/Western (2004) for further explanation.

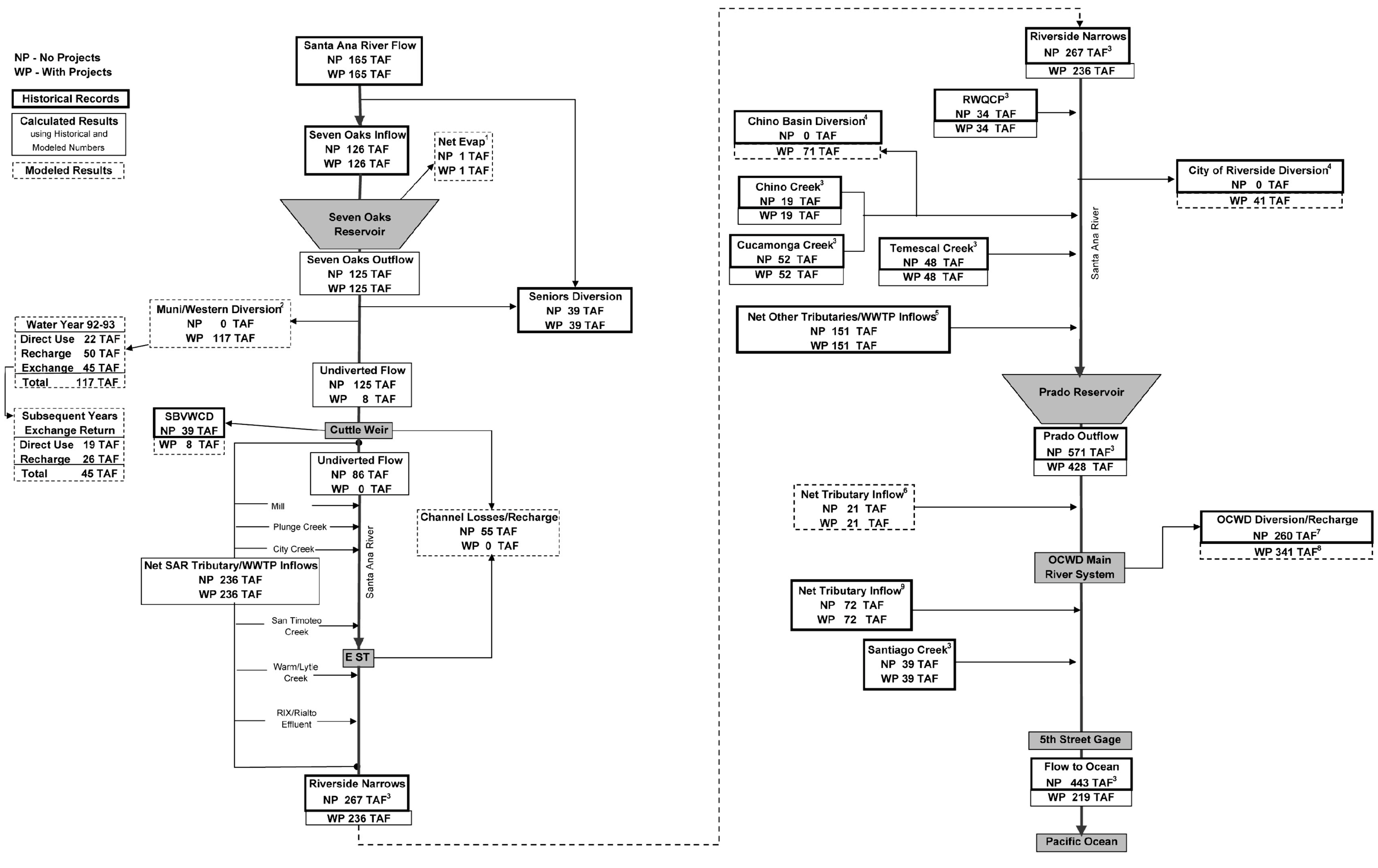
4 Chino Basin Watermaster already has a permit to divert 15,000 afy from the SAR using detention basins built prior to 1988. Therefore, net pending actual diversions do not include this existing diversion amount.

Muni/Western and SBVWCD are competing for water rights to the same 200,000 afy at Mentone Gage. Muni/Western has modeled the combined effects of its pending diversions and SBVWCD pending diversions during a simulated 1993 water year (WY 1993) (**Figure 4**). Under hydrologic conditions similar to WY 1993, both pending diversions remove all water from the SAR at Cuttle Weir (see Figure 4). Due to hydrologic conditions, existing SBVWCD diversions, and channel losses, however, the net effect at Riverside Narrows is a 31,000 afy reduction in flow volume. This net difference is reflected in Table 4.

After accounting for existing appropriations and diversions, the net potential new SAR diversions could be as much as **181,562 afy** (Table 4).

Planned Upstream Recycled Water Diversions

The SAWPA 2025 estimates for recycled water diversions assume that approximately 100,000 afy of recycled water would be diverted from future SAR discharges. These estimates represent long term planning goals for 2025 that may not be achieved. **Table 5** summarizes the wastewater recycling



Note: Water Year 92-93 is the 3rd wettest year in the period from WY 1961-62 to 1999-2000. The probability of a similar wet year occurring in any future year is 5%.

[1] Modeled value estimate at 0.2 TAF but 1 TAF used for illustrative purposes.

[2] Muni/Western Diversion based on modeled Project Scenario A.

[3] Flow volume based on USGS gage data for Water Year 1992-1993.

[4] Diversions assume water rights applications are accepted and approved by SWRCB. Chino Basin Watermaster (IEUA) has 27 TAF of water rights approved in 1994 and is applying for an additional 97 TAF. In simulated WY 1993, 71 TAF is available for diversion.

[5] Flow volume calculated as the difference between gaged river flow above and below Prado Dam net of evapotranspiration and channel losses.

[6] USACE estimate of inflow to the Santa Ana River between Prado Dam and OCWD Main River System. (Prado Conservation Feasibility Study EIS, 2004)

[7] OCWD diversions for Water Year 1992-1993. (See OCWD Water Rights DEIR, Appendix D, Attachment A, Table A)

[8] This represents OCWD's estimate of diversions during a simulated WY 1993, based on daily flow rates below Prado Dam at USGS Gage No. 11074000. OCWD assumes 108 TAF of water bypasses its points of diversion when the river is flowing over 3,500 cfs.

[9] Flow volume calculated as the difference between Prado (11074000), 5th Street (11078000), and Santiago Creek (11077500) gages and OCWD Diversions for Water Year 1992-1993.

SOURCE: OCWD, ESA 2005

OCWD . 202291

Figure 4
Schematic of Santa Ana River Flows and Diversions
Simulated Repetition of Water Year 1992-93 Hydrology (TAF / Year)
Proposed Projects from Seven Oaks Dam to the Pacific Ocean

volumes planned for 2010, which provides an aggressive estimate for recycling programs in the region during a normal year. Assuming that customers will be available in the future to reliably accept the recycled water, this assessment includes a diversion of **64,540 afy** from wastewater discharges into the SAR. Although recycled water demand would likely decrease under wet year conditions, the aggressive recycled water demand used in this assessment is assumed to provide a conservative estimate.

TABLE 5
ESTIMATED FUTURE WASTEWATER RECYCLING VOLUMES

Wastewater Treatment Provider	Projected Recycled Water Demand (afy)	Notes
City of Rialto WWTP	70	70 afy is the volume of water that the City of Rialto recycled in 2001-2002. Facility expansion plans are not anticipated before 2010.
Riverside RWQCP	2,000	Currently, the City of Riverside is in the design phase for construction of a new pump station to develop 2,000 afy of recycled water.
City of San Bernardino/Colton RIX Facility	5,000	The City of San Bernardino/Colton RIX Facility indicates that up to 18,000 afy of recycled water could be diverted from their SAR discharge. However, no recycled water is currently being diverted. Although SAWPA 2025 estimates do not include RIX diversions, for purposes of this analysis 5,000 afy has been assumed.
Inland Empire Utilities Agency	43,100	IEUA's Wastewater Facilities Master Plan (Plan), August 2002, calls for increased water recycling. The later phases of the Plan are scheduled for 2005-06, 2006-08, and 2008-10, and call for an additional 43,100 afy of recycled water from all IEAU treatment plants.
Western Riverside Regional WWTP	5,200	The Western Riverside Regional WWTP did not recycle any of its tertiary effluent in 2001-2002. Plans call for increasing plant capacity and developing recycled water; these plans, however, are only in the preliminary discussion stage and it is not anticipated that any expansion will be completed before 2010. SAWPA estimates assume 5,200 afy by 2025.
City of Corona	9,170	Based upon current construction and permitting schedules, SAWPA staff projects that approximately 70% of the City of Corona's recycled water goal will be met by 2010 (the recycled water goal is 13,100 afy by the year 2025). 9,170 afy represents 70% of 13,100 afy and is considered a reasonable amount given the uncertainties of permitting requirements and recycled water demand reliability.
Total Projected Recycled Water	**64,540**	

SOURCE: SAWPA 2004.

Note: Values are estimates presented by SAWPA based on planned recycled water development.

Summary of Wet Year Water Availability

Existing Conditions

During the 1993 water year (WY), approximately 571,000 acre-feet of water flowed out of Prado Dam (Table 1), illustrating that under existing conditions, 505,000 afy is available for diversion during wet years by OCWD at its Main River System. **Figure 4** is a schematic of the SAR that shows the water available at key points along the river during a wet year similar to WY 1993, both with and without the implementation of pending diversion projects. When simulating the hydrologic conditions of WY 1993, after all other upstream diversions are realized, 449,000 acre-feet would be available to OCWD for diversion at its Main River System. However, not all of this water would be diverted since much of it occurs during peak flow periods when river flow rates are greater than OCWD's diversion rate capacity. As noted previously, river flows greater than 2,000 cfs generally bypass the OCWD diversion points and flow to the ocean. **Figure 5** illustrates the hydrograph at Prado Dam for WY 1993. Assuming a conservative estimate that flows greater than 3,500 cfs bypass the OCWD diversion points, the graph shows that approximately 108,000 af reached the ocean in WY 1993. Making this assumption, OCWD would be able to divert approximately 341,000 af of the 449,000 af available during a similar year (see Figure 4). This scenario does not account for future changes in the watershed, such as urbanization, which would further increase river flow below Prado Dam as explained below.

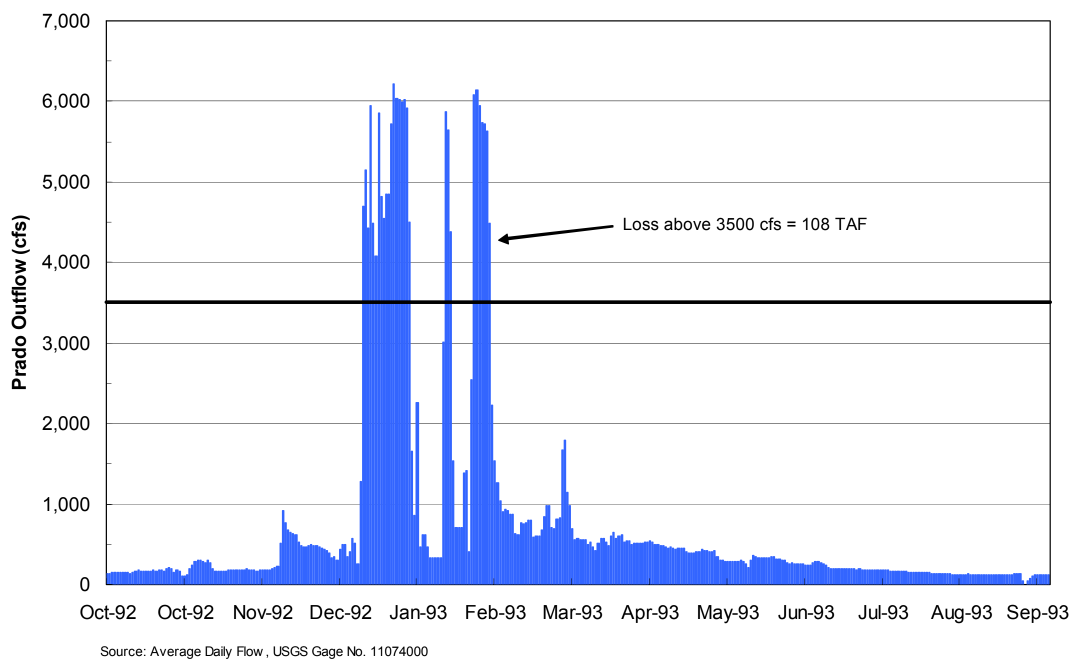


Figure 5. Water Year 1992-93 Daily Outflow at Prado Reservoir

2052 Conditions

In its projections, the USACE accounts for increased storm flows due to urbanization and therefore provides a realistic prediction of future wet weather flows in 2052. This assessment of water availability uses the USACE Future scenario, which projects a wet year flow volume of 847,000 afy at Prado Dam and 868,000 afy at OCWD's Main River System by the year 2052.

Figure 6 is a schematic of the SAR that shows future flow volume at key points along the river, from Seven Oaks Reservoir to the Pacific Ocean, both with and without implementation of pending projects. Figure 6 illustrates the projected water availability in the SAR under USACE Future wet-year conditions after accounting for the effects of existing diversions, future recycled water diversions (Table 5), pending water rights diversions, and additional flows due to conservation programs (Table 2). **Table 6** summarizes the projected water availability at OCWD's Main River System after accounting for all existing and pending diversions and projects depicted in Figure 6. Assuming that 100 percent of the allowed upstream diversions are subtracted from the total flow, estimated future wet-year flow volume at OCWD's facilities on the SAR would be at least **654,698 afy**. As shown in Figure 6, assuming 100 percent of planned diversions along the SAR are implemented, at least 262,000 afy would continue to flow to the ocean.

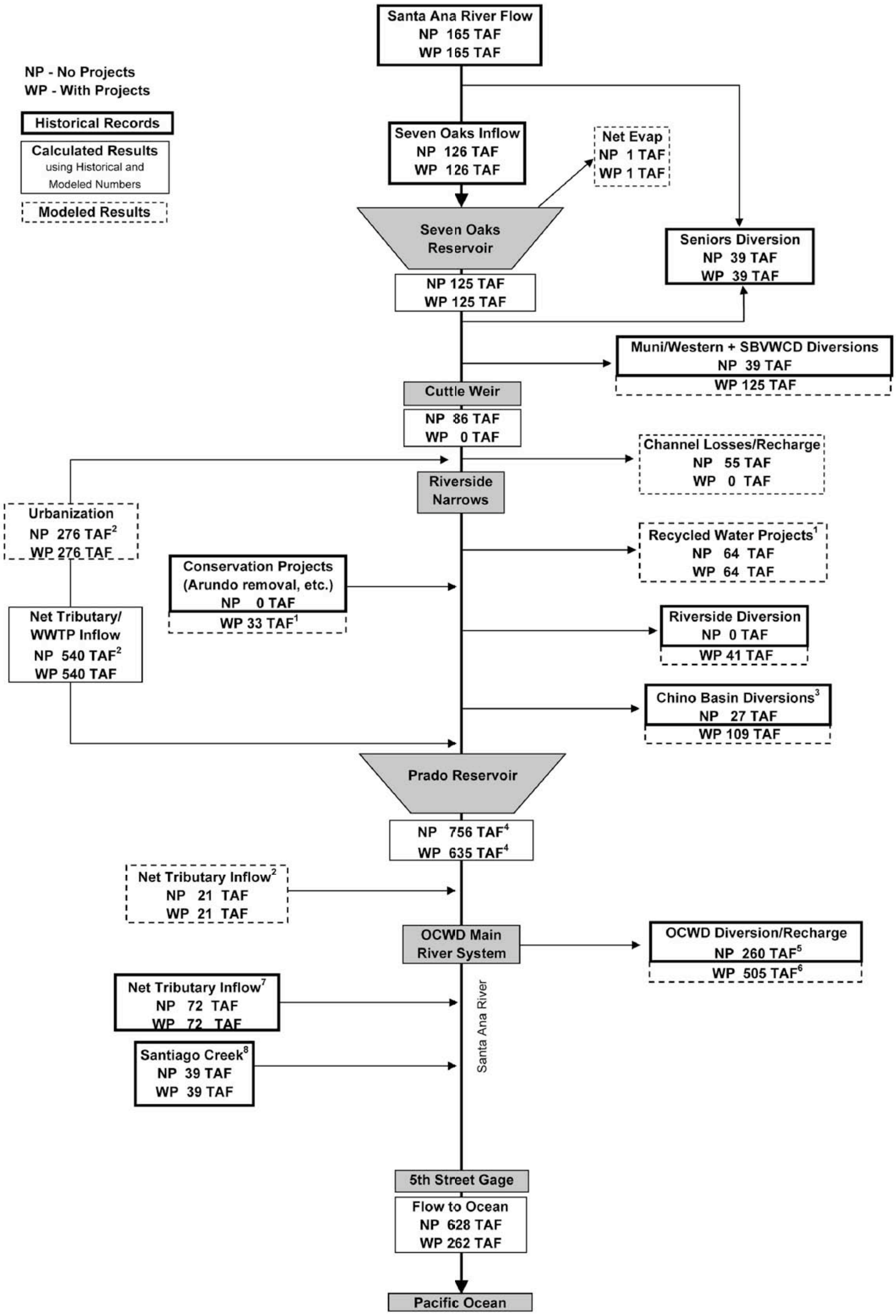
TABLE 6
SUMMARY OF NET PEAK WET YEAR FLOWS UNDER FUTURE RUNOFF CONDITIONS AT OCWD'S OPERATIONS AREA (AFY)

	A Max. Annual Future Supply Estimates (af)	B Total Pending New Water Diversion Applications	C Estimated Recycled Water Volume	D Estimated Additional Flows	Total Flows (A-B-C+D)
USACE under 2052 conditions	868,000	181,562	64,540	32,800	654,698

SOURCE:
(A) USACE 2004, including estimated inflow from tributaries between Prado Dam and Imperial Highway.
(B) See Table 4.
(C) SAWPA 2004, See Table 5.
(D) Includes SAWPA estimates for Arundo Removal and High Groundwater Mitigation Projects.

Average Year Flow Projections

Using the USACE Future wet-year projections for 2052, the average flow at OCWD's diversion points would be **382,306 afy** (see Table H in Attachment A). This projection is based on USACE's Future (2052) watershed conditions and estimates of population growth and urbanization in the watershed, including the contribution of runoff from the stretch of the river between Prado Dam and the OCWD points of diversion. Additionally, the USACE estimates show an 80% probability that average future flow volumes will exceed **300,880 afy** (see Table H in Attachment A). This does not account for future upstream pending diversions or recycled water diversions. Average year flows could be more or less depending on the amount of storm water diverted upstream and the amount of recycled water taken from the base flow. As shown in Table 2, the SAWPA projection at Prado Dam for an average water year in 2025 is **265,400 afy**, which includes recycled water diversions but does not account for pending upstream diversions.



[1] OCWD and SAWPA estimates (OCWD Water Rights DEIR, Appendix D).

[2] USACE projection of inflow to the Santa Ana River above Prado Dam (847 TAF) and between Prado Dam and OCWD Main River System (21 TAF) when accounting for urbanization in the SAR watershed (Prado Conservation Feasibility Study, 2004). Urbanization increases total flow volume at Prado Dam by 276 TAF during a year similar to the 1992-1993 Water Year.

[3] Flow volume includes Chino Basin Watermaster (IEUA) water rights approved since 1988 (27 TAF) and net pending water rights (82 TAF).

[4] **NP:** USACE 50-year projection for Prado Dam outflow for a wet year (847 TAF) minus proposed recycling projects (64 TAF) and Chino Basin (IEUA) approved diversions (27 TAF). **WP**: USACE 50-year projection for Prado Dam outflow for a wet year (847 TAF) minus proposed recycling projects (64 TAF), plus conservation projects (33 TAF), minus proposed upstream diversions (31 TAF, 41 TAF, 109 TAF).

[5] OCWD diversions for Water Year 1992-1993. (See OCWD Water Rights DEIR, Appendix D, Attachment A, Table A)

[6] This represents a theoretical diversion equal to the total water rights being requested from the SWRCB.

[7] Flow volume calculated as the difference between Prado (11074000), 5th Street (11078000), and Santiago Creek (11077500) gages and OCWD Diversions for Water Year 1992-1993. Urbanization will not affect future (2052) flows in this portion of the watershed.

[8] Flow volume based on USGS Gage No. 11077500 for Water Year 1992-1993. Urbanization will not affect future flows in Santiago Creek.

SOURCE: OCWD, 2005

OCWD . 202291

Figure 6
Schematic of Santa Ana River Annual Flows and Diversions
Simulated Repetition of Water Year 1992-93 with Urbanization (TAF / Year)
Proposed Projects from Seven Oaks Dam to the Pacific Ocean

Conclusions

The wet-year annual flow in the SAR has already exceeded the 505,000 afy requested in OCWD's application on several occasions. Accounting for future upstream diversions, this water availability assessment estimates that a minimum of 654,698 afy is reasonably foreseeable during a future wet year at the OCWD points of diversion due to the projected increases in storm flow and base flow. This volume represents a minimum wet-year volume, assuming that 100 percent of diversions proposed upstream are actually implemented. If less water is diverted upstream of Prado Dam or if recycling efforts divert less water than planned, more water will reach Prado Dam during wet years. In addition, depending on the proposed uses of recycled water, some fraction of the water may return to the SAR, increasing the amount of water reaching Prado Dam. Finally, severe wet years could result in storm flows that exceed those experienced in the past, which also would increase the potential peak flow volume of the river.

Therefore, it is reasonably foreseeable that under future cumulative river conditions, 505,000 afy will reach OCWD points of diversion during a wet year when considering the projected increases in base flow and storm flow and after accounting for planned diversions.

Attachment A

A. Annual SAR Flow Data

Source:	USGS	Watermaster	OCWD
Water Year	Total Annual Flow at USGS Gage (11074000 Below Prado Dam (acre-feet)	Baseflow at USGS Gage (11074000 Below Prado Dam (acre-feet)	Total Flow Captured by OCWD from SAR (acre-feet)
1990	144,743	119,149	141,060
1991	195,117	111,151	159,805
1992	196,682	106,948	174,771
1993	570,991	128,068	260,196
1994	159,437	111,186	156,560
1995	429,161	123,468	264,857
1996	215,407	131,861	171,491
1997	249,666	136,676	190,237
1998	462,555	155,711	271,494
1999	185,635	158,637	186,065
2000	206,516	148,269	186,042
2001	222,528	153,914	179,949
2002	174,914	145,981	155,156
average	**262,566**	**133,155**	**192,130**
median	**206,516**	**131,861**	**179,949**

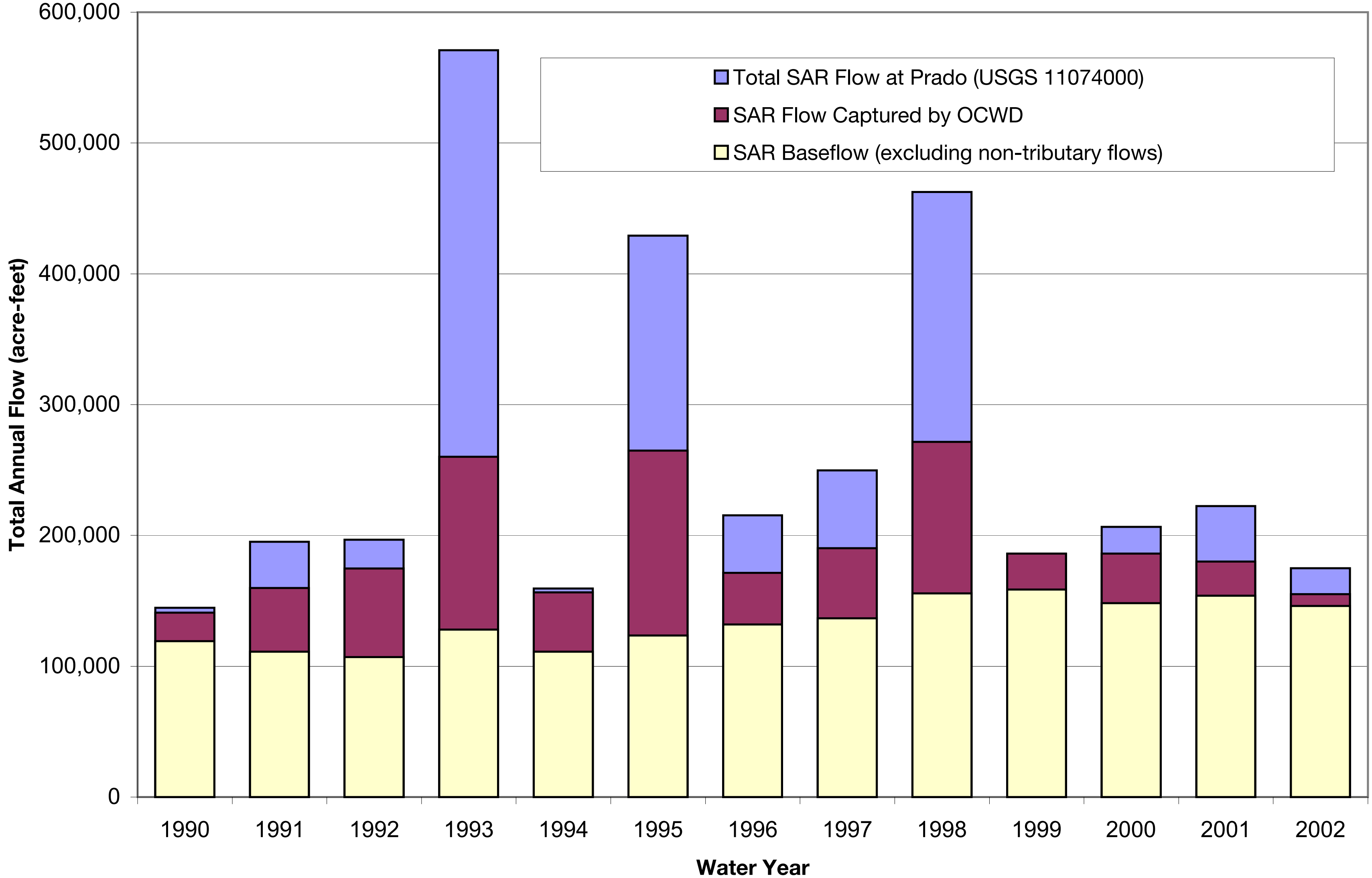
NOTES:

a Source: USGS Gage 11074000

b Source: Thirty-Second Annual Report of the Santa Ana River Watermaster (April 30, 2003). Excludes Non-Tributary flow.

c Source: Data provided by Gwen M. Sharp, OCWD (1/31/05)

Figure A.


Total SAR Flow at Prado (USGS 11074000)
SAR Flow Captured by OCWD
SAR Baseflow (excluding non-tributary flows)
Total Annual Flow (acre-feet)
600,000
500,000
400,000
300,000
200,000
100,000
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Water Year

B. USGS Gage 11074500 (Santa Ana River at County Line below Prado Dam CA)

Monthly and Annual Mean Runoff (cfs) [a]

days	31	30	31	31	28	31	30	31	30	31	31	30	Annual
month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average
WY													
1920	120.0	135.0	210.0	246.0	363.0	527.0	281.0	140.0	82.1	63.8	58.3	80.1	192.2
1921	103.0	145.0	172.0	251.0	240.0	360.0	133.0	172.0	114.0	78.2	72.7	76.0	159.7
1922	129.0	131.0	1010.0	767.0	1050.0	653.0	455.0	432.0	216.0	109.0	73.4	64.2	424.1
1923	90.5	166.0	347.0	439.0	410.0	239.0	247.0	98.6	80.2	66.7	68.6	80.1	194.4
1924	100.0	150.0	186.0	219.0	153.0	239.0	333.0	99.6	71.6	61.1	55.7	66.4	144.5
1925	95.5	116.0	151.0	188.0	156.0	119.0	166.0	94.8	80.8	57.1	57.0	64.4	112.1
1926	109.0	93.6	155.0	116.0	237.0	140.0	631.0	125.0	74.1	57.8	52.8	58.5	154.2
1927	73.4	105.0	166.0	183.0	1296.0	334.0	225.0	99.5	73.4	53.5	51.0	56.2	226.3
1928	71.7	119.0	171.0	187.0	252.0	179.0	102.0	95.4	62.1	42.5	38.6	42.0	113.5
1929	74.9	89.8	145.0	157.0	164.0	144.0	143.0	84.7	63.2	46.4	31.6	53.6	99.8
1930	63.5	70.4	83.4	161.0	136.0	153.0	91.8	125.0	69.0	49.6	40.1	52.9	91.3
1931	66.9	76.9	80.3	104.0	160.0	102.0	82.4	76.1	64.8	44.0	43.6	57.4	79.9
1932	71.5	85.5	161.0	150.0	438.0	126.0	76.7	70.8	62.4	51.5	44.4	54.8	116.1
1933	61.6	69.8	97.3	163.0	124.0	102.0	77.1	70.2	59.6	48.6	44.1	48.5	80.5
1934	54.2	63.5	99.9	204.0	110.0	94.0	64.8	60.7	53.8	46.4	42.1	42.4	78.0
1935	63.4	73.8	112.0	118.0	121.0	113.0	94.8	65.6	47.8	42.5	41.9	43.4	78.1
1936	47.8	59.3	69.8	70.8	236.0	95.5	86.4	55.7	45.0	32.7	29.5	33.0	71.8
1937	47.1	61.1	161.0	138.0	847.0	292.0	229.0	103.0	58.8	40.6	35.8	33.9	170.6
1938	45.0	59.5	84.0	86.1	156.0	2514.0	344.0	236.0	73.4	59.1	49.9	50.6	313.1
1939	70.1	86.1	143.0	129.0	136.0	112.0	89.3	66.2	56.1	47.9	46.0	68.2	87.5
1940	68.1	79.5	87.4	166.0	158.0	96.8	105.0	68.7	58.7	42.2	40.5	45.9	84.7

Monthly and Annual Total Runoff (acre-feet) [b]

days	31	30	31	31	28	31	30	31	30	31	31	30	Annual
month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
WY													
1920	7,377	8,031	12,909	15,122	20,155	32,396	16,717	8,606	4,884	3,922	3,584	4,765	138,469
1921	6,332	8,626	10,573	15,430	13,326	22,130	7,912	10,573	6,782	4,807	4,469	4,521	115,482
1922	7,930	7,793	62,088	47,150	58,300	40,142	27,068	26,556	12,850	6,701	4,512	3,819	304,909
1923	5,563	9,875	21,331	26,987	22,765	14,692	14,694	6,061	4,771	4,100	4,217	4,765	139,822
1924	6,147	8,924	11,434	13,463	8,495	14,692	19,810	6,123	4,259	3,756	3,424	3,950	104,477
1925	5,871	6,901	9,282	11,557	8,662	7,315	9,875	5,828	4,807	3,510	3,504	3,831	80,943
1926	6,701	5,568	9,528	7,131	13,159	8,606	37,538	7,684	4,408	3,553	3,246	3,480	110,603
1927	4,512	6,246	10,205	11,250	71,959	20,532	13,385	6,117	4,367	3,289	3,135	3,343	158,339
1928	4,408	7,079	10,512	11,495	13,992	11,004	6,068	5,865	3,694	2,613	2,373	2,499	81,601
1929	4,604	5,342	8,914	9,651	9,106	8,852	8,507	5,207	3,760	2,852	1,943	3,189	71,927
1930	3,904	4,188	5,127	9,897	7,551	9,405	5,461	7,684	4,105	3,049	2,465	3,147	65,984
1931	4,113	4,575	4,936	6,393	8,884	6,270	4,902	4,678	3,855	2,705	2,680	3,415	57,406
1932	4,395	5,086	9,897	9,221	24,320	7,746	4,563	4,352	3,712	3,166	2,729	3,260	82,448
1933	3,787	4,152	5,981	10,020	6,885	6,270	4,587	4,315	3,546	2,988	2,711	2,885	58,127
1934	3,332	3,778	6,141	12,540	6,108	5,778	3,855	3,731	3,201	2,852	2,588	2,522	56,427
1935	3,897	4,390	6,885	7,254	6,718	6,946	5,640	4,033	2,844	2,613	2,576	2,582	56,377
1936	2,938	3,528	4,291	4,352	13,104	5,871	5,140	3,424	2,677	2,010	1,813	1,963	51,111
1937	2,895	3,635	9,897	8,483	47,029	17,950	13,623	6,332	3,498	2,496	2,201	2,017	120,056
1938	2,766	3,540	5,164	5,293	8,662	154,543	20,465	14,508	4,367	3,633	3,068	3,010	229,017
1939	4,309	5,122	8,791	7,930	7,551	6,885	5,312	4,070	3,337	2,945	2,828	4,057	63,137
1940	4,186	4,729	5,373	10,205	8,773	5,951	6,246	4,223	3,492	2,594	2,490	2,731	60,993
Mean	4,760	5,767	11,393	12,420	18,357	19,713	11,494	7,141	4,439	3,341	2,979	3,322	**105,126**
% of total	4.5	5.5	10.8	11.8	17.5	18.8	10.9	6.8	4.2	3.2	2.8	3.2	100
Mean 1924-1940													**88,763**

NOTES:

a Recorded mean flow values from USGS Gage 11074500

b Volumes are calculated from the reported, mean monthly flow and the number of days in the given month

C. USGS Gage 11074000 (Santa Ana River below Prado Dam CA)

Monthly and Annual Mean Runoff (cfs) [a]

days	31	30	31	31	28	31	30	31	30	31	31	30	Annual
month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average
WY													
1941	61.4	80.2	223	136	387	855	593	295	87.1	60.7	56.5	65.3	241.7
1942	90.1	103	163	180	144	149	143	86.4	71.8	54.3	49.5	59.8	107.8
1943	72	87.2	108	550	354	643	257	94	67.6	57.1	53.9	59	200.2
1944	93.5	94.2	196	169	472	282	143	109	82.8	66.9	54.6	64	152.3
1945	79.9	152	155	163	324	325	166	84.8	76.3	60.3	60.5	61.3	142.3
1946	79.1	98.9	300	167	180	152	163	87.5	63.7	52.8	46.4	52.3	120.2
1947	69.2	206	238	218	170	124	84.9	77.5	65.6	46.3	45.6	53.5	116.6
1948	66	81.5	108	98.1	132	110	111	67.9	67.3	49.2	43.5	44.8	81.6
1949	59.1	72.4	92.5	115	120	133	74.5	65.1	48.6	42.3	67.7	72.3	80.2
1950	89.5	101	124	111	124	92.4	106	132	117	87.2	82.1	71.7	103.2
1951	54.5	69.7	72.2	83.7	85.7	109	138	131	113	117	106	84.8	97.1
1952	134	143	204	424	162	296	152	88.3	111	114	99.4	106	169.5
1953	113	108	104	106	124	174	86	55	46.2	69.5	113	119	101.5
1954	122	142	76.6	161	133	160	154	203	205	199	196	123	156.2
1955	136	69.6	178	174	160	213	72.3	188	135	120	111	36.4	132.8
1956	45.1	57.2	103	272	103	70.7	68.1	97.9	93.5	41.5	44.1	171	97.3
1957	109	43.2	45.7	95.1	81.3	90.8	71.3	63	47.5	32.6	24.8	28.5	61.1
1958	43.5	56.2	97	83.3	227	201	334	69.1	49.4	40.1	33.9	33.7	105.7
1959	37.6	45.7	55.3	77.5	94.9	62.8	54.9	45.4	40.9	28.7	22.3	25.6	49.3
1960	32.6	39.2	55.7	77.9	88.8	70.1	52.6	44.8	33.4	17.7	14.8	16.2	45.3
1961	24.4	42.3	49.5	52.4	49.8	54.3	43.3	35.2	29	19.9	17.1	20.4	36.5
1962	22.4	34.7	62.5	77.5	216	79.6	52.6	43.1	34.6	21.5	18.8	18.9	56.9
1963	23.4	33.5	39.5	49.2	99.1	74.4	65.2	45.9	35.1	21.1	21	54.6	46.8
1964	41.6	73.5	48.1	71	49.9	66.7	55.2	41.9	33.8	22.5	20.1	24.1	45.7
1965	25	50.7	53.8	56.7	53.8	58.1	153	45.2	39.1	29.5	23.3	26.2	51.2
1966	23.7	312	305	211	109	64.1	50	43.7	37.1	27	23	27.5	102.8
1967	32.7	48.8	709	193	65.4	74.6	115	46.2	43.9	26.2	24.3	30.4	117.5
1968	32.7	98.4	92.5	71.1	65.8	188	69.1	47.3	42.4	28.4	22.3	24.3	65.2
1969	31.3	49.3	66.4	756	2,020	2,031	780	310	84.7	115	51.2	39.1	527.8
1970	47.4	74.1	68.1	94	107	135	108	71.6	46.6	33.2	28.4	26.4	70.0
1971	39.2	73.4	213	117	88.4	79	67.4	60.6	49.2	25.9	22.9	23.5	71.6
1972	36.7	55.7	142	174	87.7	78.1	65.8	56.9	53.3	36.6	35	38.1	71.7
1973	47.1	107	109	145	183	218	158	137	59.4	46.6	41.4	28.1	106.6
1974	74	85.2	188	356	225	180	132	151	174	205	220	138	177.4
1975	163	117	179	111	130	168	115	76.4	118	163	115	91.5	128.9
1976	86.4	176	278	293	241	234	85.6	95.5	247	91.6	39.3	130	166.5
1977	102	81.7	89.4	276	128	105	80.7	111	61.5	42.7	68.8	51	99.8
1978	58	69.2	132	436	422	1,227	835	251	346	276	72.9	107	352.7
1979	200	157	147	317	232	179	268	185	214	276	160	71.5	200.5
1980	104	127	205	477	2,681	2,556	1,101	641	396	366	200	93	745.6
1981	106	161	260	211	204	236	378	129	84.9	65.5	63	68.3	163.9
1982	101	132	162	264	282	243	364	275	263	124	82.3	101	199.4
1983	93	209	327	537	794	1,918	816	843	736	261	352	187	589.4
1984	344	305	629	410	240	200	174	147	137	123	118	118	245.4
1985	136	198	512	292	366	246	209	189	159	136	130	140	226.1
1986	173	247	343	236	612	576	280	232	176	140	126	148	274.1
1987	188	192	223	270	230	254	313	184	134	139	127	78.3	194.4
1988	240	281	245	395	314	308	236	231	176	174	153	162	242.9
1989	182	225	325	293	321	281	244	138	184	183	134	141	220.9
1990	165	186	200	268	360	261	238	197	147	126	135	129	201.0
1991	147	172	184	278	229	1,013	462	180	168	144	127	122	268.8
1992	129	170	230	335	799	455	430	215	139	138	130	135	275.4
1993	160	204	449	3,543	2,662	874	538	405	292	204	142	110	798.6
1994	157	192	243	219	514	352	215	175	166	188	116	129	222.2
1995	178	225	222	1,618	608	2,029	625	446	457	393	140	146	590.6
1996	158	182	223	255	801	446	367	308	281	252	167	174	301.2
1997	197	322	425	761	395	255	240	290	287	262	333	372	344.9
1998	236	256	476	451	2,733	751	578	915	512	446	251	235	653.3
1999	184	279	297	328	309	268	268	309	221	220	195	203	256.8
2000	279	203	271	329	618	431	333	230	205	187	182	181	287.4
2001	281	313	251	376	742	440	319	236	200	188	180	199	310.4
2002	219	252	293	272	292	269	270	237	213	190	221	175	241.9
2003	190	257	420	336	694	592	488	376	306	209	197	209	356.2

Monthly and Annual Total Runoff (acre-feet) [b]

days	31	30	31	31	28	31	30	31	30	31	31	30	Annual
month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
WY													
1941	3,774	4,771	13,708	8,360	21,488	52,559	35,278	18,135	5,182	3,731	3,473	3,885	174,345
1942	5,539	6,127	10,020	11,065	7,995	9,159	8,507	5,311	4,271	3,338	3,043	3,558	77,934
1943	4,426	5,188	6,639	33,810	19,655	39,527	15,289	5,778	4,022	3,510	3,313	3,510	144,668

1944	5,748	5,604	12,049	10,389	26,207	17,335	8,507	6,701	4,926	4,113	3,356	3,807	108,742
1945	4,912	9,042	9,528	10,020	17,990	19,979	9,875	5,213	4,539	3,707	3,719	3,647	102,171
1946	4,863	5,884	18,442	10,266	9,994	9,344	9,697	5,379	3,790	3,246	2,852	3,111	86,867
1947	4,254	12,255	14,631	13,401	9,439	7,623	5,051	4,764	3,903	2,846	2,803	3,183	84,152
1948	4,057	4,848	6,639	6,031	7,329	6,762	6,603	4,174	4,004	3,024	2,674	2,665	58,811
1949	3,633	4,307	5,686	7,069	6,663	8,176	4,432	4,002	2,891	2,600	4,162	4,301	57,923
1950	5,502	6,008	7,623	6,824	6,885	5,680	6,306	8,114	6,960	5,360	5,047	4,265	74,575
1951	3,350	4,146	4,438	5,145	4,758	6,701	8,210	8,053	6,722	7,192	6,516	5,045	70,278
1952	8,237	8,507	12,540	26,065	8,995	18,196	9,042	5,428	6,603	7,008	6,110	6,306	123,039
1953	6,946	6,425	6,393	6,516	6,885	10,696	5,116	3,381	2,748	4,272	6,946	7,079	73,406
1954	7,500	8,448	4,709	9,897	7,385	9,836	9,161	12,479	12,195	12,233	12,049	7,317	113,209
1955	8,360	4,141	10,942	10,696	8,884	13,094	4,301	11,557	8,031	7,377	6,824	2,165	96,372
1956	2,772	3,403	6,332	16,721	5,719	4,346	4,051	6,018	5,562	2,551	2,711	10,173	70,359
1957	6,701	2,570	2,809	5,846	4,514	5,582	4,242	3,873	2,826	2,004	1,525	1,695	44,186
1958	2,674	3,343	5,963	5,121	12,604	12,356	19,870	4,248	2,939	2,465	2,084	2,005	75,671
1959	2,311	2,719	3,399	4,764	5,269	3,861	3,266	2,791	2,433	1,764	1,371	1,523	35,472
1960	2,004	2,332	3,424	4,789	4,931	4,309	3,129	2,754	1,987	1,088	910	964	32,620
1961	1,500	2,516	3,043	3,221	2,765	3,338	2,576	2,164	1,725	1,223	1,051	1,214	26,337
1962	1,377	2,064	3,842	4,764	11,993	4,893	3,129	2,649	2,058	1,322	1,156	1,124	40,373
1963	1,438	1,993	2,428	3,024	5,502	4,574	3,879	2,822	2,088	1,297	1,291	3,248	33,585
1964	2,557	4,373	2,957	4,365	2,771	4,100	3,284	2,576	2,011	1,383	1,236	1,434	33,045
1965	1,537	3,016	3,307	3,486	2,987	3,572	9,102	2,779	2,326	1,813	1,432	1,559	36,916
1966	1,457	18,561	18,749	12,971	6,052	3,940	2,975	2,686	2,207	1,660	1,414	1,636	74,308
1967	2,010	2,903	43,584	11,864	3,631	4,586	6,841	2,840	2,612	1,611	1,494	1,808	85,785
1968	2,010	5,854	5,686	4,371	3,653	11,557	4,111	2,908	2,522	1,746	1,371	1,446	47,234
1969	1,924	2,933	4,082	46,474	112,158	124,852	46,402	19,057	5,039	7,069	3,147	2,326	375,463
1970	2,914	4,408	4,186	5,778	5,941	8,299	6,425	4,401	2,772	2,041	1,746	1,571	50,483
1971	2,410	4,367	13,094	7,192	4,908	4,856	4,010	3,725	2,927	1,592	1,408	1,398	51,887
1972	2,256	3,314	8,729	10,696	4,869	4,801	3,914	3,498	3,171	2,250	2,152	2,267	51,917
1973	2,895	6,365	6,701	8,914	10,161	13,401	9,399	8,422	3,534	2,865	2,545	1,672	76,873
1974	4,549	5,069	11,557	21,884	12,493	11,065	7,853	9,282	10,351	12,602	13,524	8,210	128,439
1975	10,020	6,960	11,004	6,824	7,218	10,327	6,841	4,697	7,020	10,020	7,069	5,443	93,444
1976	5,311	10,470	17,089	18,012	13,381	14,385	5,092	5,871	14,694	5,631	2,416	7,734	120,086
1977	6,270	4,860	5,496	16,967	7,107	6,455	4,801	6,824	3,659	2,625	4,229	3,034	72,326
1978	3,565	4,117	8,114	26,802	23,431	75,427	49,674	15,430	20,584	16,967	4,481	6,365	254,958
1979	12,295	9,340	9,037	19,487	12,882	11,004	15,943	11,373	12,731	16,967	9,836	4,254	145,146
1980	6,393	7,555	12,602	29,323	148,860	157,125	65,498	39,404	23,558	22,499	12,295	5,533	530,645
1981	6,516	9,578	15,983	12,971	11,327	14,508	22,487	7,930	5,051	4,026	3,873	4,063	118,313
1982	6,209	7,853	9,959	16,229	15,658	14,938	21,654	16,905	15,646	7,623	5,059	6,008	143,740
1983	5,717	12,433	20,102	33,011	44,086	117,905	48,544	51,822	43,785	16,044	21,638	11,125	426,212
1984	21,147	18,144	38,667	25,204	13,326	12,295	10,351	9,037	8,150	7,561	7,254	7,020	178,155
1985	8,360	11,779	31,474	17,950	20,322	15,122	12,433	11,618	9,459	8,360	7,991	8,329	163,199
1986	10,635	14,694	21,085	14,508	33,981	35,408	16,657	14,262	10,470	8,606	7,746	8,805	196,856
1987	11,557	11,422	13,708	16,598	12,771	15,614	18,620	11,311	7,972	8,545	7,807	4,658	140,583
1988	14,754	16,717	15,061	24,282	17,435	18,934	14,040	14,200	10,470	10,696	9,405	9,637	175,630
1989	11,188	13,385	19,979	18,012	17,823	17,274	14,516	8,483	10,946	11,250	8,237	8,388	159,481
1990	10,143	11,065	12,295	16,475	19,989	16,044	14,159	12,110	8,745	7,746	8,299	7,674	144,743
1991	9,037	10,232	11,311	17,089	12,715	62,272	27,484	11,065	9,994	8,852	7,807	7,258	195,117
1992	7,930	10,113	14,139	20,593	44,364	27,970	25,581	13,217	8,269	8,483	7,991	8,031	196,682
1993	9,836	12,136	27,601	217,799	147,805	53,727	32,006	24,897	17,371	12,540	8,729	6,544	570,991
1994	9,651	11,422	14,938	13,463	28,539	21,638	12,790	10,758	9,875	11,557	7,131	7,674	159,437
1995	10,942	13,385	13,647	99,463	33,759	124,729	37,181	27,417	27,187	24,159	8,606	8,686	429,161
1996	9,713	10,827	13,708	15,676	44,475	27,417	21,833	18,934	16,717	15,491	10,266	10,351	215,407
1997	12,110	19,156	26,126	46,781	21,932	15,676	14,278	17,827	17,074	16,106	20,471	22,130	249,666
1998	14,508	15,229	29,261	27,724	151,747	46,166	34,385	56,248	30,459	27,417	15,430	13,980	462,555
1999	11,311	16,598	18,257	20,163	17,157	16,475	15,943	18,995	13,147	13,524	11,987	12,076	185,635
2000	17,151	12,076	16,659	20,225	34,314	26,495	19,810	14,139	12,195	11,495	11,188	10,768	206,516
2001	17,274	18,620	15,430	23,114	41,199	27,048	18,977	14,508	11,898	11,557	11,065	11,839	222,528
2002	13,463	14,991	18,012	16,721	16,213	16,536	16,062	14,569	12,671	11,680	13,586	10,411	174,914
2003	11,680	15,289	25,819	20,655	38,534	36,392	29,031	23,114	18,204	12,848	12,110	12,433	256,108
Mean	6,874	8,385	12,769	19,586	22,950	24,258	14,929	11,189	8,887	7,536	6,198	5,736	**149,296**
% of total	4.6	5.6	8.6	13.1	15.4	16.2	10.0	7.5	6.0	5.0	4.2	3.8	100
Mean (1941-1970)	3,876	5,290	8,593	10,437	12,035	14,628	8,955	5,768	4,063	3,487	3,228	3,252	**83,611**
% of total	4.6	6.3	10.3	12.5	14.4	17.5	10.7	6.9	4.9	4.2	3.9	3.9	100
Mean (1950-1988)	5,537	6,813	11,023	13,578	16,628	21,075	12,903	9,210	7,631	6,153	5,081	4,396	**120,029**
% of total	4.6	5.7	9.2	11.3	13.9	17.6	10.8	7.7	6.4	5.1	4.2	3.7	100
Mean (1971-2003)	9,600	11,199	16,565	27,903	32,872	33,013	20,359	16,118	13,272	11,218	8,898	7,994	**209,011**
% of total	4.6	5.4	7.9	13.4	15.7	15.8	9.7	7.7	6.4	5.4	4.3	3.8	100
Mean (1989-2003)	11,729	13,635	18,479	39,597	44,704	35,724	22,269	19,085	14,984	13,647	10,860	10,550	**255,263**
% of total	4.6	5.3	7.2	15.5	17.5	14.0	8.7	7.5	5.9	5.3	4.3	4.1	100

NOTES:

a Recorded mean flow values from USGS Gage 11074000

b Volumes are calculated from the reported, mean monthly flow and the number of days in the given month

D. USGS Gage 11078000 (Santa Ana River at Santa Ana CA)

Monthly and Annual Mean Runoff (cfs) [a]

days	31	30	31	31	28	31	30	31	30	31	31	30	Annual
month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average
WY													
1924	0	2.43	3.8	13.3	2.13	2.51	3.62	0.58	0	0	0	0	2.4
1925	0	0	2.34	1.15	0	0.14	4.22	0	0	0	0	0	0.7
1926	0	0	0	0	4.02	0.1	358	1.84	0	0	0	0	30.3
1927	0	1.67	5.03	3.16	1028	100	50	1.48	0	0	0	0	99.1
1928	0	1.97	3.41	2.35	15.5	3.72	0.58	0	0	0	0	0	2.3
1929	0.048	0.1	3.23	1.39	0	0	0.27	0	0	0	0	0	0.4
1930	0	0	0	0.76	0.014	9.98	0	1.58	0	0	0	0	1.0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0.0
1932	0	0	11.4	1.1	134	0.34	0	0	0	0	0	0	12.2
1933	0	0	0	6.58	1.64	0	0	0	0	0	0	0	0.7
1934	0	0	5.45	34.2	0	0	0	0	0	0	0	0	3.3
1935	7.94	0.83	9.42	11.3	2.05	7.13	0	0	0	0	0	0	3.2
1936	0	0.43	0	0	33	0.003	0.01	0	0	0	0	0	2.8
1937	0	0	22.1	4.43	541	174	22.9	0	0	0	0	0	63.7
1938	0	0	0	0.3	14.6	2029	47.4	4.65	0	0	0	0	174.7
1939	0	0	29.3	8.03	17.5	0.77	0	0	0	0	0	1.65	4.8
1940	0	0	0	32.5	17.2	0.58	2.26	0	0	0	0	0	4.4
1941	0	0	67	1.58	193	803	320	12.6	0.023	0	0	0	116.4
1942	0	0.25	7.27	0.93	0.55	0.59	0.21	0.084	0.007	0	0	0	0.8
1943	0	0	0	374	202	484	11.3	2.18	0	0	0	0	89.5
1944	0	0.013	5.82	7.23	219	45.8	1.33	1.71	0.03	0	0	0	23.4
1945	0	9.19	3.97	2.46	42.8	43.7	0.39	0.67	0.03	0.029	0	0	8.6
1946	0	0	36.1	1.51	0.54	5.06	2.48	0	0	0	0	0	3.8
1947	0	10.9	13.6	5.94	2.43	0.17	0.067	0.058	0.03	0	0.003	0	2.8
1948	0.071	0.027	0.084	0.084	0.09	0.49	0.32	0.081	0.027	0	0	0	0.1
1949	0.006	0	0.052	0.016	0	0	0	0	0	0	0	0	0.0
1950	0	0.057	3.2	2.19	4.21	0.097	0.93	0.045	0	0.013	0.039	0.027	0.9
1951	0.077	0.63	0.074	0.077	0.23	0.058	0.01	0.26	0	0.003	0	0.007	0.1
1952	0.084	0.027	3.34	177	0.17	89.8	0.33	0.052	0.003	0	0.003	0.037	22.6
1953	0.032	0.99	4.95	0.006	0	0	0.62	0.75	0.21	0.019	0.11	0.34	0.7
1954	0.18	0.1	0.29	6.6	12.9	2.97	0.27	0.25	0.23	0.12	0.077	0.077	2.0
1955	0.068	1.68	0.18	0.9	0.061	0.006	0.17	0.2	0.057	0.084	0.52	0.003	0.3
1956	0	0.21	0.019	54.4	6.51	0.023	0.7	0.19	0.1	0.029	0	0.12	5.2
1957	0.1	0.053	0.035	1.06	0.47	0.042	0.38	0.1	0.017	0.026	0.01	0	0.2
1958	0.13	0.05	0.56	0.47	75.6	43.8	208	0.077	0	0.045	0.071	0.003	27.4
1959	0.48	0.25	0	1.23	3.85	0	0.07	0.016	0	0	0	0	0.5
1960	0	0	0.61	4.86	2.92	0.061	2.44	0	0	0	0	0	0.9
1961	0	0.27	0.097	0.19	0	0.035	0	0	0	0	0	0	0.0
1962	0	0.35	1.19	3.97	66.5	0.19	0	0	0	0	0	0	6.0
1963	0	0	0	0.097	14.1	6.99	0.18	0.01	0	0	0	0	1.8
1964	0	11.5	0	2.57	0	0.95	0.47	0	0	0	0	0	1.3
1965	0	0.41	0.47	0.1	0	2.4	12.1	0.1	0.46	0.24	0.45	0.037	1.4
1966	0	148	109	85.8	1.5	0	0	0	0	0	0	0	28.7
1967	0	7.16	427	114	0.025	3.41	5.93	0	0	0	0	0.43	46.5
1968	0	23.7	11.9	1.63	0.52	80.3	1.66	0.074	0	0	0.006	0	10.0
1969	0.013	0.22	1.52	796	2,967	2,342	408	110	0	0	0	0	552.1
1970	0	3	0	2.94	5.21	27	0	0	0	0	0	0	3.2
1971	0	12.5	37	16	1.11	0.18	0.37	0	0	0	0	0	5.6
1972	0	0	33.7	40.1	0	0	0	0	0.029	0	0.16	0	6.2
1973	0.048	12.1	4.63	14.3	62.2	127	6.24	0	0	0	0	0	18.9
1974	0	2.11	0.094	132	0.5	24.4	0.15	0	0	0	0	0	13.3
1975	0.007	0	48.9	0.023	19.7	29.6	4.69	0.009	0	0	0	0	8.6
1976	0	0	0	0	21.7	6.76	3.47	0.1	0.1	0.1	0.005	16.6	4.1
1977	0	2.77	0.78	13.2	2.49	3.54	0	11.2	0	0	9.8	0	3.6
1978	0	0	22.5	101	961	2,044	572	0.66	0.032	0.008	0	0	308.4
1979	0	3.2	25	164	100	150	7.33	2.06	0	0	0	0	37.6
1980	0.25	0.032	0	467	3,014	2,239	889	175	4.3	22.9	0.82	0.068	567.7
1981	0	0	0.097	106	10.9	129	0.22	0.05	0.023	0	0.17	0.062	20.5
1982	0.3	8.59	0.94	7.97	10.1	123	147	0.16	0.15	0.033	0	0.086	24.9
1983	0.055	35.7	43.6	264	558	1,997	561	613	433	0.9	102	21.6	385.8
1984	179	154	230	92.2	0	0	0.051	0	0	0.006	0	0.009	54.6
1985	0.016	24.2	428	71.6	117	7.52	3.71	0	0	0	0	0.73	54.4
1986	0	118	38.4	20.7	467	349	64.8	0.012	0.003	0	0	40.6	91.5
1987	0.23	48	11.9	115	10.4	8.65	0.3	1.05	0	0	0	0	16.3
1988	13.8	6.17	56	229	12.7	0.048	21.4	0	0	0	0	0	28.3
1989	0	3.56	182	18	115	1.04	0	0	0	0	0	1.3	26.7
1990													
1991	0	0	0	6.2	59.6	635	0.21	0	0	0	0	0	58.4
1992	0	0	20.6	21.1	544	179	1.57	0.4	0	0	0	0	63.9
1993	0.86	0.19	109	3,962	2,813	538	40.9	0.91	20.1	0	0	0.12	623.8
1994	0.14	2.12	0.81	0.62	54.4	8.1	0.22	0.2	0	0	0	0	5.6
1995	0	0.083	3.18	2,252	174	1,867	240	41.3	11.7	0.018	0	0	382.4
1996	0	0.077	1.25	13.9	345	22.6	0.62	0	0	0	0	0	32.0
1997	3.13	41.7	33.3	372	0.001	0	0	0	0	0	0.001	0.9	37.6
1998	0	13.4	161	69.8	3,007	488	185	686	45	31	0.64	2.04	390.7
1999	1.85	15.2	3.51	45.3	0.21	1.97	9.63	0	0	0.03	0	0	6.5

2000	0	0	0	0.47	292	62.7	8.93	0	0.083	0	0.2	0.89	30.4
2001	16.7	0.097	1.32	248	1052	86.3	3.92	0.042	0.022	0.021	0.025	0.16	117.4
2002	0	29.5	4.72	9.65	0.13	1.69	0.34	0.005	0	0.003	0.002	0.002	3.8
2003	0.074	65.2	357	0.19	687	345	81.4	22.4	0.024	0.13	0.011	0.028	129.9

Monthly and Annual Total Runoff (acre-feet) [b]

days	31	30	31	31	28	31	30	31	30	31	31	30	Annual
month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
WY													
1924	0	145	234	818	118	154	215	36	0	0	0	0	1,719
1925	0	0	144	71	0	9	251	0	0	0	0	0	474
1926	0	0	0	0	223	6	21,297	113	0	0	0	0	21,640
1927	0	99	309	194	57,079	6,147	2,975	91	0	0	0	0	66,894
1928	0	117	210	144	861	229	35	0	0	0	0	0	1,595
1929	3	6	199	85	0	0	16	0	0	0	0	0	309
1930	0	0	0	47	1	614	0	97	0	0	0	0	758
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	701	68	7,440	21	0	0	0	0	0	0	8,230
1933	0	0	0	404	91	0	0	0	0	0	0	0	496
1934	0	0	335	2,102	0	0	0	0	0	0	0	0	2,437
1935	488	49	579	695	114	438	0	0	0	0	0	0	2,363
1936	0	26	0	0	1,832	0	1	0	0	0	0	0	1,859
1937	0	0	1,359	272	30,038	10,696	1,362	0	0	0	0	0	43,728
1938	0	0	0	18	811	124,729	2,820	286	0	0	0	0	128,663
1939	0	0	1,801	494	972	47	0	0	0	0	0	98	3,412
1940	0	0	0	1,998	955	36	134	0	0	0	0	0	3,123
1941	0	0	4,119	97	10,716	49,363	19,037	775	1	0	0	0	84,107
1942	0	15	447	57	31	36	12	5	0	0	0	0	604
1943	0	0	0	22,991	11,216	29,753	672	134	0	0	0	0	64,766
1944	0	1	358	444	12,160	2,815	79	105	2	0	0	0	15,964
1945	0	547	244	151	2,376	2,686	23	41	2	2	0	0	6,073
1946	0	0	2,219	93	30	311	148	0	0	0	0	0	2,801
1947	0	648	836	365	135	10	4	4	2	0	0	0	2,005
1948	4	2	5	5	5	30	19	5	2	0	0	0	77
1949	0	0	3	1	0	0	0	0	0	0	0	0	5
1950	0	3	197	135	234	6	55	3	0	1	2	2	637
1951	5	37	5	5	13	4	1	16	0	0	0	0	85
1952	5	2	205	10,881	9	5,520	20	3	0	0	0	2	16,648
1953	2	59	304	0	0	0	37	46	12	1	7	20	489
1954	11	6	18	406	716	183	16	15	14	7	5	5	1,401
1955	4	100	11	55	3	0	10	12	3	5	32	0	237
1956	0	12	1	3,344	361	1	42	12	6	2	0	7	3,789
1957	6	3	2	65	26	3	23	6	1	2	1	0	137
1958	8	3	34	29	4,198	2,693	12,374	5	0	3	4	0	19,350
1959	30	15	0	76	214	0	4	1	0	0	0	0	339
1960	0	0	37	299	162	4	145	0	0	0	0	0	647
1961	0	16	6	12	0	2	0	0	0	0	0	0	36
1962	0	21	73	244	3,692	12	0	0	0	0	0	0	4,042
1963	0	0	0	6	783	430	11	1	0	0	0	0	1,230
1964	0	684	0	158	0	58	28	0	0	0	0	0	928
1965	0	24	29	6	0	148	720	6	27	15	28	2	1,005
1966	0	8,805	6,701	5,274	83	0	0	0	0	0	0	0	20,863
1967	0	426	26,249	7,008	1	210	353	0	0	0	0	26	34,272
1968	0	1,410	732	100	29	4,936	99	5	0	0	0	0	7,310
1969	1	13	93	48,933	164,740	143,970	24,272	6,762	0	0	0	0	388,783
1970	0	178	0	181	289	1,660	0	0	0	0	0	0	2,308
1971	0	744	2,275	984	62	11	22	0	0	0	0	0	4,096
1972	0	0	2,072	2,465	0	0	0	0	2	0	10	0	4,548
1973	3	720	285	879	3,454	7,807	371	0	0	0	0	0	13,518
1974	0	126	6	8,114	28	1,500	9	0	0	0	0	0	9,782
1975	0	0	3,006	1	1,094	1,820	279	1	0	0	0	0	6,201
1976	0	0	0	0	1,205	416	206	6	6	6	0	988	2,833
1977	0	165	48	811	138	218	0	688	0	0	602	0	2,671
1978	0	0	1,383	6,209	53,359	125,651	34,028	41	2	0	0	0	220,673
1979	0	190	1,537	10,082	5,552	9,221	436	127	0	0	0	0	27,145
1980	15	2	0	28,708	167,349	137,638	52,887	10,758	256	1,408	50	4	399,075
1981	0	0	6	6,516	605	7,930	13	3	1	0	10	4	15,089
1982	18	511	58	490	561	7,561	8,745	10	9	2	0	5	17,970
1983	3	2,124	2,680	16,229	30,982	122,762	33,374	37,683	25,759	55	6,270	1,285	279,207
1984	11,004	9,161	14,139	5,668	0	0	3	0	0	0	0	1	39,976
1985	1	1,440	26,310	4,401	6,496	462	221	0	0	0	0	43	39,375
1986	0	7,020	2,361	1,272	25,930	21,454	3,855	1	0	0	0	2,415	64,308
1987	14	2,856	732	7,069	577	532	18	65	0	0	0	0	11,862
1988	848	367	3,442	14,077	705	3	1,273	0	0	0	0	0	20,716
1989	0	212	11,188	1,107	6,385	64	0	0	0	0	0	77	19,033
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	381	3,309	39,035	12	0	0	0	0	0	42,738
1992	0	0	1,266	1,297	30,205	11,004	93	25	0	0	0	0	43,890
1993	53	11	6,701	243,556	156,189	33,072	2,433	56	1,196	0	0	7	443,274
1994	9	126	50	38	3,021	498	13	12	0	0	0	0	3,766
1995	0	5	195	138,437	9,661	114,770	14,278	2,539	696	1	0	0	280,582

1996	0	5	77	854	19,156	1,389	37	0	0	0	0	0	21,518
1997	192	2,481	2,047	22,868	0	0	0	0	0	0	0	54	27,642
1998	0	797	9,897	4,291	166,961	29,999	11,006	42,170	2,677	1,906	39	121	269,864
1999	114	904	216	2,785	12	121	573	0	0	2	0	0	4,726
2000	0	0	0	29	16,213	3,854	531	0	5	0	12	53	20,698
2001	1,027	6	81	15,245	58,411	5,305	233	3	1	1	2	10	80,325
2002	0	1,755	290	593	7	104	20	0	0	0	0	0	2,770
2003	5	3,879	21,946	12	38,145	21,208	4,842	1,377	1	8	1	2	91,425
Mean	173	613	2,039	8,179	13,982	13,667	3,214	1,302	384	43	88	65	**43,749**
% of total	0.4	1.4	4.7	18.7	32.0	31.2	7.3	3.0	0.9	0.1	0.2	0.1	100
Mean (1924-1940)	29	26	345	436	5,914	8,419	1,712	37	0	0	0	6	**16,924**
% of total	0.2	0.2	2.0	2.6	34.9	49.7	10.1	0.2	0.0	0.0	0.0	0.0	100
Mean (1941-1970)	3	434	1,431	3,381	7,074	8,161	1,940	265	2	1	3	2	**22,698**
% of total	0.0	1.9	6.3	14.9	31.2	36.0	8.5	1.2	0.0	0.0	0.0	0.0	100
Mean (1950-1988)	307	955	2,437	4,902	12,145	15,508	4,460	1,443	669	39	180	123	**43,169**
% of total	0.7	2.2	5.6	11.4	28.1	35.9	10.3	3.3	1.6	0.1	0.4	0.3	100
Mean (1971-2003)	403	1,079	3,463	16,529	24,417	21,376	5,146	2,896	928	103	212	154	**76,706**
% of total	0.5	1.4	4.5	21.5	31.8	27.9	6.7	3.8	1.2	0.1	0.3	0.2	100
Mean (1989-2003)	93	679	3,597	28,766	33,845	17,362	2,271	3,079	305	128	4	22	**90,150**
% of total	0.1	0.8	4.0	31.9	37.5	19.3	2.5	3.4	0.3	0.1	0.0	0.0	100

NOTES:

a Recorded mean flow values from USGS Gage 11078000

b Volumes are calculated from the reported, mean monthly flow and the number of days in the given month

E. USGS Gages 11074500 and 11074000 (Santa Ana River below Prado) - Frequency Distributions for Flow Duration Curves

p = probability of exceedence

Water Year 1937
SAR @ County Line, below Prado (USGS 11074500)
n_1 = 365
total ppt = 31.5 inches

	Gage#	Date	Flow (cfs)	rank	p
USGS	11074500	2/7/1937	7720	1	0.2732
USGS	11074500	2/14/1937	4060	2	0.5464
USGS	11074500	2/6/1937	3340	3	0.8197
USGS	11074500	2/15/1937	1980	4	1.0929
USGS	11074500	12/31/1936	1710	5	1.3661
USGS	11074500	2/8/1937	1080	6	1.6393
USGS	11074500	3/16/1937	883	7	1.9126
USGS	11074500	3/17/1937	585	8	2.1858
USGS	11074500	12/28/1936	554	9	2.4590
USGS	11074500	2/16/1937	515	10	2.7322
USGS	11074500	3/22/1937	514	11	3.0055
USGS	11074500	3/18/1937	454	12	3.2787
USGS	11074500	1/1/1937	429	13	3.5519
USGS	11074500	3/19/1937	423	14	3.8251
USGS	11074500	3/23/1937	412	15	4.0984
USGS	11074500	3/13/1937	411	16	4.3716
USGS	11074500	3/25/1937	392	17	4.6448
USGS	11074500	3/21/1937	384	18	4.9180
USGS	11074500	3/20/1937	368	19	5.1913
USGS	11074500	2/9/1937	362	20	5.4645
USGS	11074500	4/16/1937	358	21	5.7377
USGS	11074500	4/17/1937	358	22	6.0109
USGS	11074500	3/24/1937	350	23	6.2842
USGS	11074500	2/18/1937	338	24	6.5574
USGS	11074500	2/19/1937	338	25	6.8306
USGS	11074500	2/17/1937	326	26	7.1038
USGS	11074500	4/18/1937	305	27	7.3770
USGS	11074500	2/20/1937	302	28	7.6503
USGS	11074500	4/13/1937	300	29	7.9235
USGS	11074500	4/15/1937	300	30	8.1967
USGS	11074500	2/21/1937	287	31	8.4699
USGS	11074500	4/19/1937	286	32	8.7432
USGS	11074500	2/10/1937	282	33	9.0164
USGS	11074500	4/14/1937	282	34	9.2896
USGS	11074500	4/12/1937	277	35	9.5628
USGS	11074500	3/26/1937	272	36	9.8361
USGS	11074500	4/11/1937	268	37	10.1093
USGS	11074500	4/20/1937	268	38	10.3825
USGS	11074500	4/10/1937	259	39	10.6557
USGS	11074500	2/22/1937	257	40	10.9290
USGS	11074500	3/14/1937	257	41	11.2022
USGS	11074500	2/26/1937	255	42	11.4754
USGS	11074500	2/11/1937	250	43	11.7486
USGS	11074500	4/3/1937	247	44	12.0219
USGS	11074500	2/25/1937	242	45	12.2951
USGS	11074500	4/21/1937	241	46	12.5683
USGS	11074500	3/15/1937	240	47	12.8415
USGS	11074500	3/28/1937	237	48	13.1148
USGS	11074500	3/27/1937	232	49	13.3880
USGS	11074500	12/29/1936	229	50	13.6612
USGS	11074500	1/2/1937	229	51	13.9344
USGS	11074500	4/9/1937	229	52	14.2077
USGS	11074500	2/23/1937	226	53	14.4809
USGS	11074500	4/2/1937	226	54	14.7541
USGS	11074500	2/12/1937	220	55	15.0273

Water Year 1978
Below Prado (USGS 11074000)
n_3 = 365
total ppt = 30.5 inches

	Gage#	Date	Flow (cfs)	rank	p
USGS	11074000	3/6/1978	2470	1	0.2732
USGS	11074000	3/10/1978	2440	2	0.5464
USGS	11074000	3/5/1978	2420	3	0.8197
USGS	11074000	3/7/1978	2400	4	1.0929
USGS	11074000	3/9/1978	2380	5	1.3661
USGS	11074000	3/11/1978	2270	6	1.6393
USGS	11074000	3/3/1978	2230	7	1.9126
USGS	11074000	3/12/1978	2230	8	2.1858
USGS	11074000	3/15/1978	2200	9	2.4590
USGS	11074000	3/4/1978	2180	10	2.7322
USGS	11074000	3/2/1978	1890	11	3.0055
USGS	11074000	3/8/1978	1690	12	3.2787
USGS	11074000	3/13/1978	1380	13	3.5519
USGS	11074000	3/16/1978	1380	14	3.8251
USGS	11074000	1/18/1978	1210	15	4.0984
USGS	11074000	4/18/1978	1180	16	4.3716
USGS	11074000	4/19/1978	1170	17	4.6448
USGS	11074000	4/20/1978	1170	18	4.9180
USGS	11074000	4/21/1978	1160	19	5.1913
USGS	11074000	4/22/1978	1150	20	5.4645
USGS	11074000	4/23/1978	1150	21	5.7377
USGS	11074000	4/24/1978	1140	22	6.0109
USGS	11074000	2/11/1978	1130	23	6.2842
USGS	11074000	4/25/1978	1130	24	6.5574
USGS	11074000	4/26/1978	1130	25	6.8306
USGS	11074000	4/27/1978	1120	26	7.1038
USGS	11074000	2/10/1978	1070	27	7.3770
USGS	11074000	4/17/1978	1010	28	7.6503
USGS	11074000	1/17/1978	962	29	7.9235
USGS	11074000	3/27/1978	938	30	8.1967
USGS	11074000	3/14/1978	930	31	8.4699
USGS	11074000	3/28/1978	928	32	8.7432
USGS	11074000	4/12/1978	887	33	9.0164
USGS	11074000	4/13/1978	887	34	9.2896
USGS	11074000	4/14/1978	887	35	9.5628
USGS	11074000	4/15/1978	887	36	9.8361
USGS	11074000	4/16/1978	887	37	10.1093
USGS	11074000	2/14/1978	858	38	10.3825
USGS	11074000	4/28/1978	857	39	10.6557
USGS	11074000	2/15/1978	814	40	10.9290
USGS	11074000	4/11/1978	790	41	11.2022
USGS	11074000	3/22/1978	690	42	11.4754
USGS	11074000	4/7/1978	690	43	11.7486
USGS	11074000	4/8/1978	690	44	12.0219
USGS	11074000	4/9/1978	690	45	12.2951
USGS	11074000	4/10/1978	690	46	12.5683
USGS	11074000	4/2/1978	678	47	12.8415
USGS	11074000	3/31/1978	667	48	13.1148
USGS	11074000	4/1/1978	667	49	13.3880
USGS	11074000	4/3/1978	667	50	13.6612
USGS	11074000	3/29/1978	656	51	13.9344
USGS	11074000	3/30/1978	656	52	14.2077
USGS	11074000	3/25/1978	644	53	14.4809
USGS	11074000	2/13/1978	635	54	14.7541
USGS	11074000	3/26/1978	633	55	15.0273

Water Year 19993
Below Prado (USGS 11074000)
n_4 = 365
total ppt = 30.9 inches

	Gage#	Date	Flow (cfs)	rank	p
USGS	11074000	1/20/1993	6210	1	0.2732
USGS	11074000	2/21/1993	6140	2	0.5464
USGS	11074000	2/20/1993	6080	3	0.8197
USGS	11074000	1/21/1993	6040	4	1.0929
USGS	11074000	1/22/1993	6020	5	1.3661
USGS	11074000	1/24/1993	6020	6	1.6393
USGS	11074000	1/23/1993	5990	7	1.9126
USGS	11074000	1/11/1993	5950	8	2.1858
USGS	11074000	2/22/1993	5940	9	2.4590
USGS	11074000	1/25/1993	5920	10	2.7322
USGS	11074000	2/9/1993	5870	11	3.0055
USGS	11074000	1/14/1993	5850	12	3.2787
USGS	11074000	2/23/1993	5730	13	3.5519
USGS	11074000	1/19/1993	5720	14	3.8251
USGS	11074000	2/24/1993	5720	15	4.0984
USGS	11074000	2/10/1993	5650	16	4.3716
USGS	11074000	2/25/1993	5630	17	4.6448
USGS	11074000	1/9/1993	5150	18	4.9180
USGS	11074000	1/17/1993	4840	19	5.1913
USGS	11074000	1/18/1993	4840	20	5.4645
USGS	11074000	1/15/1993	4820	21	5.7377
USGS	11074000	1/8/1993	4700	22	6.0109
USGS	11074000	1/16/1993	4540	23	6.2842
USGS	11074000	1/26/1993	4500	24	6.5574
USGS	11074000	1/12/1993	4480	25	6.8306
USGS	11074000	2/26/1993	4480	26	7.1038
USGS	11074000	1/10/1993	4430	27	7.3770
USGS	11074000	2/11/1993	4380	28	7.6503
USGS	11074000	1/13/1993	4080	29	7.9235
USGS	11074000	2/8/1993	3010	30	8.1967
USGS	11074000	2/19/1993	2550	31	8.4699
USGS	11074000	1/29/1993	2260	32	8.7432
USGS	11074000	2/27/1993	2230	33	9.0164
USGS	11074000	3/27/1993	1790	34	9.2896
USGS	11074000	3/26/1993	1670	35	9.5628
USGS	11074000	1/27/1993	1650	36	9.8361
USGS	11074000	2/12/1993	1540	37	10.1093
USGS	11074000	2/28/1993	1530	38	10.3825
USGS	11074000	2/17/1993	1420	39	10.6557
USGS	11074000	2/16/1993	1390	40	10.9290
USGS	11074000	1/7/1993	1280	41	11.2022
USGS	11074000	3/1/1993	1270	42	11.4754
USGS	11074000	3/28/1993	1140	43	11.7486
USGS	11074000	3/2/1993	1040	44	12.0219
USGS	11074000	3/29/1993	984	45	12.2951
USGS	11074000	3/20/1993	980	46	12.5683
USGS	11074000	3/21/1993	977	47	12.8415
USGS	11074000	3/4/1993	929	48	13.1148
USGS	11074000	12/8/1992	915	49	13.3880
USGS	11074000	3/5/1993	911	50	13.6612
USGS	11074000	3/3/1993	899	51	13.9344
USGS	11074000	3/6/1993	879	52	14.2077
USGS	11074000	3/7/1993	878	53	14.4809
USGS	11074000	1/28/1993	856	54	14.7541
USGS	11074000	3/19/1993	850	55	15.0273

USGS	11074500	4/22/1937	220	56	15.3005	USGS	11074000	2/18/1978	630	56	15.3005	USGS	11074000	3/25/1993	832	56	15.3005
USGS	11074500	3/29/1937	219	57	15.5738	USGS	11074000	2/19/1978	612	57	15.5738	USGS	11074000	3/24/1993	809	57	15.5738
USGS	11074500	2/13/1937	210	58	15.8470	USGS	11074000	1/19/1978	598	58	15.8470	USGS	11074000	3/13/1993	797	58	15.8470
USGS	11074500	3/12/1937	209	59	16.1202	USGS	11074000	2/16/1978	596	59	16.1202	USGS	11074000	3/14/1993	796	59	16.1202
USGS	11074500	4/4/1937	209	60	16.3934	USGS	11074000	2/12/1978	590	60	16.3934	USGS	11074000	12/9/1992	773	60	16.3934
USGS	11074500	4/6/1937	201	61	16.6667	USGS	11074000	2/20/1978	587	61	16.6667	USGS	11074000	3/10/1993	772	61	16.6667
USGS	11074500	1/13/1937	200	62	16.9399	USGS	11074000	1/12/1978	571	62	16.9399	USGS	11074000	3/12/1993	764	62	16.9399
USGS	11074500	4/7/1937	198	63	17.2131	USGS	11074000	1/20/1978	553	63	17.2131	USGS	11074000	3/11/1993	754	63	17.2131
USGS	11074500	4/23/1937	198	64	17.4863	USGS	11074000	1/16/1978	551	64	17.4863	USGS	11074000	2/15/1993	713	64	17.4863
USGS	11074500	2/24/1937	197	65	17.7596	USGS	11074000	1/13/1978	550	65	17.7596	USGS	11074000	2/14/1993	710	65	17.7596
USGS	11074500	12/27/1936	195	66	18.0328	USGS	11074000	2/9/1978	539	66	18.0328	USGS	11074000	2/13/1993	709	66	18.0328
USGS	11074500	2/27/1937	195	67	18.3060	USGS	11074000	4/4/1978	518	67	18.3060	USGS	11074000	3/22/1993	709	67	18.3060
USGS	11074500	4/5/1937	195	68	18.5792	USGS	11074000	12/30/1977	504	68	18.5792	USGS	11074000	3/30/1993	695	68	18.5792
USGS	11074500	4/8/1937	191	69	18.8525	USGS	11074000	4/6/1978	504	69	18.8525	USGS	11074000	3/23/1993	692	69	18.8525
USGS	11074500	3/30/1937	185	70	19.1257	USGS	11074000	1/11/1978	503	70	19.1257	USGS	11074000	3/18/1993	675	70	19.1257
USGS	11074500	2/28/1937	181	71	19.3989	USGS	11074000	12/31/1977	492	71	19.3989	USGS	11074000	12/10/1992	670	71	19.3989
USGS	11074500	3/31/1937	181	72	19.6721	USGS	11074000	6/9/1978	480	72	19.6721	USGS	11074000	12/11/1992	645	72	19.6721
USGS	11074500	1/6/1937	179	73	19.9454	USGS	11074000	1/1/1978	462	73	19.9454	USGS	11074000	4/15/1993	644	73	19.9454
USGS	11074500	3/1/1937	179	74	20.2186	USGS	11074000	2/17/1978	458	74	20.2186	USGS	11074000	12/12/1992	638	74	20.2186
USGS	11074500	3/2/1937	177	75	20.4918	USGS	11074000	1/14/1978	454	75	20.4918	USGS	11074000	3/8/1993	632	75	20.4918
USGS	11074500	1/3/1937	174	76	20.7650	USGS	11074000	1/21/1978	453	76	20.7650	USGS	11074000	12/13/1992	624	76	20.7650
USGS	11074500	12/30/1936	172	77	21.0383	USGS	11074000	3/24/1978	448	77	21.0383	USGS	11074000	1/31/1993	621	77	21.0383
USGS	11074500	3/10/1937	172	78	21.3115	USGS	11074000	1/22/1978	445	78	21.3115	USGS	11074000	2/1/1993	620	78	21.3115
USGS	11074500	3/11/1937	172	79	21.5847	USGS	11074000	1/15/1978	429	79	21.5847	USGS	11074000	3/9/1993	614	79	21.5847
USGS	11074500	4/1/1937	172	80	21.8579	USGS	11074000	12/29/1977	428	80	21.8579	USGS	11074000	4/18/1993	610	80	21.8579
USGS	11074500	4/27/1937	170	81	22.1311	USGS	11074000	1/2/1978	428	81	22.1311	USGS	11074000	3/17/1993	608	81	22.1311
USGS	11074500	4/28/1937	170	82	22.4044	USGS	11074000	1/5/1978	421	82	22.4044	USGS	11074000	4/17/1993	607	82	22.4044
USGS	11074500	4/24/1937	167	83	22.6776	USGS	11074000	6/10/1978	409	83	22.6776	USGS	11074000	4/14/1993	606	83	22.6776
USGS	11074500	3/3/1937	166	84	22.9508	USGS	11074000	7/7/1978	406	84	22.9508	USGS	11074000	3/16/1993	596	84	22.9508
USGS	11074500	3/9/1937	166	85	23.2240	USGS	11074000	6/11/1978	405	85	23.2240	USGS	11074000	3/15/1993	591	85	23.2240
USGS	11074500	3/6/1937	164	86	23.4973	USGS	11074000	7/9/1978	404	86	23.4973	USGS	11074000	1/4/1993	574	86	23.4973
USGS	11074500	3/4/1937	162	87	23.7705	USGS	11074000	6/12/1978	402	87	23.7705	USGS	11074000	4/11/1993	573	87	23.7705
USGS	11074500	3/5/1937	162	88	24.0437	USGS	11074000	7/8/1978	402	88	24.0437	USGS	11074000	4/10/1993	572	88	24.0437
USGS	11074500	1/7/1937	160	89	24.3169	USGS	11074000	7/10/1978	401	89	24.3169	USGS	11074000	4/1/1993	569	89	24.3169
USGS	11074500	3/8/1937	160	90	24.5902	USGS	11074000	7/6/1978	398	90	24.5902	USGS	11074000	4/16/1993	566	90	24.5902
USGS	11074500	4/25/1937	160	91	24.8634	USGS	11074000	7/11/1978	396	91	24.8634	USGS	11074000	4/2/1993	564	91	24.8634
USGS	11074500	3/7/1937	158	92	25.1366	USGS	11074000	7/12/1978	394	92	25.1366	USGS	11074000	4/4/1993	564	92	25.1366
USGS	11074500	1/31/1937	150	93	25.4098	USGS	11074000	1/23/1978	393	93	25.4098	USGS	11074000	4/3/1993	562	93	25.4098
USGS	11074500	12/16/1936	144	94	25.6831	USGS	11074000	7/3/1978	387	94	25.6831	USGS	11074000	3/31/1993	553	94	25.6831
USGS	11074500	4/26/1937	144	95	25.9563	USGS	11074000	7/4/1978	387	95	25.9563	USGS	11074000	4/29/1993	548	95	25.9563
USGS	11074500	5/18/1937	141	96	26.2295	USGS	11074000	7/5/1978	387	96	26.2295	USGS	11074000	4/21/1993	546	96	26.2295
USGS	11074500	12/15/1936	139	97	26.5027	USGS	11074000	7/13/1978	387	97	26.5027	USGS	11074000	4/20/1993	538	97	26.5027
USGS	11074500	5/19/1937	138	98	26.7760	USGS	11074000	7/2/1978	384	98	26.7760	USGS	11074000	12/14/1992	533	98	26.7760
USGS	11074500	1/4/1937	137	99	27.0492	USGS	11074000	6/7/1978	380	99	27.0492	USGS	11074000	4/19/1993	533	99	27.0492
USGS	11074500	4/29/1937	136	100	27.3224	USGS	11074000	6/8/1978	380	100	27.3224	USGS	11074000	4/6/1993	531	100	27.3224
USGS	11074500	1/14/1937	134	101	27.5956	USGS	11074000	6/29/1978	380	101	27.5956	USGS	11074000	4/12/1993	530	101	27.5956
USGS	11074500	5/16/1937	130	102	27.8689	USGS	11074000	6/30/1978	380	102	27.8689	USGS	11074000	4/27/1993	524	102	27.8689
USGS	11074500	5/17/1937	130	103	28.1421	USGS	11074000	7/1/1978	380	103	28.1421	USGS	11074000	4/30/1993	524	103	28.1421
USGS	11074500	1/8/1937	126	104	28.4153	USGS	11074000	7/15/1978	375	104	28.4153	USGS	11074000	4/28/1993	523	104	28.4153
USGS	11074500	1/15/1937	122	105	28.6885	USGS	11074000	3/21/1978	373	105	28.6885	USGS	11074000	12/7/1992	517	105	28.6885
USGS	11074500	4/30/1937	122	106	28.9617	USGS	11074000	7/14/1978	373	106	28.9617	USGS	11074000	4/9/1993	516	106	28.9617
USGS	11074500	1/12/1937	121	107	29.2350	USGS	11074000	7/16/1978	371	107	29.2350	USGS	11074000	4/26/1993	514	107	29.2350
USGS	11074500	1/5/1937	119	108	29.5082	USGS	11074000	6/28/1978	361	108	29.5082	USGS	11074000	1/5/1993	510	108	29.5082
USGS	11074500	2/1/1937	119	109	29.7814	USGS	11074000	3/1/1978	358	109	29.7814	USGS	11074000	4/23/1993	507	109	29.7814
USGS	11074500	1/16/1937	117	110	30.0546	USGS	11074000	1/6/1978	357	110	30.0546	USGS	11074000	4/25/1993	507	110	30.0546
USGS	11074500	1/30/1937	117	111	30.3279	USGS	11074000	7/17/1978	356	111	30.3279	USGS	11074000	4/24/1993	505	111	30.3279
USGS	11074500	5/15/1937	116	112	30.6011	USGS	11074000	6/6/1978	355	112	30.6011	USGS	11074000	12/31/1992	495	112	30.6011
USGS	11074500	5/20/1937	116	113	30.8743	USGS	11074000	6/13/1978	350	113	30.8743	USGS	11074000	5/1/1993	495	113	30.8743
USGS	11074500	1/9/1937	113	114	31.1475	USGS	11074000	1/24/1978	344	114	31.1475	USGS	11074000	1/1/1993	494	114	31.1475
USGS	11074500	1/10/1937	113	115	31.4208	USGS	11074000	7/18/1978	342	115	31.4208	USGS	11074000	4/5/1993	492	115	31.4208
USGS	11074500	1/17/1937	113	116	31.6940	USGS	11074000	1/25/1978	339	116	31.6940	USGS	11074000	12/19/1992	491	116	31.6940
USGS	11074500	1/18/1937	113	117	31.9672	USGS	11074000	6/16/1978	339	117	31.9672	USGS	11074000	4/22/1993	490	117	31.9672
USGS	11074500	1/19/1937	113	118	32.2404	USGS	11074000	1/26/1978	336	118	32.2404	USGS	11074000	5/2/1993	490	118	32.2404
USGS	11074500	12/17/1936	111	119	32.5137	USGS	11074000	1/27/1978	333	119	32.5137	USGS	11074000	12/18/1992	486	119	32.5137
USGS	11074500	1/20/1937	111	120	32.7869	USGS	11074000	6/17/1978	331	120	32.7869	USGS	11074000	4/13/1993	486	120	32.7869
USGS	11074500	1/29/1937	111	121	33.0601	USGS	11074000	6/26/1978	327	121	33.0601	USGS	11074000	5/3/1993	485	121	33.0601
USGS	11074500	2/2/1937	111	122	33.3333	USGS	11074000	6/27/1978	327	122	33.3333	USGS	11074000	12/20/1992	484	122	33.3333

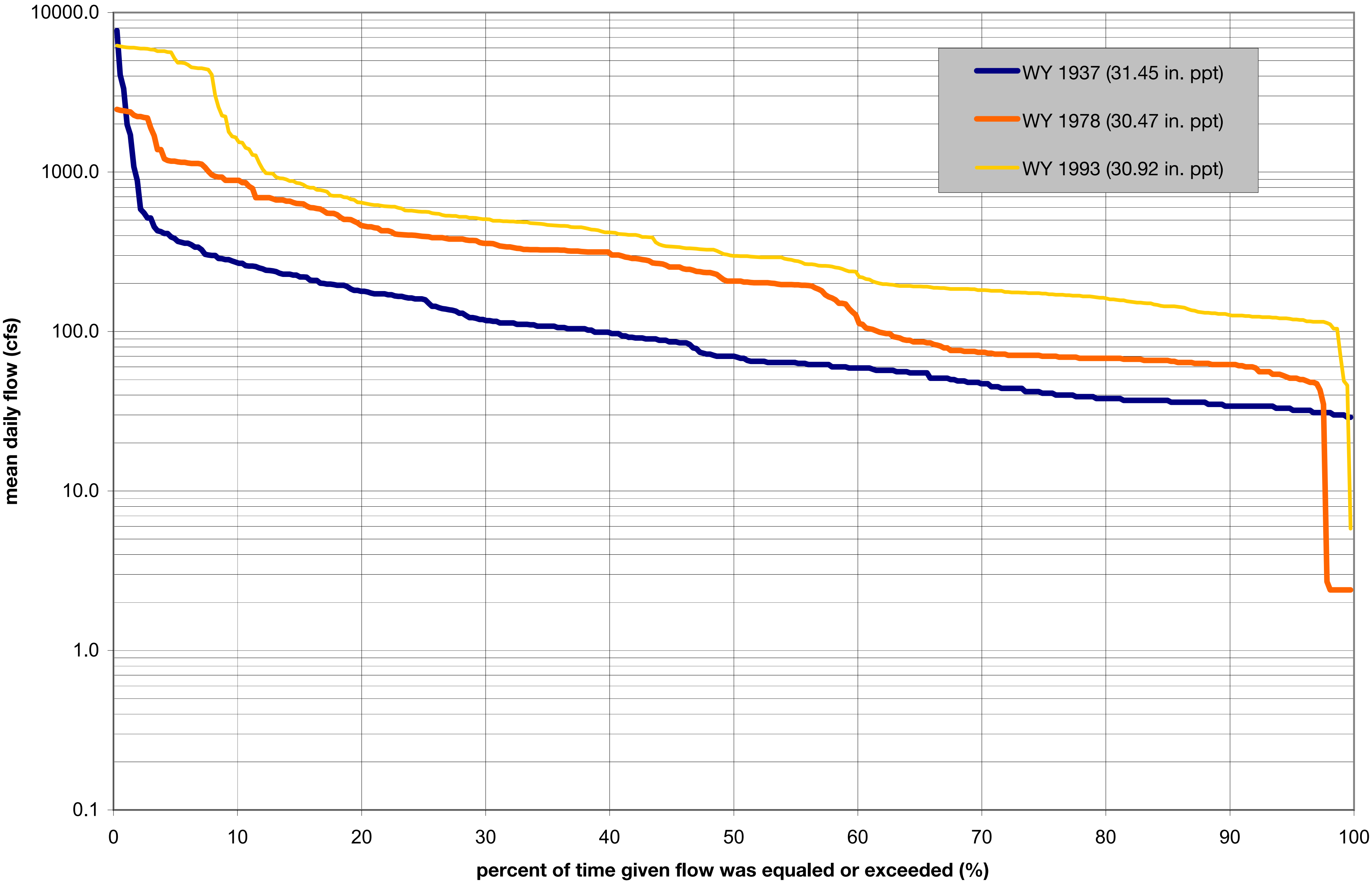
USGS	11074500	1/11/1937	110	123	33.6066	USGS	11074000	5/25/1978	326	123	33.6066	USGS	11074000	12/15/1992	478	123	33.6066
USGS	11074500	1/21/1937	110	124	33.8798	USGS	11074000	6/21/1978	326	124	33.8798	USGS	11074000	12/21/1992	476	124	33.8798
USGS	11074500	1/22/1937	108	125	34.1530	USGS	11074000	6/25/1978	326	125	34.1530	USGS	11074000	5/4/1993	475	125	34.1530
USGS	11074500	1/23/1937	108	126	34.4262	USGS	11074000	5/26/1978	325	126	34.4262	USGS	11074000	1/30/1993	473	126	34.4262
USGS	11074500	1/24/1937	108	127	34.6995	USGS	11074000	6/19/1978	325	127	34.6995	USGS	11074000	12/16/1992	471	127	34.6995
USGS	11074500	1/26/1937	108	128	34.9727	USGS	11074000	6/20/1978	325	128	34.9727	USGS	11074000	12/22/1992	466	128	34.9727
USGS	11074500	1/27/1937	108	129	35.2459	USGS	11074000	6/22/1978	325	129	35.2459	USGS	11074000	12/17/1992	464	129	35.2459
USGS	11074500	1/28/1937	108	130	35.5191	USGS	11074000	6/23/1978	325	130	35.5191	USGS	11074000	5/7/1993	462	130	35.5191
USGS	11074500	1/25/1937	106	131	35.7923	USGS	11074000	6/24/1978	325	131	35.7923	USGS	11074000	4/7/1993	461	131	35.7923
USGS	11074500	2/3/1937	106	132	36.0656	USGS	11074000	5/27/1978	324	132	36.0656	USGS	11074000	2/2/1993	460	132	36.0656
USGS	11074500	5/11/1937	106	133	36.3388	USGS	11074000	6/18/1978	324	133	36.3388	USGS	11074000	5/5/1993	460	133	36.3388
USGS	11074500	2/4/1937	104	134	36.6120	USGS	11074000	5/28/1978	321	134	36.6120	USGS	11074000	5/6/1993	458	134	36.6120
USGS	11074500	2/5/1937	104	135	36.8852	USGS	11074000	5/29/1978	319	135	36.8852	USGS	11074000	12/23/1992	452	135	36.8852
USGS	11074500	5/1/1937	104	136	37.1585	USGS	11074000	6/15/1978	319	136	37.1585	USGS	11074000	5/8/1993	451	136	37.1585
USGS	11074500	5/10/1937	104	137	37.4317	USGS	11074000	7/19/1978	319	137	37.4317	USGS	11074000	5/11/1993	451	137	37.4317
USGS	11074500	5/14/1937	104	138	37.7049	USGS	11074000	2/21/1978	317	138	37.7049	USGS	11074000	5/12/1993	450	138	37.7049
USGS	11074500	5/21/1937	104	139	37.9781	USGS	11074000	5/30/1978	316	139	37.9781	USGS	11074000	5/10/1993	446	139	37.9781
USGS	11074500	5/22/1937	102	140	38.2514	USGS	11074000	5/24/1978	315	140	38.2514	USGS	11074000	5/9/1993	442	140	38.2514
USGS	11074500	5/27/1937	102	141	38.5246	USGS	11074000	5/31/1978	315	141	38.5246	USGS	11074000	12/24/1992	436	141	38.5246
USGS	11074500	5/2/1937	99	142	38.7978	USGS	11074000	6/1/1978	315	142	38.7978	USGS	11074000	12/30/1992	434	142	38.7978
USGS	11074500	5/12/1937	99	143	39.0710	USGS	11074000	6/2/1978	315	143	39.0710	USGS	11074000	5/19/1993	431	143	39.0710
USGS	11074500	5/23/1937	99	144	39.3443	USGS	11074000	6/3/1978	315	144	39.3443	USGS	11074000	5/20/1993	424	144	39.3443
USGS	11074500	5/24/1937	99	145	39.6175	USGS	11074000	6/4/1978	315	145	39.6175	USGS	11074000	12/25/1992	418	145	39.6175
USGS	11074500	5/31/1937	99	146	39.8907	USGS	11074000	6/5/1978	315	146	39.8907	USGS	11074000	5/24/1993	418	146	39.8907
USGS	11074500	5/25/1937	97	147	40.1639	USGS	11074000	12/28/1977	302	147	40.1639	USGS	11074000	4/8/1993	417	147	40.1639
USGS	11074500	5/26/1937	97	148	40.4372	USGS	11074000	1/10/1978	302	148	40.4372	USGS	11074000	5/21/1993	416	148	40.4372
USGS	11074500	5/30/1937	97	149	40.7104	USGS	11074000	7/20/1978	302	149	40.7104	USGS	11074000	5/22/1993	409	149	40.7104
USGS	11074500	5/9/1937	94	150	40.9836	USGS	11074000	5/23/1978	298	150	40.9836	USGS	11074000	5/13/1993	407	150	40.9836
USGS	11074500	5/13/1937	94	151	41.2568	USGS	11074000	1/7/1978	293	151	41.2568	USGS	11074000	5/18/1993	406	151	41.2568
USGS	11074500	5/3/1937	92	152	41.5301	USGS	11074000	1/28/1978	291	152	41.5301	USGS	11074000	2/18/1993	404	152	41.5301
USGS	11074500	5/8/1937	92	153	41.8033	USGS	11074000	1/8/1978	287	153	41.8033	USGS	11074000	5/17/1993	404	153	41.8033
USGS	11074500	10/30/1936	91	154	42.0765	USGS	11074000	6/14/1978	287	154	42.0765	USGS	11074000	1/3/1993	403	154	42.0765
USGS	11074500	12/18/1936	91	155	42.3497	USGS	11074000	1/4/1978	285	155	42.3497	USGS	11074000	5/23/1993	399	155	42.3497
USGS	11074500	12/26/1936	91	156	42.6230	USGS	11074000	1/9/1978	282	156	42.6230	USGS	11074000	12/26/1992	391	156	42.6230
USGS	11074500	12/25/1936	90	157	42.8962	USGS	11074000	7/21/1978	280	157	42.8962	USGS	11074000	5/14/1993	391	157	42.8962
USGS	11074500	5/6/1937	90	158	43.1694	USGS	11074000	5/22/1978	278	158	43.1694	USGS	11074000	5/16/1993	390	158	43.1694
USGS	11074500	5/7/1937	90	159	43.4426	USGS	11074000	1/29/1978	269	159	43.4426	USGS	11074000	5/15/1993	389	159	43.4426
USGS	11074500	5/28/1937	90	160	43.7158	USGS	11074000	1/3/1978	268	160	43.7158	USGS	11074000	6/8/1993	363	160	43.7158
USGS	11074500	5/4/1937	88	161	43.9891	USGS	11074000	1/30/1978	267	161	43.9891	USGS	11074000	5/25/1993	352	161	43.9891
USGS	11074500	5/29/1937	88	162	44.2623	USGS	11074000	1/31/1978	265	162	44.2623	USGS	11074000	12/28/1992	346	162	44.2623
USGS	11074500	6/1/1937	88	163	44.5355	USGS	11074000	2/1/1978	261	163	44.5355	USGS	11074000	6/15/1993	343	163	44.5355
USGS	11074500	12/19/1936	86	164	44.8087	USGS	11074000	5/18/1978	254	164	44.8087	USGS	11074000	6/9/1993	341	164	44.8087
USGS	11074500	12/23/1936	86	165	45.0820	USGS	11074000	5/19/1978	254	165	45.0820	USGS	11074000	1/2/1993	340	165	45.0820
USGS	11074500	5/5/1937	86	166	45.3552	USGS	11074000	5/20/1978	254	166	45.3552	USGS	11074000	6/16/1993	339	166	45.3552
USGS	11074500	12/20/1936	85	167	45.6284	USGS	11074000	5/21/1978	254	167	45.6284	USGS	11074000	6/14/1993	338	167	45.6284
USGS	11074500	12/22/1936	85	168	45.9016	USGS	11074000	5/17/1978	248	168	45.9016	USGS	11074000	12/27/1992	335	168	45.9016
USGS	11074500	12/24/1936	85	169	46.1749	USGS	11074000	12/27/1977	245	169	46.1749	USGS	11074000	6/10/1993	332	169	46.1749
USGS	11074500	12/21/1936	83	170	46.4481	USGS	11074000	7/22/1978	245	170	46.4481	USGS	11074000	6/12/1993	332	170	46.4481
USGS	11074500	10/31/1936	79	171	46.7213	USGS	11074000	3/23/1978	242	171	46.7213	USGS	11074000	6/11/1993	331	171	46.7213
USGS	11074500	11/1/1936	78	172	46.9945	USGS	11074000	5/16/1978	238	172	46.9945	USGS	11074000	6/13/1993	330	172	46.9945
USGS	11074500	6/2/1937	74	173	47.2678	USGS	11074000	5/15/1978	237	173	47.2678	USGS	11074000	2/6/1993	328	173	47.2678
USGS	11074500	12/9/1936	73	174	47.5410	USGS	11074000	4/5/1978	235	174	47.5410	USGS	11074000	2/5/1993	327	174	47.5410
USGS	11074500	6/4/1937	72	175	47.8142	USGS	11074000	5/13/1978	234	175	47.8142	USGS	11074000	2/3/1993	326	175	47.8142
USGS	11074500	6/5/1937	72	176	48.0874	USGS	11074000	5/14/1978	234	176	48.0874	USGS	11074000	2/4/1993	326	176	48.0874
USGS	11074500	12/7/1936	71	177	48.3607	USGS	11074000	2/2/1978	231	177	48.3607	USGS	11074000	2/7/1993	326	177	48.3607
USGS	11074500	11/2/1936	70	178	48.6339	USGS	11074000	2/8/1978	228	178	48.6339	USGS	11074000	6/17/1993	320	178	48.6339
USGS	11074500	12/4/1936	70	179	48.9071	USGS	11074000	5/12/1978	219	179	48.9071	USGS	11074000	6/18/1993	313	179	48.9071
USGS	11074500	12/5/1936	70	180	49.1803	USGS	11074000	9/8/1978	211	180	49.1803	USGS	11074000	11/5/1992	306	180	49.1803
USGS	11074500	12/8/1936	70	181	49.4536	USGS	11074000	2/3/1978	207	181	49.4536	USGS	11074000	6/7/1993	304	181	49.4536
USGS	11074500	6/6/1937	70	182	49.7268	USGS	11074000	4/29/1978	207	182	49.7268	USGS	11074000	5/26/1993	300	182	49.7268
USGS	11074500	6/7/1937	70	183	50.0000	USGS	11074000	4/30/1978	207	183	50.0000	USGS	11074000	12/29/1992	298	183	50.0000
USGS	11074500	6/3/1937	69	184	50.2732	USGS	11074000	5/1/1978	207	184	50.2732	USGS	11074000	5/27/1993	298	184	50.2732
USGS	11074500	12/6/1936	68	185	50.5464	USGS	11074000	5/2/1978	207	185	50.5464	USGS	11074000	11/6/1992	297	185	50.5464
USGS	11074500	12/10/1936	68	186	50.8197	USGS	11074000	2/4/1978	204	186	50.8197	USGS	11074000	11/9/1992	297	186	50.8197
USGS	11074500	12/14/1936	66	187	51.0929	USGS	11074000	2/24/1978	204	187	51.0929	USGS	11074000	6/19/1993	297	187	51.0929
USGS	11074500	11/30/1936	65	188	51.3661	USGS	11074000	2/5/1978	203	188	51.3661	USGS	11074000	6/20/1993	295	188	51.3661
USGS	11074500	12/11/1936	65	189	51.6393	USGS	11074000	5/3/1978	202	189	51.6393	USGS	11074000	6/3/1993	294	189	51.6393

USGS	11074500	12/12/1936	65	190	51.9126	USGS	11074000	5/4/1978	202	190	51.9126	USGS	11074000	6/4/1993	293	190	51.9126
USGS	11074500	12/13/1936	65	191	52.1858	USGS	11074000	5/5/1978	202	191	52.1858	USGS	11074000	5/28/1993	292	191	52.1858
USGS	11074500	6/9/1937	65	192	52.4590	USGS	11074000	5/6/1978	202	192	52.4590	USGS	11074000	5/29/1993	292	192	52.4590
USGS	11074500	11/5/1936	64	193	52.7322	USGS	11074000	5/7/1978	202	193	52.7322	USGS	11074000	5/30/1993	292	193	52.7322
USGS	11074500	11/6/1936	64	194	53.0055	USGS	11074000	9/9/1978	201	194	53.0055	USGS	11074000	5/31/1993	292	194	53.0055
USGS	11074500	11/23/1936	64	195	53.2787	USGS	11074000	5/8/1978	200	195	53.2787	USGS	11074000	6/1/1993	292	195	53.2787
USGS	11074500	11/26/1936	64	196	53.5519	USGS	11074000	9/30/1978	198	196	53.5519	USGS	11074000	6/2/1993	292	196	53.5519
USGS	11074500	12/1/1936	64	197	53.8251	USGS	11074000	2/22/1978	197	197	53.8251	USGS	11074000	7/2/1993	292	197	53.8251
USGS	11074500	12/3/1936	64	198	54.0984	USGS	11074000	5/9/1978	197	198	54.0984	USGS	11074000	11/7/1992	286	198	54.0984
USGS	11074500	6/8/1937	64	199	54.3716	USGS	11074000	5/10/1978	197	199	54.3716	USGS	11074000	7/3/1993	283	199	54.3716
USGS	11074500	6/10/1937	64	200	54.6448	USGS	11074000	5/11/1978	197	200	54.6448	USGS	11074000	11/4/1992	281	200	54.6448
USGS	11074500	6/11/1937	64	201	54.9180	USGS	11074000	2/23/1978	196	201	54.9180	USGS	11074000	11/8/1992	278	201	54.9180
USGS	11074500	11/3/1936	63	202	55.1913	USGS	11074000	2/25/1978	196	202	55.1913	USGS	11074000	11/10/1992	276	202	55.1913
USGS	11074500	11/25/1936	63	203	55.4645	USGS	11074000	2/26/1978	195	203	55.4645	USGS	11074000	7/4/1993	271	203	55.4645
USGS	11074500	11/28/1936	63	204	55.7377	USGS	11074000	2/27/1978	195	204	55.7377	USGS	11074000	7/1/1993	265	204	55.7377
USGS	11074500	11/4/1936	62	205	56.0109	USGS	11074000	9/29/1978	194	205	56.0109	USGS	11074000	6/21/1993	264	205	56.0109
USGS	11074500	11/7/1936	62	206	56.2842	USGS	11074000	9/28/1978	193	206	56.2842	USGS	11074000	6/23/1993	264	206	56.2842
USGS	11074500	11/24/1936	62	207	56.5574	USGS	11074000	9/27/1978	188	207	56.5574	USGS	11074000	6/24/1993	262	207	56.5574
USGS	11074500	11/27/1936	62	208	56.8306	USGS	11074000	9/10/1978	184	208	56.8306	USGS	11074000	6/25/1993	259	208	56.8306
USGS	11074500	11/29/1936	62	209	57.1038	USGS	11074000	12/26/1977	180	209	57.1038	USGS	11074000	1/6/1993	258	209	57.1038
USGS	11074500	12/2/1936	62	210	57.3770	USGS	11074000	9/7/1978	170	210	57.3770	USGS	11074000	6/22/1993	258	210	57.3770
USGS	11074500	6/12/1937	62	211	57.6503	USGS	11074000	2/7/1978	165	211	57.6503	USGS	11074000	6/26/1993	257	211	57.6503
USGS	11074500	10/19/1936	60	212	57.9235	USGS	11074000	9/26/1978	162	212	57.9235	USGS	11074000	7/5/1993	255	212	57.9235
USGS	11074500	11/8/1936	60	213	58.1967	USGS	11074000	3/20/1978	158	213	58.1967	USGS	11074000	6/27/1993	252	213	58.1967
USGS	11074500	11/10/1936	60	214	58.4699	USGS	11074000	2/6/1978	150	214	58.4699	USGS	11074000	6/5/1993	250	214	58.4699
USGS	11074500	6/13/1937	60	215	58.7432	USGS	11074000	9/21/1978	150	215	58.7432	USGS	11074000	6/28/1993	247	215	58.7432
USGS	11074500	6/14/1937	60	216	59.0164	USGS	11074000	12/18/1977	149	216	59.0164	USGS	11074000	6/29/1993	242	216	59.0164
USGS	11074500	10/17/1936	59	217	59.2896	USGS	11074000	2/28/1978	139	217	59.2896	USGS	11074000	11/3/1992	238	217	59.2896
USGS	11074500	10/20/1936	59	218	59.5628	USGS	11074000	9/22/1978	133	218	59.5628	USGS	11074000	6/30/1993	238	218	59.5628
USGS	11074500	11/9/1936	59	219	59.8361	USGS	11074000	7/23/1978	127	219	59.8361	USGS	11074000	7/6/1993	237	219	59.8361
USGS	11074500	11/11/1936	59	220	60.1093	USGS	11074000	12/19/1977	112	220	60.1093	USGS	11074000	12/6/1992	220	220	60.1093
USGS	11074500	11/12/1936	59	221	60.3825	USGS	11074000	9/11/1978	111	221	60.3825	USGS	11074000	12/5/1992	218	221	60.3825
USGS	11074500	11/15/1936	59	222	60.6557	USGS	11074000	8/5/1978	105	222	60.6557	USGS	11074000	7/7/1993	213	222	60.6557
USGS	11074500	11/22/1936	59	223	60.9290	USGS	11074000	8/6/1978	104	223	60.9290	USGS	11074000	6/6/1993	212	223	60.9290
USGS	11074500	11/14/1936	58	224	61.2022	USGS	11074000	8/7/1978	103	224	61.2022	USGS	11074000	10/25/1992	206	224	61.2022
USGS	11074500	10/29/1936	57	225	61.4754	USGS	11074000	8/8/1978	101	225	61.4754	USGS	11074000	10/26/1992	203	225	61.4754
USGS	11074500	11/13/1936	57	226	61.7486	USGS	11074000	8/9/1978	99	226	61.7486	USGS	11074000	7/12/1993	200	226	61.7486
USGS	11074500	11/21/1936	57	227	62.0219	USGS	11074000	8/10/1978	98	227	62.0219	USGS	11074000	7/11/1993	198	227	62.0219
USGS	11074500	6/15/1937	57	228	62.2951	USGS	11074000	8/11/1978	97	228	62.2951	USGS	11074000	7/13/1993	198	228	62.2951
USGS	11074500	6/16/1937	57	229	62.5683	USGS	11074000	8/12/1978	97	229	62.5683	USGS	11074000	12/4/1992	197	229	62.5683
USGS	11074500	6/17/1937	57	230	62.8415	USGS	11074000	8/13/1978	93	230	62.8415	USGS	11074000	7/14/1993	196	230	62.8415
USGS	11074500	10/21/1936	56	231	63.1148	USGS	11074000	12/24/1977	92	231	63.1148	USGS	11074000	7/10/1993	194	231	63.1148
USGS	11074500	11/16/1936	56	232	63.3880	USGS	11074000	8/14/1978	91	232	63.3880	USGS	11074000	11/2/1992	193	232	63.3880
USGS	11074500	11/17/1936	56	233	63.6612	USGS	11074000	8/15/1978	89	233	63.6612	USGS	11074000	11/24/1992	193	233	63.6612
USGS	11074500	11/18/1936	56	234	63.9344	USGS	11074000	7/26/1978	88	234	63.9344	USGS	11074000	7/8/1993	193	234	63.9344
USGS	11074500	10/18/1936	55	235	64.2077	USGS	11074000	9/6/1978	88	235	64.2077	USGS	11074000	7/9/1993	193	235	64.2077
USGS	11074500	10/22/1936	55	236	64.4809	USGS	11074000	12/23/1977	86	236	64.4809	USGS	11074000	7/15/1993	192	236	64.4809
USGS	11074500	10/23/1936	55	237	64.7541	USGS	11074000	12/25/1977	86	237	64.7541	USGS	11074000	7/16/1993	192	237	64.7541
USGS	11074500	11/19/1936	55	238	65.0273	USGS	11074000	8/16/1978	86	238	65.0273	USGS	11074000	7/17/1993	192	238	65.0273
USGS	11074500	11/20/1936	55	239	65.3005	USGS	11074000	9/15/1978	86	239	65.3005	USGS	11074000	10/24/1992	191	239	65.3005
USGS	11074500	6/18/1937	55	240	65.5738	USGS	11074000	12/22/1977	85	240	65.5738	USGS	11074000	11/11/1992	191	240	65.5738
USGS	11074500	10/24/1936	51	241	65.8470	USGS	11074000	9/12/1978	85	241	65.8470	USGS	11074000	7/19/1993	190	241	65.8470
USGS	11074500	10/26/1936	51	242	66.1202	USGS	11074000	9/13/1978	83	242	66.1202	USGS	11074000	11/19/1992	188	242	66.1202
USGS	11074500	10/27/1936	51	243	66.3934	USGS	11074000	9/14/1978	82	243	66.3934	USGS	11074000	7/18/1993	188	243	66.3934
USGS	11074500	6/21/1937	51	244	66.6667	USGS	11074000	8/17/1978	81	244	66.6667	USGS	11074000	12/1/1992	187	244	66.6667
USGS	11074500	6/22/1937	51	245	66.9399	USGS	11074000	12/20/1977	79	245	66.9399	USGS	11074000	7/20/1993	187	245	66.9399
USGS	11074500	6/30/1937	51	246	67.2131	USGS	11074000	8/18/1978	79	246	67.2131	USGS	11074000	7/22/1993	186	246	67.2131
USGS	11074500	10/25/1936	50	247	67.4863	USGS	11074000	11/24/1977	76	247	67.4863	USGS	11074000	11/20/1992	185	247	67.4863
USGS	11074500	10/28/1936	50	248	67.7596	USGS	11074000	12/21/1977	76	248	67.7596	USGS	11074000	11/25/1992	185	248	67.7596
USGS	11074500	6/19/1937	49	249	68.0328	USGS	11074000	7/27/1978	76	249	68.0328	USGS	11074000	7/21/1993	185	249	68.0328
USGS	11074500	6/20/1937	49	250	68.3060	USGS	11074000	8/19/1978	76	250	68.3060	USGS	11074000	7/23/1993	185	250	68.3060
USGS	11074500	6/24/1937	49	251	68.5792	USGS	11074000	11/23/1977	75	251	68.5792	USGS	11074000	7/24/1993	185	251	68.5792
USGS	11074500	10/16/1936	48	252	68.8525	USGS	11074000	7/24/1978	75	252	68.8525	USGS	11074000	7/25/1993	185	252	68.8525
USGS	11074500	6/25/1937	48	253	69.1257	USGS	11074000	9/16/1978	75	253	69.1257	USGS	11074000	11/23/1992	184	253	69.1257
USGS	11074500	6/27/1937	48	254	69.3989	USGS	11074000	9/17/1978	75	254	69.3989	USGS	11074000	7/26/1993	184	254	69.3989
USGS	11074500	6/29/1937	48	255	69.6721	USGS	11074000	11/6/1977	74	255	69.6721	USGS	11074000	11/30/1992	182	255	69.6721
USGS	11074500	6/26/1937	47	256	69.9454	USGS	11074000	11/25/1977	74	256	69.9454	USGS	11074000	7/27/1993	182	256	69.9454

USGS	11074500	6/28/1937	47	257	70.2186	USGS	11074000	8/20/1978	74	257	70.2186	USGS	11074000	7/28/1993	182	257	70.2186
USGS	11074500	7/1/1937	47	258	70.4918	USGS	11074000	12/1/1977	73	258	70.4918	USGS	11074000	12/3/1992	181	258	70.4918
USGS	11074500	6/23/1937	45	259	70.7650	USGS	11074000	12/13/1977	73	259	70.7650	USGS	11074000	10/28/1992	180	259	70.7650
USGS	11074500	7/2/1937	45	260	71.0383	USGS	11074000	11/7/1977	72	260	71.0383	USGS	11074000	11/18/1992	180	260	71.0383
USGS	11074500	7/6/1937	45	261	71.3115	USGS	11074000	11/21/1977	72	261	71.3115	USGS	11074000	12/2/1992	180	261	71.3115
USGS	11074500	7/3/1937	44	262	71.5847	USGS	11074000	11/28/1977	72	262	71.5847	USGS	11074000	7/29/1993	180	262	71.5847
USGS	11074500	7/7/1937	44	263	71.8579	USGS	11074000	12/12/1977	72	263	71.8579	USGS	11074000	10/22/1992	177	263	71.8579
USGS	11074500	7/8/1937	44	264	72.1311	USGS	11074000	11/5/1977	71	264	72.1311	USGS	11074000	7/30/1993	177	264	72.1311
USGS	11074500	7/11/1937	44	265	72.4044	USGS	11074000	11/8/1977	71	265	72.4044	USGS	11074000	10/21/1992	176	265	72.4044
USGS	11074500	7/12/1937	44	266	72.6776	USGS	11074000	11/22/1977	71	266	72.6776	USGS	11074000	11/21/1992	176	266	72.6776
USGS	11074500	7/16/1937	44	267	72.9508	USGS	11074000	11/26/1977	71	267	72.9508	USGS	11074000	11/22/1992	176	267	72.9508
USGS	11074500	9/3/1937	44	268	73.2240	USGS	11074000	11/27/1977	71	268	73.2240	USGS	11074000	11/26/1992	175	268	73.2240
USGS	11074500	7/9/1937	42	269	73.4973	USGS	11074000	11/30/1977	71	269	73.4973	USGS	11074000	11/29/1992	175	269	73.4973
USGS	11074500	7/13/1937	42	270	73.7705	USGS	11074000	12/2/1977	71	270	73.7705	USGS	11074000	10/13/1992	174	270	73.7705
USGS	11074500	7/15/1937	42	271	74.0437	USGS	11074000	12/14/1977	71	271	74.0437	USGS	11074000	10/19/1992	174	271	74.0437
USGS	11074500	7/17/1937	42	272	74.3169	USGS	11074000	12/15/1977	71	272	74.3169	USGS	11074000	11/17/1992	174	272	74.3169
USGS	11074500	7/19/1937	42	273	74.5902	USGS	11074000	12/16/1977	71	273	74.5902	USGS	11074000	11/27/1992	174	273	74.5902
USGS	11074500	7/4/1937	41	274	74.8634	USGS	11074000	10/30/1977	70	274	74.8634	USGS	11074000	10/20/1992	173	274	74.8634
USGS	11074500	7/5/1937	41	275	75.1366	USGS	11074000	10/31/1977	70	275	75.1366	USGS	11074000	11/28/1992	173	275	75.1366
USGS	11074500	7/10/1937	41	276	75.4098	USGS	11074000	11/14/1977	70	276	75.4098	USGS	11074000	10/18/1992	171	276	75.4098
USGS	11074500	7/18/1937	41	277	75.6831	USGS	11074000	11/20/1977	70	277	75.6831	USGS	11074000	11/16/1992	171	277	75.6831
USGS	11074500	7/14/1937	40	278	75.9563	USGS	11074000	12/7/1977	70	278	75.9563	USGS	11074000	10/12/1992	170	278	75.9563
USGS	11074500	7/22/1937	40	279	76.2295	USGS	11074000	11/19/1977	69	279	76.2295	USGS	11074000	11/15/1992	170	279	76.2295
USGS	11074500	8/11/1937	40	280	76.5027	USGS	11074000	12/8/1977	69	280	76.5027	USGS	11074000	7/31/1993	170	280	76.5027
USGS	11074500	8/29/1937	40	281	76.7760	USGS	11074000	12/10/1977	69	281	76.7760	USGS	11074000	10/23/1992	169	281	76.7760
USGS	11074500	9/1/1937	40	282	77.0492	USGS	11074000	12/17/1977	69	282	77.0492	USGS	11074000	10/29/1992	169	282	77.0492
USGS	11074500	9/2/1937	40	283	77.3224	USGS	11074000	7/25/1978	69	283	77.3224	USGS	11074000	11/12/1992	168	283	77.3224
USGS	11074500	7/20/1937	39	284	77.5956	USGS	11074000	8/21/1978	69	284	77.5956	USGS	11074000	11/13/1992	168	284	77.5956
USGS	11074500	7/21/1937	39	285	77.8689	USGS	11074000	10/29/1977	68	285	77.8689	USGS	11074000	8/1/1993	168	285	77.8689
USGS	11074500	7/23/1937	39	286	78.1421	USGS	11074000	11/1/1977	68	286	78.1421	USGS	11074000	10/17/1992	166	286	78.1421
USGS	11074500	7/24/1937	39	287	78.4153	USGS	11074000	11/4/1977	68	287	78.4153	USGS	11074000	8/2/1993	166	287	78.4153
USGS	11074500	8/16/1937	39	288	78.6885	USGS	11074000	11/13/1977	68	288	78.6885	USGS	11074000	8/3/1993	166	288	78.6885
USGS	11074500	8/31/1937	39	289	78.9617	USGS	11074000	11/18/1977	68	289	78.9617	USGS	11074000	10/16/1992	165	289	78.9617
USGS	11074500	10/15/1936	38	290	79.2350	USGS	11074000	11/29/1977	68	290	79.2350	USGS	11074000	11/14/1992	164	290	79.2350
USGS	11074500	8/8/1937	38	291	79.5082	USGS	11074000	12/3/1977	68	291	79.5082	USGS	11074000	10/15/1992	163	291	79.5082
USGS	11074500	8/12/1937	38	292	79.7814	USGS	11074000	12/5/1977	68	292	79.7814	USGS	11074000	8/4/1993	163	292	79.7814
USGS	11074500	8/13/1937	38	293	80.0546	USGS	11074000	12/9/1977	68	293	80.0546	USGS	11074000	8/5/1993	161	293	80.0546
USGS	11074500	9/27/1937	38	294	80.3279	USGS	11074000	12/11/1977	68	294	80.3279	USGS	11074000	10/14/1992	159	294	80.3279
USGS	11074500	9/28/1937	38	295	80.6011	USGS	11074000	9/1/1978	68	295	80.6011	USGS	11074000	8/6/1993	159	295	80.6011
USGS	11074500	9/29/1937	38	296	80.8743	USGS	11074000	9/2/1978	68	296	80.8743	USGS	11074000	10/6/1992	158	296	80.8743
USGS	11074500	9/30/1937	38	297	81.1475	USGS	11074000	9/3/1978	68	297	81.1475	USGS	11074000	8/7/1993	157	297	81.1475
USGS	11074500	10/6/1936	37	298	81.4208	USGS	11074000	11/3/1977	67	298	81.4208	USGS	11074000	8/8/1993	157	298	81.4208
USGS	11074500	10/11/1936	37	299	81.6940	USGS	11074000	11/9/1977	67	299	81.6940	USGS	11074000	10/7/1992	155	299	81.6940
USGS	11074500	10/13/1936	37	300	81.9672	USGS	11074000	12/6/1977	67	300	81.9672	USGS	11074000	8/9/1993	154	300	81.9672
USGS	11074500	10/14/1936	37	301	82.2404	USGS	11074000	8/4/1978	67	301	82.2404	USGS	11074000	10/5/1992	153	301	82.2404
USGS	11074500	7/25/1937	37	302	82.5137	USGS	11074000	8/31/1978	67	302	82.5137	USGS	11074000	8/10/1993	152	302	82.5137
USGS	11074500	7/26/1937	37	303	82.7869	USGS	11074000	9/4/1978	67	303	82.7869	USGS	11074000	8/11/1993	152	303	82.7869
USGS	11074500	7/31/1937	37	304	83.0601	USGS	11074000	10/28/1977	66	304	83.0601	USGS	11074000	10/8/1992	151	304	83.0601
USGS	11074500	8/14/1937	37	305	83.3333	USGS	11074000	11/2/1977	66	305	83.3333	USGS	11074000	10/9/1992	150	305	83.3333
USGS	11074500	8/15/1937	37	306	83.6066	USGS	11074000	11/12/1977	66	306	83.6066	USGS	11074000	8/12/1993	150	306	83.6066
USGS	11074500	8/18/1937	37	307	83.8798	USGS	11074000	11/15/1977	66	307	83.8798	USGS	11074000	8/13/1993	148	307	83.8798
USGS	11074500	8/28/1937	37	308	84.1530	USGS	11074000	11/17/1977	66	308	84.1530	USGS	11074000	10/4/1992	147	308	84.1530
USGS	11074500	8/30/1937	37	309	84.4262	USGS	11074000	12/4/1977	66	309	84.4262	USGS	11074000	10/27/1992	145	309	84.4262
USGS	11074500	9/4/1937	37	310	84.6995	USGS	11074000	8/23/1978	66	310	84.6995	USGS	11074000	10/3/1992	144	310	84.6995
USGS	11074500	9/26/1937	37	311	84.9727	USGS	11074000	9/5/1978	66	311	84.9727	USGS	11074000	10/11/1992	144	311	84.9727
USGS	11074500	10/4/1936	36	312	85.2459	USGS	11074000	8/22/1978	65	312	85.2459	USGS	11074000	8/14/1993	144	312	85.2459
USGS	11074500	7/27/1937	36	313	85.5191	USGS	11074000	8/24/1978	65	313	85.5191	USGS	11074000	8/15/1993	144	313	85.5191
USGS	11074500	8/2/1937	36	314	85.7923	USGS	11074000	10/27/1977	64	314	85.7923	USGS	11074000	10/2/1992	143	314	85.7923
USGS	11074500	8/6/1937	36	315	86.0656	USGS	11074000	11/16/1977	64	315	86.0656	USGS	11074000	10/10/1992	142	315	86.0656
USGS	11074500	8/10/1937	36	316	86.3388	USGS	11074000	8/27/1978	64	316	86.3388	USGS	11074000	8/16/1993	141	316	86.3388
USGS	11074500	8/17/1937	36	317	86.6120	USGS	11074000	8/28/1978	64	317	86.6120	USGS	11074000	8/17/1993	138	317	86.6120
USGS	11074500	8/20/1937	36	318	86.8852	USGS	11074000	8/30/1978	64	318	86.8852	USGS	11074000	10/1/1992	136	318	86.8852
USGS	11074500	8/24/1937	36	319	87.1585	USGS	11074000	10/19/1977	63	319	87.1585	USGS	11074000	8/30/1993	135	319	87.1585
USGS	11074500	8/27/1937	36	320	87.4317	USGS	11074000	10/24/1977	63	320	87.4317	USGS	11074000	8/20/1993	133	320	87.4317
USGS	11074500	9/22/1937	36	321	87.7049	USGS	11074000	8/25/1978	63	321	87.7049	USGS	11074000	8/18/1993	132	321	87.7049
USGS	11074500	9/23/1937	36	322	87.9781	USGS	11074000	8/26/1978	63	322	87.9781	USGS	11074000	8/21/1993	131	322	87.9781
USGS	11074500	10/2/1936	35	323	88.2514	USGS	11074000	8/29/1978	63	323	88.2514	USGS	11074000	9/18/1993	131	323	88.2514

USGS	11074500	10/3/1936	35	324	88.5246	USGS	11074000	10/18/1977	62	324	88.5246	USGS	11074000	8/22/1993	130	324	88.5246
USGS	11074500	10/5/1936	35	325	88.7978	USGS	11074000	10/20/1977	62	325	88.7978	USGS	11074000	9/19/1993	130	325	88.7978
USGS	11074500	10/10/1936	35	326	89.0710	USGS	11074000	10/21/1977	62	326	89.0710	USGS	11074000	8/19/1993	129	326	89.0710
USGS	11074500	10/12/1936	35	327	89.3443	USGS	11074000	10/22/1977	62	327	89.3443	USGS	11074000	8/23/1993	129	327	89.3443
USGS	11074500	10/1/1936	34	328	89.6175	USGS	11074000	10/23/1977	62	328	89.6175	USGS	11074000	9/17/1993	129	328	89.6175
USGS	11074500	10/7/1936	34	329	89.8907	USGS	11074000	11/10/1977	62	329	89.8907	USGS	11074000	8/24/1993	127	329	89.8907
USGS	11074500	10/8/1936	34	330	90.1639	USGS	11074000	11/11/1977	62	330	90.1639	USGS	11074000	8/25/1993	126	330	90.1639
USGS	11074500	10/9/1936	34	331	90.4372	USGS	11074000	3/17/1978	62	331	90.4372	USGS	11074000	8/26/1993	126	331	90.4372
USGS	11074500	7/29/1937	34	332	90.7104	USGS	11074000	10/25/1977	61	332	90.7104	USGS	11074000	8/29/1993	126	332	90.7104
USGS	11074500	7/30/1937	34	333	90.9836	USGS	11074000	10/26/1977	61	333	90.9836	USGS	11074000	9/25/1993	126	333	90.9836
USGS	11074500	8/1/1937	34	334	91.2568	USGS	11074000	10/12/1977	60	334	91.2568	USGS	11074000	9/28/1993	125	334	91.2568
USGS	11074500	8/4/1937	34	335	91.5301	USGS	11074000	10/13/1977	60	335	91.5301	USGS	11074000	9/30/1993	125	335	91.5301
USGS	11074500	8/7/1937	34	336	91.8033	USGS	11074000	9/23/1978	60	336	91.8033	USGS	11074000	9/26/1993	124	336	91.8033
USGS	11074500	8/9/1937	34	337	92.0765	USGS	11074000	10/17/1977	59	337	92.0765	USGS	11074000	9/27/1993	124	337	92.0765
USGS	11074500	8/19/1937	34	338	92.3497	USGS	11074000	10/14/1977	56	338	92.3497	USGS	11074000	9/29/1993	124	338	92.3497
USGS	11074500	8/26/1937	34	339	92.6230	USGS	11074000	10/16/1977	56	339	92.6230	USGS	11074000	8/27/1993	123	339	92.6230
USGS	11074500	9/5/1937	34	340	92.8962	USGS	11074000	9/24/1978	56	340	92.8962	USGS	11074000	8/28/1993	123	340	92.8962
USGS	11074500	9/24/1937	34	341	93.1694	USGS	11074000	9/25/1978	56	341	93.1694	USGS	11074000	8/31/1993	123	341	93.1694
USGS	11074500	9/25/1937	34	342	93.4426	USGS	11074000	10/11/1977	54	342	93.4426	USGS	11074000	9/2/1993	122	342	93.4426
USGS	11074500	7/28/1937	33	343	93.7158	USGS	11074000	10/15/1977	54	343	93.7158	USGS	11074000	9/14/1993	122	343	93.7158
USGS	11074500	8/3/1937	33	344	93.9891	USGS	11074000	3/18/1978	54	344	93.9891	USGS	11074000	9/3/1993	121	344	93.9891
USGS	11074500	8/21/1937	33	345	94.2623	USGS	11074000	10/4/1977	53	345	94.2623	USGS	11074000	9/13/1993	121	345	94.2623
USGS	11074500	8/23/1937	33	346	94.5355	USGS	11074000	10/10/1977	52	346	94.5355	USGS	11074000	9/16/1993	121	346	94.5355
USGS	11074500	8/25/1937	33	347	94.8087	USGS	11074000	10/3/1977	51	347	94.8087	USGS	11074000	9/15/1993	120	347	94.8087
USGS	11074500	8/5/1937	32	348	95.0820	USGS	11074000	10/7/1977	51	348	95.0820	USGS	11074000	9/11/1993	119	348	95.0820
USGS	11074500	8/22/1937	32	349	95.3552	USGS	11074000	10/8/1977	51	349	95.3552	USGS	11074000	9/12/1993	119	349	95.3552
USGS	11074500	9/15/1937	32	350	95.6284	USGS	11074000	10/1/1977	50	350	95.6284	USGS	11074000	9/1/1993	118	350	95.6284
USGS	11074500	9/17/1937	32	351	95.9016	USGS	11074000	10/9/1977	50	351	95.9016	USGS	11074000	9/7/1993	118	351	95.9016
USGS	11074500	9/19/1937	32	352	96.1749	USGS	11074000	10/5/1977	49	352	96.1749	USGS	11074000	9/4/1993	116	352	96.1749
USGS	11074500	9/21/1937	32	353	96.4481	USGS	11074000	10/2/1977	48	353	96.4481	USGS	11074000	9/10/1993	116	353	96.4481
USGS	11074500	9/7/1937	31	354	96.7213	USGS	11074000	10/6/1977	48	354	96.7213	USGS	11074000	9/5/1993	115	354	96.7213
USGS	11074500	9/8/1937	31	355	96.9945	USGS	11074000	3/19/1978	47	355	96.9945	USGS	11074000	9/6/1993	115	355	96.9945
USGS	11074500	9/13/1937	31	356	97.2678	USGS	11074000	7/28/1978	43	356	97.2678	USGS	11074000	9/8/1993	115	356	97.2678
USGS	11074500	9/14/1937	31	357	97.5410	USGS	11074000	9/18/1978	35	357	97.5410	USGS	11074000	9/9/1993	115	357	97.5410
USGS	11074500	9/16/1937	31	358	97.8142	USGS	11074000	9/19/1978	2.7	358	97.8142	USGS	11074000	11/1/1992	113	358	97.8142
USGS	11074500	9/20/1937	31	359	98.0874	USGS	11074000	7/29/1978	2.4	359	98.0874	USGS	11074000	10/31/1992	111	359	98.0874
USGS	11074500	9/6/1937	30	360	98.3607	USGS	11074000	7/30/1978	2.4	360	98.3607	USGS	11074000	10/30/1992	104	360	98.3607
USGS	11074500	9/11/1937	30	361	98.6339	USGS	11074000	7/31/1978	2.4	361	98.6339	USGS	11074000	9/24/1993	104	361	98.6339
USGS	11074500	9/12/1937	30	362	98.9071	USGS	11074000	8/1/1978	2.4	362	98.9071	USGS	11074000	9/23/1993	71	362	98.9071
USGS	11074500	9/18/1937	30	363	99.1803	USGS	11074000	8/2/1978	2.4	363	99.1803	USGS	11074000	9/20/1993	49	363	99.1803
USGS	11074500	9/9/1937	29	364	99.4536	USGS	11074000	8/3/1978	2.4	364	99.4536	USGS	11074000	9/22/1993	46	364	99.4536
USGS	11074500	9/10/1937	29	365	99.7268	USGS	11074000	9/20/1978	2.4	365	99.7268	USGS	11074000	9/21/1993	5.8	365	99.7268

Figure E. Flow Duration Curves: USGS 11074000 and 11074500, SAR Below Prado
WET YEARS



F. USGS Gage 11078000 (Santa Ana River at Santa Ana CA) - Frequency Distributions for Flow Duration Curves

p = probability of exceedence

Water Year 1937
n_1 = 365
total ppt = 31.5 inches

	Gage#	Date	Flow (cfs)	rank	p
USGS	11078000	2/7/1937	6300.00	1	0.2732
USGS	11078000	2/14/1937	3140.00	2	0.5464
USGS	11078000	2/6/1937	1840.00	3	0.8197
USGS	11078000	2/15/1937	1710.00	4	1.0929
USGS	11078000	2/8/1937	1320.00	5	1.3661
USGS	11078000	3/17/1937	964.00	6	1.6393
USGS	11078000	3/16/1937	959.00	7	1.9126
USGS	11078000	12/31/1936	500.00	8	2.1858
USGS	11078000	3/18/1937	400.00	9	2.4590
USGS	11078000	3/22/1937	370.00	10	2.7322
USGS	11078000	3/19/1937	330.00	11	3.0055
USGS	11078000	2/16/1937	292.00	12	3.2787
USGS	11078000	3/20/1937	292.00	13	3.5519
USGS	11078000	3/21/1937	276.00	14	3.8251
USGS	11078000	3/23/1937	270.00	15	4.0984
USGS	11078000	2/13/1937	222.00	16	4.3716
USGS	11078000	3/24/1937	220.00	17	4.6448
USGS	11078000	3/25/1937	210.00	18	4.9180
USGS	11078000	3/26/1937	175.00	19	5.1913
USGS	11078000	3/14/1937	160.00	20	5.4645
USGS	11078000	3/27/1937	155.00	21	5.7377
USGS	11078000	3/28/1937	140.00	22	6.0109
USGS	11078000	2/17/1937	128.00	23	6.2842
USGS	11078000	3/15/1937	120.00	24	6.5574
USGS	11078000	3/29/1937	115.00	25	6.8306
USGS	11078000	12/28/1936	100.00	26	7.1038
USGS	11078000	3/30/1937	100.00	27	7.3770
USGS	11078000	3/31/1937	90.00	28	7.6503
USGS	11078000	4/5/1937	84.00	29	7.9235
USGS	11078000	4/3/1937	83.00	30	8.1967
USGS	11078000	4/4/1937	82.00	31	8.4699
USGS	11078000	4/1/1937	78.00	32	8.7432
USGS	11078000	4/2/1937	75.00	33	9.0164
USGS	11078000	2/25/1937	70.00	34	9.2896
USGS	11078000	12/27/1936	65.00	35	9.5628
USGS	11078000	4/8/1937	63.00	36	9.8361
USGS	11078000	1/1/1937	60.00	37	10.1093
USGS	11078000	2/9/1937	60.00	38	10.3825
USGS	11078000	3/13/1937	57.00	39	10.6557
USGS	11078000	4/6/1937	56.00	40	10.9290
USGS	11078000	12/29/1936	20.00	41	11.2022
USGS	11078000	2/10/1937	20.00	42	11.4754
USGS	11078000	4/7/1937	20.00	43	11.7486
USGS	11078000	1/22/1937	15.00	44	12.0219
USGS	11078000	4/9/1937	15.00	45	12.2951
USGS	11078000	4/10/1937	14.00	46	12.5683
USGS	11078000	2/18/1937	13.00	47	12.8415
USGS	11078000	2/26/1937	13.00	48	13.1148
USGS	11078000	4/11/1937	13.00	49	13.3880
USGS	11078000	4/12/1937	13.00	50	13.6612
USGS	11078000	1/30/1937	12.00	51	13.9344
USGS	11078000	4/13/1937	12.00	52	14.2077
USGS	11078000	4/14/1937	12.00	53	14.4809
USGS	11078000	4/15/1937	11.00	54	14.7541
USGS	11078000	4/16/1937	11.00	55	15.0273

Water Year 1978
n_2 = 365
total ppt = 30.5 inches

	Gage#	Date	Flow (cfs)	rank	p
USGS	11078000	3/4/1978	6330.00	1	0.2732
USGS	11078000	3/5/1978	6170.00	2	0.5464
USGS	11078000	3/2/1978	6000.00	3	0.8197
USGS	11078000	3/3/1978	4500.00	4	1.0929
USGS	11078000	3/1/1978	4100.00	5	1.3661
USGS	11078000	3/6/1978	3960.00	6	1.6393
USGS	11078000	3/11/1978	3630.00	7	1.9126
USGS	11078000	3/12/1978	3620.00	8	2.1858
USGS	11078000	3/7/1978	3450.00	9	2.4590
USGS	11078000	3/10/1978	3400.00	10	2.7322
USGS	11078000	2/10/1978	3300.00	11	3.0055
USGS	11078000	3/15/1978	2980.00	12	3.2787
USGS	11078000	3/9/1978	2940.00	13	3.5519
USGS	11078000	3/13/1978	2730.00	14	3.8251
USGS	11078000	3/8/1978	2660.00	15	4.0984
USGS	11078000	2/11/1978	2550.00	16	4.3716
USGS	11078000	2/12/1978	2390.00	17	4.6448
USGS	11078000	3/16/1978	2340.00	18	4.9180
USGS	11078000	2/9/1978	2130.00	19	5.1913
USGS	11078000	2/15/1978	2100.00	20	5.4645
USGS	11078000	2/13/1978	2060.00	21	5.7377
USGS	11078000	2/14/1978	2040.00	22	6.0109
USGS	11078000	2/16/1978	1920.00	23	6.2842
USGS	11078000	2/18/1978	1350.00	24	6.5574
USGS	11078000	2/17/1978	1320.00	25	6.8306
USGS	11078000	2/19/1978	1000.00	26	7.1038
USGS	11078000	4/24/1978	898.00	27	7.3770
USGS	11078000	3/28/1978	894.00	28	7.6503
USGS	11078000	4/19/1978	894.00	29	7.9235
USGS	11078000	4/18/1978	873.00	30	8.1967
USGS	11078000	4/20/1978	873.00	31	8.4699
USGS	11078000	4/23/1978	831.00	32	8.7432
USGS	11078000	4/25/1978	831.00	33	9.0164
USGS	11078000	4/22/1978	772.00	34	9.2896
USGS	11078000	4/27/1978	772.00	35	9.5628
USGS	11078000	2/7/1978	767.00	36	9.8361
USGS	11078000	2/6/1978	760.00	37	10.1093
USGS	11078000	3/31/1978	759.00	38	10.3825
USGS	11078000	4/12/1978	744.00	39	10.6557
USGS	11078000	4/21/1978	735.00	40	10.9290
USGS	11078000	4/26/1978	717.00	41	11.2022
USGS	11078000	4/28/1978	716.00	42	11.4754
USGS	11078000	2/20/1978	700.00	43	11.7486
USGS	11078000	4/15/1978	699.00	44	12.0219
USGS	11078000	4/16/1978	655.00	45	12.2951
USGS	11078000	4/17/1978	647.00	46	12.5683
USGS	11078000	4/7/1978	645.00	47	12.8415
USGS	11078000	4/13/1978	613.00	48	13.1148
USGS	11078000	2/28/1978	600.00	49	13.3880
USGS	11078000	2/8/1978	597.00	50	13.6612
USGS	11078000	4/2/1978	589.00	51	13.9344
USGS	11078000	4/14/1978	573.00	52	14.2077
USGS	11078000	4/1/1978	549.00	53	14.4809
USGS	11078000	3/14/1978	490.00	54	14.7541
USGS	11078000	3/29/1978	482.00	55	15.0273

Water Year 1993
n_3 = 365
total ppt = 30.9 inches

	Gage#	Date	Flow (cfs)	rank	p
USGS	11078000	2/20/1993	7960.00	1	0.2732
USGS	11078000	1/19/1993	7900.00	2	0.5464
USGS	11078000	1/17/1993	7750.00	3	0.8197
USGS	11078000	1/16/1993	7500.00	4	1.0929
USGS	11078000	1/18/1993	7500.00	5	1.3661
USGS	11078000	1/15/1993	7140.00	6	1.6393
USGS	11078000	1/20/1993	6970.00	7	1.9126
USGS	11078000	2/21/1993	6710.00	8	2.1858
USGS	11078000	2/9/1993	6450.00	9	2.4590
USGS	11078000	2/22/1993	6270.00	10	2.7322
USGS	11078000	1/21/1993	6180.00	11	3.0055
USGS	11078000	1/14/1993	6080.00	12	3.2787
USGS	11078000	1/22/1993	5900.00	13	3.5519
USGS	11078000	2/10/1993	5890.00	14	3.8251
USGS	11078000	2/23/1993	5800.00	15	4.0984
USGS	11078000	1/23/1993	5580.00	16	4.3716
USGS	11078000	1/25/1993	5580.00	17	4.6448
USGS	11078000	1/9/1993	5530.00	18	4.9180
USGS	11078000	2/24/1993	5380.00	19	5.1913
USGS	11078000	1/11/1993	5220.00	20	5.4645
USGS	11078000	1/26/1993	5110.00	21	5.7377
USGS	11078000	2/11/1993	5100.00	22	6.0109
USGS	11078000	2/25/1993	5090.00	23	6.2842
USGS	11078000	2/26/1993	5060.00	24	6.5574
USGS	11078000	1/12/1993	4880.00	25	6.8306
USGS	11078000	1/24/1993	4210.00	26	7.1038
USGS	11078000	1/8/1993	4060.00	27	7.3770
USGS	11078000	1/13/1993	3960.00	28	7.6503
USGS	11078000	1/10/1993	3910.00	29	7.9235
USGS	11078000	2/8/1993	3210.00	30	8.1967
USGS	11078000	2/19/1993	2900.00	31	8.4699
USGS	11078000	1/7/1993	2860.00	32	8.7432
USGS	11078000	1/27/1993	2600.00	33	9.0164
USGS	11078000	12/7/1992	2380.00	34	9.2896
USGS	11078000	1/29/1993	2340.00	35	9.5628
USGS	11078000	2/12/1993	2250.00	36	9.8361
USGS	11078000	2/27/1993	2120.00	37	10.1093
USGS	11078000	1/6/1993	1730.00	38	10.3825
USGS	11078000	3/26/1993	1640.00	39	10.6557
USGS	11078000	2/17/1993	1550.00	40	10.9290
USGS	11078000	3/28/1993	1490.00	41	11.2022
USGS	11078000	3/27/1993	1460.00	42	11.4754
USGS	11078000	2/16/1993	1200.00	43	11.7486
USGS	11078000	2/28/1993	1180.00	44	12.0219
USGS	11078000	1/30/1993	1120.00	45	12.2951
USGS	11078000	3/1/1993	983.00	46	12.5683
USGS	11078000	3/2/1993	967.00	47	12.8415
USGS	11078000	2/13/1993	800.00	48	13.1148
USGS	11078000	2/15/1993	750.00	49	13.3880
USGS	11078000	3/5/1993	708.00	50	13.6612
USGS	11078000	3/3/1993	682.00	51	13.9344
USGS	11078000	1/31/1993	668.00	52	14.2077
USGS	11078000	3/29/1993	665.00	53	14.4809
USGS	11078000	3/4/1993	653.00	54	14.7541
USGS	11078000	3/6/1993	617.00	55	15.0273

USGS	11078000	1/28/1937	10.00	56	15.3005
USGS	11078000	1/29/1937	10.00	57	15.5738
USGS	11078000	2/11/1937	10.00	58	15.8470
USGS	11078000	4/17/1937	10.00	59	16.1202
USGS	11078000	4/18/1937	9.00	60	16.3934
USGS	11078000	4/19/1937	9.00	61	16.6667
USGS	11078000	4/20/1937	8.00	62	16.9399
USGS	11078000	2/27/1937	6.50	63	17.2131
USGS	11078000	1/23/1937	5.00	64	17.4863
USGS	11078000	1/24/1937	5.00	65	17.7596
USGS	11078000	1/26/1937	5.00	66	18.0328
USGS	11078000	1/6/1937	4.00	67	18.3060
USGS	11078000	1/31/1937	4.00	68	18.5792
USGS	11078000	4/21/1937	4.00	69	18.8525
USGS	11078000	1/25/1937	3.00	70	19.1257
USGS	11078000	2/19/1937	2.90	71	19.3989
USGS	11078000	1/2/1937	2.00	72	19.6721
USGS	11078000	1/27/1937	2.00	73	19.9454
USGS	11078000	2/1/1937	2.00	74	20.2186
USGS	11078000	2/12/1937	2.00	75	20.4918
USGS	11078000	4/22/1937	2.00	76	20.7650
USGS	11078000	12/30/1936	1.00	77	21.0383
USGS	11078000	2/20/1937	1.00	78	21.3115
USGS	11078000	4/23/1937	1.00	79	21.5847
USGS	11078000	4/24/1937	1.00	80	21.8579
USGS	11078000	2/28/1937	0.50	81	22.1311
USGS	11078000	1/7/1937	0.20	82	22.4044
USGS	11078000	2/21/1937	0.20	83	22.6776
USGS	11078000	1/8/1937	0.10	84	22.9508
USGS	11078000	1/9/1937	0.10	85	23.2240
USGS	11078000	2/22/1937	0.10	86	23.4973
USGS	11078000	2/23/1937	0.10	87	23.7705
USGS	11078000	2/24/1937	0.10	88	24.0437
USGS	11078000	3/1/1937	0.10	89	24.3169
USGS	**11078000**	**10/1/1936**	**0.01**	**90**	**24.5902**
USGS	11078000	10/2/1936	0.00	91	24.8634
USGS	11078000	10/3/1936	0.00	92	25.1366
USGS	11078000	10/4/1936	0.00	93	25.4098
USGS	11078000	10/5/1936	0.00	94	25.6831
USGS	11078000	10/6/1936	0.00	95	25.9563
USGS	11078000	10/7/1936	0.00	96	26.2295
USGS	11078000	10/8/1936	0.00	97	26.5027
USGS	11078000	10/9/1936	0.00	98	26.7760
USGS	11078000	10/10/1936	0.00	99	27.0492
USGS	11078000	10/11/1936	0.00	100	27.3224
USGS	11078000	10/12/1936	0.00	101	27.5956
USGS	11078000	10/13/1936	0.00	102	27.8689
USGS	11078000	10/14/1936	0.00	103	28.1421
USGS	11078000	10/15/1936	0.00	104	28.4153
USGS	11078000	10/16/1936	0.00	105	28.6885
USGS	11078000	10/17/1936	0.00	106	28.9617
USGS	11078000	10/18/1936	0.00	107	29.2350
USGS	11078000	10/19/1936	0.00	108	29.5082
USGS	11078000	10/20/1936	0.00	109	29.7814
USGS	11078000	10/21/1936	0.00	110	30.0546
USGS	11078000	10/22/1936	0.00	111	30.3279
USGS	11078000	10/23/1936	0.00	112	30.6011
USGS	11078000	10/24/1936	0.00	113	30.8743
USGS	11078000	10/25/1936	0.00	114	31.1475
USGS	11078000	10/26/1936	0.00	115	31.4208
USGS	11078000	10/27/1936	0.00	116	31.6940
USGS	11078000	10/28/1936	0.00	117	31.9672
USGS	11078000	10/29/1936	0.00	118	32.2404
USGS	11078000	10/30/1936	0.00	119	32.5137
USGS	11078000	10/31/1936	0.00	120	32.7869
USGS	11078000	11/1/1936	0.00	121	33.0601
USGS	11078000	11/2/1936	0.00	122	33.3333

USGS	11078000	1/18/1978	477.00	56	15.3005
USGS	11078000	4/3/1978	475.00	57	15.5738
USGS	11078000	3/27/1978	471.00	58	15.8470
USGS	11078000	1/19/1978	470.00	59	16.1202
USGS	11078000	4/4/1978	462.00	60	16.3934
USGS	11078000	3/30/1978	454.00	61	16.6667
USGS	11078000	1/17/1978	432.00	62	16.9399
USGS	11078000	4/11/1978	412.00	63	17.2131
USGS	11078000	2/21/1978	400.00	64	17.4863
USGS	11078000	12/29/1977	372.00	65	17.7596
USGS	11078000	4/8/1978	348.00	66	18.0328
USGS	11078000	3/26/1978	339.00	67	18.3060
USGS	11078000	4/10/1978	333.00	68	18.5792
USGS	11078000	4/9/1978	300.00	69	18.8525
USGS	11078000	3/25/1978	290.00	70	19.1257
USGS	11078000	1/15/1978	288.00	71	19.3989
USGS	11078000	1/16/1978	252.00	72	19.6721
USGS	11078000	1/10/1978	212.00	73	19.9454
USGS	11078000	12/26/1977	207.00	74	20.2186
USGS	11078000	2/22/1978	200.00	75	20.4918
USGS	11078000	1/20/1978	176.00	76	20.7650
USGS	11078000	1/14/1978	150.00	77	21.0383
USGS	11078000	2/25/1978	150.00	78	21.3115
USGS	11078000	1/5/1978	148.00	79	21.5847
USGS	11078000	3/22/1978	145.00	80	21.8579
USGS	11078000	3/23/1978	130.00	81	22.1311
USGS	11078000	1/9/1978	127.00	82	22.4044
USGS	11078000	1/6/1978	126.00	83	22.6776
USGS	11078000	2/23/1978	125.00	84	22.9508
USGS	11078000	2/26/1978	125.00	85	23.2240
USGS	11078000	2/27/1978	125.00	86	23.4973
USGS	11078000	2/24/1978	110.00	87	23.7705
USGS	11078000	4/6/1978	110.00	88	24.0437
USGS	11078000	1/4/1978	109.00	89	24.3169
USGS	11078000	2/5/1978	92.00	90	24.5902
USGS	11078000	3/17/1978	90.00	91	24.8634
USGS	11078000	1/3/1978	79.00	92	25.1366
USGS	11078000	12/27/1977	54.00	93	25.4098
USGS	11078000	4/29/1978	50.00	94	25.6831
USGS	11078000	4/5/1978	40.00	95	25.9563
USGS	11078000	3/24/1978	30.00	96	26.2295
USGS	11078000	12/28/1977	21.00	97	26.5027
USGS	11078000	1/11/1978	21.00	98	26.7760
USGS	11078000	12/18/1977	17.00	99	27.0492
USGS	11078000	12/30/1977	15.00	100	27.3224
USGS	11078000	1/29/1978	14.00	101	27.5956
USGS	11078000	1/27/1978	11.00	102	27.8689
USGS	11078000	1/28/1978	10.00	103	28.1421
USGS	11078000	4/30/1978	10.00	104	28.4153
USGS	11078000	12/31/1977	8.00	105	28.6885
USGS	11078000	5/1/1978	7.70	106	28.9617
USGS	11078000	1/7/1978	7.20	107	29.2350
USGS	11078000	1/23/1978	7.20	108	29.5082
USGS	11078000	1/21/1978	5.00	109	29.7814
USGS	11078000	5/2/1978	5.00	110	30.0546
USGS	11078000	1/22/1978	4.50	111	30.3279
USGS	11078000	1/1/1978	4.00	112	30.6011
USGS	11078000	1/26/1978	3.90	113	30.8743
USGS	11078000	3/21/1978	3.80	114	31.1475
USGS	11078000	12/25/1977	3.50	115	31.4208
USGS	11078000	1/30/1978	3.30	116	31.6940
USGS	11078000	5/3/1978	3.00	117	31.9672
USGS	11078000	1/2/1978	2.00	118	32.2404
USGS	11078000	3/18/1978	2.00	119	32.5137
USGS	11078000	3/19/1978	2.00	120	32.7869
USGS	11078000	3/20/1978	2.00	121	33.0601
USGS	11078000	5/4/1978	2.00	122	33.3333

USGS	11078000	2/2/1993	606.00	56	15.3005
USGS	11078000	3/7/1993	600.00	57	15.5738
USGS	11078000	2/1/1993	587.00	58	15.8470
USGS	11078000	12/8/1992	583.00	59	16.1202
USGS	11078000	2/18/1993	520.00	60	16.3934
USGS	11078000	3/8/1993	515.00	61	16.6667
USGS	11078000	3/30/1993	510.00	62	16.9399
USGS	11078000	1/28/1993	461.00	63	17.2131
USGS	11078000	2/14/1993	460.00	64	17.4863
USGS	11078000	6/5/1993	450.00	65	17.7596
USGS	11078000	3/20/1993	434.00	66	18.0328
USGS	11078000	3/25/1993	434.00	67	18.3060
USGS	11078000	3/11/1993	432.00	68	18.5792
USGS	11078000	3/21/1993	416.00	69	18.8525
USGS	11078000	3/22/1993	373.00	70	19.1257
USGS	11078000	3/10/1993	360.00	71	19.3989
USGS	11078000	3/13/1993	340.00	72	19.6721
USGS	11078000	3/14/1993	317.00	73	19.9454
USGS	11078000	3/12/1993	315.00	74	20.2186
USGS	11078000	12/29/1992	303.00	75	20.4918
USGS	11078000	2/3/1993	294.00	76	20.7650
USGS	11078000	2/7/1993	265.00	77	21.0383
USGS	11078000	3/15/1993	262.00	78	21.3115
USGS	11078000	3/24/1993	252.00	79	21.5847
USGS	11078000	3/31/1993	251.00	80	21.8579
USGS	11078000	3/18/1993	209.00	81	22.1311
USGS	11078000	3/19/1993	189.00	82	22.4044
USGS	11078000	3/9/1993	177.00	83	22.6776
USGS	11078000	3/17/1993	169.00	84	22.9508
USGS	11078000	2/6/1993	156.00	85	23.2240
USGS	11078000	3/23/1993	132.00	86	23.4973
USGS	11078000	4/2/1993	132.00	87	23.7705
USGS	11078000	4/4/1993	128.00	88	24.0437
USGS	11078000	2/5/1993	126.00	89	24.3169
USGS	11078000	4/1/1993	125.00	90	24.5902
USGS	11078000	3/16/1993	123.00	91	24.8634
USGS	11078000	4/3/1993	122.00	92	25.1366
USGS	11078000	2/4/1993	86.00	93	25.4098
USGS	11078000	6/6/1993	86.00	94	25.6831
USGS	11078000	4/16/1993	83.00	95	25.9563
USGS	11078000	1/2/1993	82.00	96	26.2295
USGS	11078000	4/5/1993	78.00	97	26.5027
USGS	11078000	4/15/1993	74.00	98	26.7760
USGS	11078000	4/18/1993	70.00	99	27.0492
USGS	11078000	4/19/1993	67.00	100	27.3224
USGS	11078000	12/28/1992	54.00	101	27.5956
USGS	11078000	4/17/1993	51.00	102	27.8689
USGS	11078000	4/22/1993	51.00	103	28.1421
USGS	11078000	4/11/1993	47.00	104	28.4153
USGS	11078000	4/12/1993	47.00	105	28.6885
USGS	11078000	4/21/1993	30.00	106	28.9617
USGS	11078000	6/10/1993	27.00	107	29.2350
USGS	11078000	4/6/1993	24.00	108	29.5082
USGS	11078000	4/7/1993	24.00	109	29.7814
USGS	11078000	10/30/1992	19.00	110	30.0546
USGS	11078000	4/20/1993	19.00	111	30.3279
USGS	11078000	12/12/1992	17.00	112	30.6011
USGS	11078000	12/30/1992	17.00	113	30.8743
USGS	11078000	4/13/1993	17.00	114	31.1475
USGS	11078000	6/9/1993	13.00	115	31.4208
USGS	11078000	6/11/1993	11.00	116	31.6940
USGS	11078000	4/8/1993	10.00	117	31.9672
USGS	11078000	12/11/1992	8.50	118	32.2404
USGS	11078000	4/10/1993	6.40	119	32.5137
USGS	11078000	4/23/1993	5.30	120	32.7869
USGS	11078000	10/31/1992	4.90	121	33.0601
USGS	11078000	6/12/1993	4.40	122	33.3333

USGS	11078000	11/3/1936	0.00	123	33.6066	USGS	11078000	1/31/1978	1.00	123	33.6066	USGS	11078000	12/9/1992	4.20	123	33.6066
USGS	11078000	11/4/1936	0.00	124	33.8798	USGS	11078000	5/5/1978	1.00	124	33.8798	USGS	11078000	1/3/1993	4.20	124	33.8798
USGS	11078000	11/5/1936	0.00	125	34.1530	USGS	11078000	1/24/1978	0.84	125	34.1530	USGS	11078000	12/13/1992	3.90	125	34.1530
USGS	11078000	11/6/1936	0.00	126	34.4262	USGS	11078000	2/1/1978	0.59	126	34.4262	USGS	11078000	12/18/1992	3.40	126	34.4262
USGS	11078000	11/7/1936	0.00	127	34.6995	USGS	11078000	5/6/1978	0.50	127	34.6995	USGS	11078000	11/1/1992	3.30	127	34.6995
USGS	11078000	11/8/1936	0.00	128	34.9727	USGS	11078000	1/25/1978	0.48	128	34.9727	USGS	11078000	6/7/1993	3.00	128	34.9727
USGS	11078000	11/9/1936	0.00	129	35.2459	USGS	11078000	2/2/1978	0.48	129	35.2459	USGS	11078000	4/24/1993	2.70	129	35.2459
USGS	11078000	11/10/1936	0.00	130	35.5191	USGS	11078000	2/3/1978	0.40	130	35.5191	USGS	11078000	4/25/1993	2.40	130	35.5191
USGS	11078000	11/11/1936	0.00	131	35.7923	USGS	11078000	2/4/1978	0.40	131	35.7923	USGS	11078000	12/31/1992	1.90	131	35.7923
USGS	11078000	11/12/1936	0.00	132	36.0656	USGS	11078000	1/12/1978	0.32	132	36.0656	USGS	11078000	4/27/1993	1.90	132	36.0656
USGS	11078000	11/13/1936	0.00	133	36.3388	USGS	11078000	5/7/1978	0.20	133	36.3388	USGS	11078000	4/29/1993	1.80	133	36.3388
USGS	11078000	11/14/1936	0.00	134	36.6120	USGS	11078000	1/8/1978	0.16	134	36.6120	USGS	11078000	5/1/1993	1.80	134	36.6120
USGS	11078000	11/15/1936	0.00	135	36.8852	USGS	11078000	1/13/1978	0.16	135	36.8852	USGS	11078000	10/24/1992	1.70	135	36.8852
USGS	11078000	11/16/1936	0.00	136	37.1585	USGS	11078000	5/8/1978	0.10	136	37.1585	USGS	11078000	12/14/1992	1.70	136	37.1585
USGS	11078000	11/17/1936	0.00	137	37.4317	USGS	11078000	5/9/1978	0.05	137	37.4317	USGS	11078000	4/26/1993	1.70	137	37.4317
USGS	11078000	11/18/1936	0.00	138	37.7049	USGS	11078000	5/10/1978	0.04	138	37.7049	USGS	11078000	4/30/1993	1.70	138	37.7049
USGS	11078000	11/19/1936	0.00	139	37.9781	USGS	11078000	5/11/1978	0.04	139	37.9781	USGS	11078000	5/3/1993	1.70	139	37.9781
USGS	11078000	11/20/1936	0.00	140	38.2514	USGS	11078000	5/12/1978	0.04	140	38.2514	USGS	11078000	5/5/1993	1.70	140	38.2514
USGS	11078000	11/21/1936	0.00	141	38.5246	USGS	11078000	5/13/1978	0.04	141	38.5246	USGS	11078000	6/13/1993	1.70	141	38.5246
USGS	11078000	11/22/1936	0.00	142	38.7978	USGS	11078000	5/14/1978	0.04	142	38.7978	USGS	11078000	12/10/1992	1.60	142	38.7978
USGS	11078000	11/23/1936	0.00	143	39.0710	USGS	11078000	5/15/1978	0.04	143	39.0710	USGS	11078000	4/14/1993	1.60	143	39.0710
USGS	11078000	11/24/1936	0.00	144	39.3443	USGS	11078000	5/16/1978	0.04	144	39.3443	USGS	11078000	4/28/1993	1.60	144	39.3443
USGS	11078000	11/25/1936	0.00	145	39.6175	USGS	11078000	5/17/1978	0.04	145	39.6175	USGS	11078000	5/2/1993	1.60	145	39.6175
USGS	11078000	11/26/1936	0.00	146	39.8907	USGS	11078000	5/18/1978	0.04	146	39.8907	USGS	11078000	5/4/1993	1.60	146	39.8907
USGS	11078000	11/27/1936	0.00	147	40.1639	USGS	11078000	5/19/1978	0.04	147	40.1639	USGS	11078000	11/2/1992	1.50	147	40.1639
USGS	11078000	11/28/1936	0.00	148	40.4372	USGS	11078000	5/20/1978	0.04	148	40.4372	USGS	11078000	5/6/1993	1.50	148	40.4372
USGS	11078000	11/29/1936	0.00	149	40.7104	USGS	11078000	5/21/1978	0.04	149	40.7104	USGS	11078000	5/11/1993	1.50	149	40.7104
USGS	11078000	11/30/1936	0.00	150	40.9836	USGS	11078000	5/22/1978	0.04	150	40.9836	USGS	11078000	5/7/1993	1.40	150	40.9836
USGS	11078000	12/1/1936	0.00	151	41.2568	USGS	11078000	5/23/1978	0.04	151	41.2568	USGS	11078000	5/13/1993	1.40	151	41.2568
USGS	11078000	12/2/1936	0.00	152	41.5301	USGS	11078000	5/24/1978	0.04	152	41.5301	USGS	11078000	6/8/1993	1.40	152	41.5301
USGS	11078000	12/3/1936	0.00	153	41.8033	USGS	11078000	5/25/1978	0.04	153	41.8033	USGS	11078000	1/4/1993	1.30	153	41.8033
USGS	11078000	12/4/1936	0.00	154	42.0765	USGS	11078000	5/26/1978	0.04	154	42.0765	USGS	11078000	5/9/1993	1.30	154	42.0765
USGS	11078000	12/5/1936	0.00	155	42.3497	USGS	11078000	5/27/1978	0.04	155	42.3497	USGS	11078000	5/14/1993	1.30	155	42.3497
USGS	11078000	12/6/1936	0.00	156	42.6230	USGS	11078000	5/28/1978	0.04	156	42.6230	USGS	11078000	4/9/1993	1.20	156	42.6230
USGS	11078000	12/7/1936	0.00	157	42.8962	USGS	11078000	5/29/1978	0.04	157	42.8962	USGS	11078000	5/8/1993	1.20	157	42.8962
USGS	11078000	12/8/1936	0.00	158	43.1694	USGS	11078000	5/30/1978	0.04	158	43.1694	USGS	11078000	5/12/1993	1.10	158	43.1694
USGS	11078000	12/9/1936	0.00	159	43.4426	USGS	11078000	5/31/1978	0.04	159	43.4426	USGS	11078000	5/10/1993	1.00	159	43.4426
USGS	11078000	12/10/1936	0.00	160	43.7158	USGS	11078000	6/1/1978	0.04	160	43.7158	USGS	11078000	5/19/1993	1.00	160	43.7158
USGS	11078000	12/11/1936	0.00	161	43.9891	USGS	11078000	6/2/1978	0.04	161	43.9891	USGS	11078000	6/16/1993	0.92	161	43.9891
USGS	11078000	12/12/1936	0.00	162	44.2623	USGS	11078000	6/3/1978	0.04	162	44.2623	USGS	11078000	12/19/1992	0.90	162	44.2623
USGS	11078000	12/13/1936	0.00	163	44.5355	USGS	11078000	6/4/1978	0.04	163	44.5355	USGS	11078000	11/3/1992	0.87	163	44.5355
USGS	11078000	12/14/1936	0.00	164	44.8087	USGS	11078000	6/5/1978	0.04	164	44.8087	USGS	11078000	1/1/1993	0.87	164	44.8087
USGS	11078000	12/15/1936	0.00	165	45.0820	USGS	11078000	6/6/1978	0.04	165	45.0820	USGS	11078000	5/15/1993	0.86	165	45.0820
USGS	11078000	12/16/1936	0.00	166	45.3552	USGS	11078000	6/7/1978	0.04	166	45.3552	USGS	11078000	1/5/1993	0.82	166	45.3552
USGS	11078000	12/17/1936	0.00	167	45.6284	USGS	11078000	6/8/1978	0.03	167	45.6284	USGS	11078000	12/15/1992	0.77	167	45.6284
USGS	11078000	12/18/1936	0.00	168	45.9016	USGS	11078000	6/9/1978	0.03	168	45.9016	USGS	11078000	5/18/1993	0.77	168	45.9016
USGS	11078000	12/19/1936	0.00	169	46.1749	USGS	11078000	6/10/1978	0.03	169	46.1749	USGS	11078000	5/16/1993	0.73	169	46.1749
USGS	11078000	12/20/1936	0.00	170	46.4481	USGS	11078000	6/11/1978	0.03	170	46.4481	USGS	11078000	10/25/1992	0.72	170	46.4481
USGS	11078000	12/21/1936	0.00	171	46.7213	USGS	11078000	6/12/1978	0.03	171	46.7213	USGS	11078000	12/21/1992	0.72	171	46.7213
USGS	11078000	12/22/1936	0.00	172	46.9945	USGS	11078000	6/13/1978	0.03	172	46.9945	USGS	11078000	6/14/1993	0.71	172	46.9945
USGS	11078000	12/23/1936	0.00	173	47.2678	USGS	11078000	6/14/1978	0.03	173	47.2678	USGS	11078000	5/24/1993	0.68	173	47.2678
USGS	11078000	12/24/1936	0.00	174	47.5410	USGS	11078000	6/15/1978	0.03	174	47.5410	USGS	11078000	5/20/1993	0.66	174	47.5410
USGS	11078000	12/25/1936	0.00	175	47.8142	USGS	11078000	6/16/1978	0.03	175	47.8142	USGS	11078000	6/15/1993	0.61	175	47.8142
USGS	11078000	12/26/1936	0.00	176	48.0874	USGS	11078000	6/17/1978	0.03	176	48.0874	USGS	11078000	12/20/1992	0.58	176	48.0874
USGS	11078000	1/3/1937	0.00	177	48.3607	USGS	11078000	6/18/1978	0.03	177	48.3607	USGS	11078000	12/22/1992	0.57	177	48.3607
USGS	11078000	1/4/1937	0.00	178	48.6339	USGS	11078000	6/19/1978	0.03	178	48.6339	USGS	11078000	5/17/1993	0.57	178	48.6339
USGS	11078000	1/5/1937	0.00	179	48.9071	USGS	11078000	6/20/1978	0.03	179	48.9071	USGS	11078000	5/23/1993	0.54	179	48.9071
USGS	11078000	1/10/1937	0.00	180	49.1803	USGS	11078000	6/21/1978	0.03	180	49.1803	USGS	11078000	5/21/1993	0.48	180	49.1803
USGS	11078000	1/11/1937	0.00	181	49.4536	USGS	11078000	6/22/1978	0.03	181	49.4536	USGS	11078000	6/17/1993	0.48	181	49.4536
USGS	11078000	1/12/1937	0.00	182	49.7268	USGS	11078000	6/23/1978	0.03	182	49.7268	USGS	11078000	12/16/1992	0.46	182	49.7268
USGS	11078000	1/13/1937	0.00	183	50.0000	USGS	11078000	6/24/1978	0.03	183	50.0000	USGS	11078000	12/17/1992	0.40	183	50.0000
USGS	11078000	1/14/1937	0.00	184	50.2732	USGS	11078000	6/25/1978	0.03	184	50.2732	USGS	11078000	5/25/1993	0.38	184	50.2732
USGS	11078000	1/15/1937	0.00	185	50.5464	USGS	11078000	6/26/1978	0.03	185	50.5464	USGS	11078000	12/23/1992	0.35	185	50.5464
USGS	11078000	1/16/1937	0.00	186	50.8197	USGS	11078000	6/27/1978	0.03	186	50.8197	USGS	11078000	12/27/1992	0.33	186	50.8197
USGS	11078000	1/17/1937	0.00	187	51.0929	USGS	11078000	6/28/1978	0.03	187	51.0929	USGS	11078000	6/24/1993	0.31	187	51.0929
USGS	11078000	1/18/1937	0.00	188	51.3661	USGS	11078000	6/29/1978	0.03	188	51.3661	USGS	11078000	5/22/1993	0.30	188	51.3661
USGS	11078000	1/19/1937	0.00	189	51.6393	USGS	11078000	6/30/1978	0.03	189	51.6393	USGS	11078000	5/26/1993	0.30	189	51.6393

USGS	11078000	1/20/1937	0.00	190	51.9126	USGS	11078000	7/1/1978	0.03	190	51.9126	USGS	11078000	6/18/1993	0.28	190	51.9126
USGS	11078000	1/21/1937	0.00	191	52.1858	USGS	11078000	7/2/1978	0.03	191	52.1858	USGS	11078000	9/18/1993	0.28	191	52.1858
USGS	11078000	2/2/1937	0.00	192	52.4590	USGS	11078000	7/3/1978	0.03	192	52.4590	USGS	11078000	6/25/1993	0.27	192	52.4590
USGS	11078000	2/3/1937	0.00	193	52.7322	USGS	11078000	7/4/1978	0.02	193	52.7322	USGS	11078000	9/17/1993	0.27	193	52.7322
USGS	11078000	2/4/1937	0.00	194	53.0055	USGS	11078000	7/5/1978	0.02	194	53.0055	USGS	11078000	9/19/1993	0.26	194	53.0055
USGS	11078000	2/5/1937	0.00	195	53.2787	USGS	11078000	7/6/1978	0.02	195	53.2787	USGS	11078000	10/26/1992	0.22	195	53.2787
USGS	11078000	3/2/1937	0.00	196	53.5519	USGS	11078000	7/7/1978	0.02	196	53.5519	USGS	11078000	6/26/1993	0.22	196	53.5519
USGS	11078000	3/3/1937	0.00	197	53.8251	USGS	11078000	7/8/1978	0.01	197	53.8251	USGS	11078000	5/27/1993	0.21	197	53.8251
USGS	11078000	3/4/1937	0.00	198	54.0984	USGS	11078000	7/9/1978	0.01	198	54.0984	USGS	11078000	9/7/1993	0.20	198	54.0984
USGS	11078000	3/5/1937	0.00	199	54.3716	USGS	11078000	7/10/1978	0.01	199	54.3716	USGS	11078000	9/28/1993	0.20	199	54.3716
USGS	11078000	3/6/1937	0.00	200	54.6448	USGS	11078000	7/11/1978	0.01	200	54.6448	USGS	11078000	12/24/1992	0.19	200	54.6448
USGS	11078000	3/7/1937	0.00	201	54.9180	USGS	11078000	7/12/1978	0.01	201	54.9180	USGS	11078000	6/19/1993	0.19	201	54.9180
USGS	11078000	3/8/1937	0.00	202	55.1913	USGS	11078000	7/13/1978	0.01	202	55.1913	USGS	11078000	6/20/1993	0.19	202	55.1913
USGS	11078000	3/9/1937	0.00	203	55.4645	USGS	11078000	7/14/1978	0.01	203	55.4645	USGS	11078000	6/21/1993	0.19	203	55.4645
USGS	11078000	3/10/1937	0.00	204	55.7377	USGS	11078000	10/1/1977	0.01	204	55.7377	USGS	11078000	9/30/1993	0.19	204	55.7377
USGS	11078000	3/11/1937	0.00	205	56.0109	**USGS**	**11078000**	**10/2/1977**	**0.01**	**205**	**56.0109**	USGS	11078000	11/4/1992	0.18	205	56.0109
USGS	11078000	3/12/1937	0.00	206	56.2842	USGS	11078000	10/3/1977	0.00	206	56.2842	USGS	11078000	5/28/1993	0.18	206	56.2842
USGS	11078000	4/25/1937	0.00	207	56.5574	USGS	11078000	10/4/1977	0.00	207	56.5574	USGS	11078000	9/8/1993	0.18	207	56.5574
USGS	11078000	4/26/1937	0.00	208	56.8306	USGS	11078000	10/5/1977	0.00	208	56.8306	USGS	11078000	9/23/1993	0.18	208	56.8306
USGS	11078000	4/27/1937	0.00	209	57.1038	USGS	11078000	10/6/1977	0.00	209	57.1038	USGS	11078000	9/27/1993	0.18	209	57.1038
USGS	11078000	4/28/1937	0.00	210	57.3770	USGS	11078000	10/7/1977	0.00	210	57.3770	USGS	11078000	9/29/1993	0.18	210	57.3770
USGS	11078000	4/29/1937	0.00	211	57.6503	USGS	11078000	10/8/1977	0.00	211	57.6503	USGS	11078000	9/14/1993	0.17	211	57.6503
USGS	11078000	4/30/1937	0.00	212	57.9235	USGS	11078000	10/9/1977	0.00	212	57.9235	USGS	11078000	9/16/1993	0.17	212	57.9235
USGS	11078000	5/1/1937	0.00	213	58.1967	USGS	11078000	10/10/1977	0.00	213	58.1967	USGS	11078000	9/24/1993	0.17	213	58.1967
USGS	11078000	5/2/1937	0.00	214	58.4699	USGS	11078000	10/11/1977	0.00	214	58.4699	USGS	11078000	5/29/1993	0.16	214	58.4699
USGS	11078000	5/3/1937	0.00	215	58.7432	USGS	11078000	10/12/1977	0.00	215	58.7432	USGS	11078000	6/22/1993	0.16	215	58.7432
USGS	11078000	5/4/1937	0.00	216	59.0164	USGS	11078000	10/13/1977	0.00	216	59.0164	USGS	11078000	9/25/1993	0.16	216	59.0164
USGS	11078000	5/5/1937	0.00	217	59.2896	USGS	11078000	10/14/1977	0.00	217	59.2896	USGS	11078000	9/26/1993	0.16	217	59.2896
USGS	11078000	5/6/1937	0.00	218	59.5628	USGS	11078000	10/15/1977	0.00	218	59.5628	USGS	11078000	6/23/1993	0.15	218	59.5628
USGS	11078000	5/7/1937	0.00	219	59.8361	USGS	11078000	10/16/1977	0.00	219	59.8361	USGS	11078000	5/30/1993	0.12	219	59.8361
USGS	11078000	5/8/1937	0.00	220	60.1093	USGS	11078000	10/17/1977	0.00	220	60.1093	USGS	11078000	9/9/1993	0.12	220	60.1093
USGS	11078000	5/9/1937	0.00	221	60.3825	USGS	11078000	10/18/1977	0.00	221	60.3825	USGS	11078000	9/20/1993	0.12	221	60.3825
USGS	11078000	5/10/1937	0.00	222	60.6557	USGS	11078000	10/19/1977	0.00	222	60.6557	USGS	11078000	9/15/1993	0.11	222	60.6557
USGS	11078000	5/11/1937	0.00	223	60.9290	USGS	11078000	10/20/1977	0.00	223	60.9290	USGS	11078000	12/25/1992	0.10	223	60.9290
USGS	11078000	5/12/1937	0.00	224	61.2022	USGS	11078000	10/21/1977	0.00	224	61.2022	USGS	11078000	6/27/1993	0.10	224	61.2022
USGS	11078000	5/13/1937	0.00	225	61.4754	USGS	11078000	10/22/1977	0.00	225	61.4754	USGS	11078000	9/13/1993	0.10	225	61.4754
USGS	11078000	5/14/1937	0.00	226	61.7486	USGS	11078000	10/23/1977	0.00	226	61.7486	USGS	11078000	5/31/1993	0.09	226	61.7486
USGS	11078000	5/15/1937	0.00	227	62.0219	USGS	11078000	10/24/1977	0.00	227	62.0219	USGS	11078000	6/1/1993	0.09	227	62.0219
USGS	11078000	5/16/1937	0.00	228	62.2951	USGS	11078000	10/25/1977	0.00	228	62.2951	USGS	11078000	6/2/1993	0.09	228	62.2951
USGS	11078000	5/17/1937	0.00	229	62.5683	USGS	11078000	10/26/1977	0.00	229	62.5683	USGS	11078000	6/3/1993	0.09	229	62.5683
USGS	11078000	5/18/1937	0.00	230	62.8415	USGS	11078000	10/27/1977	0.00	230	62.8415	USGS	11078000	9/10/1993	0.09	230	62.8415
USGS	11078000	5/19/1937	0.00	231	63.1148	USGS	11078000	10/28/1977	0.00	231	63.1148	USGS	11078000	9/22/1993	0.09	231	63.1148
USGS	11078000	5/20/1937	0.00	232	63.3880	USGS	11078000	10/29/1977	0.00	232	63.3880	USGS	11078000	6/4/1993	0.07	232	63.3880
USGS	11078000	5/21/1937	0.00	233	63.6612	USGS	11078000	10/30/1977	0.00	233	63.6612	USGS	11078000	10/23/1992	0.06	233	63.6612
USGS	11078000	5/22/1937	0.00	234	63.9344	USGS	11078000	10/31/1977	0.00	234	63.9344	USGS	11078000	12/26/1992	0.05	234	63.9344
USGS	11078000	5/23/1937	0.00	235	64.2077	USGS	11078000	11/1/1977	0.00	235	64.2077	USGS	11078000	9/11/1993	0.04	235	64.2077
USGS	11078000	5/24/1937	0.00	236	64.4809	USGS	11078000	11/2/1977	0.00	236	64.4809	USGS	11078000	9/12/1993	0.04	236	64.4809
USGS	11078000	5/25/1937	0.00	237	64.7541	USGS	11078000	11/3/1977	0.00	237	64.7541	USGS	11078000	9/21/1993	0.04	237	64.7541
USGS	11078000	5/26/1937	0.00	238	65.0273	USGS	11078000	11/4/1977	0.00	238	65.0273	USGS	11078000	10/27/1992	0.01	238	65.0273
USGS	11078000	5/27/1937	0.00	239	65.3005	USGS	11078000	11/5/1977	0.00	239	65.3005	USGS	11078000	6/28/1993	0.01	239	65.3005
USGS	11078000	5/28/1937	0.00	240	65.5738	USGS	11078000	11/6/1977	0.00	240	65.5738	**USGS**	**11078000**	**10/1/1992**	**0.01**	**240**	**65.5738**
USGS	11078000	5/29/1937	0.00	241	65.8470	USGS	11078000	11/7/1977	0.00	241	65.8470	USGS	11078000	10/2/1992	0.00	241	65.8470
USGS	11078000	5/30/1937	0.00	242	66.1202	USGS	11078000	11/8/1977	0.00	242	66.1202	USGS	11078000	10/3/1992	0.00	242	66.1202
USGS	11078000	5/31/1937	0.00	243	66.3934	USGS	11078000	11/9/1977	0.00	243	66.3934	USGS	11078000	10/4/1992	0.00	243	66.3934
USGS	11078000	6/1/1937	0.00	244	66.6667	USGS	11078000	11/10/1977	0.00	244	66.6667	USGS	11078000	10/5/1992	0.00	244	66.6667
USGS	11078000	6/2/1937	0.00	245	66.9399	USGS	11078000	11/11/1977	0.00	245	66.9399	USGS	11078000	10/6/1992	0.00	245	66.9399
USGS	11078000	6/3/1937	0.00	246	67.2131	USGS	11078000	11/12/1977	0.00	246	67.2131	USGS	11078000	10/7/1992	0.00	246	67.2131
USGS	11078000	6/4/1937	0.00	247	67.4863	USGS	11078000	11/13/1977	0.00	247	67.4863	USGS	11078000	10/8/1992	0.00	247	67.4863
USGS	11078000	6/5/1937	0.00	248	67.7596	USGS	11078000	11/14/1977	0.00	248	67.7596	USGS	11078000	10/9/1992	0.00	248	67.7596
USGS	11078000	6/6/1937	0.00	249	68.0328	USGS	11078000	11/15/1977	0.00	249	68.0328	USGS	11078000	10/10/1992	0.00	249	68.0328
USGS	11078000	6/7/1937	0.00	250	68.3060	USGS	11078000	11/16/1977	0.00	250	68.3060	USGS	11078000	10/11/1992	0.00	250	68.3060
USGS	11078000	6/8/1937	0.00	251	68.5792	USGS	11078000	11/17/1977	0.00	251	68.5792	USGS	11078000	10/12/1992	0.00	251	68.5792
USGS	11078000	6/9/1937	0.00	252	68.8525	USGS	11078000	11/18/1977	0.00	252	68.8525	USGS	11078000	10/13/1992	0.00	252	68.8525
USGS	11078000	6/10/1937	0.00	253	69.1257	USGS	11078000	11/19/1977	0.00	253	69.1257	USGS	11078000	10/14/1992	0.00	253	69.1257
USGS	11078000	6/11/1937	0.00	254	69.3989	USGS	11078000	11/20/1977	0.00	254	69.3989	USGS	11078000	10/15/1992	0.00	254	69.3989
USGS	11078000	6/12/1937	0.00	255	69.6721	USGS	11078000	11/21/1977	0.00	255	69.6721	USGS	11078000	10/16/1992	0.00	255	69.6721
USGS	11078000	6/13/1937	0.00	256	69.9454	USGS	11078000	11/22/1977	0.00	256	69.9454	USGS	11078000	10/17/1992	0.00	256	69.9454

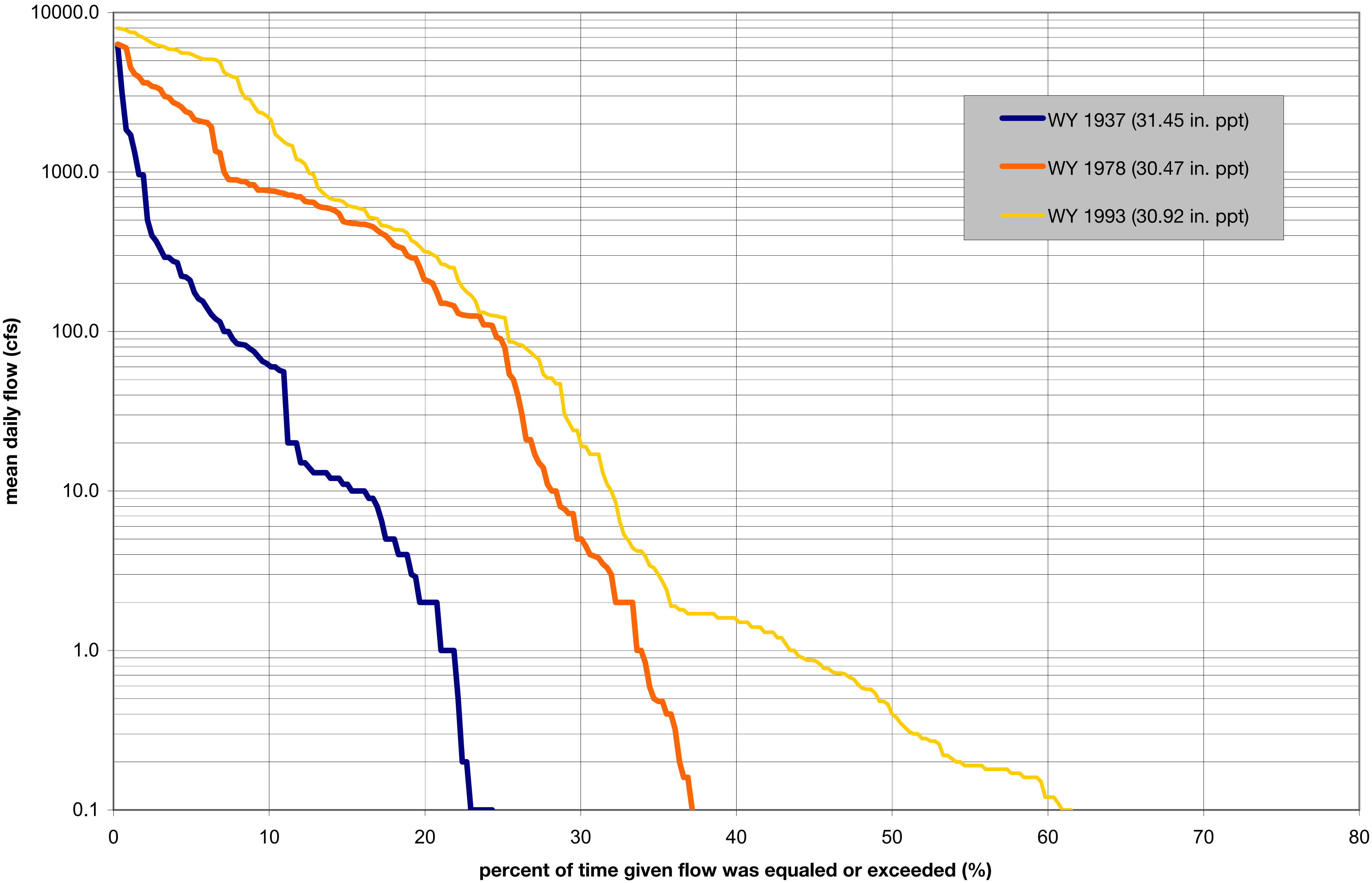
USGS	11078000	6/14/1937	0.00	257	70.2186	USGS	11078000	11/23/1977	0.00	257	70.2186	USGS	11078000	10/18/1992	0.00	257	70.2186
USGS	11078000	6/15/1937	0.00	258	70.4918	USGS	11078000	11/24/1977	0.00	258	70.4918	USGS	11078000	10/19/1992	0.00	258	70.4918
USGS	11078000	6/16/1937	0.00	259	70.7650	USGS	11078000	11/25/1977	0.00	259	70.7650	USGS	11078000	10/20/1992	0.00	259	70.7650
USGS	11078000	6/17/1937	0.00	260	71.0383	USGS	11078000	11/26/1977	0.00	260	71.0383	USGS	11078000	10/21/1992	0.00	260	71.0383
USGS	11078000	6/18/1937	0.00	261	71.3115	USGS	11078000	11/27/1977	0.00	261	71.3115	USGS	11078000	10/22/1992	0.00	261	71.3115
USGS	11078000	6/19/1937	0.00	262	71.5847	USGS	11078000	11/28/1977	0.00	262	71.5847	USGS	11078000	10/28/1992	0.00	262	71.5847
USGS	11078000	6/20/1937	0.00	263	71.8579	USGS	11078000	11/29/1977	0.00	263	71.8579	USGS	11078000	10/29/1992	0.00	263	71.8579
USGS	11078000	6/21/1937	0.00	264	72.1311	USGS	11078000	11/30/1977	0.00	264	72.1311	USGS	11078000	11/5/1992	0.00	264	72.1311
USGS	11078000	6/22/1937	0.00	265	72.4044	USGS	11078000	12/1/1977	0.00	265	72.4044	USGS	11078000	11/6/1992	0.00	265	72.4044
USGS	11078000	6/23/1937	0.00	266	72.6776	USGS	11078000	12/2/1977	0.00	266	72.6776	USGS	11078000	11/7/1992	0.00	266	72.6776
USGS	11078000	6/24/1937	0.00	267	72.9508	USGS	11078000	12/3/1977	0.00	267	72.9508	USGS	11078000	11/8/1992	0.00	267	72.9508
USGS	11078000	6/25/1937	0.00	268	73.2240	USGS	11078000	12/4/1977	0.00	268	73.2240	USGS	11078000	11/9/1992	0.00	268	73.2240
USGS	11078000	6/26/1937	0.00	269	73.4973	USGS	11078000	12/5/1977	0.00	269	73.4973	USGS	11078000	11/10/1992	0.00	269	73.4973
USGS	11078000	6/27/1937	0.00	270	73.7705	USGS	11078000	12/6/1977	0.00	270	73.7705	USGS	11078000	11/11/1992	0.00	270	73.7705
USGS	11078000	6/28/1937	0.00	271	74.0437	USGS	11078000	12/7/1977	0.00	271	74.0437	USGS	11078000	11/12/1992	0.00	271	74.0437
USGS	11078000	6/29/1937	0.00	272	74.3169	USGS	11078000	12/8/1977	0.00	272	74.3169	USGS	11078000	11/13/1992	0.00	272	74.3169
USGS	11078000	6/30/1937	0.00	273	74.5902	USGS	11078000	12/9/1977	0.00	273	74.5902	USGS	11078000	11/14/1992	0.00	273	74.5902
USGS	11078000	7/1/1937	0.00	274	74.8634	USGS	11078000	12/10/1977	0.00	274	74.8634	USGS	11078000	11/15/1992	0.00	274	74.8634
USGS	11078000	7/2/1937	0.00	275	75.1366	USGS	11078000	12/11/1977	0.00	275	75.1366	USGS	11078000	11/16/1992	0.00	275	75.1366
USGS	11078000	7/3/1937	0.00	276	75.4098	USGS	11078000	12/12/1977	0.00	276	75.4098	USGS	11078000	11/17/1992	0.00	276	75.4098
USGS	11078000	7/4/1937	0.00	277	75.6831	USGS	11078000	12/13/1977	0.00	277	75.6831	USGS	11078000	11/18/1992	0.00	277	75.6831
USGS	11078000	7/5/1937	0.00	278	75.9563	USGS	11078000	12/14/1977	0.00	278	75.9563	USGS	11078000	11/19/1992	0.00	278	75.9563
USGS	11078000	7/6/1937	0.00	279	76.2295	USGS	11078000	12/15/1977	0.00	279	76.2295	USGS	11078000	11/20/1992	0.00	279	76.2295
USGS	11078000	7/7/1937	0.00	280	76.5027	USGS	11078000	12/16/1977	0.00	280	76.5027	USGS	11078000	11/21/1992	0.00	280	76.5027
USGS	11078000	7/8/1937	0.00	281	76.7760	USGS	11078000	12/17/1977	0.00	281	76.7760	USGS	11078000	11/22/1992	0.00	281	76.7760
USGS	11078000	7/9/1937	0.00	282	77.0492	USGS	11078000	12/19/1977	0.00	282	77.0492	USGS	11078000	11/23/1992	0.00	282	77.0492
USGS	11078000	7/10/1937	0.00	283	77.3224	USGS	11078000	12/20/1977	0.00	283	77.3224	USGS	11078000	11/24/1992	0.00	283	77.3224
USGS	11078000	7/11/1937	0.00	284	77.5956	USGS	11078000	12/21/1977	0.00	284	77.5956	USGS	11078000	11/25/1992	0.00	284	77.5956
USGS	11078000	7/12/1937	0.00	285	77.8689	USGS	11078000	12/22/1977	0.00	285	77.8689	USGS	11078000	11/26/1992	0.00	285	77.8689
USGS	11078000	7/13/1937	0.00	286	78.1421	USGS	11078000	12/23/1977	0.00	286	78.1421	USGS	11078000	11/27/1992	0.00	286	78.1421
USGS	11078000	7/14/1937	0.00	287	78.4153	USGS	11078000	12/24/1977	0.00	287	78.4153	USGS	11078000	11/28/1992	0.00	287	78.4153
USGS	11078000	7/15/1937	0.00	288	78.6885	USGS	11078000	7/15/1978	0.00	288	78.6885	USGS	11078000	11/29/1992	0.00	288	78.6885
USGS	11078000	7/16/1937	0.00	289	78.9617	USGS	11078000	7/16/1978	0.00	289	78.9617	USGS	11078000	11/30/1992	0.00	289	78.9617
USGS	11078000	7/17/1937	0.00	290	79.2350	USGS	11078000	7/17/1978	0.00	290	79.2350	USGS	11078000	12/1/1992	0.00	290	79.2350
USGS	11078000	7/18/1937	0.00	291	79.5082	USGS	11078000	7/18/1978	0.00	291	79.5082	USGS	11078000	12/2/1992	0.00	291	79.5082
USGS	11078000	7/19/1937	0.00	292	79.7814	USGS	11078000	7/19/1978	0.00	292	79.7814	USGS	11078000	12/3/1992	0.00	292	79.7814
USGS	11078000	7/20/1937	0.00	293	80.0546	USGS	11078000	7/20/1978	0.00	293	80.0546	USGS	11078000	12/4/1992	0.00	293	80.0546
USGS	11078000	7/21/1937	0.00	294	80.3279	USGS	11078000	7/21/1978	0.00	294	80.3279	USGS	11078000	12/5/1992	0.00	294	80.3279
USGS	11078000	7/22/1937	0.00	295	80.6011	USGS	11078000	7/22/1978	0.00	295	80.6011	USGS	11078000	12/6/1992	0.00	295	80.6011
USGS	11078000	7/23/1937	0.00	296	80.8743	USGS	11078000	7/23/1978	0.00	296	80.8743	USGS	11078000	6/29/1993	0.00	296	80.8743
USGS	11078000	7/24/1937	0.00	297	81.1475	USGS	11078000	7/24/1978	0.00	297	81.1475	USGS	11078000	6/30/1993	0.00	297	81.1475
USGS	11078000	7/25/1937	0.00	298	81.4208	USGS	11078000	7/25/1978	0.00	298	81.4208	USGS	11078000	7/1/1993	0.00	298	81.4208
USGS	11078000	7/26/1937	0.00	299	81.6940	USGS	11078000	7/26/1978	0.00	299	81.6940	USGS	11078000	7/2/1993	0.00	299	81.6940
USGS	11078000	7/27/1937	0.00	300	81.9672	USGS	11078000	7/27/1978	0.00	300	81.9672	USGS	11078000	7/3/1993	0.00	300	81.9672
USGS	11078000	7/28/1937	0.00	301	82.2404	USGS	11078000	7/28/1978	0.00	301	82.2404	USGS	11078000	7/4/1993	0.00	301	82.2404
USGS	11078000	7/29/1937	0.00	302	82.5137	USGS	11078000	7/29/1978	0.00	302	82.5137	USGS	11078000	7/5/1993	0.00	302	82.5137
USGS	11078000	7/30/1937	0.00	303	82.7869	USGS	11078000	7/30/1978	0.00	303	82.7869	USGS	11078000	7/6/1993	0.00	303	82.7869
USGS	11078000	7/31/1937	0.00	304	83.0601	USGS	11078000	7/31/1978	0.00	304	83.0601	USGS	11078000	7/7/1993	0.00	304	83.0601
USGS	11078000	8/1/1937	0.00	305	83.3333	USGS	11078000	8/1/1978	0.00	305	83.3333	USGS	11078000	7/8/1993	0.00	305	83.3333
USGS	11078000	8/2/1937	0.00	306	83.6066	USGS	11078000	8/2/1978	0.00	306	83.6066	USGS	11078000	7/9/1993	0.00	306	83.6066
USGS	11078000	8/3/1937	0.00	307	83.8798	USGS	11078000	8/3/1978	0.00	307	83.8798	USGS	11078000	7/10/1993	0.00	307	83.8798
USGS	11078000	8/4/1937	0.00	308	84.1530	USGS	11078000	8/4/1978	0.00	308	84.1530	USGS	11078000	7/11/1993	0.00	308	84.1530
USGS	11078000	8/5/1937	0.00	309	84.4262	USGS	11078000	8/5/1978	0.00	309	84.4262	USGS	11078000	7/12/1993	0.00	309	84.4262
USGS	11078000	8/6/1937	0.00	310	84.6995	USGS	11078000	8/6/1978	0.00	310	84.6995	USGS	11078000	7/13/1993	0.00	310	84.6995
USGS	11078000	8/7/1937	0.00	311	84.9727	USGS	11078000	8/7/1978	0.00	311	84.9727	USGS	11078000	7/14/1993	0.00	311	84.9727
USGS	11078000	8/8/1937	0.00	312	85.2459	USGS	11078000	8/8/1978	0.00	312	85.2459	USGS	11078000	7/15/1993	0.00	312	85.2459
USGS	11078000	8/9/1937	0.00	313	85.5191	USGS	11078000	8/9/1978	0.00	313	85.5191	USGS	11078000	7/16/1993	0.00	313	85.5191
USGS	11078000	8/10/1937	0.00	314	85.7923	USGS	11078000	8/10/1978	0.00	314	85.7923	USGS	11078000	7/17/1993	0.00	314	85.7923
USGS	11078000	8/11/1937	0.00	315	86.0656	USGS	11078000	8/11/1978	0.00	315	86.0656	USGS	11078000	7/18/1993	0.00	315	86.0656
USGS	11078000	8/12/1937	0.00	316	86.3388	USGS	11078000	8/12/1978	0.00	316	86.3388	USGS	11078000	7/19/1993	0.00	316	86.3388
USGS	11078000	8/13/1937	0.00	317	86.6120	USGS	11078000	8/13/1978	0.00	317	86.6120	USGS	11078000	7/20/1993	0.00	317	86.6120
USGS	11078000	8/14/1937	0.00	318	86.8852	USGS	11078000	8/14/1978	0.00	318	86.8852	USGS	11078000	7/21/1993	0.00	318	86.8852
USGS	11078000	8/15/1937	0.00	319	87.1585	USGS	11078000	8/15/1978	0.00	319	87.1585	USGS	11078000	7/22/1993	0.00	319	87.1585
USGS	11078000	8/16/1937	0.00	320	87.4317	USGS	11078000	8/16/1978	0.00	320	87.4317	USGS	11078000	7/23/1993	0.00	320	87.4317
USGS	11078000	8/17/1937	0.00	321	87.7049	USGS	11078000	8/17/1978	0.00	321	87.7049	USGS	11078000	7/24/1993	0.00	321	87.7049
USGS	11078000	8/18/1937	0.00	322	87.9781	USGS	11078000	8/18/1978	0.00	322	87.9781	USGS	11078000	7/25/1993	0.00	322	87.9781
USGS	11078000	8/19/1937	0.00	323	88.2514	USGS	11078000	8/19/1978	0.00	323	88.2514	USGS	11078000	7/26/1993	0.00	323	88.2514

USGS	11078000	8/20/1937	0.00	324	88.5246
USGS	11078000	8/21/1937	0.00	325	88.7978
USGS	11078000	8/22/1937	0.00	326	89.0710
USGS	11078000	8/23/1937	0.00	327	89.3443
USGS	11078000	8/24/1937	0.00	328	89.6175
USGS	11078000	8/25/1937	0.00	329	89.8907
USGS	11078000	8/26/1937	0.00	330	90.1639
USGS	11078000	8/27/1937	0.00	331	90.4372
USGS	11078000	8/28/1937	0.00	332	90.7104
USGS	11078000	8/29/1937	0.00	333	90.9836
USGS	11078000	8/30/1937	0.00	334	91.2568
USGS	11078000	8/31/1937	0.00	335	91.5301
USGS	11078000	9/1/1937	0.00	336	91.8033
USGS	11078000	9/2/1937	0.00	337	92.0765
USGS	11078000	9/3/1937	0.00	338	92.3497
USGS	11078000	9/4/1937	0.00	339	92.6230
USGS	11078000	9/5/1937	0.00	340	92.8962
USGS	11078000	9/6/1937	0.00	341	93.1694
USGS	11078000	9/7/1937	0.00	342	93.4426
USGS	11078000	9/8/1937	0.00	343	93.7158
USGS	11078000	9/9/1937	0.00	344	93.9891
USGS	11078000	9/10/1937	0.00	345	94.2623
USGS	11078000	9/11/1937	0.00	346	94.5355
USGS	11078000	9/12/1937	0.00	347	94.8087
USGS	11078000	9/13/1937	0.00	348	95.0820
USGS	11078000	9/14/1937	0.00	349	95.3552
USGS	11078000	9/15/1937	0.00	350	95.6284
USGS	11078000	9/16/1937	0.00	351	95.9016
USGS	11078000	9/17/1937	0.00	352	96.1749
USGS	11078000	9/18/1937	0.00	353	96.4481
USGS	11078000	9/19/1937	0.00	354	96.7213
USGS	11078000	9/20/1937	0.00	355	96.9945
USGS	11078000	9/21/1937	0.00	356	97.2678
USGS	11078000	9/22/1937	0.00	357	97.5410
USGS	11078000	9/23/1937	0.00	358	97.8142
USGS	11078000	9/24/1937	0.00	359	98.0874
USGS	11078000	9/25/1937	0.00	360	98.3607
USGS	11078000	9/26/1937	0.00	361	98.6339
USGS	11078000	9/27/1937	0.00	362	98.9071
USGS	11078000	9/28/1937	0.00	363	99.1803
USGS	11078000	9/29/1937	0.00	364	99.4536
USGS	11078000	9/30/1937	0.00	365	99.7268

USGS	11078000	8/20/1978	0.00	324	88.5246
USGS	11078000	8/21/1978	0.00	325	88.7978
USGS	11078000	8/22/1978	0.00	326	89.0710
USGS	11078000	8/23/1978	0.00	327	89.3443
USGS	11078000	8/24/1978	0.00	328	89.6175
USGS	11078000	8/25/1978	0.00	329	89.8907
USGS	11078000	8/26/1978	0.00	330	90.1639
USGS	11078000	8/27/1978	0.00	331	90.4372
USGS	11078000	8/28/1978	0.00	332	90.7104
USGS	11078000	8/29/1978	0.00	333	90.9836
USGS	11078000	8/30/1978	0.00	334	91.2568
USGS	11078000	8/31/1978	0.00	335	91.5301
USGS	11078000	9/1/1978	0.00	336	91.8033
USGS	11078000	9/2/1978	0.00	337	92.0765
USGS	11078000	9/3/1978	0.00	338	92.3497
USGS	11078000	9/4/1978	0.00	339	92.6230
USGS	11078000	9/5/1978	0.00	340	92.8962
USGS	11078000	9/6/1978	0.00	341	93.1694
USGS	11078000	9/7/1978	0.00	342	93.4426
USGS	11078000	9/8/1978	0.00	343	93.7158
USGS	11078000	9/9/1978	0.00	344	93.9891
USGS	11078000	9/10/1978	0.00	345	94.2623
USGS	11078000	9/11/1978	0.00	346	94.5355
USGS	11078000	9/12/1978	0.00	347	94.8087
USGS	11078000	9/13/1978	0.00	348	95.0820
USGS	11078000	9/14/1978	0.00	349	95.3552
USGS	11078000	9/15/1978	0.00	350	95.6284
USGS	11078000	9/16/1978	0.00	351	95.9016
USGS	11078000	9/17/1978	0.00	352	96.1749
USGS	11078000	9/18/1978	0.00	353	96.4481
USGS	11078000	9/19/1978	0.00	354	96.7213
USGS	11078000	9/20/1978	0.00	355	96.9945
USGS	11078000	9/21/1978	0.00	356	97.2678
USGS	11078000	9/22/1978	0.00	357	97.5410
USGS	11078000	9/23/1978	0.00	358	97.8142
USGS	11078000	9/24/1978	0.00	359	98.0874
USGS	11078000	9/25/1978	0.00	360	98.3607
USGS	11078000	9/26/1978	0.00	361	98.6339
USGS	11078000	9/27/1978	0.00	362	98.9071
USGS	11078000	9/28/1978	0.00	363	99.1803
USGS	11078000	9/29/1978	0.00	364	99.4536
USGS	11078000	9/30/1978	0.00	365	99.7268

USGS	11078000	7/27/1993	0.00	324	88.5246
USGS	11078000	7/28/1993	0.00	325	88.7978
USGS	11078000	7/29/1993	0.00	326	89.0710
USGS	11078000	7/30/1993	0.00	327	89.3443
USGS	11078000	7/31/1993	0.00	328	89.6175
USGS	11078000	8/1/1993	0.00	329	89.8907
USGS	11078000	8/2/1993	0.00	330	90.1639
USGS	11078000	8/3/1993	0.00	331	90.4372
USGS	11078000	8/4/1993	0.00	332	90.7104
USGS	11078000	8/5/1993	0.00	333	90.9836
USGS	11078000	8/6/1993	0.00	334	91.2568
USGS	11078000	8/7/1993	0.00	335	91.5301
USGS	11078000	8/8/1993	0.00	336	91.8033
USGS	11078000	8/9/1993	0.00	337	92.0765
USGS	11078000	8/10/1993	0.00	338	92.3497
USGS	11078000	8/11/1993	0.00	339	92.6230
USGS	11078000	8/12/1993	0.00	340	92.8962
USGS	11078000	8/13/1993	0.00	341	93.1694
USGS	11078000	8/14/1993	0.00	342	93.4426
USGS	11078000	8/15/1993	0.00	343	93.7158
USGS	11078000	8/16/1993	0.00	344	93.9891
USGS	11078000	8/17/1993	0.00	345	94.2623
USGS	11078000	8/18/1993	0.00	346	94.5355
USGS	11078000	8/19/1993	0.00	347	94.8087
USGS	11078000	8/20/1993	0.00	348	95.0820
USGS	11078000	8/21/1993	0.00	349	95.3552
USGS	11078000	8/22/1993	0.00	350	95.6284
USGS	11078000	8/23/1993	0.00	351	95.9016
USGS	11078000	8/24/1993	0.00	352	96.1749
USGS	11078000	8/25/1993	0.00	353	96.4481
USGS	11078000	8/26/1993	0.00	354	96.7213
USGS	11078000	8/27/1993	0.00	355	96.9945
USGS	11078000	8/28/1993	0.00	356	97.2678
USGS	11078000	8/29/1993	0.00	357	97.5410
USGS	11078000	8/30/1993	0.00	358	97.8142
USGS	11078000	8/31/1993	0.00	359	98.0874
USGS	11078000	9/1/1993	0.00	360	98.3607
USGS	11078000	9/2/1993	0.00	361	98.6339
USGS	11078000	9/3/1993	0.00	362	98.9071
USGS	11078000	9/4/1993	0.00	363	99.1803
USGS	11078000	9/5/1993	0.00	364	99.4536
USGS	11078000	9/6/1993	0.00	365	99.7268

Figure F. Flow Duration Curves: USGS 11078000 Santa Ana River @ Santa Ana
WET YEARS



G. SAN BERNARDINO CA PRECIPITATION (WY 1871-2003)
(inches)
Source:
1. Global Historical Climatology Network (GHCN) Oct 1870-Dec 1989
2. Wester Regional Climate Center - DRI (NCDC dataset) Jan 1990-Sep 2003

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1871	0.09	3.11	0.89	6.91	2.21	0.19	0.34	0.11	0.07	0.00	0.04	0.13	**14.09**
1872	0.60	0.88	3.91	0.00	2.20	0.37	0.79	0.06	0.00	0.00	0.18	0.04	**9.03**
1873	0.00	1.17	4.40	6.50	1.25	0.51	0.84	0.21	0.00	0.00	1.06	0.02	**15.96**
1874	0.01	0.74	5.73	5.51	8.76	1.08	0.48	0.42	0.00	0.00	0.00	0.06	**22.79**
1875	1.82	1.88	2.20	7.20	0.15	0.22	0.07	0.05	0.00	0.00	0.00	0.00	**13.59**
1876	0.00	7.50	0.02	6.55	1.92	3.41	0.44	0.03	0.03	0.00	0.00	0.00	**19.91**
1877	0.20	0.40	0.00	3.50	4.03	0.83	0.26	0.30	0.00	0.00	0.00	0.00	**9.52**
1878	0.86	0.50	3.95	3.33	6.68	2.57	1.71	0.66	0.07	0.07	0.00	0.02	**20.42**
1879	0.14	0.05	4.70	3.59	1.00	0.50	1.20	0.24	0.03	0.11	0.02	0.01	**11.60**
1880	0.94	3.40	6.50	1.56	1.33	1.45	5.00	0.04	0.00	0.00	0.00	0.00	**20.22**
1881	0.14	0.67	8.80	1.40	0.36	1.66	0.46	0.01	0.00	0.00	0.00	0.00	**13.50**
1882	0.80	0.27	0.50	1.11	2.65	3.30	2.91	0.00	0.00	0.00	0.00	0.00	**11.54**
1883	0.10	0.15	0.45	1.60	1.10	2.82	2.95	0.00	0.00	0.19	0.00	0.53	**9.88**
1884	0.85	0.09	2.63	1.63	12.20	9.95	5.68	3.17	0.59	0.00	0.00	0.00	**36.79**
1885	0.00	0.11	3.75	2.79	0.11	0.28	1.89	1.69	0.19	0.00	0.00	0.00	**10.81**
1886	0.39	4.36	1.20	6.44	2.52	4.18	2.36	0.32	0.16	0.00	0.00	0.00	**21.93**
1887	0.00	0.11	0.61	0.39	6.44	4.41	1.90	0.42	0.22	0.11	0.04	0.09	**14.74**
1888	1.17	2.29	1.91	4.01	3.60	3.41	0.58	0.52	0.03	0.00	0.00	0.00	**17.52**
1889	0.05	4.12	4.64	0.93	1.50	6.55	2.05	1.13	0.00	0.17	0.63	0.11	**21.88**
1890	2.30	2.23	10.85	5.44	2.15	0.89	0.00	0.31	0.00	0.13	2.16	0.88	**27.34**
1891	0.58	1.27	3.02	0.00	7.78	0.06	0.53	1.67	0.00	0.00	0.91	0.93	**16.75**
1892	0.01	0.01	1.67	3.24	3.30	1.75	0.37	2.10	0.08	0.00	0.01	0.00	**12.54**
1893	0.16	1.02	2.23	4.53	3.37	8.00	0.48	0.03	0.00	0.20	0.00	0.05	**20.07**
1894	1.05	0.30	2.28	1.26	0.88	1.15	0.40	0.56	0.00	0.01	0.16	0.37	**8.43**
1895	0.15	0.00	7.25	7.36	1.14	3.44	0.64	0.44	0.00	0.00	0.00	0.00	**20.43**
1896	0.00	1.14	0.66	2.02	0.00	2.92	0.37	1.00	0.00	0.01	0.17	0.00	**8.30**
1897	2.10	0.98	1.09	3.40	5.40	3.41	0.08	0.11	0.00	0.01	0.00	0.13	**16.71**
1898	2.10	0.21	0.57	2.10	0.60	0.97	0.48	1.08	0.00	0.00	0.00	0.00	**8.10**
1899	0.03	0.05	0.44	2.03	0.51	3.22	0.07	0.19	0.95	0.00	0.01	0.01	**7.52**
1900	0.81	1.47	0.84	0.92	0.00	0.92	1.96	1.71	0.01	0.34	0.00	0.23	**9.21**
1901	0.36	6.10	0.00	3.48	4.58	0.43	0.56	1.23	0.05	0.00	0.27	0.07	**17.13**
1902	1.09	0.28	0.04	1.65	3.02	3.89	0.57	0.12	0.15	0.01	0.00	0.00	**10.82**
1903	0.09	1.94	1.94	1.96	1.67	6.47	3.10	0.24	0.00	0.00	0.15	0.46	**18.02**
1904	0.07	0.00	0.00	0.18	2.21	5.34	0.80	0.16	0.00	0.00	0.14	0.06	**8.96**
1905	0.32	0.00	1.03	3.92	6.58	6.00	1.18	1.55	0.00	0.00	0.00	0.13	**20.71**
1906	0.00	2.81	0.74	2.97	2.89	8.00	1.16	0.96	0.22	0.01	0.01	0.05	**19.83**
1907	0.01	2.42	7.12	6.33	2.14	4.58	0.16	0.11	0.25	0.00	0.00	0.00	**23.13**
1908	2.75	0.10	0.97	4.71	4.20	2.03	0.53	0.31	0.02	0.05	0.00	1.11	**16.78**
1909	1.45	0.26	0.66	7.49	3.76	2.29	0.17	0.02	0.10	0.00	1.28	0.00	**17.48**
1910	0.04	2.28	7.19	2.43	0.08	1.58	0.14	0.00	0.01	0.05	0.03	0.36	**14.19**
1911	1.04	0.54	0.03	6.58	4.22	2.52	0.48	0.40	0.19	0.01	0.00	1.47	**17.48**
1912	0.50	0.58	1.17	0.75	0.00	5.18	3.67	0.52	0.00	0.00	0.06	0.01	**12.44**
1913	1.42	0.47	0.01	1.69	5.26	0.63	0.66	0.48	0.39	0.19	0.05	0.02	**11.27**
1914	0.00	2.54	0.96	8.73	4.71	0.64	3.45	0.03	0.13	0.01	0.00	0.01	**21.21**
1915	0.91	0.26	2.98	4.99	5.52	1.25	2.29	1.43	0.00	0.00	0.53	0.05	**20.21**
1916	0.00	0.67	3.92	15.51	1.86	1.90	0.08	0.20	0.00	0.00	0.37	1.06	**25.57**
1917	1.80	0.03	2.81	3.24	2.70	0.19	0.97	0.62	0.00	0.21	0.04	0.00	**12.61**
1918	0.01	0.40	0.00	0.53	3.05	7.44	0.32	0.32	1.02	0.05	0.03	0.29	**13.47**
1919	0.89	1.95	1.72	0.52	3.79	2.60	1.08	0.70	0.00	0.02	0.14	2.37	**15.78**
1920	0.67	1.20	0.90	0.62	4.78	6.15	1.36	1.07	0.00	0.00	0.00	0.18	**16.93**
1921	1.76	0.26	1.41	3.94	1.03	3.85	0.69	3.34	0.00	0.00	0.00	1.10	**17.38**
1922	1.10	0.11	10.62	6.60	3.75	2.45	0.75	1.27	0.00	0.02	0.02	0.00	**26.69**
1923	0.46	2.04	3.16	1.88	1.09	0.50	1.86	0.01	0.00	0.00	0.02	0.13	**11.15**
1924	0.34	0.96	1.84	0.85	0.20	4.51	2.49	0.01	0.00	0.00	0.00	0.02	**11.22**
1925	1.02	1.15	2.18	0.36	0.69	2.05	1.77	1.07	0.58	0.01	0.00	0.01	**10.89**
1926	2.29	1.02	1.49	0.92	3.14	1.08	9.35	1.07	0.03	0.00	0.01	0.00	**20.41**
1927	0.02	2.18	3.08	1.36	9.83	2.66	0.94	0.40	0.08	0.00	0.00	0.00	**20.55**
1928	3.27	1.09	3.39	0.74	2.65	1.30	0.51	1.10	0.00	0.00	0.00	0.00	**14.05**
1929	0.82	1.10	1.99	2.28	1.89	1.60	2.41	0.00	0.12	0.00	0.00	0.53	**12.73**
1930	0.05	0.00	0.00	5.12	1.16	3.80	1.08	2.32	0.00	0.00	0.00	0.00	**13.53**
1931	0.89	2.22	0.00	2.88	3.99	0.45	3.55	1.26	0.07	0.00	1.16	0.15	**16.62**
1932	1.25	3.06	4.54	1.86	8.83	0.16	0.82	0.01	0.12	0.00	0.00	0.00	**20.65**
1933	0.28	0.00	3.51	5.37	0.22	0.47	2.16	0.95	0.20	0.00	0.05	0.00	**13.21**
1934	0.24	0.38	6.31	2.55	2.40	0.67	0.14	0.00	0.24	0.00	0.01	0.14	**13.09**
1935	2.44	1.63	4.24	3.77	3.30	3.24	1.70	0.21	0.00	0.00	1.28	0.02	**21.83**
1936	0.40	0.35	0.71	0.01	11.12	2.19	1.02	0.00	0.00	0.09	0.00	0.06	**15.95**
1937	4.63	0.26	8.24	3.58	8.64	5.43	0.60	0.00	0.07	0.00	0.00	0.00	**31.45**
1938	0.00	0.02	3.44	2.12	6.48	10.10	2.46	0.65	0.09	0.42	0.00	0.04	**25.82**
1939	0.67	0.06	6.48	3.43	2.29	1.87	0.85	0.06	0.00	0.00	0.04	2.22	**17.97**
1940	0.79	1.01	0.57	5.54	4.21	1.53	2.42	0.00	0.00	0.00	0.00	0.01	**16.09**
1941	1.89	0.95	7.34	2.57	9.05	9.65	3.82	0.25	0.38	0.00	0.54	0.00	**36.44**

G. SAN BERNARDINO CA PRECIPITATION (WY 1871-2003)
(inches)
Source:
1. Global Historical Climatology Network (GHCN) Oct 1870-Dec 1989
2. Wester Regional Climate Center - DRI (NCDC dataset) Jan 1990-Sep 2003

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1942	2.61	0.70	5.88	0.57	1.14	2.04	3.16	0.06	0.00	0.00	0.21	0.00	**16.37**
1943	0.71	0.55	1.66	9.76	5.46	6.07	3.04	0.00	0.07	0.00	0.00	0.02	**27.34**
1944	1.33	0.31	7.27	1.39	7.71	2.06	1.71	0.00	0.11	0.00	0.00	0.02	**21.91**
1945	0.00	6.05	1.37	0.42	4.39	5.29	0.58	0.20	0.00	0.00	0.94	0.04	**19.28**
1946	0.48	0.05	6.22	0.21	1.44	2.49	0.64	0.10	0.00	0.33	0.00	0.61	**12.57**
1947	1.46	6.84	3.78	0.50	1.02	1.11	0.91	0.33	0.13	0.00	0.00	0.26	**16.34**
1948	0.09	0.00	1.60	0.09	2.45	2.66	2.66	0.30	0.84	0.00	0.00	0.01	**10.70**
1949	1.36	0.00	2.87	4.84	3.14	0.89	0.02	1.29	0.00	0.00	0.00	0.00	**14.41**
1950	0.12	2.37	2.17	2.52	2.48	1.07	0.88	0.20	0.03	0.00	0.00	0.00	**11.84**
1951	0.03	1.79	0.00	3.16	0.81	0.61	1.73	1.22	0.00	0.03	0.03	0.22	**9.64**
1952	0.70	1.42	7.10	6.40	0.53	5.53	1.96	0.00	0.00	0.06	0.00	0.50	**24.20**
1953	0.00	3.42	3.29	1.85	0.31	1.47	2.16	0.30	0.01	0.00	0.03	0.00	**12.85**
1954	0.07	0.86	0.31	7.07	2.57	4.90	0.30	0.01	0.13	0.08	0.01	0.01	**16.33**
1955	0.00	3.02	1.25	4.46	1.72	0.42	0.73	1.55	0.04	0.08	0.01	0.01	**13.30**
1956	0.00	1.72	1.49	7.28	0.47	0.01	1.70	0.58	0.00	0.21	0.00	0.00	**13.46**
1957	0.53	0.00	0.43	6.34	1.92	0.95	1.10	2.26	0.28	0.00	0.00	0.01	**13.82**
1958	2.53	0.77	4.29	1.81	6.64	6.38	3.88	0.54	0.00	0.01	0.38	0.88	**28.13**
1959	0.14	0.16	0.01	1.35	4.01	0.00	0.46	0.23	0.01	0.01	0.02	0.22	**6.63**
1960	0.02	0.73	2.64	3.30	2.91	0.88	1.17	0.36	0.01	0.01	0.00	1.05	**13.08**
1961	0.58	2.25	0.17	0.75	0.00	1.65	0.17	0.25	0.01	0.00	0.18	0.00	**6.02**
1962	0.01	1.41	2.11	2.32	5.58	1.74	0.02	0.67	0.01	0.00	0.00	0.00	**13.87**
1963	0.14	0.01	0.04	0.77	3.12	1.61	2.42	0.00	0.48	0.00	0.02	4.42	**13.04**
1964	1.58	2.66	0.27	1.65	0.32	2.26	0.77	0.39	0.15	0.02	0.00	0.07	**10.14**
1965	0.11	2.35	1.79	0.69	0.27	1.70	5.40	0.15	0.10	0.10	0.02	0.58	**13.26**
1966	0.00	8.47	4.23	0.94	1.65	0.69	0.13	0.16	0.00	0.01	0.00	0.12	**16.40**
1967	0.44	1.48	9.14	4.39	0.00	2.07	4.24	0.40	0.21	0.00	0.39	0.20	**22.96**
1968	0.00	3.04	2.19	1.05	0.49	2.41	1.18	0.29	0.10	0.26	0.12	0.00	**11.13**
1969	0.17	0.36	1.07	13.64	12.50	1.35	1.08	1.21	0.07	0.12	0.01	0.22	**31.80**
1970	0.16	1.50	0.10	1.31	2.15	3.46	0.45	0.07	0.10	0.02	0.03	0.00	**9.35**
1971	0.02	3.57	3.36	0.95	0.80	1.11	1.13	1.01	0.02	0.00	0.00	0.00	**11.97**
1972	2.30	0.27	5.87	0.00	0.05	0.00	0.13	0.22	0.22	0.00	0.25	0.31	**9.63**
1973	0.43	3.32	1.92	3.39	5.68	3.58	0.08	0.04	0.00	0.00	0.02	0.00	**18.46**
1974	0.09	1.48	0.14	6.88	0.28	3.00	0.78	0.05	0.00	0.00	0.00	0.02	**12.72**
1975	0.96	0.17	2.92	0.35	2.37	4.33	1.81	0.22	0.23	0.00	0.00	0.13	**13.49**
1976	1.17	0.74	0.58	0.00	4.80	1.63	1.32	0.30	0.12	0.08	0.00	5.12	**15.85**
1977	0.10	0.59	1.01	2.93	0.68	1.51	0.00	2.70	0.03	0.00	2.40	0.00	**11.96**
1978	0.05	0.24	4.37	6.31	6.86	9.65	2.31	0.04	0.00	0.00	0.01	0.63	**30.47**
1979	0.19	2.38	2.45	4.33	3.65	4.68	0.00	1.01	0.13	0.00	0.00	0.00	**18.82**
1980	2.31	0.15	0.20	8.96	9.88	5.47	0.94	0.04	0.00	0.00	0.00	0.00	**27.95**
1981	0.70	0.00	0.58	4.33	0.88	2.69	1.08	0.19	0.00	0.00	0.00	0.00	**10.45**
1982	0.69	1.15	0.50	4.69	2.01	6.01	1.64	0.52	0.04	0.00	0.02	1.09	**18.36**
1983	0.24	4.35	2.31	5.41	4.90	7.46	3.22	0.05		0.00	3.72	0.68	**32.35**
1984	2.15	3.55	3.23	0.19	0.22	0.35	0.49	0.00	0.02	0.36	0.09	0.16	**10.81**
1985	0.24	1.36	5.45	1.67	1.64	1.82	0.19	0.03	0.04	0.00	0.00	0.42	**12.86**
1986	0.51	4.01	0.57	1.43	4.32	4.52	0.86	0.00	0.00	0.26	0.02	1.36	**17.86**
1987	0.26	0.79	1.70	1.64	1.07	2.01	0.24	0.00	0.00	0.09	0.13	0.15	**8.09**
1988	3.54	2.44	1.72	1.77	0.90	0.76	2.46	0.12	0.00	0.00	0.00	0.07	**13.78**
1989	0.00	0.56	5.54	1.16	2.52	1.87	0.00	0.47	0.00	0.00	0.00	0.52	**12.64**
1990	0.29	0.40	0.00	1.88	3.16	0.83	1.54	0.41	0.02	0.00	0.00	0.00	**8.53**
1991	0.00	0.27	0.00	2.45	4.43	8.23	0.01	0.02	0.00	0.00	0.00	0.07	**15.48**
1992	0.63	0.16	1.84	1.86	5.51	6.07	0.19	0.05	0.00	0.23	0.00	0.00	**16.54**
1993	1.13	0.00	5.06	13.87	9.04	1.68	0.00	0.00	0.14	0.00	0.00	0.00	**30.92**
1994	0.11	0.73	0.72	0.99	3.68	3.24	1.47	0.65	0.00	0.03	0.00	0.00	**11.62**
1995	0.56	0.90	1.75	11.35	1.54	5.98	0.76	0.20	0.86	0.05	0.00	0.20	**24.15**
1996	0.00	0.00	0.70	2.11	6.48	2.04	0.59	0.00	0.00	0.00	0.00	0.00	**11.92**
1997	1.08	3.06	3.34	8.88	0.84	0.00	0.00	0.00	0.18	0.00	0.00	1.26	**18.64**
1998	0.54	2.38		1.83	15.03		1.67			0.00			**21.45**
1999		0.00	0.06			0.99		0.05	0.40	0.00	0.00	0.00	**1.50**
2000	0.00	0.01	0.15	1.07	6.45	2.55	1.51	0.03	0.00	0.00	0.00	0.00	**11.77**
2001	0.87	0.38		0.44	5.68	1.14	1.37	0.00	0.00	0.00	0.00	0.00	**9.88**
2002	0.00	0.39		1.40			0.42	0.00	0.00	0.00	0.00	0.00	**2.21**
2003	0.00			0.00					0.00	0.00	0.00		**0.00**
mean	0.70	1.36	2.55	3.25	3.31	2.79	1.33	0.49	0.09	0.04	0.16	0.29	**16.06**
min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
max	4.63	8.47	10.85	15.51	15.03	10.10	9.35	3.34	1.02	0.42	3.72	5.12	36.79
MEDIAN YEAR-TYPE STATISTICS												**median:**	**14.41**
monthly	0.40	0.78	1.84	2.20	2.52	2.04	0.88	0.24	0.01	0.00	0.00	0.02	**10.93**
monthly ratio	0.04	0.07	0.17	0.20	0.23	0.19	0.08	0.02	0.00	0.00	0.00	0.00	
adjusted MEDIAN	**0.52**	**1.03**	**2.42**	**2.90**	**3.32**	**2.69**	**1.16**	**0.32**	**0.02**	**0.00**	**0.00**	**0.03**	**14.41**
DRY YEAR-TYPE (80% EXCEED) STATISTICS												**80% exceed:**	**10.90**
monthly	0.02	0.15	0.48	0.92	0.83	0.83	0.32	0.02	0.00	0.00	0.00	0.00	**3.57**
monthly ratio	0.01	0.04	0.13	0.26	0.23	0.23	0.09	0.01	0.00	0.00	0.00	0.00	
adjusted DRY	**0.06**	**0.46**	**1.46**	**2.81**	**2.54**	**2.53**	**0.97**	**0.06**	**0.00**	**0.00**	**0.00**	**0.00**	**10.90**

H. Forebay Recharge

data provided by Gwen M. Sharp, OCWD (1/31/05)

				ANNUAL			ANNUAL (Water Year)		
	Available Supply	**Native Inflow-Purch**	Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation
Jul-86	10,419	8,590	na						
Aug-86	9,686	7,740	na						
Sep-86	14,910	7,430	na						
Oct-86	18,700	11,570	na						
Nov-86	13,820	8,450	na						
Dec-86	13,598	11,428	na						
Jan-87	9,267	9,196	na						
Feb-87	10,662	10,650	na						
Mar-87	15,170	15,162	na						
Apr-87	18,640	18,640	na						
May-87	11,861	11,220	na						
Jun-87	8,500	8,030	na	155,232	128,106	na			
Jul-87	8,512	8,050	na						
Aug-87	11,657	7,820	na						
Sep-87	9,989	4,720	na						
Oct-87	19,302	14,830	na						
Nov-87	22,735	16,740	na						
Dec-87	19,078	13,340	na						
Jan-88	19,444	17,941	na						
Feb-88	18,768	18,130	na						
Mar-88	19,107	19,000	na						
Apr-88	13,484	12,415	na						
May-88	17,635	14,200	na						
Jun-88	14,473	9,518	na	194,183	156,704	na			
Jul-88	8,947	6,248	na						
Aug-88	9,472	7,611	na						
Sep-88	8,999	6,513	na						
Oct-88	11,924	10,278	na						
Nov-88	10,896	9,588	na						
Dec-88	16,495	16,470	na						

				ANNUAL			ANNUAL (Water Year)		
	Available Supply	**Native Inflow-Purch**	Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation
Jan-89	17,135	16,620	na						
Feb-89	13,807	13,740	na						
Mar-89	17,417	17,417	na						
Apr-89	14,840	13,872	na						
May-89	8,528	8,284	na						
Jun-89	12,935	10,910	na	151,395	137,551	na			
Jul-89	16,116	5,079	18,341						
Aug-89	10,567	7,759	12,872						
Sep-89	8,545	8,510	9,453						
Oct-89	10,212	10,210	10,307						
Nov-89	13,131	11,210	11,251						
Dec-89	12,402	12,310	12,187						
Jan-90	16,880	16,880	14,714						
Feb-90	16,520	16,520	14,691						
Mar-90	18,656	16,050	17,088						
Apr-90	24,070	14,170	20,777						
May-90	12,545	12,250	16,543						
Jun-90	10,136	8,740	13,049	169,780	139,688	171,273			
Jul-90	7,815	7,631	10,631						
Aug-90	8,322	7,684	9,055						
Sep-90	10,117	7,405	10,243				160,806	141,060	160,536
Oct-90	16,969	8,444	15,954						
Nov-90	12,738	9,765	12,650						
Dec-90	11,290	10,935	10,462						
Jan-91	19,754	17,021	15,757						
Feb-91	15,134	14,218	15,690						
Mar-91	31,290	31,290	23,156						
Apr-91	27,810	27,709	26,825						
May-91	11,060	10,542	16,034						
Jun-91	9,990	9,535	12,364	182,289	162,179	178,821			
Jul-91	8,850	7,472	10,003						
Aug-91	9,883	6,612	12,510						
Sep-91	17,748	6,262	16,240				192,516	159,805	187,645

				ANNUAL			ANNUAL (Water Year)		
	Available Supply	**Native Inflow-Purch**	Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation
Oct-91	26,090	6,707	24,183						
Nov-91	18,767	8,504	19,050						
Dec-91	25,413	11,772	21,663						
Jan-92	20,867	20,643	19,717						
Feb-92	30,600	30,204	25,107						
Mar-92	26,395	26,041	25,789						
Apr-92	29,063	25,550	28,204						
May-92	13,320	13,250	19,602						
Jun-92	9,920	9,266	13,290	236,916	172,285	235,358			
Jul-92	12,103	8,033	13,944						
Aug-92	16,210	7,395	18,468						
Sep-92	10,399	7,405	12,349				239,147	174,771	241,366
Oct-92	9,955	8,404	10,213						
Nov-92	13,957	11,600	14,328						
Dec-92	35,392	28,692	25,060						
Jan-93	39,757	38,174	32,342						
Feb-93	48,988	48,640	29,092						
Mar-93	26,406	26,406	30,172						
Apr-93	29,470	29,470	32,525						
May-93	24,930	24,930	27,493						
Jun-93	20,874	18,850	22,216	288,441	258,000	268,202			
Jul-93	13,497	11,843	17,150						
Aug-93	20,012	7,315	22,065						
Sep-93	13,601	5,871	17,240				296,838	260,196	279,896
Oct-93	9,670	9,425	10,424						
Nov-93	11,510	11,076	11,774						
Dec-93	15,120	14,678	13,516						
Jan-94	16,801	12,988	15,819						
Feb-94	30,252	30,110	22,132						
Mar-94	28,391	21,579	26,947						
Apr-94	26,807	12,326	27,003						
May-94	28,735	9,901	28,013						
Jun-94	28,059	9,335	28,130	242,455	156,449	240,213			

				ANNUAL			ANNUAL (Water Year)		
	Available Supply	**Native Inflow-Purch**	Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation
Jul-94	11,365	11,365	19,492						
Aug-94	7,037	6,805	12,460						
Sep-94	7,643	6,971	10,043				221,390	156,560	225,753
Oct-94	16,319	9,511	14,297						
Nov-94	20,881	9,858	20,098						
Dec-94	15,598	12,297	14,326						
Jan-95	32,600	32,600	22,674						
Feb-95	26,260	26,260	25,682						
Mar-95	44,633	44,633	34,777						
Apr-95	33,226	33,226	30,619						
May-95	26,142	26,142	26,820						
Jun-95	28,141	28,141	27,945	269,844	247,809	259,233			
Jul-95	24,241	24,241	25,968						
Aug-95	8,661	8,661	14,369						
Sep-95	9,287	9,287	11,140				285,988	264,857	268,715
Oct-95	9,790	9,790	10,628						
Nov-95	10,810	10,810	10,601						
Dec-95	13,740	13,193	13,768						
Jan-96	15,743	15,297	15,356						
Feb-96	26,457	26,172	23,257						
Mar-96	28,134	28,054	28,104						
Apr-96	22,048	17,983	24,605						
May-96	18,950	11,953	21,468						
Jun-96	16,730	10,212	17,617	204,591	185,654	216,881			
Jul-96	15,500	8,822	17,156						
Aug-96	10,320	9,716	14,158						
Sep-96	10,430	9,489	11,902				198,652	171,491	208,620
Oct-96	18,698	11,573	18,636						
Nov-96	19,515	18,361	15,349						
Dec-96	30,507	29,650	23,744						
Jan-97	31,211	30,650	28,825						
Feb-97	23,533	22,910	22,719						
Mar-97	16,912	16,109	19,941						

				ANNUAL			ANNUAL (Water Year)		
	Available Supply	**Native Inflow-Purch**	Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation
Apr-97	16,503	11,875	17,471						
May-97	22,269	10,180	23,807						
Jun-97	17,322	10,377	18,582	232,719	189,712	232,290			
Jul-97	16,230	9,303	16,855						
Aug-97	20,915	8,715	21,157						
Sep-97	22,701	10,534	20,655				256,315	190,237	247,741
Oct-97	14,710	11,904	18,261						
Nov-97	15,783	15,171	14,644						
Dec-97	24,350	24,235	19,734						
Jan-98	25,615	25,615	22,820						
Feb-98	34,443	34,443	21,300						
Mar-98	25,573	25,573	23,277						
Apr-98	27,787	27,787	26,281						
May-98	22,275	22,275	23,078						
Jun-98	28,411	28,411	27,484	278,793	243,966	255,546			
Jul-98	26,690	25,540	26,991						
Aug-98	16,932	15,953	19,008						
Sep-98	15,101	14,588	16,418				277,670	271,494	259,296
Oct-98	22,090	12,207	21,946						
Nov-98	17,450	17,450	15,723						
Dec-98	18,920	18,920	20,068						
Jan-99	18,857	18,829	17,850						
Feb-99	18,331	17,984	17,049						
Mar-99	16,921	16,593	16,898						
Apr-99	16,629	16,355	16,138						
May-99	19,364	19,271	20,205						
Jun-99	13,509	13,388	15,845	220,794	207,075	224,139			
Jul-99	15,793	12,777	17,661						
Aug-99	14,707	11,210	15,075						
Sep-99	14,535	11,083	13,487				207,105	186,065	207,945
Oct-99	19,468	11,899	18,081						
Nov-99	13,450	13,102	16,425						
Dec-99	19,150	15,628	16,172						

				ANNUAL			ANNUAL (Water Year)		
	Available Supply	**Native Inflow-Purch**	Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation	Available Supply	**Native Inflow Purch**	Annual Percolation
Jan-00	23,220	19,022	20,700						
Feb-00	23,552	21,133	20,374						
Mar-00	27,329	27,052	24,466						
Apr-00	20,229	19,732	20,030						
May-00	14,838	14,216	17,565						
Jun-00	15,791	11,715	16,900	222,060	188,569	216,936			
Jul-00	20,344	11,616	23,383						
Aug-00	22,718	10,673	23,295						
Sep-00	22,306	10,254	21,751				242,394	186,042	239,142
Oct-00	27,490	12,969	24,955						
Nov-00	20,315	12,523	18,903						
Dec-00	16,990	13,289	17,178						
Jan-01	20,521	19,808	18,317						
Feb-01	20,861	20,744	20,343						
Mar-01	24,452	24,364	24,354						
Apr-01	23,757	19,009	23,193						
May-01	15,242	14,139	18,396						
Jun-01	12,210	10,919	13,209	247,206	180,307	247,277			
Jul-01	11,877	11,488	15,028						
Aug-01	10,591	10,285	12,084						
Sep-01	10,859	10,412	12,067				215,165	179,949	218,027
Oct-01	21,752	11,999	19,848						
Nov-01	26,827	14,917	25,503						
Dec-01	19,672	17,414	19,896						
Jan-02	19,303	15,956	18,982						
Feb-02	16,134	15,633	17,526						
Mar-02	16,263	14,515	17,156						
Apr-02	15,404	13,232	17,427						
May-02	15,122	12,565	17,794						
Jun-02	18,260	11,029	19,881	202,064	159,443	213,192			
Jul-02	22,023	9,574	20,592						
Aug-02	22,347	9,106	22,566						
Sep-02	13,156	9,218	16,030				226,263	155,156	233,201

	Available Supply	**Native Inflow-Purch**	Percolation	ANNUAL Available Supply	ANNUAL **Native Inflow Purch**	ANNUAL Annual Percolation	ANNUAL (Water Year) Available Supply	ANNUAL (Water Year) **Native Inflow Purch**	ANNUAL (Water Year) Annual Percolation
Oct-02	16,343	10,408	16,732						
Nov-02	15,946	13,471	14,323						
Dec-02	15,687	15,111	14,624						
Jan-03	20,993	19,913	17,663						
Feb-03	21,651	20,086	17,409						
Mar-03	30,336	28,704	24,549						
Apr-03	28,810	28,342	27,955						
May-03	23,066	22,984	26,292						
Jun-03	18,895	18,187	20,658	249,253	205,102	239,393			
Jul-03	17,622	11,736	20,903						
Aug-03	12,498	9,834	16,152						
Sep-03	12,235	9,718	13,974				234,083	208,493	231,234
Oct-03	13,956	10,775	15,490						
Nov-03	18,133	14,814	15,576						
Dec-03	17,618	14,396	17,454						
Jan-04	23,057	22,700	16,997						
Feb-04	18,939	18,186	16,918						
Mar-04	23,532	23,473	21,354						
Apr-04	19,029	18,741	19,499						
May-04	14,743	14,583	20,705						
Jun-04	10,815	10,697	14,895	202,177	179,653	209,917			
Jul-04	11,040	9,898	14,516						
Aug-04	9,912	9,508	11,412						
Sep-04	10,954	9,638	12,353				191,727	177,408	197,169
Oct-04	16,100	15,918	13,264						
Nov-04	16,460	16,261	16,338						
Dec-04									
				avg	1990-2004		**229,737**	**192,239**	**227,086**
				avg	1990-2002		**232,327**	**192,130**	**229,068**
				avg	**1990-2003**		**232,452**	**193,298**	**229,223**

I. USACE (2004) Predicted SAR Flows

	USACE (2004) "PRESENT" CONDITION (for 2002)				USACE (2004) "FUTURE" CONDITION (for 2052)			
Base Year	**Inflow to Prado**	Total Water Spread by OCWD	Water "Lost"	**Total Inflow to OCWD Area** [a]	**Inflow to Prado**	Total Water Spread by OCWD	Water "Lost"	**Total Inflow to OCWD Area** [a]
1950	234,000	239,000	0	239,000	319,000	321,000	3,750	324,750
1951	214,000	216,000	0	216,000	299,000	301,000	0	301,000
1952	358,000	284,000	93,200	377,200	462,000	345,000	139,000	484,000
1953	234,000	238,000	0	238,000	320,000	324,000	0	324,000
1954	251,000	247,000	12,000	259,000	341,000	323,000	26,700	349,700
1955	246,000	251,000	2,470	253,470	334,000	329,000	12,500	341,500
1956	246,000	227,000	19,900	246,900	336,000	308,000	28,300	336,300
1957	209,000	213,000	20	213,020	295,000	297,000	2,740	299,740
1958	321,000	266,000	64,800	330,800	425,000	328,000	109,000	437,000
1959	202,000	202,000	0	202,000	288,000	285,000	2,520	287,520
1960	202,000	206,000	230	206,230	289,000	289,000	3,370	292,370
1961	188,000	197,000	120	197,120	273,000	281,000	1,070	282,070
1962	213,000	211,000	9,660	220,660	302,000	287,000	23,500	310,500
1963	200,000	204,000	0	204,000	288,000	286,000	4,640	290,640
1964	197,000	201,000	0	201,000	283,000	286,000	2,660	288,660
1965	210,000	214,000	0	214,000	298,000	300,000	2,130	302,130
1966	280,000	225,000	56,600	281,600	380,000	297,000	83,800	380,800
1967	294,000	223,000	81,900	304,900	395,000	299,000	109,000	408,000
1968	224,000	233,000	220	233,220	315,000	309,000	15,900	324,900
1969	699,000	282,000	435,900	717,900	846,000	348,000	520,000	**868,000**
1970	214,000	217,000	0	217,000	302,000	296,000	*NA* [b]	302000 [b]
1971	217,000	214,000	6,560	220,560	306,000	288,000	21,200	309,200
1972	208,000	202,000	9,600	211,600	296,000	281,000	19,700	300,700
1973	257,000	246,000	14,100	260,100	350,000	325,000	29,700	354,700
1974	240,000	230,000	19,100	249,100	333,000	312,000	30,800	342,800
1975	216,000	218,000	0	218,000	304,000	304,000	2,210	306,210
1976	214,000	217,000	500	217,500	302,000	296,000	8,980	304,980
1977	205,000	206,000	0	206,000	293,000	288,000	6,800	294,800
1978	493,000	268,000	254,900	522,900	624,000	332,000	325,000	657,000
1979	302,000	280,000	25,600	305,600	402,000	342,000	63,900	405,900
1980	707,000	298,000	427,100	725,100	847,000	363,000	505,000	**868,000**
1981	234,000	237,000	910	237,910	322,000	313,000	14,000	327,000
1982	276,000	270,000	11,000	281,000	372,000	334,000	43,900	377,900
1983	589,000	341,000	274,900	615,900	713,000	396,000	353,000	749,000
1984	284,000	265,000	27,200	292,200	374,000	335,000	42,300	377,300
1985	263,000	253,000	12,600	265,600	353,000	328,000	26,000	354,000
1986	281,000	269,000	23,400	292,400	376,000	337,000	51,300	388,300
1987	220,000	224,000	0	224,000	307,000	304,000	7,380	311,380
1988	247,000	251,000	980	251,980	339,000	326,000	19,200	345,200
Mean	**279,205**	**238,077**	**48,345**	**286,422**	**374,436**	**313,923**	**70,025**	**382,306**
Median								**327,000**
80% Exceed								**300,880**

NOTES:

a [Total Inflow to OCWD Area] is calculated as: [Total Water Spread by OCWD] + [Water "Lost"]

b USACE (2004) reported [Water "Lost"] to be 296,000 acre-feet; this was likely an error since the [Total Water Spread by OCWD] was also reported as 296,000 acre-feet. Thus, [Water "Lost"] was omitted in this case and the [Total Inflow to OCWD Area] was set equal to the [Inflow to Prado].

Appendix E

Status of the Santa Ana sucker in the Santa Ana River

SMEA
San Marino Environmental Associates

560 South Greenwood Avenue
San Marino, California 91108
(626) 792-2382, fax 792-8233

Memorandum

To: Environmental Science Associates

From: Thomas R. Haglund and Jonathan N. Baskin

Date: 23 March 2005

Re: Status of Santa Ana suckers in the Santa Ana River with particular attention to their status downstream of Prado Dam

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In recent years (1990s onward), the Santa Ana sucker has been found in the Santa Ana River from just downstream of Imperial Highway bridge upstream to the Rialto Drain. Historically, the species was probably more widespread and abundant in the lowland portion of the drainage.

However, within the river today the fishes are not evenly distributed. The river reach from just downstream of Mission Boulevard upstream to Rialto Drain contains the greatest number of suckers (Photo 1) (Swift 2001, Haglund *et al.* 2003).

Photo 1. The Santa Ana River upstream of Market Street. Note the habitat variability, including riffles with gravel substrate, deeper runs, shallow areas with emergent vegetation, and vegetation marginal to a deep run along the bank. This is excellent sucker habitat.

The river reach upstream of MWD crossing to Mission Boulevard consistently contains fish, but the numbers are relatively low in comparison to the upstream reach. Swift was able to find adult suckers in the vicinity of Arroyo Tequesquite in both February and June 2000, but no suckers were captured in the Arroyo itself. This stream reach also contains Anza Park Drain and Sunnyslope Creek. Suckers are found in both of these tributaries (Chadwick 1991, Susan Ellis (CA DFG) pers comm., Chadwick 1996, Mike Giusti (CA DFG) pers comm., Swift in 2000 (2001), Haglund *et al.* 2003). Sunnyslope Creek is a well-documented reproductive site for the Santa Ana sucker (Haglund *et al.* 2003).

From the MWD crossing downstream to Prado Dam, fish are widely scattered and not very abundant. Suckers regularly occur at MWD crossing. This was one of Saiki's (2000) study sites, and he found fish in both 1998 and 1999. USGS collections for the NAQUA program captured suckers at MWD crossing in July 2001 (previously in 1999 and 2000), and SMEA had collected suckers at MWD crossing earlier in the year, March 2001. Swift's (2001) work in 2000 yielded only 11 adult suckers by trapping about 4 days per month for the entire year downstream of River Road. His seining surveys yielded one adult sucker downstream of River Road in 2000. SMEA conducted a one-time, intensive survey upstream and downstream of Van Buren Street bridge in June of 2001 (Baskin and Haglund 2001) and failed to locate any suckers. Swift reported visual sighting of suckers at Hamner Avenue Crossing and upstream almost to California Avenue. Suckers do occur downstream of MWD crossing, but the numbers are low and the fish scattered. The only place where fish have been reliably found is in the vicinity of the Riverside Water Reclamation facility (Chadwick 1991, Susan Ellis (CA DFG) pers comm.; Chadwick 1996, Mike Giusti (CA DFG) pers comm.; Swift 2001).

Below Prado Dam, suckers currently appear to be rare. In the early 1990s adult suckers could regularly be taken just upstream of Imperial Highway (Haglund unpubl data), and on one occasion, in excess of 100 adult suckers were trapped by a diversion immediately downstream of Imperial Highway (R. Fisher pers comm.). This was the last time large numbers of suckers were taken downstream of Prado Dam.

In 1994 the California Department of Fish and Game sponsored a survey for Santa Ana suckers in the first 3 miles of stream below Prado Dam. During this survey 5 teams each intensively electroshocked somewhat over ½ mile of stream. Survey teams all located suckers except the team surveying the first ½ mile downstream of Prado Dam. A moderate number of young-of-the-year and a few adult suckers were captured.

Swift's (2001) surveys in 2000 failed to produce any suckers below Prado Dam, and Saiki's (2000) team never captured any suckers during their work (1998, 1999) at Imperial Highway. However, work by SMEA for the U.S. Army Corps of Engineers (ACOE) from 21-28 September 2000 located 8 suckers, six adult fish and two fish, which may have been young-of-the-year. SMEA conducted the surveys in conjunction with ACOE's diversion of the river between Weir Canyon and Imperial Highway (Baskin and Haglund 2000). The diversion affected about 3 miles of river. Thus, not many suckers were located given the length of stream surveyed. However, the diversion was conducted in such a way that fish could have moved out of the area on the declining flows. More recently (2003/2004) SMEA worked with ACOE during a stream diversion just upstream of Weir Canyon. Again the diversion procedure was designed to allow fish to escape, however no suckers were captured during this diversion (Haglund and Baskin 2003). Subsequent monitoring (2004) of the diversion area and near Weir Canyon bridge has also failed to locate any suckers.

This has been the pattern recently, surveys find a few fish or none. When Santa Ana suckers are captured, the individuals captured are adults and/or young-of-the-year. Thus, although no recent, thorough surveys exist for the river below Prado Dam, in general, Santa Ana suckers appear to have declined in recent years in the river below Prado Dam. But at least a remenant population persists.

The river immediately below Prado Dam is different from the river reaches upstream of the dam. Much of the river is deeper, more slowly flowing with a siltier bottom (Photo 2). The stream reach around Imperial Highway which held relatively large numbers of suckers in the early 1990s has been significantly impacted by construction (Photo 3).

Photo 2. The Santa Ana River downstream of Prado Dam along the Green River Golf Club. The river is deeper, slower flowing and the bottom is primarily composed of fine sediments. Compare this photograph with Photo 1.

Photo 3. Santa Ana River at Imperial Highway.

It is not known whether there was recently, or is a self-sustaining population of Santa Ana suckers downstream of Prado Dam. No thorough survey has been conducted of the reach from Prado Dam down to Imperial Highway, so even the distribution and abundance of suckers in the lower river is based on "point" data such as that previously cited. Prado Dam certainly provides a barrier to upstream movement of the Santa Ana sucker, but downstream movement may be possible. No reproduction has been documented below Prado in recent years and no fry have been found. However, fry are unlikely to be located unless a survey is conducted that specifically looks for fry, and reproduction can be difficult to document. Because there has been no documented reproduction, there is the possibility that the population in the lower river below Prado Dam may be sustained solely by immigration from the upstream population. In the absence of more complete systematically collected data, the status of the Santa Ana sucker below Prado Dam is difficult to determine.

The stream below Prado Dam certainly was historical sucker habitat. In recent years the U.S. Fish and Wildlife Service has tended to view the river below Prado Dam as potential sucker habitat, without taking a strong position on whether or not there is a self-sustaining population.

References:

Baskin, J.N. and T.R. Haglund. 2000. Santa Ana sucker survey/seining in the Santa Ana River. Unpubl. report prepared for USACOE, Los Angeles District, under subcontract to Aspen Environmental Group. 8p.

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Haglund, T.R., J.N. Baskin, and C.C. Swift. 2003. Results of the year 3 implementation of the Santa Ana sucker conservation program for the Santa Ana River. Unpubl. Report, SAWPA. 142p.

Haglund, T.R. and J.N. Baskin. 2003. Santa Ana Sucker protection during stream divrsion in Reach 9 of the Santa Ana River. Unpubl. report prepared for USACOE, Los Angeles District, under subcontract to Aspen Environmental Group. 16p.

Saiki, M.K. 2000. Water quality and other environmental variables associated with variations in population densities of the Santa Ana sucker. Unpubl report to SAWPA from USGS/BRD, Western Fisheries Research Center. 117p.

Swift, C.C. 2001. The Santa Ana sucker in the Santa Ana River: distribution, relative abundance, spawning areas, and the impact of exotic predators. Unpubl report to SAWPA from Larry Munsey International. 94p.

Appendix F

History of NEPA/CEQA Review of USACE SAR Mainstem Projects

APPENDIX F

A HISTORY OF NEPA/CEQA REVIEW OF USACE SAR MAINSTEM PROJECTS

This appendix provides a summary of flood control improvements conducted on the SAR by the U.S. Army Corp of Engineers (USACE). The Santa Ana River Main Stem Flood Control Project (SARP) was developed by the USACE to provide protection against a 190-year flood in the Santa Ana River watershed. An initial Survey Report[1] was published by the USACE in 1975, providing an extensive review of flood control problems in the Santa Ana River Basin and proposing nine project alternatives. The SARP alternatives analysis was revised in the USACE's Phase I General Design Memorandum (GDM) in 1980 and refined to five project alternatives. The Phase I GDM was authorized by the U.S. Congress under Section 109 of the Water Resources Development Act of 1976 (PL 94-587). The SARP was reviewed again in the subsequent Phase II GDM, which identified the recommended plan. Phase II GDM was authorized in 1986 under Section 401(a) of the Water Resources Development Act of 1986.

In accordance with the recommended plan detailed in the Phase II GDM, the USACE has implemented many flood control projects and improvements along the Santa Ana River (SAR) in conjunction with local agencies, including Orange County Water District (OCWD). The following is a summary of the primary USACE SARP reports and corresponding NEPA Environmental Impact Statements (EIS):

- Phase I GDM on the Santa Ana River Mainstem including Santiago Creek and Oak Street Drain, Main Report and Supplemental EIS, July 1980.
- Phase II GDM on the Santa Ana River Mainstem including Santiago Creek, Main Report and Supplemental EIS, August 1988.
- Prado Basin and Vicinity, Including Reach 9 and Stabilization of the Bluff Toe at Norco Bluffs, Supplemental Final EIS/EIR, November 2001.
- Lower Santa Ana River, Reach 2 Channel Excavation to Design Grade, Draft Supplemental Environmental Assessment and Addendum to the 1988 Phase II General Design memorandum SEIS/EIR, 2002.

The results of Section 7 consultations with the U.S. Department of Fish and Wildlife (USFWS) regarding impacts to sensitive species pursuant to the Endangered Species Act are highlighted in this summary appendix.

[1] USACE. 1975. Review Report on the Santa Ana River Project, 1975.

PHASE I GDM

Project Description

In the 1980 Phase I GDM Main Report, the USACE revisited five of the nine project alternatives originally presented in the 1975 Survey Report. The recommended project (All River Plan) included the following elements: (1) raising Prado Dam from 566 feet to 596 feet above National Geodetic Vertical Datum (NGVD); (2) acquisition of the Santa Ana Canyon flood plain below Prado Dam (Reach 9); (3) improving the lower SAR from Prado Dam to the Pacific Ocean with levees, rock revetments, and drop structures; (4) improving the Santiago Creek channel in Orange County; (5) preserving 92 acres of marsh habitat at the mouth of the SAR; and (6) modifying the SAR mouth to make it wider and deeper.[2]

Impacts & Mitigations

The 1980 Supplemental EIS[3] (SEIS) that accompanied the Phase I GDM Main Report was a supplement to the Final EIS[4] that accompanied the 1975 Survey Report. By 1980, the lower SAR had already been modified by flood control and water conservation activities. "From 3 miles above Imperial Highway to the Pacific Ocean about 23 miles downstream, the river is completely contained by channels to protect the densely populated, broad, gently shaped coastal plain of Orange County." (USACE, 1980; p. 25)

The 1980 SEIS reviewed the positive and negative significant impacts associated with all five project alternatives. The USACE incorporated environmental compensation features into each alternative project during Phase I planning, considering the mitigations proposed previously in the 1977 FEIS. The compensation measures were agreed upon by federal, state, and local agencies. The 1980 SEIS identified the following impacts and mitigations associated with the All River Plan (recommended plan):

Impacts

- Loss of riparian habitat at Prado Dam;
- Loss of cultural properties (prehistoric adobe) at Prado Dam;
- Improvement in overall project-related water quality;
- Recreation-related impacts at Prado Dam due to the development of 630 acres as four recreation lakes and as trails around the basin periphery;
- Loss of some California least tern nesting area at Huntington Beach State;
- Loss of eight acres of estuarine wetland near the SAR mouth;

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2 USACE. 1980. Phase I GDM on the Santa Ana River Main Stem including Santiago Creek and Oak Street Drain, Main Report and Supplemental Environmental Impact Statement, July 1980.
3 *Ibid.*
4 USACE. 1977. Review Report on the Santa Ana River Main Stem—including Santiago Creek and Oak Street Drain—for Flood Control and Allied Purposes, Final Environmental Statement, September 1977.

- Possible reduction in groundwater recharge potential in the Santiago Creek gravel pits; and
- Beach replenishment from the disposal of suitable soil material on local beaches.

Mitigations

- Preservation of Santa Ana Canyon and riparian vegetation as open space;
- Restoration of California least tern nesting habitat at Huntington Beach State Park; and
- Acquisition and restoration of 92 acres of coastal salt marsh.

USFWS Biological Opinion

In 1980, the primary concerns of the USFWS were the biological impacts at Prado Basin and at the SAR mouth. In its 1980 Biological Opinion (1-1-80-F-75), the USFWS considered the impacts to species at the mouth of the SAR, leaving impacts at Prado Dam and Basin to be considered later in the Phase II GDM. Impacts to species in the lower SAR between Weir Canyon Road and 17th Street were not considered because this stretch of the river was not considered valuable habitat for wildlife due to disturbances from surrounding urban development and groundwater recharge operations. Only species tolerant of disturbances were present in this stretch of the river. The species that were considered in the 1980 Biological Opinion (BO) were the endangered California least tern, endangered light-footed clapper rail, endangered California brown pelican, and endangered salt marsh bird's beak plant. Given the mitigation measures suggested by USACE, the BO concluded that the project would promote the conservation of the California least tern and light-footed clapper rail and would not jeopardize the continued existence of the California brown pelican. There was insufficient information to render an opinion about the effects of the project on the salt marsh bird's beak.

PHASE II GDM

Project Description

The 1988 Phase II GDM reviewed and described in greater detail the All River Plan which was the recommended project alternative for the SARP. The All River Plan was comprised of seven elements: (1) constructing Seven Oaks Dam upstream of Prado Dam to accommodate a 350-year flood event; (2) managing the flood plain between Seven Oaks Dam and Prado Dam; (3) raising Mill Creek levees; (4) enlarging Prado Flood Control Basin; (5) acquiring the Santa Ana Canyon floodplain; (6) improving the lower SAR from Prado Dam to the Pacific Ocean; and (7) improving Santiago Creek.[5] USACE reaffirmed and revised its plan to raise Prado Dam from an elevation of 566 to 594.4 feet above NGVD and construct new intake structures and outlet conduits. At this height, Prado Dam would provide protection from a 190-year flood. The modified dam and improved lower SAR would accommodate a peak controlled outflow of 30,000 cfs. Although Prado Dam would be raised, the debris pool level would still be maintained

5 USACE. 1988. Phase II GDM on the Santa Ana River Mainstem including Santiago Creek, Main Report & Supplemental Environmental Impact Statement, August 1988.

at 490 feet above NGVD. In addition, a recreation master plan—the Resource Use Plan—was prepared for Prado Reservoir along with recreation plans for the lower SAR and Santiago Creek, which included a system of bicycle/hiking/equestrian trails. NEPA documentation for specific recreation features were to be developed at a later date.

Impacts & Mitigations

The 1988 SEIS that accompanied the Phase II GDM evaluated the environmental effects of the All River Plan. The 1988 SEIS addressed new project details and evaluated the project relative to the most recent environmental conditions and information. The SEIS concluded that the benefits of flood protection in combination with mitigation measures justified and compensated for short-term and long-term adverse environmental impacts associated with the recommended plan.

The same environmental features developed previously for the Phase I GDM were incorporated into the All River Plan in the Phase II GDM. The 1988 SEIS identified the environmental impacts of the recommended plan and associated mitigation commitments. The summary of Environmental Commitments from the 1988 SEIS is included here in **Attachment A**. The 1988 SEIS included the following major impacts and mitigations:

<u>Impacts</u>

- Increased reservoir capacity behind Prado Dam requires the acquisition of 1,661 additional acres of flood easements up to an elevation of 566 feet.
- Loss of wildlife habitat in Prado Basin;
- Loss of 133 acres of suitable least Bell's vireo habitat in Prado Basin;
- Displacement of 197 properties including farms, dairies, and residences in Prado Basin;
- Loss of five acres at Victoria Pond at the SAR mouth; and
- Esthetic impacts of construction and flood control infrastructure.

<u>Mitigations</u>

- Creation of 133 acres of vireo habitat in Prado Basin above an elevation of 505 feet;
- Funding for a vireo management and monitoring program;
- Acquisition of 1,100 acres of flood plain in the Santa Ana Canyon, to be protected as wildlife habitat and open space;
- Restoration of 92 acres in the Santa Ana River Salt Marsh, with eight acres as direct mitigation for project impacts and 84 acres for preservation and enhancement of endangered species;
- Creation of five acres at Victoria Pond; and
- Esthetic landscaping and replanting along the river channel.

USFWS Biological Opinion

The USACE Biological Assessment for the Phase II GDM covered three elements of the recommended plan that had the potential to affect endangered species—building Seven Oaks Dam, raising Mill Creek levees, and raising Prado Dam. The BO (1-6-88-F-6) of the USFWS for the Phase II GDM considered the effects of the project on five endangered species: least Bell's vireo, peregrine falcon, bald eagle, Santa Ana River woolly star, and slender-horned spineflower. USFWS determined that the project was not likely to affect the falcon, eagle, or spineflower based on the analyses presented in the USACE Biological Assessment. USFWS determined that given the compensation measures proposed by USACE in the Phase II GDM, the project was not likely to jeopardize the continued existence of the least Bell's vireo. However, in addition to vireo habitat replacement, USFWS also mandated that the USACE fund and implement a vireo monitoring program in the 133-acre restored habitat area, and provide $450,000 to fund a 10-year vireo management program to compensate for short-term losses of vireo habitat while restoration areas develop. USFWS determined that the project was likely to jeopardize the continued existence of the Santa Ana River woolly star because the construction of Seven Oaks Dam would decrease flood and sediment flows, which would make habitat less suitable for the woolly star.

SUPPLEMENT TO THE PHASE II GDM

Project Description

In 2001, the USACE adopted an SEIS for three projects to complete the Phase II GDM.[6] These projects included raising Prado Dam, stabilizing Norco Bluffs, and Reach 9 bank stabilization. The SEIS reviews the stabilization of Norco Bluffs as well as construction of new dikes and floodwalls in Prado Basin and channel improvements in Reach 9 for bank stabilization. In addition, the EIS/EIR reviews the impact of past and present project elements on two newly-listed species—the federally-threatened Santa Ana sucker and federally-endangered southwestern willow flycatcher—and on the endangered least Bell's vireo for which critical habitat has been designated since 1988.

Impacts & Mitigations

The 2001 SEIS identified construction related impacts to water resources (sedimentation and turbidity), biological resources, air quality (NO_x, PM_{10}, CO, ROC), noise, and cultural resources at Norco Bluffs, Prado Basin, and Reach 9. All impacts were mitigated to less than significant levels with measures such as erosion control plans; dewatering permits; monitoring and relocation programs for sensitive species (least Bell's vireo, southwestern willow flycatcher, bald and golden eagles, and Santa Ana sucker); recreation and restoration of riparian and perennial stream habitat; erection of noise barriers; and construction monitoring by qualified archaeologists. The SEIS also identified long-term operation and maintenance impacts and mitigations. In some cases, the mitigation measures agreed to under the 1988 Phase II GDM SEIS were sufficient to compensate for new impacts. Other impacts and mitigations were as follows:

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6 USACE. 2001. Prado Basin and Vicinity, Including Reach 9 and Stabilization of the Bluff Toe at Norco Bluffs, Supplemental Final EIS/EIR, November 2001.

Impacts

- Damage or destruction of vireo woodland and riparian habitat in Reach 9 due to larger flow volumes from Prado Dam (maximum of 30,000 cfs);
- Larger flow volumes from Prado Dam (maximum of 30,000 cfs) could wash suckers downstream where they would be stranded;
- Flooding of prehistoric property, the Yorba Slaughter Adobe, in Prado Basin; and
- Flooding of potential prehistoric site, Alta Vista, in Reach 9.

Mitigations

- The County of Orange developed the *Santa Ana River Canyon Habitat Management Plan*, which protects 1,100 acres of flood plain as open space and wildlife habitat within Reach 9. Acquisition of these lands compensates for the adverse effects of flood control projects to wildlife in this stretch of the river and is to be implemented prior to the start of construction.
- Investigate a design for a wildlife migration corridor over Prado Dam (e.g., a ramp vegetated with native species);
- Redesign drop structures in Reach 9 to minimize risk of fish injury or death and to maintain connectivity in the river;
- Implement a “trap and haul” program in Reach 9 to periodically trap and transport suckers from pools below drop structures to more favorable upstream habitat;
- Develop a plan to floodproof the Yorba Slaughter Adobe in Prado Basin, to be reviewed by the State Historic Preservation Officer and Advisory Council on Historic Preservation; and
- If the Alta Vista site is eligible for the National Register of Historic Places (NRHP), develop a flood protection plan.

USFWS Biological Opinion

In its 2001 BO (FWS-SB-909.6), the USFWS concluded that the projects at Norco Bluffs, Prado Basin, and Reach 9 were not likely to jeopardize the continued existence of the vireo, flycatcher, or sucker, or adversely modify vireo critical habitat. This decision was contingent upon mitigation measures agreed to by the USACE and its local sponsors (e.g., OCWD). The list of mitigation measures was extensive and can be reviewed in the BO included in **Appendix K-7**. The mitigation measures included, for example, the following:

- Any riparian or perennial stream habitat temporarily disturbed is to be kept free of exotic species and restored to pre-project conditions.
- Any riparian habitat permanently destroyed is to be replaced with three acres of created riparian vegetation within the project area.
- All created or restored riparian habitat will be protected in perpetuity.

- Maintain the baseline acreage of riparian vegetation in Reach 9 as indicated in the *Habitat Management Plan*, and conduct vegetation mapping every 10 years to document long-term trends.
- Establish a vireo monitoring program at Norco Bluffs and survey for birds during spring and summer prior to and during stabilization construction.

ADDENDUM TO THE PHASE II GDM: REACH 2 CHANNEL EXCAVATION TO DESIGN GRADE

Project Description

In 2002, USACE published an addendum to the 1988 Phase II GDM SEIS that covered an excavation project in the lower SAR. Approximately 40,000 cubic yards of sediment had accumulated above the design grade of the SAR channel between the Fairview Channel confluence and Station 194 upstream of Adams Avenue. USACE refers to this stretch of the SAR as Reach 2. The goal of the project was to excavate this reach back to design grade and then turn over ownership of Reach 2 to the County of Orange.[7]

Impacts & Mitigations

The Supplemental Environmental Assessment (SEA) determined that ponded water and perennial flows in this stretch of the river had resulted in substantial development of primarily non-native riparian vegetation. Channel excavation would remove all vegetation in this reach, including 22 acres of mudflats/sandbars with limited riparian vegetation; 4 acres of wetland/riparian/streambed; and 7.6 acres of cocklebur and other non-native species. Excavated vegetation and debris was to be transported to a local landfill. The portion of the excavated material that was clean riverine sand was to be deposited within the littoral zone at Newport Beach outside of the California least tern nesting season.

The SEA stated that construction and flood control improvements in the lower SAR were reviewed in the 1988 Phase II GDM SEIS. The impacts of river modification and habitat removal were fully mitigated at that time. The SEA included findings of no significant impact of the excavation project.

USFWS Biological Opinion

In its 2003 BO (FWS-OR-1304.8), the USFWS considered the effects of the Reach 2 excavation project on the least Bell's vireo only and concluded that the project would not jeopardize the continued existence of the vireo. In 2002, a single calling vireo was observed in Reach 2 during surveys conducted at the request of USFWS. Consideration of the effects of the Santa Ana River Mainstem Project on the vireo in Reach 2 were not considered in previous Section 7 consultations

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[7] USACE. 2002. Santa Ana River Mainstem Project (SARP), Lower Santa Ana River, Reach 2 Channel Excavation to Design Grade, Supplemental Environmental Assessment and Addendum to the 1988 Phase II General Design Memorandum SEIS/EIR, March 2002.

because the USACE design plans originally intended this reach to have a concrete bottom instead of a soft bottom that could support riparian vegetation. This BO is included in **Appendix K-8**.

The mitigation measures developed by USFWS required construction and excavation activities to occur outside the nesting season for riparian birds (March 1 through September 15) to avoid impacts to vireo. In addition, annual mowing of the reach was to be scheduled between August 15 and March 1, to avoid nesting season. USFWS also mandated the restoration of 17 acres of riparian habitat through removal of *Arundo* and/or creation in another appropriate location.

Attachment A
Environmental Commitments

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
I. SEVEN OAKS DAM				
A. Sedimentation	Slope stabilization on roads, borrow areas, and other impacted soil.	Specify procedures. Implement.	Input into Plans & Specifications (P&S). During and after construction.	USFWS concerns over mass movement.
		Environmental Compliance (EC) inspections.	Same as above.	
B. Water Quality 1. Reservoir Pool	Monitor water quality upon filling.	Specify WQ analysis. Take and analyze samples.	Can wait until construction near complete. During and after initial filling of reservoir.	B.1. - B.4.: Need to assure pool water quality.
	Monitoring during operation.	Sampling for chemical and limnological parameters.	In pool and outlet. Months when water is present.	Corps regulations, EPA concerns.
	Control measures.	Selective withdrawal from different levels.	If and when anaerobic problems occur.	EPA concerns.
2. Turbidity	Design borrow areas to minimize turbidity. Controls such as settling basins.	Detailed design. Implement. EC inspections.	P&S input. During construction. During construction.	Regional Water Quality Control Board (RWQCB) concern. RWQCB regulations for dewatering and discharges.
3. Toxics	Leakproof areas--impervious aprons for lubrication and other toxic fluids. Leave no contamination.	Specify procedures. Design containment areas. EC inspections.	P&S input. P&S input. During, after construction.	Clean Water Act.

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
4. Permits	Obtain and comply with all necessary water quality permits (Contractor responsibility).	Specify in P&S Implement requirements.	Design phase pre- and Pre- and construction phase.	
C. Recreation	(No recreation proposed.) Control access.	No action. Lock dam access gate.	Not applicable. After construction.	Request of USFS. Request of USFS.

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
I. SEVEN OAKS DAM (Con't)				
D. Air Quality 1. Particulates (dust)	Control measures: Approved Approved dust suppressants; water dirt haul routes and excavation and deposition areas frequently.	Specify procedures. Implement. EC Inspections	P&S input. During construction. During construction.	South Coast Air Quality Management District (SCAQMD).
2. Permits	Obtain and comply with all necessary AQ permits.	Specify in P&S. Implement requirements.	Design phase. Pre- and construction phase.	SCAQMD dust control regulations.
E. Transportation & Utilities	Traffic control-flagman and signs as needed.	Determine specific measures. Coordinate with local authorities.	Input into P&S. P&S phase.	County guidelines and public concerns over traffic impacts.
	New Powerhouse No. 3	Environmental analysis, NEPA document. Detailed design Construction.	Before detailed design P&S (separate project). After construction of dam.	Southern Calif. Edison Company concerns, NEPA.
F. Noise	Time and day restrictions on noise near residences may be necessary.	Determine exact requirements. Write specs. EC inspection.	Before detailed design. P&S phase. During construction.	County and local noise ordinances.
G. Biological Resources: 1. Project habitat impacts a. Riparian, deer, other	(1a) Acquisition of Filaree Flats (139 acres) and Section 5 (649 acres) and transfer of title to USFS. Acquisition and riparian habitat improvement of 60 acres of Santa	Real estate purchases. Define land to be purchased. Purchase land. Input to O&M plans.	Agreements: before completion of final plans. Acquisition: prior to project construction.	(1.a. and 1.b.) USFS, USFWS, and CDFG, public concern. Fish and Wildlife Coordination Act. Endangered Species Act.

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
I. SEVEN OAKS DAM (Con't)				
G. Biological Resources (cont'd)				
a. (Con't)	Ana River Wash between Greenspot Road and Seven Oaks Dam.		Habitat improvements: after construction activities at Seven Oaks Dam are complete.	
b. Endangered Species: Eriastrum	Acquisition of wash lands below Greenspot Road. Incorporation of endangered species management responsibilities for these acquired lands into the local cooperative agreement as part of the local sponsor's overall O&M responsibilities.	Final definition of purchase. Purchase of land. EC inspections. Input to O&M plans.	Prior to Construction. Prior to Construction. Prior to construction. During, after improvements.	Endangered Species Act.
2. Borrow Areas, Haul Roads, Access Roads	Seed (including Eriastrum seed) and contour for erosion control.	Detailed design. Implementation. EC inspections.	P&S phase. During, after construction. During, after construction.	Good engineering practice.
H. Palentological Resources	Monitor during excavation of Potato sandstone and gather samples if fossils present.	Arrange for paleontological monitor on site.	Before excavation begins.	NEPA, Reservoir Salvage Act. Archeologic and Historic Preservation Act.
I. Cultural Resources	Mitigation of National Register eligible sites.	Negotiate MOA-including mitigation program design.	Before and during P&S.	National Historic Preservation Act and requirements as to be specified in MOA.

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
I. SEVEN OAKS DAM (Con't)				
I. Cultural Resources (cont'd)		Implement measures such as avoidance, long term preservation, interpretation programs, documentation, and data recovery excavation.	Before and during construction, depending on the type and timing of impact.	SHPO, Advisory Council on Historic Preservation requirements.
		EC inspections.	During mitigation actions.	
J. Esthetics	On downstream side of dam: esthetic colored or stained boulder placement.	Detailed P&S	During design phase.	USFS concerns over appearance of dam.
		Implementation.	Part of construction.	
		EC Inspection.	During and after implementation.	
II. PRADO DAM				
A. Sedimentation	See I. A.	See I. A.	See I. A.	See I. A.
B. Water Quality	See I. B.2,3,4.	See I. B.2,3,4.	See I. B.2,3,4.	See I. B.2,3,4.
C. Recreation	Recreation Use Plan.	Public comment.	Results in FSEIS.	Water Resources Development Act.
	Detailed recreation features as plans are designed by the Corps and local sponsors.	Cost-sharing and specific plan.	Deferred at present.	Local sponsors.
		Implementation.	Indefinite at present.	Cost-sharing agreements when signed,
		Additional NEPA documents.	As needed.	NEPA.

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
II. PRADO DAM (Con't)				
D. Air Quality	See I. D.1 and 2.	See I. D.1 and 2.	See I. D.1 and 2.	See I. D.1 and 2.
E. Transportation & Utilities.	Flagmen, dip crossings where needed.	See I. E.	See I. E.	See I. E.
F. Noise	See I. F.	See I. F.	See I. F.	See I. F.
G. Biological Resources				
1. Shrublands	Esthetic Treatment Plan. Change land use category of 32 acres to category 1 (lowest use). Protect mitigation area.	See II.J. Update Resource Use Plan. Input to O&M manual.	See II.J. Prior to future recreation plans. Prior to completion of construction.	See II.J. USFWS, CDFG, and public concerns. Fish and Wildlife Coordination Act.
2. Canada Geese	Phased use of borrow area #2. Mow geese habitat area. Esthetic treatment plan.	Input to, and review of construction plans & specs. Implementation. EC inspections.	During design phase. During construction period.	USFWS, CDFG, & public concerns. Fish and Wildlife Coordination Act.

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
II. PRADO DAM (Con't)				
3. Oak Woodlands	Establishment of new oak woodlands near Prado Regional Park; replace 84 trees impacted by Hwy 71 dike at 4:1 ratio.	Confirm proposed site. Design site.	Prior to or during construction.	USFWS, CDFG, & public concerns. Fish and Wildlife Coordination Act.
	Irrigate and protect trees.	P&S input. EC Inspections.	During design. During construction.	
	Minimize impacts to oaks.	P&S input. Flag trees. EC Inspections.	During design. Prior to construction. During construction.	
	Protect mitigation area.	Input to O&M manual.	Prior to completion of construction.	
4. Riparian Woodlands	Avoid impacts to sycamore trees along north edge of borrow area #1.	P&S input. EC Inspections.	During design. During construction.	Fish and Wildlife Coordination Act.
5. Endangered Species	Establish 133 acres of willow woodland with understory above 505 ft elevation.	Establish site plan design and evaluation criteria. P&S input. Evaluate results-P&S input.	Prior to construction. During design. Annually for 5 years.	USFWS and public concerns over effects to Federally listed endangered species. Endangered Species Act.
	Set aside $450,000 for a monitoring program for least Bell's vireo and a management program for its pests.	Develop scope of work. Set up funding mechanism. Review annual reports.	Prior to construction. At onset of construction.	
	Protect replacement habitat.	Input to O&M manual.	Prior to completion of construction.	

Table SEIS-16. Environmental Comments

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
H. Palentological Resources	Monitoring during excavation of borrow site 1 and gather samples if fossils present.	Arrange for paleontologic monitor on site. Monitor.	Before excavation begins. During excavation.	See I. H.
I. Cultural Resources	Same as commitments under Seven Oaks Dam. (I. I.)	See I. I.	See I. I.	See I. I.

Table SEIS-16. Environment Commitments.

Resource Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
II. PRADO DAM (Con't)				
J. Esthetics	Stockpile topsoil from dike sites and borrow areas; reuse it. Seed and maintain downstream sides of 3 dikes with forbs and grasses. Contractor limit disturbance to previously designated areas. Esthetically reshape borrow areas and reseed with native shrubland, native wetland, or geese foraging species, as appropriate. Scarify haul roads when retired from use.	P&S input. EC Inspections.	As individual project segments are completed.	USFWS, CDFG, & public concerns. Fish and Wildlife Coordination Act.
III. LOWER RIVER				
A. Sedimentation	See Water Quality below.			
B. Water Quality	Deposit only non-polluting natural sediment on beach or in ocean.	P&S input. Clean up and abandon oil wells.	Design phase. Before construction.	RWQCB, CWA, USFWS, CCC, Calif. Health and Safety Code.

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
III. LOWER RIVER (Con't)				
		Separate unsuitable material.	During construction.	
		Remove unsuitable non-toxic material to landfill or fill area.	During construction.	
		Remove oily and hazardous material to Class III landfill.	During construction.	
		EC inspections.	During construction.	
	Minimize turbidity.	P&S input.	Design phase.	
		Design marsh construction sequence.	Design phase.	

Table SEIS-16. Environmental Commitments.

Resource Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
III. LOWER RIVER (Con't)				
		Use sand dikes for slurried beach replenishment.	During construction.	
		Monitor turbidity.	During construction.	
		Relocate beach deposition point farther south if needed.	During construction.	
		EC inspections.	During, after construction.	
	Maintain tidal opening for marsh.	P&S input.	Design phase.	
		Monitor any blockage.	During construction.	
		Excavate mouth if plugged.	During construction.	
		EC inspections.	During & after construction.	
C. Recreation	No mitigation, except for rerouting of trails as is possible during construction.	Coordinate with local sponsors. P&S input.	Design and construction phases.	
D. Air Resources	See I. D.	See I. D.	See I. D.	See I. D.
E. Transportation & Utilities	Avoid closing bridges. Avoid reducing traffic capacity on two adjacent bridges simultaneously. Use of signing & flagmen.	Coordination with locals.	Design phase.	County guidelines and public concern over traffic impacts.
		P&S input.	Design phase.	
		Implementation.	During construction period.	

Table SEIS-16. Environmental Commitments.

Resource Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
III. LOWER RIVER (Con't)				
F. Noise	See I. F.	See I. F.	See I. F.	See I. F.
G. Biological Resources 1. Marsh	Acquisition & restoration of 92 acres of Santa Ana salt marsh (84 acres enhancement and 8 acres mitigation).	Details of Victoria Pond and marsh restorations.	Design phase.	USFWS, CDFG, and NMFS. Fish and Wildlife Coordination Act. Endangered Species Act.
		P&S input.	Design phase.	
	Restoration of 5 acres of Victoria Pond land. A 100-foot fenced buffer area to be constructed around the pond.	EC Inspections.	Biological monitor on-site during construction.	
	Marsh excavation and settling of turbidity to be complete before construction begins on lower SAR channel.	Coordinate disposal plan with CCC and local cities.	During P&S phase.	Public Comment. California Coastal Commission. Coastal Zone Management Act. USFWS.
	Biological monitoring of least tern foraging during channel excavation and beach disposal.	Disposal plan specifications on site monitoring.	During construction.	
	Monitor turbidity from beach replenishment. Biological monitor during restoration.	Formalize marsh management and ownership of marsh by FWS.	Before or during construction.	
2. Santa Ana Canyon	Maintenance of approx. 1100 acres of floodplain acquired in the canyon for wildlife habitat values.	Input to O&M manual.	Prior to completion of construction.	Fish and Wildlife Coordination Act.
	Agricultural lands acquired in fee will not be leased back for agriculture.	Real Estate Purchase Agreements.	Prior to construction.	

Table SEIS-16. Environmental Committments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
H. Palentological Resources	No mitigation (no impact)			

Table SEIS-16. Environmental Commitments.

Resource Impacted	Commitment	Action	Implementation and When to Occur	Source of Commitment
III. LOWER RIVER (Con't)				
I. Cultural Resources	Same as for Seven Oaks Dam. (See I. I.) Also, avoid old Pacific Electric Railway bridge.	See I. I.	See I. I. During construction.	See I. I. See I. I.
J. Esthetics	Landscape planting of exotics and natives along the channel. Irrigation system.	P&S input. Planting. EC inspections.	During design phase. During and after construction.	Public concern over esthetic impacts.
IV. MILL CREEK LEVEE				
A. Sedimentation	No mitigation required.			
B. Water Quality	No mitigation required.			
C. Recreation	None required. No recreation planned at Mill Creek.			
D. Air Quality	See I. D.	See I. D.	See I. D.	See I. D.
E. Transportation Utilities	See I. E.	See I. E.	See I. E.	See I. E.
F. Noise	See I. F.	See I. F.	See I. F.	See I. F.

Table SEIS-16. Environmental Commitments.

Resource Impacted	Commitment	Action	Implementation and When to Occur	Source of Commitment
IV. MILL CREEK LEVEE (Cont'd)				
G. Biological Resources				
1. Alluvial Scrub (erosion control & esthetics)	Reseed disturbed areas with natives. Avoid disturbance of trees. Replace trees impacted.	Input to plans and specs. P&S input. EC inspections	During and after construction. Design phase. During and after construction.	USFWS, CDFG, & public concerns over impacts to biological resources. Fish and Wildlife Coordination Act.
2. Endangered Species	Survey for Eriastrum and Centrostegia in spring 1988.	Conduct survey. No action.	Accomplished Spring 1988. (Survey negative).	USFWS and public concerns. Endangered Species Act.
H. Palentological Resources	No impact - no mitigation.			
I. Cultural Resources	No mitigation required.			
J. Esthetics	Plant native trees and shrubs near levee.		Mitigation to occur when construction of levee is complete.	Public concern.
	Drip irrigation system.	P&S input. Planting. EC inspections.	Design phase. After construction.	

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
V. OAK STREET DRAIN				
A. Sedimentation	No mitigation required.			
B. Water Quality	No mitigation required.			
C. Recreation	None required.			
D. Air Quality	See I. D.	See I. D.	See I. D.	See I. D.
E. Transportation Utilities	See I. E.	See I. E.	See I. E.	See I. E.
F. Noise	See I. F.	See I. F.	See I. F.	See I. F.
G. Biological Resources	No additional mitigation necessary.	None required.		
H. Palentological Resources	No impact - no mitigation.			
I. Cultural Resources	No mitigation required.			
J. Esthetics	No mitigation required.			
VI. SANTIAGO CREEK				
A. Sedimentation	No mitigation required.			
B. Water Quality	No mitigation required.			

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
VI. SANTIAGO CREEK (Cont'd)				
C. Recreation	No mitigation necessary at this time. Specific project details not yet known.	Detailed design of trail system.		Local sponsors.
D. Air Quality	See I. D.1.	See I. D.1.	See I. D.1.	See I. D.1.
E. Transportation Utilities	Temporarily re-route bike route. Flagmen if necessary for truck traffic.	Coordinate with local authorities. Implementation.	P&S phase. During construction period.	 County and local traffic ordinances.
F. Noise	See I. F.	See I. F.	See I. F.	See I. F.
G. Biological Resources	Plant 2.7 acres of willows, cottonwoods, sycamores, & mulefat along old creek bed upstream from overflow structure. Irrigation for 2 years. Protect mitigation area.	Develop detailed planting and irrigation plan. P&S input. Planting. EC inspections. Input to O&M manual.	Design phase. Design phase. During, after construction. During, after construction. Prior to completion of construction.	USFWS, CDFG, & public concerns. Fish and Wildlife Coordination Act.
H. Palentological Resources	No impact - no mitigation.			
I. Cultural Resources	Same as mitigation under Seven Oaks Dam (I. I.).	See I. I.	See I. I.	See I. I.

Table SEIS-16. Environmental Commitments.

Resources Impacted	Commitment	Action	Implementation and When to Occur	Source of Requirements
VI. SANTIAGO CREEK (Con't)				
J. Esthetics	Along downstream channel fence line: planting of shrubs and ground cover. Landscaping. Drip irrigation system.	Specific landscaping plan. P&S input Implementation. EC inspections.	Indefinite. Design phase. During, after construction. During, after construction.	Strong public concern over esthetic quality of downstream reach.

Appendix G
Air Emissions Worksheets

ESTIMATED EMISSIONS FROM ANAHEIM LAKE EXPANDED RECHARGE

Construction Inputs

Total days Allowed for Project	75.00
Total Days Allowed for Construction (Days)	75.00
Total Site Acres (Acres)	30.00
Number of Employees	20
Average Trip Length One Way POV (Miles)	30
Total Work Hours Per Day (Hours/Day)	8
Daily Number of Haul Trucks	0
Average Trip Length One Way Haul Trucks (Miles)	0
Total VMT Water Trucks per day (Miles)	10
Total VMT Grader per day (Miles)	7.5
Total VMT Scraper per day (Miles)	5

Total Number of Each Equipment used for Construction

# of equipment	2	0	0	0	0	0
Hours per Day	6	0	0	0	0	0
Days in Operation	75	0	0	0	0	0
	scraper	trencher	compressor	boom truck	welder	crane
	diesel	diesel	diesel	diesel	diesel	diesel

# of equipment	0	1	0	1	0	0
Hours per Day	0	4	0	6	0	0
Days in Operation	0	75	0	75	0	0
	loaders	dozer	mortor mix	grader	paver	crane
	diesel	diesel	diesel	diesel	diesel	diesel

Assumptions Used in EMFAC-2002

Chosen Speed	25		% LDA	66.00%
% Cold Start	75.00%		%LDT	34.00%
% Hot Start	25.00%		Season	summer
Daily VMT LDA & LDT	1215.000		Daily VMT Haul Truck	0

EMFAC-2002 Inputs

	LDA	LDT	HDD
	Grams/Mile	Grams/Mile	Grams/Mile
Carbon Monoxide (CO)	3.7	5.998	3.773
Reactive Organic Compounds (ROC)	0.164	0.261	0.671
Nitrogen Oxides (NOx)	0.438	0.71	11.65
Particulates (PM10)	0.009	0.01	0.211

Source: EMFAC7G

Vehicle Exhaust Emissions from POV, Construction

Construction Workers POV Emissions

	EMFAC-2002 Emissions Factor. Grams/Mile	Cold Start Emissions Factor. Grams/Trip	Hot Start Emissions Factor. Grams/Trip	Est. Emissions lbs/day
Carbon Monoxide (CO)	4.48132	24.77205	0.52885	14.22
Reactive Organic Compounds (ROC)	0.19698	2.2998	0.05255	0.73
Nitrogen Oxides (NOx)	0.53048	1.4394	0.148	1.56
Sulfur Oxides (SOx) *	0	0	0	0
Particulates (PM10)	0	0	0	0

Source: Emission Factors From EMFAC-2002 at 70 Deg Fahrenheit at Chosen Speed

*Source: Table A9-5-L SCAQMD CEQA Handbook

Haul Truck Emissions

	EMFAC-2002 Emissions Factor. Grams/Mile	Est. Emissions lbs/day
Carbon Monoxide (CO)	3.773	0.00
Reactive Organic Compounds (ROC)	0.671	0.00
Nitrogen Oxides (NOx)	11.65	0.00
Sulfur Oxides (SOx)	NA	0
Particulates (PM10)	0.211	0.00

Source: EMFAC-2002

Construction Equipment Emissions

	scraper 250 hp diesel lbs/hour	trencher 120 hp diesel lbs/hour	compressor 50 hp diesel lbs/hour	boom truck 175 hp diesel lbs/hour	welder 50 hp diesel lbs/hour	crane 175 hp diesel lbs/hour	Total Emissions lbs/day
Carbon Monoxide (CO)	0.34	0.10	0.55	0.2	0.55	0.22	4.1
Reactive Organic Compounds (ROC)	0.18	0.05	0.1	0.11	0.1	0.11	2.2
Nitrogen Oxides (NOx)	3.13	0.93	0.9	1.85	0.9	2.01	37.6
Particulates (PM10)	0.08	0.02	0.05	0.05	0.05	0.05	1.0

	loaders 74 hp diesel lbs/hour	dozer 500 hp diesel lbs/hour	mortor mixer 50 hp diesel lbs/hour	grader 175 hp diesel lbs/hour	paver 175 hp diesel lbs/hour	crane 175 hp diesel lbs/hour	Total Emissions lbs/day
Carbon Monoxide (CO)	0.05	0.62	0.5	0.24	0.24	0.22	2.7
Reactive Organic Compounds (ROC)	0.03	0.24	0.1	0.12	0.13	0.11	1.7
Nitrogen Oxides (NOx)	0.50	4.85	1.2	2.18	2.22	2.01	32.5
Particulates (PM10)	0.01	0.10	0.05	0.05	0.05	0.05	0.7

Source: ARB Emission Inventory Publication Number MO99_32.3 Table 13 released: 2000

Source: ARB Inventory Publication MO99_32.5 App. B released: 2000

Total PM10 Fugitive Dust Emissions from construction

Air Pollutant	Emission Factor		Unmitigated Emissions		Est. Emissions (lbs/day)
Particulates (PM10) Grader	8.84	lb/vmt	66.3	lb/day	33.15
Particulates (PM10) Bulldozer	2.4	lb/hr	9.6	lb/day	4.8
Particulates (PM10) Scraper @ 5 Miles	4.3	lb/vmt	21.5	lb/day	11
Particulates (PM10) Demo 20% 6000CF	0.00042	lb/cubic feet	0.5	lb/day	0.5
Particulates (PM10) POV & Haul Truck*	0.42	gm/mile			1.12
			Total Particulates		**50.57**

Source: Table 11.9-1 EPA AP-42

*Source: ARB Recommended

Volatile Organic Compounds from Architectural Coatings

Square Footage per day	Coating Equivalent	Equivalent Square Footage
0 ft^2/day	2	0 ft^2/day
Paint Coating Factor	Paint VOC Content	
400 ft^2/day	2.08 lb/gal	
	Total Commercial VOC from Architectural Coatings	
	0.0 lb/day VOC	

Source: SCAQMD Recommended

Reactive Organic Compounds From Street Paving

Asphalt ROC Emission Factor*	0	lb/acre
Total Acres Being Paved		acres
Total ROC from Paving	0.00	lb/day ROC

*Source: Urbemis Asphalt Emission Factor

Total Air Emissions from Construction Including POV, Fugitive Dust, and

Air Pollutant	Est. Emissions (lbs/day)	SCAQMD Thresholds (lbs/day)	Significant?
Carbon Monoxide (CO)	**21.02**	550.00	NO
Reactive Organic Compounds (ROC)	**4.57**	75.00	NO
Nitrogen Oxides (NOx)	**71.60**	100.00	NO
Particulates (PM10)	**52.23**	150.00	NO

Source: EMFAC-2002 and SCAQMD CEQA Air Quality Handbook

ESTIMATED EMISSIONS FROM SANTIAGO CREEK RECHARGE

Construction Inputs

Total days Allowed for Project	150.00
Total Days Allowed for Construction (Days)	150.00
Total Site Acres (Acres)	
Number of Employees	20
Average Trip Length One Way POV (Miles)	30
Total Work Hours Per Day (Hours/Day)	8
Daily Number of Haul Trucks	10
Average Trip Length One Way Haul Trucks (Miles)	15
Total VMT Water Trucks per day (Miles)	10
Total VMT Scraper per day (Miles)	0
Total Days for Demo	0

Total Number of Each Equipment used for Construction

	backhoe diesel	trencher diesel	compressor diesel	boom truck diesel	welder diesel	crane diesel
# of equipment	1	1	0	0	0	0
Hours per Day	6	6	0	0	0	0
Days in Operation	150	150	0	0	0	0

	loaders diesel	crawler dozer diesel	mortor mix diesel	grader diesel	paver diesel	crane diesel
# of equipment	0	0	0	0	0	0
Hours per Day	0	0	0	0	0	0
Days in Operation	0	0	0	0	0	0

Assumptions Used in EMFAC-2002

Chosen Speed	40	% LDA	66.00%
% Cold Start	75.00%	%LDT	34.00%
% Hot Start	25.00%	Season	summer
Daily VMT LDA & LDT	1210.000	Daily VMT Haul Truck	300

EMFAC-2002 Inputs

	LDA Grams/Mile	LDT Grams/Mile	HDD Grams/Mile
Carbon Monoxide (CO)	3.7	5.998	3.773
Reactive Organic Compounds (ROC)	0.164	0.261	0.671
Nitrogen Oxides (NOx)	0.438	0.71	11.65
Particulates (PM10)	0.009	0.01	0.211

Source: EMFAC7G

Vehicle Exhaust Emissions from POV, Construction

Construction Workers POV Emissions

	EMFAC-2002 Emissions Factor. Grams/Mile	Cold Start Emissions Factor. Grams/Trip	Hot Start Emissions Factor. Grams/Trip	Est. Emissions lbs/day
Carbon Monoxide (CO)	4.48132	24.77205	0.52885	14.17
Reactive Organic Compounds (ROC)	0.19698	2.2998	0.05255	0.73
Nitrogen Oxides (NOx)	0.53048	1.4394	0.148	1.55
Sulfur Oxides (SOx) *	0	0	0	0
Particulates (PM10)	0	0	0	0

Source: Emission Factors From EMFAC-2002 at 70 Deg Fahrenheit at Chosen Speed

*Source: Table A9-5-L SCAQMD CEQA Handbook

Haul Truck Emissions

	EMFAC-2002 Emissions Factor. Grams/Mile	Est. Emissions lbs/day
Carbon Monoxide (CO)	3.773	2.49
Reactive Organic Compounds (ROC)	0.671	0.44
Nitrogen Oxides (NOx)	11.65	7.70
Sulfur Oxides (SOx)	NA	0
Particulates (PM10)	0.211	0.14

Source: EMFAC-2002

Construction Equipment Emissions

	backhoe 120 hp diesel lbs/hour	trencher 120 hp diesel lbs/hour	compressor 50 hp diesel lbs/hour	boom truck 175 hp diesel lbs/hour	welder 50 hp diesel lbs/hour	crane 175 hp diesel lbs/hour	Total Emissions lbs/day
Carbon Monoxide (CO)	0.11	0.10	0.55	0.2	0.55	0.22	1.3
Reactive Organic Compounds (ROC)	0.06	0.05	0.1	0.11	0.1	0.11	0.7
Nitrogen Oxides (NOx)	1.01	0.93	0.9	1.85	0.9	2.01	11.6
Particulates (PM10)	0.02	0.02	0.05	0.05	0.05	0.05	0.2

	loaders 74 hp diesel lbs/hour	crawler dozer 250 hp diesel lbs/hour	mortor mixer 50 hp diesel lbs/hour	grader 175 hp diesel lbs/hour	paver 175 hp diesel lbs/hour	crane 175 hp diesel lbs/hour	Total Emissions lbs/day
Carbon Monoxide (CO)	0.05	0.31	0.5	0.24	0.24	0.22	0.0
Reactive Organic Compounds (ROC)	0.03	0.16	0.1	0.12	0.13	0.11	0.0
Nitrogen Oxides (NOx)	0.50	2.79	1.2	2.18	2.22	2.01	0.0
Particulates (PM10)	0.01	0.07	0.05	0.05	0.05	0.05	0.0

Source: ARB Emission Inventory Publication Number MO99_32.3 Table 13 released: 2000

Source: ARB Inventory Publication MO99_32.5 App. B released: 2000

Total PM10 Fugitive Dust Emissions from construction						
Air Pollutant	Emission Factor		Unmitigated Emissions		% reduced b by mit meas	Est. Emissions (lbs/day)
Particulates (PM10) Loaders	2.4	lb/hr	14.4	lb/day	50%	7.2
Particulates (PM10) Bulldozer	2.4	lb/hr	0	lb/day	50%	0
Particulates (PM10) POV & Haul Truck*	0.42	gm/mile				1.40
			Total Particulates			**8.60**

Source: Table 11.9-1 EPA AP-42

*Source: ARB Recommended

Volatile Organic Compounds from Architectural Coatings					
Square Footage per day		Coating Equivalent		Equivalent Square Footage	
0	ft^2/day	2		0	ft^2/day
Paint Coating Factor		Paint VOC Content			
400	ft^2/day	2.08	lb/gal		
		Total Commercial VOC from Architectural Coatings			
		0.0	lb/day VOC		

Source: SCAQMD Recommended

Reactive Organic Compounds From Street Paving		
Asphalt ROC Emission Factor*	0	lb/acre
Total Acres Being Paved		acres
Total ROC from Paving	0.00	lb/day ROC

*Source: Urbemis Asphalt Emission Factor

Total Air Emissions from Construction Including POV, Fugitive Dust, and			
Air Pollutant	Est. Emissions (lbs/day)	SCAQMD Thresholds (lbs/day)	Significant?
Carbon Monoxide (CO)	**17.93**	550.00	NO
Reactive Organic Compounds (ROC)	**1.84**	75.00	NO
Nitrogen Oxides (NOx)	**20.89**	100.00	NO
Particulates (PM10)	**8.98**	150.00	NO

Source: EMFAC-2002 and SCAQMD CEQA Air Quality Handbook

ESTIMATED EMISSIONS FROM LA JOLLA RECHARGE BASIN

Construction Inputs

Total days Allowed for Project	150.00
Total Days Allowed for Construction (Days)	150.00
Total Site Acres (Acres)	
Number of Employees	20
Average Trip Length One Way POV (Miles)	30
Total Work Hours Per Day (Hours/Day)	8
Daily Number of Haul Trucks	60
Average Trip Length One Way Haul Trucks (Miles)	15
Total VMT Water Trucks per day (Miles)	10
Total VMT Scraper per day (Miles)	5

Total Number of Each Equipment used for Construction

# of equipment	1	1	0	0	0	0
Hours per Day	6	6	0	0	0	0
Days in Operation	100	75	0	0	0	0
	scraper	trencher	compressor	boom truck	welder	crane
	diesel	diesel	diesel	diesel	diesel	diesel
# of equipment	2	2	0	0	0	0
Hours per Day	3	6	0	0	0	0
Days in Operation	150	100	0	0	0	0
	loaders	crawler dozer	mortor mix	grader	paver	crane
	diesel	diesel	diesel	diesel	diesel	diesel

Assumptions Used in EMFAC7G

Chosen Speed	25	% LDA	66.00%
% Cold Start	75.00%	%LDT	34.00%
% Hot Start	25.00%	Season	summer
Daily VMT LDA & LDT	1215.000	Daily VMT Haul Truck	1800

EMFAC7G Inputs

	LDA	LDT	HDD
	Grams/Mile	Grams/Mile	Grams/Mile
Carbon Monoxide (CO)	4.2	4.49	9.98
Reactive Organic Compounds (ROC)	0.24	0.29	1.51
Nitrogen Oxides (NOx)	0.44	0.7	9.25
Particulates (PM10)	0		0.59

Source: EMFAC7G

Vehicle Exhaust Emissions from POV, Construction

Construction Workers POV Emissions

	EMFAC7G Emissions Factor. Grams/Mile	Cold Start Emissions Factor. Grams/Trip	Hot Start Emissions Factor. Grams/Trip	Est. Emissions lbs/day
Carbon Monoxide (CO)	4.2986	24.77205	0.52885	13.73
Reactive Organic Compounds (ROC)	0.257	2.2998	0.05255	0.90
Nitrogen Oxides (NOx)	0.5284	1.4394	0.148	1.55
Sulfur Oxides (SOx) *	0	0	0	0
Particulates (PM10)	0	0	0	0

Source: Emission Factors From EMFAC7G at 70 Deg Fahrenheit at Chosen Speed

*Source: Table A9-5-L SCAQMD CEQA Handbook

Haul Truck Emissions

	EMFAC7G Emissions Factor. Grams/Mile	Est. Emissions lbs/day
Carbon Monoxide (CO)	9.98	39.57
Reactive Organic Compounds (ROC)	1.51	5.99
Nitrogen Oxides (NOx)	9.25	36.67
Sulfur Oxides (SOx)	NA	0
Particulates (PM10)	0.59	2.34

Source: EMFAC7G

Construction Equipment Emissions

	scraper 250 hp diesel lbs/hour	trencher 120 hp diesel lbs/hour	compressor 50 hp diesel lbs/hour	boom truck 175 hp diesel lbs/hour	welder 50 hp diesel lbs/hour	crane 175 hp diesel lbs/hour	Total Emissions lbs/day
Carbon Monoxide (CO)	0.34	0.10	0.55	0.2	0.55	0.22	1.7
Reactive Organic Compounds (ROC)	0.18	0.05	0.1	0.11	0.1	0.11	0.9
Nitrogen Oxides (NOx)	3.13	0.93	0.9	1.85	0.9	2.01	15.3
Particulates (PM10)	0.08	0.02	0.05	0.05	0.05	0.05	0.4

	loaders 74 hp diesel lbs/hour	crawler dozer 250 hp diesel lbs/hour	mortor mixer 50 hp diesel lbs/hour	grader 175 hp diesel lbs/hour	paver 175 hp diesel lbs/hour	crane 175 hp diesel lbs/hour	Total Emissions lbs/day
Carbon Monoxide (CO)	0.05	0.31	0.5	0.24	0.24	0.22	2.8
Reactive Organic Compounds (ROC)	0.03	0.16	0.1	0.12	0.13	0.11	1.5
Nitrogen Oxides (NOx)	0.50	2.79	1.2	2.18	2.22	2.01	25.3
Particulates (PM10)	0.01	0.07	0.05	0.05	0.05	0.05	0.6

Source: ARB Emission Inventory Publication Number MO99_32.3 Table 13 released: 2000

Source: ARB Inventory Publication MO99_32.5 App. B released: 2000

Total PM10 Fugitive Dust Emissions from construction

Air Pollutant	Emission Factor		Unmitigated Emissions		% reduced by mit meas	Est. Emissions (lbs/day)
Particulates (PM10) Loaders	2.4	lb/hr	14.4	lb/day	50%	7.2
Particulates (PM10) Bulldozer	2.4	lb/hr	28.8	lb/day	50%	14.4
Particulates (PM10) Scraper @ 5 Miles	4.3	lb/vmt	43	lb/day	50%	21.5
Particulates (PM10) Demo 20% 6000CF	0.00042	lb/cubic feet	2.5	lb/day		2.5
Particulates (PM10) POV & Haul Truck*	0.42	gm/mile				2.79
				Total Particulates		**48.41**

Source: Table 11.9-1 EPA AP-42

*Source: ARB Recommended

** coversation with SCAQMD personnel; Table 11-4 CEQA Air quality Handbook

Volatile Organic Compounds from Architectural Coatings

Square Footage per day	Coating Equivalent	Equivalent Square Footage
0 ft^2/day	2	0 ft^2/day
Paint Coating Factor	Paint VOC Content	
400 ft^2/day	2.08 lb/gal	
	Total Commercial VOC from Architectural Coatings	
	0.0 lb/day VOC	

Source: SCAQMD Recommended

Reactive Organic Compounds From Street Paving

Asphalt ROC Emission Factor*	0	lb/acre
Total Acres Being Paved		acres
Total ROC from Paving	0.00	lb/day ROC

*Source: Urbemis 7G Asphalt Emission Factor

Total Air Emissions from Construction Including POV, Fugitive Dust, and

Air Pollutant	Est. Emissions (lbs/day)	SCAQMD Thresholds (lbs/day)	Significant?
Carbon Monoxide (CO)	**57.74**	550.00	NO
Reactive Organic Compounds (ROC)	**9.21**	75.00	NO
Nitrogen Oxides (NOx)	**78.86**	100.00	NO
Particulates (PM10)	**51.75**	150.00	NO

Source: EMFAC7G and SCAQMD CEQA Air Quality Handbook

ESTIMATED EMISSIONS FROM OPERATIONS

Construction Inputs

Total days Allowed for Project	1.00
Total Days Allowed for Construction (Days)	1.00
Total Site Acres (Acres)	
Number of Employees	10
Average Trip Length One Way POV (Miles)	30
Total Work Hours Per Day (Hours/Day)	8
Daily Number of Haul Trucks	0
Average Trip Length One Way Haul Trucks (Miles)	0
Total VMT Water Trucks per day (Miles)	0
Total VMT Scraper per day (Miles)	0

Total Number of Each Equipment used for Construction

# of equipment	0	0	0	0	0	0
Hours per Day	0	0	0	0	0	0
Days in Operation	0	0	0	0	0	0
	scraper	forklift	compressor	boom truck	welder	crane
	diesel	diesel	diesel	diesel	diesel	diesel

# of equipment	0	2	0	0	0	0
Hours per Day	0	6	0	0	0	0
Days in Operation	0	1	0	0	0	0
	loaders	crawler dozer	mortor mix	grader	paver	crane
	diesel	diesel	diesel	diesel	diesel	diesel

Assumptions Used in EMFAC-2002

Chosen Speed	25	% LDA	66.00%
% Cold Start	75.00%	%LDT	34.00%
% Hot Start	25.00%	Season	summer
Daily VMT LDA & LDT	600.000	Daily VMT Haul Truck	0

EMFAC-2002 Inputs

	LDA Grams/Mile	LDT Grams/Mile	HDD Grams/Mile
Carbon Monoxide (CO)	3.7	5.998	3.773
Reactive Organic Compounds (ROC)	0.164	0.261	0.671
Nitrogen Oxides (NOx)	0.438	0.71	11.65
Particulates (PM10)	0.009	0.01	0.211

Source: EMFAC7G

Vehicle Exhaust Emissions from POV, Construction

Construction Workers POV Emissions

	EMFAC-2002 Emissions Factor. Grams/Mile	Cold Start Emissions Factor. Grams/Trip	Hot Start Emissions Factor. Grams/Trip	Est. Emissions lbs/day
Carbon Monoxide (CO)	4.48132	24.77205	0.52885	7.04
Reactive Organic Compounds (ROC)	0.19698	2.2998	0.05255	0.36
Nitrogen Oxides (NOx)	0.53048	1.4394	0.148	0.77
Sulfur Oxides (SOx) *	0	0	0	0
Particulates (PM10)	0	0	0	0

Source: Emission Factors From EMFAC-2002 at 70 Deg Fahrenheit at Chosen Speed

*Source: Table A9-5-L SCAQMD CEQA Handbook

Haul Truck Emissions

	EMFAC-2002 Emissions Factor. Grams/Mile	Est. Emissions lbs/day
Carbon Monoxide (CO)	3.773	0.00
Reactive Organic Compounds (ROC)	0.671	0.00
Nitrogen Oxides (NOx)	11.65	0.00
Sulfur Oxides (SOx)	NA	0
Particulates (PM10)	0.211	0.00

Source: EMFAC7G

Construction Equipment Emissions

	scraper 250 hp diesel lbs/hour	forklift 175 hp diesel lbs/hour	compressor 50 hp diesel lbs/hour	boom truck 175 hp diesel lbs/hour	welder 50 hp diesel lbs/hour	crane 175 hp diesel lbs/hour	Total Emissions lbs/day
Carbon Monoxide (CO)	0.34	0.24	0.55	0.2	0.55	0.22	0.0
Reactive Organic Compounds (ROC)	0.18	0.13	0.1	0.11	0.1	0.11	0.0
Nitrogen Oxides (NOx)	3.13	2.24	0.9	1.85	0.9	2.01	0.0
Particulates (PM10)	0.08	0.05	0.05	0.05	0.05	0.05	0.0

	loaders 74 hp diesel lbs/hour	crawler dozer 250 hp diesel lbs/hour	mortor mixer 50 hp diesel lbs/hour	grader 175 hp diesel lbs/hour	paver 175 hp diesel lbs/hour	crane 175 hp diesel lbs/hour	Total Emissions lbs/day
Carbon Monoxide (CO)	0.05	0.31	0.5	0.24	0.24	0.22	3.7
Reactive Organic Compounds (ROC)	0.03	0.16	0.1	0.12	0.13	0.11	1.9
Nitrogen Oxides (NOx)	0.50	2.79	1.2	2.18	2.22	2.01	33.5
Particulates (PM10)	0.01	0.07	0.05	0.05	0.05	0.05	0.8

Source: ARB Emission Inventory Publication Number MO99_32.3 Table 13 released: 2000

Source: ARB Inventory Publication MO99_32.5 App. B released: 2000

Total Air Emissions from Construction Including POV, Fugitive Dust, and

Air Pollutant	Est. Emissions (lbs/day)	SCAQMD Thresholds (lbs/day)	Significant?
Carbon Monoxide (CO)	**10.76**	550.00	NO
Reactive Organic Compounds (ROC)	**2.28**	75.00	NO
Nitrogen Oxides (NOx)	**34.25**	100.00	NO
Particulates (PM10)	**0.84**	150.00	NO

Source: EMFAC-2002 and SCAQMD CEQA Air Quality Handbook

Appendix H
Cultural Records Search Report

South Central Coastal Information Center
California Historical Resources Information System
California State University, Fullerton
Department of Anthropology
800 North State College Boulevard
Fullerton, CA 92834-6846
714.278.5395 / FAX 714.278-5542
anthro.fullerton.edu/sccic.html - sccic@fullerton.edu

Ventura
Los Angeles
Orange

November 20, 2002

Mr. Dean A. Martorana
Environmental Science Associates
8950 Cal Center Drive
Building 3, Suite 300
Sacramento, CA 95826
(916) 564-4500

RE: Expedited Record Search for the Proposed Orange County Water Rights Application (ESA Project #202291)

Dear Mr. Martorana,

As per your request received on November 19, 2002, we have conducted an expedited records search for the above referenced project. This search includes a review of all recorded historic and prehistoric archaeological sites within a one-quarter mile radius of the project area as well as a review of all known cultural resource reports. In addition, we have checked our file of historic maps, the California Points of Historical Interest (PHI), the listing of California Historical Landmarks (CHL) in the region, the National Register of Historic Places (NR), and the California State Historic Resources Inventory (HRI) for the referenced project. The following is a discussion of our findings for the project area.

ARCHAEOLOGICAL RESOURCES:

Three prehistoric archaeological sites (30-000428, 30-000429 and 30-000430) have been identified within a one-quarter mile radius of the project area (see enclosed map). Of which, none are located within the project area and none are listed on the National Register Archaeological Determination of Eligibility list. No prehistoric isolates have been identified within a one-quarter mile radius of the project area.

No historic archaeological sites have been identified within a one-quarter mile radius of the project area (see enclosed map). No historic isolates have been identified within a one-quarter mile radius of the project area.

HISTORIC RESOURCES:

No recorded historic built environment has been identified within a one-quarter mile radius of the project area.

A copy of our historic map – Anaheim (1896 and 1942) 15' USGS - is enclosed for your review.

The California Point of Historical Interest (1992) of the Office of Historic Preservation, Department of Parks and Recreation, lists no properties within a one-quarter mile radius of the project area.

The California Historical Landmarks (1990) of the Office of Historic Preservation, Department of Parks and Recreation, lists no properties within a one-quarter mile radius of the project area.

The National Register of Historic Places lists no properties within a one-quarter mile radius of the project area.

The California Historic Resources Inventory lists several properties that have been evaluated for historical significance that may be within a one-quarter mile radius of the project area (see enclosed list).

PREVIOUS CULTURAL RESOURCES INVESTIGATIONS:

Three studies (OR1596*, OR1836* and OR2501*) have been conducted within a one-quarter mile radius of the project area. Of these, all three are located within the project area. There are two additional investigations located on the Orange 7.5' USGS Quadrangle and are potentially within a one-quarter mile radius of the project area. These reports are not mapped due to insufficient locational information.
(* = Located within the project area)

Please forward a copy of any reports from this project to our office as soon as possible. Due to the sensitive nature of archaeological site location data, we ask that you **do not include** records search maps in your report. If you have any questions regarding the results presented herein, please feel free to contact our office at 714.278.5395 Monday through Thursday 8:00 am to 3:30 pm.

Invoices are mailed approximately two weeks after records searches are completed. This enables your firm to request further information under the same invoice number. Please reference the invoice number listed below when making inquiries. Requests made after the invoicing will result in the preparation of a separate invoice with a $15.00 handling fee.

Sincerely,
SCCIC

Catharine M. Wood
Staff Archaeologist

Enclosures:

- ( ) Primary Number Explanation
- ( ) Site List
- ( ) Survey List
- (X) Map – Orange 7.5' USGS Quadrangle and Anaheim 15' USGS Quadrangle
- (X) Bibliography – 1 page
- (X) HRI – 4 pages
- ( ) National Register Status Codes
- (X) Site Records – 30-000428, 30-000429 & 30-000430
- ( ) Survey Reports
- (X) Confidentiality Form
- ( ) Invoice #2059

Bibliography
Orange 7.5' USGS Quadrangle

IC ID#: OR1596 **DATE:** 1974 **PAGES:** 13 # Missing from files#

AUTHOR: Clewlow, William C.
FIRM: University of California, Los Angeles
TITLE: Preliminary Report of The Potential Impact on Archaeological Resources of the Proposed Gas Transmission Pipeline From Los Angeles Harbor to Yorba Linda - Southern California Gas Co.: Environmental Analysis
AREA: 37 li mi
SITES: 30-000277

QUADNAME: San Pedro, Long Beach, Los Alamitos, Anaheim, Orange, Yorba Linda
MEMO:

IC ID#: OR1836 **DATE:** 1998 **PAGES:** 31

AUTHOR: Padon, Beth
FIRM: Discovery Works, Inc.
TITLE: Cultural Resource Review for Groundwater Replenishment System Program EIR/Tier I/EIS, Orange County Water District and County Sanitation Districts of Orange County
AREA: 17.3 li mi
SITES: none

QUADNAME: Orange, Anaheim, Newport Beach
MEMO:

IC ID#: OR2501 **DATE:** 1994 **PAGES:** 14

AUTHOR: Conkling, Steven W., Deborah McLean, and Brad Sturn
FIRM: LSA
TITLE: Cultural Resources Assessment for Five Vacant lots and 42 Potential Historic Buildings within the Northeast Anaheim Redevelopment Area, Orange County, California
AREA: 60 ac
SITES: none

QUADNAME: Orange
MEMO:

Appendix I
Initial Study Checklists

Appendix I-1

Anaheim Lake Expansion Recharge Project, Initial Study

ESA

INITIAL STUDY CHECKLIST

The following Environmental Checklist and discussion of potential environmental effects were completed in accordance with Section 15063(d)(3) of the CEQA Guidelines to determine if the project may have any significant effect on the environment.

A brief explanation is provided for all determinations. A "No Impact" or "Less than Significant Impact" determination is made when the project will not have any impact or will not have a significant effect on the environment for that issue area based on a project-specific analysis.

CEQA ENVIRONMENTAL CHECKLIST FORM AND INITIAL STUDY

1. Project Title:	Anaheim Lake Expanded Recharge Project
2. Lead Agency Name and Address:	Orange County Water District 10500 Ellis Avenue Fountain Valley, CA 92708
3. Contact Person and Phone Number:	Craig Miller, Assistant General Manager
4. Project Location:	Anaheim, CA
5. Project Sponsor's Name and Address:	Orange County Water District 10500 Ellis Avenue Fountain Valley, CA 92708
6. General Plan Designation:	Water Uses
7. Zoning:	Public Recreational Zone (PR)
8. Description of Project:	The Anaheim Lake is the largest recharge basin of the Deep Basin System located on Mira Loma Avenue in Anaheim, CA. The proposed project would involve draining the lake and flattening three islands in the middle of the lake with heavy earthmoving equipment and spreading the material over the bottom of the lake. The bottom of the lake would then be "groomed" and then the lake would be refilled. Removing the islands would increase the basin's recharge capacity. Construction would require about 6 months, but would be separated into two three-month periods during the drier summer months over two consecutive years.
9. Surrounding Land Uses and Setting:	Surrounding land uses include a mixture of residential, commercial, and industrial land uses.

10. Other agencies whose approval is required (i.e., permits, financing, or participation agreement:

State Water Resources Control Board	State-wide construction storm water discharge permit (SWPPP)

Environmental Factors Potentially Affected:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as Indicated by the checklist on the following pages:

☐ Aesthetics	☐ Agriculture Resources	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☐ Geology / Soils
☐ Hazards & Hazardous Materials	☒ Hydrology / Water Quality	☐ Land Use / Planning
☐ Mineral Resources	☐ Noise	☐ Population / Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities / Service Systems	☒ Mandatory Findings of Significance	

DETERMINATION: (To be completed by lead agency)
On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

______________________________	______________________________
Signature	Date
Craig Miller, Assistant General Manager	______________________________
Printed Name	For

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
I. AESTHETICS - Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒
II. AGRICULTURE RESOURCES - Would the project: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland.				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒
III. AIR QUALITY – Would the project: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations.				
a) Conflict with or obstruct implementation of the applicable Air Quality Attainment Plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute to an existing or projected air quality violation?	☒	☐	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?	☒	☐	☐	☐

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
III. AIR QUALITY – (cont.):				
d) Expose sensitive receptors to substantial pollutant concentrations?	☒	☐	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐
IV. BIOLOGICAL RESOURCES – Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒
V. CULTURAL RESOURCES - Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to §15064.5?	☒	☐	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☒	☐	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
VI. GEOLOGY AND SOILS - Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on strata or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
VII. HAZARDS AND HAZARDOUS MATERIALS - Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
HAZARDS AND HAZARDOUS MATERIALS - (cont.):				
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒
VIII. HYDROLOGY AND WATER QUALITY - Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☒	☐	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there should be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
VIII. HYDROLOGY AND WATER QUALITY – (cont.):				
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation of seiche, tsunami, or mudflow?	☐	☐	☐	☒
IX. LAND USE AND PLANNING - Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c) Conflict with any applicable habitat conservation plan or natural communities' conservation plan?	☐	☐	☐	☒
X. MINERAL RESOURCES - Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒
XI. NOISE - Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
XII. NOISE – (cont.):				
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport of public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
XIII. POPULATION AND HOUSING - Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
XIV. PUBLIC SERVICES:				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☒	☐
Other public facilities?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
XV. RECREATION:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?	☐	☐	☐	☒
XVI. TRANSPORTATION / TRAFFIC - Would the project:				
a) Cause an increase in traffic, which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?	☐	☐	☒	☐
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☒	☐
g) Conflict with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒
XVII. UTILITIES AND SERVICE SYSTEMS - Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
XVIII. UTILITIES AND SERVICE SYSTEMS - (cont.):				
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒
XIX. MANDATORY FINDINGS OF SIGNIFICANCE - Would the project:				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulative considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☒	☐	☐	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☒	☐

DISCUSSION OF IMPACTS AND MITIGATION MEASURES

I. AESTHETICS

A. Have a substantial adverse effect on a scenic vista?

B. Substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Less than Significant Impact

Anaheim Lake is approximately 5 miles from State Route 91 (SR-91), which has been designated as a California Scenic Highway.[1] The view of Anaheim Lake from SR-91 is completely obstructed by the surrounding urban development, including residential, commercial, and industrial structures. The proposed project would flatten three small islands in the middle of Anaheim Lake, which are not substantial aesthetic resources or part of substantial viewsheds. Therefore, the proposed project would not have an adverse impact on a scenic vista and would not substantially damage scenic resources within a state scenic highway.

C. Substantially degrade the existing visual character or quality of the site and its surroundings?

Less than Significant Impact

The proposed project would remove three small islands from Anaheim Lake. These islands, due to continual fluctuation of the water table within the lake, possess little aesthetic value. A reconnaissance trip to the site by ESA[2] confirmed that vegetation on the islands is disturbed, non-native, and ruderal with dead and dying trees. A less-than-significant impact is expected to the visual character of the site.

D. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

No Impact

The proposed project would not create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area. No new lighting or reflective surfaces would result due to the implementation of the proposed project. Therefore, there would be no impact.

II. AGRICULTURAL RESOURCES

A. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

B. Conflict with existing zoning for agricultural use, or a Williamson Act contract?

C. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?

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1 Information accessed at the Caltrans website (http://www.dot.ca.gov/hq/LandArch/scenic_highways/).

2 Reconaissance of Anaheim Lake conducted March 2005 by Jennifer Jacobus of ESA.

No Impact

Anaheim Lake is located in an urban commercial/industrial area. There are no agricultural lands at or adjacent to the proposed project site, and the site is not zoned for agriculture or included in a Williamson Act contract. No impact would occur.

III. AIR QUALITY

A. Conflict with or obstruct implementation of the applicable Air Quality Attainment Plan?

No Impact

The Air Quality Management Plan (AQMP) prepared by the South Coast Air Quality Management District (SCAQMD) in 2003 (currently being reviewed by EPA) identifies construction equipment (off-road mobile source emissions) as an increasing contributor to air pollution. The AQMP includes a control strategy that would allow the SCAQMD to adopt rules requiring that existing heavy-duty construction equipment obtain emissions control retrofits. These rules have not yet been developed or adopted. The construction equipment used to construct the proposed project would be required, under existing SCAQMD Rules, to comply with existing emissions standards. Compliance with SCAQMD stationary source permitting Rules would ensure that the project was consistent with the AQMP prepared by the SCAQMD. No impacts are anticipated.

B. Violate any air quality standard or contribute to an existing or projected air quality violation?

C. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?

D. Expose sensitive receptors to substantial pollutant concentrations?

Potentially Significant Impact

Construction-related activities would add air pollutants to the regional air basin, which is already in violation of state and federal air quality standards. Construction emissions could exceed thresholds of significance. The EIR will analyze project-related construction to air quality significance thresholds established by the SCAQMD. The EIR will also analyze the project’s impact on surrounding sensitive receptors such as residential neighborhoods and schools.

E. Create objectionable odors affecting substantial number of people?

Less than Significant Impact

Construction of the proposed project could create temporary objectionable odors due to the combustion of diesel fuels in heavy construction equipment. However, this impact would be temporary and intermittent and the nearest sensitive receptor is 400 feet away. Therefore, a less-than-significant impact is anticipated.

IV. BIOLOGICAL RESOURCES

A. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or

regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Potentially Significant Impact

The proposed project would remove existing vegetation on the islands that may provide nesting habitat for birds. The EIR will evaluate nesting habitat at the lake and potential Migratory Bird Treaty Act (MBTA) concerns.

B. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?
C. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?
D. Interfere substantially with the movement of any native resident or migratory fish or wildlife corridors, or impede the use of native wildlife nursery sites?
E. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?
F. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan?

No Impact

The project would not result in a linear feature or other feature that could substantially impede the movement of wildlife. The trees that would be removed on the islands are not protected by local ordinance. The vegetation on the islands are not sensitive riparian communities or protected wetlands. The project does not lie within an area under the jurisdiction of a Habitat Conservation Plan, Natural Community Conservation Plan, or other conservation plan. Therefore, there would be no impact.

V. CULTURAL RESOURCES

A. Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?

No Impact

The project would not demolish any existing structures, historic or otherwise. Therefore, there would be no impact.

B. Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to §15064.5?
C. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Potentially Significant Impact

The proposed project would involve excavating the existing islands and spreading the material uniformly on the bottom of the lake. It is possible, although unlikely, that the islands may contain previously unknown archaeological or paleontological resources. Given the proximity of the project area to previously identified prehistoric resources, the area has a moderate to high potential for encountering previously unidentified prehistoric materials. This potential impact will be further addressed in the EIR.

D. Disturb any human remains, including those interred outside of formal cemeteries?

No Impact

It is unlikely that any human remains would be unearthed by the construction of the proposed project. However, in the event that human remains were discovered, construction would immediately cease, all construction personnel would be instructed by the construction foreman to leave the project site until the remains were removed and clearance to return to the site was granted by the local authorities. Local authorities and the Orange County Sheriff Coroners office would be notified and asked to assist in the removal of the remains.

VI. GEOLOGY AND SOILS

A. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

- **i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.**
- **ii) Strong seismic ground shaking?**
- **iii) Seismic-related ground failure, including liquefaction?**
- **iv) Landslides?**

No Impact

The proposed project is not located within Alquist-Priolo Earthquake Fault Zone and would be subject to seismic impact similar to the existing condition. The proposed project site’s topography is relatively flat and, thus, the project site would not likely be subject to seismic ground failure, including liquefaction and landslides. Therefore, there would be no impact.

B. Result in substantial soil erosion or the loss of topsoil?

No Impact

The proposed project would not result in substantial erosion or loss of topsoil from the site. The material from the excavated islands would be redistributed on site on the lake bottom. No impact is expected.

C. Be located on strata or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

D. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property?

No Impact

Soils underlying Anaheim Lake have reached maximum saturation and experience little expansion/contraction. Water levels in Anaheim Lake fluctuate depending on the volume and rate of water diversion to the lake. The substrate is a highly-permeable sandy soil with low shrink-swell potential. The soil that underlies Anaheim Lake is not unstable or expansive soil. In addition, no structures would be built as a result of the project. Therefore, there would be no risk to life or property.

E. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

No Impact

The proposed project would not involve the use of septic tanks. The nature of the proposed project does not necessitate the need for septic tanks. Therefore, there would be no impacts.

VII. HAZARDS AND HAZARDOUS MATERIALS

A. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?
B. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?
C. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?
D. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

No Impact

The project would not involve the generation or storage of hazardous materials or wastes and is not located on a site pursuant to Government Code Section 65962.5. Therefore, there would be no impact.

E. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?
F. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

No Impact

The project site is not located within the immediate vicinity of any airport or private airstrip. The nearest airport to the project site, John Wayne International Airport, is located over 15 miles south of the project site. The proposed project would not result in a safety hazard for the people working in the project area or visiting the project site. There would be no impact.

G. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

No Impact

All project staging and construction would occur within OCWD property at Anaheim Lake and would not require temporary closures of adjacent streets. Other than the initial delivery of heavy construction equipment to the site and removal of said equipment after completion of the project, no materials would need to be delivered to the site or hauled from the site. Therefore, there would be no impact.

H. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

No Impact

The proposed project is not located adjacent to wildlands or near a substantial amount of dry brush that could expose people to wildfire risks. Anaheim Lake is surrounded by industrial structures and paved surfaces. There would be no impact.

VIII. HYDROLOGY AND WATER QUALITY

A. Violate any water quality standards or waste discharge requirements?

Potentially Significant Impact

The project would require the use of heavy earthmoving equipment, exposing substantial quantities of soil and construction debris to storm water runoff. The activities would be similar to the District's existing lakebed cleaning operations, which involves heavy equipment moving soils at the bottom of a lakebed. The District would be required to prepare a Storm Water Pollution Prevention Plan (SWPPP) to obtain coverage under the state-wide construction storm water discharge permit. The SWPPP would detail best management practices (BMPs) to minimize runoff. This issue will be further addressed in the EIR.

B. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there should be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Beneficial Impact

The purpose of the proposed project is to reconfigure the Anaheim Lake bottom in order to increase groundwater recharge rates. Therefore, the project would enhance, not deplete, groundwater supplies and groundwater recharge. A net beneficial impact is anticipated.

C. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

D. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

E. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems?

F. Otherwise substantially degrade water quality?

G. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

H. Place housing within a 100-year flood hazard area structures which would impede or redirect flood flows?

I. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

J. Inundation of seiche, tsunami, or mudflow?

No Impact

Anaheim Lake is an artificial recharge basin fed by water diversion pipelines. The proposed project would not affect drainage or alter the course of a river or stream. The island excavation would occur within the boundaries of the lake and all runoff is expected to be contained within the dry lakebed. The project site is located in an area designated as the 100-year flood plain; however, construction and operation activities associated with the proposed project would not subject people or structures to flooding, dam failure, tsunami, mudflow, or seiche wave impacts. No impacts are anticipated.

IX. LAND USE AND PLANNING

A. Physically divide an established community?

No Impact

The proposed project is not a linear feature that could potentially divide an established community. There would be no impact.

B. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Less than Significant Impact

Anaheim Lake is designated for Water Uses in the City of Anaheim's General Plan Land Use Element. Therefore, the proposed project would not conflict with any applicable land use plan, policy, or regulation. However, during construction, the lake would not be available for recreational use for six months during two consecutive summers. Recreational activities would resume once the lake is refilled and restocked with fish. This would be considered a short-term significant impact.

C. Conflict with any applicable habitat conservation plan or natural communities' conservation plan?

No Impact

There are no applicable habitat conservation plans or natural communities' plans for the project vicinity. Therefore, there would be no impact.

X. MINERAL RESOURCES

A. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

B. Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

No Impact

The proposed project would not result in the loss of availability of any mineral resource that would be of future value.[3] There are no known mineral resources within the proposed project site. Therefore, there is no potential for impacts.

XI. NOISE

A. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

B. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

D. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Less than Significant Impact

Construction activities associated with the proposed project could increase noise levels in and around the construction site. Construction activities would include the use of heavy equipment for ground clearing and earth moving. Construction noise levels would fluctuate depending on the particular type, number, and duration of use of construction equipment.

3 Orange County General Plan, Resources Element, 2000.

Ground clearing activities would result in an average noise level of 84 dBA at 200 feet from the construction activities.[4] This noise level would be attenuated to approximately 78 dBA at 400 feet, which is the distance to the closest sensitive receptor from the site. The noise would be further attenuated due to intervening geographic feature. Additionally, the proposed project would comply with the City of Anaheim Noise Ordinance, which states that "sound created by construction or building repair of any premises within the City shall be exempt from application of this chapter during the hours of 7:00 am and 7:00 pm." Therefore, a less-than-significant impact is anticipated.

C. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

No Impact

Operation of the proposed project would not permanently increase ambient noise levels in the project vicinity. The project would not create any structures or permanently place any equipment that would generate noise. Therefore, there would be no impact.

E. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport of public use airport, would the project expose people residing or working in the project area to excessive noise levels?
F. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No Impact

The project is not an airport-related project and the project site is greater than two miles from any public or private airport. No impact is anticipated.

XII. POPULATION AND HOUSING

A. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?
B. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?
C. Displace substantial numbers of people necessitating the construction of replacement housing elsewhere?

No Impact

The proposed project would remove three small islands from Anaheim Lake and would spread the material over the lake bottom. These activities are not growth inducing and would not displace any housing or people. Therefore, there would be no impact.

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4 Bolt, Baranek, and Newman, *Noise form Construction Equipment and Operations, Building Equipment, and Home Appliances*, 1971.

XIII. PUBLIC SERVICES

A. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

Fire protection?
Police protection?
Schools?
Other public facilities?

Less than Significant Impact

The proposed project would cut down three small islands in the middle of Anaheim Lake and would spread the material over the lake bottom. These activities are not growth inducing and the project activities would not affect any facilities; therefore, this project would not impact fire protection, police protection, schools, or other facilities.

Parks?

Less than Significant Impact

Anaheim Lake functions as a recreational facility. Public usage of this facility would be temporarily disrupted during project construction. Recreational activities would resume once construction is completed and the lake is refilled and restocked with fish. The disruption would be similar to the outages caused by routine maintenance. A less than significant impact is anticipated.

XIV. RECREATION

A. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

B. Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?

No Impact

The proposed project would not increase demand for neighborhood or regional parks. The proposed project involves the movement of material within the lake, would not require the construction of additional recreational facilities, and thus is not growth inducing. No impact is anticipated.

XV. TRANSPORTATION / TRAFFIC

A. Cause an increase in traffic, which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?
B. Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?
E. Result in inadequate emergency access?
F. Result in inadequate parking capacity?

Less than Significant Impact

Implementation of the proposed project would not increase traffic trips or alter levels of service at local intersections. Construction staging and activities would remain completely on OCWD property. Except for delivery and removal of construction equipment, the proposed project would not require the hauling of material to or from the project site. Construction employees would utilize local roads to get to and from Anaheim Lake, but this condition would be temporary and their numbers would be minimal. Parking for construction employees would be available on-site. The proposed project construction and operation would not affect emergency access. A less-than-significant impact is anticipated.

C. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?
D. Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

No Impact

The project would not alter air traffic patterns. The project would not alter the current roadway designs. No impact is expected.

G. Conflict with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks)?

No Impact

The project would not conflict with adopted City policies supporting alternative transportation. The project will comply with applicable plans, programs, and policies affecting alternative transportation. Therefore, no significant impacts are anticipated.

XVI. UTILITIES AND SERVICE SYSTEMS

A. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?
B. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

C. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

D. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

E. Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

F. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

G. Comply with federal, state, and local statutes and regulations related to solid waste?

No Impact

The proposed project would not require waste discharge requirements and would not increase water consumption. The project would not require new water supplies or increased capacity and would not increase solid waste capacity needs. Construction and demolition debris would not be generated, as all materials would remain in the lake, and there would be no need to haul debris to a local landfill. The project would not affect regional utilities and there would be no impact.

XVII. MANDATORY FINDINGS OF SIGNIFICANCE

A. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

Potentially Significant Impact

The proposed project would move material in the lake and would not degrade the quality of the environment as to result in significant impacts to sensitive species. However, cultural resources are known to exist near the proposed project site could occur at the project site. Loss, destruction, or alteration of a cultural resource as a result of the project would be considered a potentially significant impact. This issue will be further addressed in the EIR.

B. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulative considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Potentially Significant Impact

The EIR will evaluate the proposed project's contribution to cumulative impacts to regional resources. The EIR will identify planned projects that together with the existing conditions make up the cumulative baseline condition.

C. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Potentially Significant Impact

Construction impacts to air quality could affect nearby residents, which necessitate further evaluation in an EIR.

Appendix I-2
Santiago Creek Expanded Recharge Project, Initial Study

INITIAL STUDY CHECKLIST

The following Environmental Checklist and discussion of potential environmental effects were completed in accordance with Section 15063(d)(3) of the CEQA Guidelines to determine if the project may have any significant effect on the environment.

A brief explanation is provided for all determinations. A "No Impact" or "Less than Significant Impact" determination is made when the project will not have any impact or will not have a significant effect on the environment for that issue area based on a project-specific analysis.

CEQA ENVIRONMENTAL CHECKLIST FORM AND INITIAL STUDY

1. Project Title: Santiago Creek Expanded Recharge Project

2. Lead Agency Name and Address: Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708

3. Contact Person and Phone Number: Craig Miller, Assistant General Manager

4. Project Location: Orange, CA

5. Project Sponsor's Name and Address: Orange County Water District
10500 Ellis Avenue
Fountain Valley, CA 92708

6. General Plan Designation: Open space (park) (OS-P)

7. Zoning: Recreation Open Space (R-O)

8. Description of Project:

The Orange County Water District is proposing to install approximately 1,500 linear feet of 36-inch diameter pipeline below a concrete-lined portion of Santiago Creek as it traverses Hart Park in Orange, CA; the concrete area is used as parking for the park. The creek traverses soils with high percolation capacity. The District currently pumps water from Santiago Basin into Santiago Creek upstream of Hart Park at a rate of 15 cubic feet per second (cfs). The water percolates into the groundwater aquifer before reaching the park. The proposed project would allow the District to discharge water up to 30 cfs into Santiago Creek without flooding the parking area for the park. Installation of the pipeline would require construction activities within portions of Santiago Creek, the excavation of a trench to a depth of approximately 10 to 15 feet, and the removal and disposal of up to 1,500 cubic yards of soil. The project would require approximately six months to complete and would add approximately 3,000 acre-feet per year (afy) of recharge capacity to the creek.

9. Surrounding Land Uses and Setting:

Surrounding land uses include a mixture of residential and commercial land uses.

10. Other agencies whose approval is required (i.e., permits, financing, or participation agreement:

City of Orange	Encroachment permit
U.S. Army Corp of Engineers	Clean Water Act, Section 404 permit
Santa Ana Regional Water Quality Control Board	Clean Water Act, Section 401 certification
	Statewide construction storm water discharge permit (SWPPP)
California Department of Fish & Game	Streambed Alteration Agreement

Environmental Factors Potentially Affected:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a “Potentially Significant Impact” as Indicated by the checklist on the following pages:

☐ Aesthetics	☐ Agriculture Resources	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☒ Geology / Soils
☒ Hazards & Hazardous Materials	☒ Hydrology / Water Quality	☐ Land Use / Planning
☐ Mineral Resources	☒ Noise	☐ Population / Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities / Service Systems	☒ Mandatory Findings of Significance	

DETERMINATION: (To be completed by lead agency)
On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☒ I find that the proposed project MAY have a “potentially significant impact” or “potentially significant unless mitigated” impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

______________________________	______________________________
Signature	Date
Craig Miller, Assistant General Manager	______________________________
Printed Name	For

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
I. AESTHETICS--Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒
II. AGRICULTURE RESOURCES-- In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. **Would the project:**				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒
III. AIR QUALITY-- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. **Would the project:**				
a) Conflict with or obstruct implementation of the applicable Air Quality Attainment Plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute to an existing or projected air quality violation?	☒	☐	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?	☒	☐	☐	☐

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
III. AIR QUALITY--(cont.):				
d) Expose sensitive receptors to substantial pollutant concentrations?	☒	☐	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐
IV. BIOLOGICAL RESOURCES--Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☒	☐	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒
V. CULTURAL RESOURCES--Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☒	☐	☐	☐
b) Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to §15064.5?	☒	☐	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☒	☐	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
VI. GEOLOGY AND SOILS--Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☒	☐
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☒	☐	☐	☐
c) Be located on strata or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
VII. HAZARDS AND HAZARDOUS MATERIALS--Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☒	☐	☐	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☒	☐	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
VII. HAZARDS AND HAZARDOUS MATERIALS--(cont):				
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒
VIII. HYDROLOGY AND WATER QUALITY--Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☒	☐	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there should be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☒	☐	☐	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
VIII. HYDROLOGY AND WATER QUALITY -- (cont.)				
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation of seiche, tsunami, or mudflow?	☐	☐	☐	☒
IX. LAND USE AND PLANNING--Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c) Conflict with any applicable habitat conservation plan or natural communities' conservation plan?	☐	☐	☐	☒
X. MINERAL RESOURCES--Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☒	☐
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☒	☐
XI. NOISE--Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☒	☐	☐	☐

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
XI. NOISE--(cont.)				
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☒	☐	☐	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport of public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
XII. POPULATION AND HOUSING--Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
XIII. PUBLIC SERVICES:				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☒	☐
Other public facilities?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
XIV. RECREATION:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?	☐	☐	☐	☒
XV. TRANSPORTATION/TRAFFIC--Would the project:				
a) Cause an increase in traffic, which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?	☐	☐	☒	☐
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☒	☐
f) Result in inadequate parking capacity?	☐	☐	☒	☐
g) Conflict with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒
XVI. UTILITIES AND SERVICE SYSTEMS--Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
XVI. UTILITIES AND SERVICE SYSTEMS--(cont.):				
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒
XVII. MANDATORY FINDINGS OF SIGNIFICANCE-- Would the project:				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulative considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☒	☐	☐	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☐	☐

DISCUSSION OF IMPACTS AND MITIGATION MEASURES

I. AESTHETICS

A. Have a substantial adverse effect on a scenic vista?
B. Substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?
C. Substantially degrade the existing visual character or quality of the site and its surroundings?

No Impact

The proposed project site is over 5 miles from State Route 91 (SR-91), which is a California Scenic Highway.[1] From SR-91, the view of Hart Park is completely obstructed by substantial urban development, including numerous multi-story buildings of varying heights and residential, commercial, and industrial structures. Construction equipment would temporarily affect the visual character of Hart Park; however, the completed project pipeline would be buried underground and would not obstruct or block adjacent viewsheds. The proposed project would not have a significant impact on a scenic vista, would not substantially damage scenic resources within a state scenic highway, and would not permanently degrade the existing visual character or quality of the site. Therefore, there would be no impact to aesthetic resources.

D. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

No Impact

The proposed project would not create a new source of substantial light or glare that could adversely affect day or nighttime views in the area. No new lighting or reflective surfaces would result due to the implementation of the proposed project. Therefore, there would be no impact.

II. AGRICULTURAL RESOURCES

A. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?
B. Conflict with existing zoning for agricultural use, or a Williamson Act contract?
C. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?

No Impact

Hart Park is surrounded by a highly urbanized area, dominated by residential land uses. There are no agricultural lands at or adjacent to the proposed project site, and the site is not zoned for

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1 Information accessed at the Caltrans website (http://www.dot.ca.gov/hq/LandArch/scenic_highways/).

agriculture or included in a Williamson Act contract. Therefore, there would be no impact to agricultural resources.

III. AIR QUALITY

A. Conflict with or obstruct implementation of the applicable Air Quality Attainment Plan?

No Impact

The Air Quality Management Plan (AQMP) prepared by the South Coast Air Quality Management District (SCAQMD) in 2003 (currently being reviewed by EPA) identifies construction equipment (off-road mobile source emissions) as an increasing contributor to air pollution. The AQMP includes a control strategy that would allow the SCAQMD to adopt rules requiring that existing heavy-duty construction equipment obtain emissions control retrofits. These rules have not yet been developed or adopted. The construction equipment used to construct the proposed project would be required, under existing SCAQMD Rules, to comply with existing emissions standards. Compliance with SCAQMD stationary source permitting Rules would ensure that the project was consistent with the AQMP prepared by the SCAQMD. No impacts are anticipated.

B. Violate any air quality standard or contribute to an existing or projected air quality violation?
C. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?
D. Expose sensitive receptors to substantial pollutant concentrations?

Potentially Significant Impact

Once completed, the proposed project will not significantly affect air quality. However, construction-related activities would add air pollutants to the regional air basin, which is already in violation of state and federal air quality standards. Construction emissions could exceed thresholds of significance. The EIR will analyze emissions associated with project construction relative to air quality significance thresholds established by the SCAQMD. The EIR will also analyze the project’s impact on surrounding sensitive receptors such as residential neighborhoods and schools.

E. Create objectionable odors affecting substantial number of people?

Less than Significant Impact

Construction of the proposed project could create temporary objectionable odors due to the combustion of diesel fuels in heavy construction equipment. However, this impact would be temporary and intermittent. Therefore, a less-than-significant impact is anticipated.

IV. BIOLOGICAL RESOURCES

A. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Potentially Significant Impact

Santiago Creek in the vicinity of Hart Park contains mostly non-native grasses and vegetation, some riparian and wetland vegetation, and wildlife that are tolerant of human disturbance. The proposed project could encourage additional growth of native riparian vegetation and could affect potential nesting and foraging habitat for sensitive species. These issues will be further addressed in the EIR.

B. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

C. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Potentially Significant Impact

Increasing the flow in Lower Santiago Creek from an intermittent 15 cubic feet per second (cfs) to a constant 30 cfs could affect existing vegetation and encourage the development of riparian habitat. Some native plant species and communities could be significantly affected by the persistent flow. In addition, desert wash habitat could be displaced by invasive plant species, such as *Arundo donax*, with additional access to water. These issues will be further addressed in the EIR.

Santiago Creek qualifies as an intermittent stream and as "Waters of the U.S." and, therefore, is under the jurisdiction of the U.S. Army Corps of Engineers (USACE) and the California Department of Fish & Game (CDFG). Construction of the proposed bypass pipeline under Hart Park would directly alter the streambed and thus require a Section 404 permit from USACE, a Section 401 certification from SARWQCB, and a Streambed Alteration Agreement from CDFG. This issue will be further addressed in the EIR.

D. Interfere substantially with the movement of any native resident or migratory fish or wildlife corridors, or impede the use of native wildlife nursery sites?

E. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

F. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan?

No Impact

The proposed project would not result in an aboveground linear feature or other feature that could substantially impede the movement of wildlife. The proposed project does not lie within an area under the jurisdiction of a Habitat Conservation Plan, Natural Community Conservation Plan, or other conservation plan or local ordinance that protects biological resources. Therefore, there would be no impact.

V. CULTURAL RESOURCES

A. Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?

Potentially Significant Impact

The parking lot within Hart Park was installed over 50 years ago. The sidewalls of the creek have some architectural uniqueness that could be of historic value, and removal or alteration of these structures may result in a significant impact to historical resources. This issue will be further addressed in the EIR.

B. Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to §15064.5?
C. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Potentially Significant Impact

It is possible that the project site may contain previously unknown archaeological or paleontological resources. This potential impact will be further addressed in the EIR.

D. Disturb any human remains, including those interred outside of formal cemeteries?

No Impact

It is unlikely that any human remains would be unearthed by the construction of the proposed project. However, in the event that human remains were discovered, construction would immediately cease, all construction personnel would be instructed by the construction foreman to leave the project site until the remains were removed and clearance to return to the site was granted by the local authorities, and the local authorities and the Orange County Sheriff Coroners office would be notified and asked to assist in the removal of the remains.

VI. GEOLOGY AND SOILS

A. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
- **i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.**
- **ii) Strong seismic ground shaking?**
- **iii) Seismic-related ground failure, including liquefaction?**
- **iv) Landslides?**

Less than Significant Impact

The proposed project site is not located within an Alquist-Priolo Earthquake Fault zone. However, the proposed pipeline could be subject to ground shaking and ground failure such as liquefaction due to seismic activity on any regional faults. The pipeline would be construction to withstand seismic hazards pursuant to the Uniform Building Code (UBC). The proposed project would not increase liquefaction or landslide hazards for neighboring residents. Therefore, a less-than-significant impact is anticipated.

B. Result in substantial soil erosion or the loss of topsoil?

Potentially Significant Impact

The proposed project would increase the amount of flow within the creek from an intermittent 15 cfs to a constant 30 cfs and, as a result, may cause soil erosion or increase sediment transport within the creek. This issue will be further discussed in the EIR.

C. Be located on strata or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

D. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property?

Less than Significant Impact

Santiago Creek contains highly-porous, sandy soils that have low shrink-swell potential but could be subject to liquefaction during strong ground shaking events. Liquefaction within the creek would not compromise the integrity of the creek bed or the pipeline. The pipeline would be constructed to withstand seismic activity pursuant to the UBC. The proposed project involves no structures other than replacement of the parking lot pavement, and poses minimal risks to life or property.

E. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

No Impact

The proposed project would not involve the use of septic tanks. The nature of the proposed project does not necessitate the need for septic tanks. Therefore, there would be no impacts.

VII. HAZARDS AND HAZARDOUS MATERIALS

A. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

B. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

Potentially Significant Impact

During construction of the proposed bypass pipeline, contaminated soil could be encountered during excavation and could release hazardous contaminants into the creek. Additionally, construction activities would require the use of heavy machinery in the creek bed. Any seepage from engines or fuel spills during fueling operations could contaminate soil in the creek. These issues will be further addressed in the EIR

C. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

No Impact

The proposed project site is not currently within 0.25 mile of an existing or proposed school. Therefore, there would be no impact.

D. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

No Impact

Operation of the project would not involve the generation or storage of hazardous materials or wastes and is not located on a site pursuant to Government Code Section 65962.5. There would be no impact.

E. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

F. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

No Impact

The project site is not located within the immediate vicinity of any airport or private airstrip. The nearest airport to the project site, John Wayne International Airport, is located over 10 miles south of the project site. The proposed project would not result in a safety hazard for the people working in the project area or visiting the project site. There would be no impact.

G. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

Less Than Significant

All project staging and construction would occur in and around Hart Park, off of local access roads and would not require temporary closures of adjacent streets. If temporary lane or road closures were necessary during delivery or removal of construction equipment or materials, contractors would prepare traffic control plans to provide alternative emergency routes and detours. A less-than-significant impact is anticipated.

H. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

No Impact

The proposed project is not located adjacent to wildlands or near a substantial amount of dry brush that could expose people to wildfire risks. Any dead vegetation present at the park is removed by City workers and the park is also maintained by them. There would be no impact.

VIII. HYDROLOGY AND WATER QUALITY

A. Violate any water quality standards or waste discharge requirements?

Potentially Significant Impact

The project would require the use of heavy earthmoving equipment, exposing substantial quantities of soil and construction debris to storm water runoff. The District would be required to prepare a Storm Water Pollution Prevention Plan (SWPPP) to obtain coverage under the state-wide NPDES construction storm water discharge permit. The SWPPP would detail best management practices (BMPs) to minimize runoff. This issue will be further addressed in the EIR.

B. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there should be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Beneficial Impact

The proposed project would increase the District’s maximum water diversion capacity to Santiago Creek by 15 cfs, which would increase groundwater recharge rates. The project would increase, not deplete, groundwater supplies, which would result in a net beneficial impact.

C. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

Potentially Significant Impact

The proposed project would increase the District’s maximum water diversion capacity to Santiago Creek by 15 cfs. The project would not change the drainage pattern of Santiago Creek. All water diverted to the creek for groundwater recharge would percolate before reaching the confluence with the Santa Ana River. The project would increase flow in the creek, however, which may result in erosion or increased sediment transport downstream. This issue will be further addressed in the EIR.

D. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

E. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems?

F. Otherwise substantially degrade water quality?

G. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

H. Place housing within a 100-year flood hazard area structures which would impede or redirect flood flows?

I. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

J. Inundation of seiche, tsunami, or mudflow?

No Impact

The proposed project would not increase the rate of surface runoff because the project would not increase the amount of impervious surfaces within the project vicinity. Similarly, the proposed project would not contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems because all water diverted to the creek for groundwater recharge would percolate before reaching the confluence with the Santa Ana River. As the project site is a creek, the site is located within an area designated as 100-year or 500-year flood plain; however, construction and operation activities associated with the proposed project would not subject people or structures to flooding, dam failure, tsunami, mudflow, or seiche wave impacts. No impacts are anticipated.

IX. LAND USE AND PLANNING

A. Physically divide an established community?

No Impact

The proposed project would not physically divide an established community as the project area is not an aboveground or linear feature that could potentially divide a community. There would be no impact.

B. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Less than Significant Impact

The Santiago Creek site is designated as Open Space (Park) in the City of Orange's General Plan Land Use Element. Therefore, the proposed project would not conflict with any applicable land use plan, policy, or regulation. However, during construction, the Hart Park parking lot would not be available, thus restricting recreational access. This would be a short-term impact. Access to the parking lot would resume after pipeline construction is completed and the parking lot is repaved. A less-than-significant impact is anticipated.

C. Conflict with any applicable habitat conservation plan or natural communities' conservation plan?

No Impact

There are no applicable habitat conservation plans or natural community conservation plans for the project vicinity. Therefore, there would be no impact.

X. MINERAL RESOURCES

A. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?
B. Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

Less Than Significant Impact

Santiago Creek is designated as a mineral resource for aggregate material. The Santiago Pits now used as recharge basins were created by mineral extraction activities. The County and City of Orange approve land uses in the area, including assigning areas for mineral extraction. There are no plans by the City or County to conduct aggregate mining in the lower Santiago Creek. Increasing flow in the creek from 15 cfs to 30 cfs would not affect future land use decisions or obstruct extraction of mineral resources. A less-than-significant impact is anticipated.

XI. NOISE

A. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
B. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?
D. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Potentially Significant Impact

Construction activities associated with the proposed project could intermittently generate high noise and vibration levels at and adjacent to the construction site. Construction activities would include the use of heavy construction equipment for pavement demolition, excavation, and earth moving activities. Construction noise levels would fluctuate depending on the particular type, number, and duration of use of construction equipment. This issue will be further addressed in the EIR.

C. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

No Impact

Operation of the proposed project would not permanently increase ambient noise levels in the project vicinity other than an increase in the sound of rushing water. The project would not create any structures or permanently place any equipment that would generate noise. Therefore, there would be no impact.

E. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport of public use airport, would the project expose people residing or working in the project area to excessive noise levels?

F. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No Impact

The project is not an airport-related project and the project site is more than two miles from any public or private airport. No impact is anticipated.

XII. POPULATION AND HOUSING

A. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

B. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

C. Displace substantial numbers of people necessitating the construction of replacement housing elsewhere?

No Impact

The proposed project would not increase the District's maximum water diversion capacity to Santiago Creek from 15 cfs to 30 cfs and increase groundwater recharge capacity by 3,000 afy. These activities would not displace any housing or people and are not growth inducing. The District is responsible for the sustainability of the Orange County groundwater basin, which currently is in an overdraft condition. Increasing recharge would not impact population or housing.

XIII. PUBLIC SERVICES

A. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

Fire protection?
Police protection?
Schools?
Other public facilities?

No Impact

The District is responsible for ensuring a sustainable water supply, and the Orange County groundwater basin is currently in an overdraft condition. The proposed project would increase the District's groundwater recharge capacity by 3,000 afy. Replenishment of groundwater supplies is not a growth inducing activity because it does not directly facilitate increases in development. Therefore, the project would not require additional public services or facilities, and there would be no impact.

Parks?

Less than Significant Impact

Hart Park is a recreational facility, Construction of the proposed project would temporarily disrupt the parking lot and restrict public access to this facility. This is a short-term impact; access to parking at Hart Park would resume after completion of the proposed construction. A less-than-significant impact is anticipated.

XIV. RECREATION

A. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?
B. Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?

No Impact

The proposed project would not increase demand for neighborhood or regional parks, which is often the case with residential projects or other development projects that create a permanent increase in the number of people in a particular areas. In this case, the project entails the increased flow in the creek, is not growth inducing, and would not require the construction of additional facilities. Therefore, the project would have no impact on recreational facilities.

XV. TRANSPORTATION / TRAFFIC

A. Cause an increase in traffic, which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?
B. Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?
E. Result in inadequate emergency access?
F. Result in inadequate parking capacity?

Less than Significant Impact

The proposed project would not increase traffic or appreciably alter the level of service at local intersections, roads, or highways. However, pipeline construction would temporarily affect parking and through traffic. The District would need to obtain an encroachment permit from the City of Orange. The permit would include a traffic control plan and a temporary parking location during construction. Once the pipeline is installed, parking and traffic would no longer be affected. Therefore, a less-than-significant impact is anticipated.

C. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

D. Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

No Impact

The project would not alter air traffic patterns. The project would not alter the current roadway designs. No impact is expected.

G. Conflict with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks)?

No Impact

The project would not conflict with adopted City policies supporting alternative transportation. The project will comply with applicable plans, programs, and policies affecting alternative transportation. Therefore, no significant impacts are anticipated.

XVI. UTILITIES AND SERVICE SYSTEMS

A. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

B. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

C. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

D. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

E. Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

G. Comply with federal, state, and local statutes and regulations related to solid waste?

No Impact

The proposed project would not require waste discharge requirements and would not require construction of new water, wastewater, or storm water treatment facilities. The project would not require new or increased water supplies and would not increase solid waste capacity needs. The project would comply with federal, state, and local statutes and regulations related to solid waste. Therefore, there would be no impact.

F. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

Less than Significant Impact

Waste soils would be generated during the excavation and construction of the proposed bypass pipeline. Waste soils would be hauled off site to an appropriate disposal facility. The quantity of waste soils generated as a result of the proposed project would be minimal relative to the capacity of local disposal sites. Therefore, a less-than-significant impact is anticipated.

XVII. MANDATORY FINDINGS OF SIGNIFICANCE

A. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

Potentially Significant Impact

The proposed project could affect riparian or wetland habitats that could support sensitive plant or animal species. The proposed project also could destroy or alter cultural resources. These issues will be further addressed in the EIR.

B. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulative considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Potentially Significant Impact

The EIR will evaluate the project's contribution to cumulative impacts to regional resources. The EIR will identify planned projects that together with the existing conditions make up the cumulative baseline condition.

C. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Potentially Significant Impact

Construction impacts to air quality, noise, water quality, and the potential to unearth hazardous materials at the site could affect nearby residents, which necessitate further evaluation in an EIR.

Appendix J
Santa Ana River Watershed Cumulative Impact Analysis

APPENDIX J

Santa Ana River Watershed Cumulative Impact Analysis

Summary

This appendix provides a summary of cumulative impacts identified by diversion applicants within the Santa Ana River (SAR) watershed. **Table J-1** compiles a list of cumulative impact conclusions identified for four reaches of the SAR: the first three columns cover the segments of the river above Prado Basin (See Figure 4.2-4): Seven Oaks Dam to the RIX facility in San Bernardino County; RIX to Prado Basin; and the Chino Basin watershed. Chino Basin includes the San Antonio, Chino and Cucamonga Creeks that join the SAR at Prado Basin. The information regarding cumulative impacts in these three segments of the river has been provided by Muni/Western[1] and the Chino Basin Watermaster Optimum Basin Management Program EIR prepared by IEUA.[2] The District merely reproduces these analyses and makes no representation about their accuracy. The fourth column covers the segment of the river from Prado Basin (including the basin itself) to the Pacific Ocean. The information regarding cumulative impacts in this segment of the river has been provided by Orange County Water District (OCWD).[3]

Table J-1 provides a compilation of conclusions regarding cumulative impacts adopted by four different agencies encompassing four different segments of the SAR watershed. They are provided here to provide a quick reference of the cumulative impact analyses prepared by four agencies that are planning to divert water from the SAR if their water rights applications are approved. This summary of cumulative impacts is provided for information purposes only.

1 San Bernardino Valley Municipal Water District/Western Municipal Water District, Santa Ana River Water Right Application for Supplemental Water Supply Draft EIR, October 2004.

2 Inland Empire Utilities Agency Optimum Basin Management Plan Program EIR, 2001.

3 Orange County Water District Application to Appropriate Santa Ana River Water, Recirculated Draft Program EIR, March 2006.

Table J-1
Cumulative Effects of All Projects

	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
Aesthetics	Cumulative impacts within and adjacent to the Santa Ana River would be temporary during construction of project facilities and less than significant. **(LTS)** Infrequent increases in the duration of higher reservoir elevations during the months of March through September would be the same as for the Project and less than significant. **(LTS)** Increases in the number of dry days in the river from Cuttle Weir to "E" Street and reduced flow from "E" Street to the RIX-Rialto Effluent Outfall would also be less than significant. **(LTS)** (SAR DEIR, 6-48, AE-1 and SAR DEIR, 6-49, AE-2)	Reduce baseflow in the river segment from the RIX and Rialto WWTP Outfall to Riverside Narrows would be a significant aesthetic impact. **(S)** (SAR DEIR 6-51, AE-4) Cumulative impacts associated with growth include conversion of open space to urbanized development. Significant unavoidable cumulative impact. **(S)** (SAR DEIR, 6-50, AE-3)	Since the OBMP has no potential to adversely impact any existing aesthetic qualities in Chino Basin or significant views to or from the basin after implementing mitigation measures, the proposed project cannot contribute to any cumulative adverse aesthetic or visual resource impacts. **(NI)** (OBMP PEIR, 4-444)	Flood control improvements and urbanization have affected the visual character of the SAR downstream of Prado Dam. The cumulative effect of SAR diversions would not affect the existing visual character of the SAR downstream of Prado Dam. An expanded conservation pool would not significantly alter the existing visual character of Prado Basin or add to a cumulatively significant impact to the basin's character. **(LTS)** Off-river storage reservoirs would add to the cumulative degradation of aesthetics in open space areas. Use of open space for reservoirs could add to the regional decline in open space as development encroaches in the region. This would be considered a cumulatively significant impact for regional aesthetics. **(S)** (OCWD DEIR 7-13 and 7-15, C-2)
Agricultural Resources	Cumulative impacts associated with growth include conversion of farmland to some form of urbanized development. Despite general plan policies, significant unavoidable cumulative impacts to agricultural resources would still occur. **(S)** (SAR DEIR, 6-41, AG-2)	Cumulative impacts associated with growth include conversion of farmland to some form of urbanized development. Despite general plan policies, significant unavoidable cumulative impacts to agricultural resources would still occur. **(S)** (SAR DEIR, 6-41, AG-2)	The loss of agricultural land within the southern portion of the Chino Basin has been identified as an unavoidable cumulative impact from transition of the existing agricultural operations to urban uses. The OBMP could contribute to this loss of agricultural activity in a small, but cumulatively significant manner by converting up to 100 acres of agricultural acreage to OBMP program water resource uses. The project's potential contribution to this cumulative impact can be avoided by implementing the proposed mitigation. **(LTS)** (OBMP PEIR, 4-26)	Cumulative impacts of growth to land conversion would not affect agricultural resources downstream of Prado Basin since the area is highly urbanized already. No cumulative impact would occur downstream of Prado Basin. **(NI)**

Table J.
Cumulative Effects of All Projects (con't)

	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
Air Quality	Emissions from construction activities could exceed the daily and calendar quarter air quality standards for the South Coast Air Basin. Daily thresholds for ROC, CO, NOx could be exceeded; calendar quarter thresholds for ROC, CO, NOx, and PM_{10} could be exceeded. Construction near this portion of the river would expose the public to some concentration of TACs. **(S)**	Emissions from construction activities could exceed the daily and calendar quarter air quality standards for the South Coast Air Basin. Daily thresholds for ROC, CO, NOx could be exceeded; calendar quarter thresholds for ROC, CO, NOx, and PM_{10} could be exceeded. **(S)**	Implementation of the OBMP will contribute pollutants into the SCAB from construction and operation of facilities. These facilities are designed to provide an adequate water supply for the land uses and intensities identified in applicable general plans. The AQMD assumes that if growth occurs that is consistent with applicable general plans, then ambient air quality standards can be met. Because this project does not propose amendments to existing general plan land uses, it is in conformity with the AQMD and will not result in significant adverse cumulative air quality impacts. **(LTS)** (OBMP PEIR, 4-295)	Emissions from construction activities of future recharge and storage projects could exceed the daily and calendar quarter air quality standards for the South Coast Air Basin. Cumulative impacts to air quality would be considered significant since air quality is already significantly affected by other activities in the region. Implementation of mitigation measures would minimize emissions. However, the cumulative impact would remain significant. **(S)** (OCWD DEIR 7-11 and 7-14, C-3)
Biology	Repeated loss of native vegetation and temporary effects on common wildlife species due water storage in Seven Oaks reservoir. The cumulative effect would be less than significant and no mitigation is required. (SAR DEIR, 6-32, BIO-1) Direct impacts or habitat modification could affect common species resulting in, an adverse but less than significant impact. **(LTS)** (SAR DEIR, 6-32, BIO-2) Temporary removal of habitat and other construction effects would be a significant cumulative impact on sensitive species, including several state- and or federally listed species. While project-specific mitigations would reduce these impacts the residual impact would be significant. These mitigation measures may not	Growth and other development would impact wetlands and may impact riparian habitats and special status species including state and federally listed species. Despite general plan policies, significant unavoidable cumulative biological resources impacts would still occur. **(S)** (SAR DEIR, 6-36, BIO-7)	No significant biological resource impacts are forecast to occur due to OBMP implementation. If all potential biological impacts are fully mitigated according to all required mitigation ratios established by jurisdictional agencies, then the net cumulative impacts to these resources will be less than significant, and no unavoidable significant adverse impacts to biological resources are forecast to occur as a result of project implementation. **(LTS)** (OBMP PEIR, 4-344)	Since new recharge basins would likely be occurring in previously developed portions of Orange County, no cumulatively significant impacts to biological resources would occur during construction. Operating recharge facilities would have minimal effects to biological resources. Since the recharge basins would have little effect on biological resources, they would not contribute significantly to cumulative impacts to biological resources in the region. **(LTS)** Storage reservoirs constructed in designated conservation lands would add to the cumulative degradation of biological resources in the region as development encroaches upon open space. This would be considered a potential cumulatively significant impact. **(S)**

Table J-1
Cumulative Effects of All Projects (con't)

	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
Biology (cont.)	reduce impacts to sensitive species to a level of less than significant. **(S)** (SAR DEIR, 6-33, BIO-3) Cumulative removal of RAFSS habitat would be significant cumulative impact. While project-specific mitigations would reduce these impacts the residual impact would be significant. Mitigation actions may not fully restore the structure and function of RAFSS in a reasonable timeframe. **(S)** (SAR DEIR, 6-33, BIO-4) Cumulative changes in flow downstream of Seven Oaks Dam would have less than significant cumulative effects on riparian habitat, aquatic habitat, and aquatic species. The cumulative reduction in flow is not expected to impact riparian habitat or associated species. **(LTS)** (SAR DEIR, 6-34, BIO-5) Cumulative reduction in flood flows and a similar reduction in overbank flooding and within-channel upper terrace scour within the upper stretch of the SAR between the Cuttle Weir and areas just downstream of the confluence with Mill Creek would significantly impact the highly sensitive nature of the dominant plant community (RAFSS), and the presence of habitat of several state- and/or federally listed species within the flood reduced area. While project-specific mitigations would reduce these impacts the residual impact would be significant.			Increasing the Prado Dam conservation pool could result in inundation of least Bell's vireo and southwestern flycatcher habitat. Compensation lands provided as mitigation for these project level impacts would ensure that the project would not add to the cumulative reduction in habitat for these sensitive species in the watershed. **(LTS)** (OCWD DEIR 7-11 through 7-15. C-3)
Biology (cont.)	Mitigation actions may not be fully effective			

Table J-1
Cumulative Effects of All Projects (con't)

	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
	in restoring the structure and function of RAFSS either initially or over long timeframes. **(S)** (SAR DEIR, 6-35, BIO-6) Growth and other development would impact wetlands and may impact riparian habitats and special status species including state and federally listed species. Despite general plan policies, significant unavoidable cumulative biological resource impacts would still occur. **(S)** (SAR DEIR, 6-36, BIO-7) Removal of river wash vegetation and habitat, including RAFSS, Plummer's mariposa lily, Parry's spineflower, San Bernardino Kangaroo Rat habitat, and Coastal California Gnatcatcher habitat during construction. Minor changes in non-storm day flows downstream of the point of diversion.[3]			
Cultural and Paleontological Resources	Construction of cumulative projects would cause a significant adverse change in the significance of a historical or archaeological resource, destroy a unique paleonotological resource, or disturb human remains. While project-specific mitigations would reduce these impacts the residual impact may be significant. These mitigation measures may not reduce impacts to a level of less than significant. **(S)** (SAR DEIR, 6-44, CR-1)	Growth and other development would impact cultural resources. Despite the policies and mitigation measures in the San Bernardino County and Riverside County General Plans, significant cumulative impacts to cultural resources could still occur given the potentially large amount of ground disturbance related to growth and development. **(S)** (SAR DEIR, 6-45, CR-2)	Cumulative cultural resource impacts can only occur when such resources are not avoided or are not recovered, evaluated, and their data value placed in the broader contest of such resources. Based on the requirement to ensure that such resources are avoided or otherwise protected and evaluated, no cumulative significant cultural resource impacts are forecast to occur if the OMBP is implemented. **(NI)** (OBMP PEIR, 4-434)	Construction of recharge basins could encounter previously unknown cultural resources. However, with implementation of project-level mitigation, no significant cumulative impacts would occur. **(LTS)** Construction of storage reservoirs could encounter previously unknown cultural resources. However, with implementation of project-level mitigation, no significant cumulative impacts would occur. **(LTS)** (OCWD DEIR 7-12 through 7-14)
Cultural and Paleontological	Growth and other development would impact cultural resources. Despite the			

Table J-1
Cumulative Effects of All Projects (con't)

	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
Resources (cont.)	policies and mitigation measures in the San Bernardino County and Riverside County General Plans, significant cumulative impacts to cultural resources could still occur given the potentially large amount of ground disturbance related to growth and development. **(S)** (SAR DEIR, 6-45, CR-2)			
Geology, Soils and Minerals	Substantial sources of erosion, sedimentation and turbidity may occur during short-term construction activities. Implementation of mitigation measures, erosion, sedimentation, and turbidity would reduce these cumulative impacts to a less than significant level. **(LTS)** (SAR DEIR, 6-19) Construction of division facilities and other related structures in the flood hazard area would be subject to flooding and other dangers. Since these structures would be designed to withstand these hazards this would be a less than significant impact without further mitigation **(LTS)** (SAR DEIR, 6-20) New facilities would be subject to geologic hazards and associated significant impacts. Residual cumulative seismic impacts would be significant and unavoidable, because even with implementation of identified mitigation, substantial damage may still occur during a seismic event. **(S)** (SAR DEIR, 6-37, GEO-1)	**(NI)** No Impact. (??)	Future development in accordance with the OBMP will not cause any significant adverse geologic or soil impacts. With implementation of mitigation measures, the proposed project will not contribute to cumulative exposure of humans in occupied structures to seismic, liquefaction or subsidence hazards. Therefore, no additional mitigation measures are required to ensure that cumulative geologic and soil impacts remain below a significant impact threshold. **(NI)** (OBMP PEIR, 4-87)	Construction of recharge basins would not affect regional geology and soils and would not contribute to cumulatively significant impacts to geologic hazards. **(NI)** (OCWD DEIR 7-12 through 7-14)
Geology, Soils and Minerals (cont.)	Overlapping effects on groundwater levels could locally and intermittently result in significant impacts from the potential for liquefaction if groundwater			

Table J-1
Cumulative Effects of All Projects (con't)

	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
	levels are less than 50 feet from the ground surface. In the absence of a regional groundwater management plan with goals to maintain a safe groundwater level, impacts would be significant and unavoidable, because elevated groundwater levels could not be avoided. **(S)** (SAR DEIR, 6-38, GEO-2) Growth and other development would result in ground disturbance and associated erosion, resulting in adverse impacts to local drainages, creeks, and the Santa Ana River. As a result of existing permit requirements and general plan policies, cumulative impacts would be less than significant. **(LTS)** (SAR DEIR, 6-39, GEO-3)			
Groundwater Hydrology and Water Quality (including groundwater contamination)	Interference with regional groundwater recharge resulting in a net loss of water stored in the SBBA. Because SAR water diversions would not result in a net deficit in aquifer volume, cumulative impacts would be less than significant. **(LTS)** (SAR DEIR, 6-29) Nitrate and TDS concentrations could increase to the point where they would exceed WQOs. Residual cumulative nitrate and TDS impacts would be significant and unavoidable. **(S)** (SAR DEIR, 6-30 & -31)	(??)	(See Surface Water Hydrology and Water Quality)	Excessive recharge could result in groundwater mounding that could adversely affect surface structures. This would be considered a cumulative impact of proposed recharge projects. In addition, impacts to groundwater quality could result depending on source water quality and on existing contamination in surface soils. Mitigation measures for individual recharge projects such as site assessments for new recharge locations and on-going groundwater modeling would reduce cumulative impacts of groundwater mounding and effects to surface structures. Cumulative impacts to

Table J-1
Cumulative Effects of All Projects (con't)

	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
Groundwater Hydrology and Water Quality (including groundwater contamination) (cont.)	Growth and other development would increase water demand, generate urban contaminants, cause a loss of natural recharge areas and could reduce aquifer volume. Despite general plan policies, significant unavoidable cumulative groundwater impacts would still occur. **(S)** (SAR DEIR, 6-31 & -32)			groundwater quality would be less than significant. **(LTS)** (OCWD DEIR 7-12 and 7-13)
Hazardous Materials	Cumulative increase in routine transport, use, and disposal of hazardous materials and waste used during grading and construction could increase risk of hazards through upset and accident conditions involving the release of construction equipment-related hazardous materials into the environment including directly enter local drainages and creeks, including the SAR. With mitigation, residual impacts would be less than significant. **(LTS)** (SAR DEIR, 6-52, HAZ-1) Cumulative projects would locally and intermittently result in Perchlorate, TCE, and PCE plumes moving and affecting wells resulting in a significant impact. Mitigation could reduce impacts however residual impacts would remain significant. **(S)** (SAR DEIR, 6-53, HAZ-2) Impacts related to urban development and growth could result in significant impacts related to hazardous waste use and storage. These impacts would be mitigated to less than significant by local governments implementing existing policies. **(LTS)**	**(NI)** No Impact.(??)	Hazards, risk of upset, and human health impacts within Chino Basin are not forecast to be cumulatively significant and adverse. The proposed project has no identified potential to significantly increase the risk of such impacts beyond current levels. The proposed project will not contribute to any new cumulative adverse impacts. **(NI)** (OBMP PEIR, 4-366)	Recharge basins would not substantially affect the baseline condition for hazards materials. **(NI)** Storage reservoirs would not substantially affect the baseline condition for local public services, utilities, or hazards. **(NI)** (OCWD DEIR 7-12, 7-14, and 7-15)
Hazardous Materials	(SAR DEIR, 6-54, HAZ-3)			

Table J-1
Cumulative Effects of All Projects (con't)

	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
(con't)				
Land Use and Planning	Cumulative changes in groundwater spreading could result in high groundwater levels in specific local areas which could, in turn, limit uses on overlying properties, creating a significant land use impact. Mitigation could reduce impacts however residual impacts would remain significant. **(S)** (SAR DEIR, 6-39, LU-1) Land use impacts associated with growth include incompatibility between existing and future land uses, and the conversion of undeveloped portions of the counties to some form of urbanized development. These impacts would be mitigated to less than significant by local governments implementing existing policies. **(LTS)** (SAR DEIR, 6-40, LU-3)	Land use impacts associated with growth include incompatibility between existing and future land uses, and the conversion of undeveloped portions of the counties to some form of urbanized development. These impacts would be mitigated to less than significant by local governments implementing existing policies. **(LTS)** (SAR DEIR, 6-40, LU-3)	The proposed project has been evaluated as being fully consistent with the Study area's general plans and the OBMP activities are not forecast to contribute to any land use incompatibilities with existing or future uses within the Study area based on implementing identified mitigation measures. **(NI)** (OBMP PEIR, 4-26)	Recharge basins could modify local land uses, but the new facilities would be consistent with local General Plans and would not result in cumulatively significant effects to land uses. **(LTS)** Off-river storage reservoirs may be located in areas currently designated as open space. Use of open space for reservoirs could add to the regional decline in open space as development encroaches in the region. This would be considered a cumulatively significant impact to land use. **(S)** (OCWD DEIR 7-11, 7-13, and 7-15, C-3)
Noise	No Cumulative Impact since there are no noise sensitive resources associated with this portion of the Santa Ana River. **(NI)**	No Cumulative Impact since there are no noise sensitive resources associated with this portion of the Santa Ana River. **(NI)**	The noise forecast data contained in local agency general plans demonstrate that future traffic noise levels from general growth (cumulative traffic increases) within the Chino Basin will result in significant noise impacts. However, the OBMP is not forecast to cause or contribute to such cumulative noise impacts. Any traffic generated by OBMP operations is considered a *de minimis* contribution to this traffic related noise impact. Therefore, the proposed project is not forecast to contribute to cumulatively significant noise impacts. **(LTS)** (OBMP PEIR, 4-392)	Construction activities would temporarily increase noise close to the construction sites. Due to the temporary nature of construction, no significant cumulative noise impacts would occur. **(LTS)** Once constructed, recharge basins would not generate significant noise, since maintenance requirements would require minimal activities. **(LTS)** Construction of the proposed off-river storm water storage reservoirs could add significantly to cumulative noise impacts. **(S)**
Noise (cont.)				(OCWD DEIR 7-11 and 7-13 through 7-15, C-3)

Table J-1
Cumulative Effects of All Projects (con't)

	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
Public Services and Utilities	No Cumulative Impact since there are no public service resources associated with this portion of the Santa Ana River. **(NI)**	No Cumulative Impact since there are no public service resources associated with this portion of the Santa Ana River. **(NI)**	The OBMP is consistent with planned future growth projections in Chino Basin. The OBMP can be implemented without causing or contributing to significant growth or development in Chino Basin. Therefore, implementation of the OBMP would not significantly increase demand for public services or utilities that could be considered cumulatively significant and adverse. **(LTS)** (OBMP PEIR, 4-409, 4-424)	Construction of recharge basins would not substantially affect regional public services or utilities. **(NI)** Storage reservoirs would not substantially affect the baseline condition for local public services or utilities. **(NI)** (OCWD DEIR 7-12, 7-14, and 7-15)
Recreation	Increase in number of zero flow days in river reach with generally little to no flow. (??)	Impacts to recreation resources associated with growth include conversion of recreational lands to urban uses, over use and crowding at existing recreational facilities, and need for expansion of parks and recreational facilities. These impacts would be mitigated to less than significant by local governments implementing existing policies. **(LTS)** (SAR DEIR, 6-42, REC-1)	The OBMP would have no cumulative impacts on recreation (See Land Uses and Planning). **(NI)**	Raising the Prado Dam conservation pool could constrict future recreational uses within Prado Basin. However, the constraints would not add significantly to cumulative effects to recreational facilities. **(LTS)** (OCWD DEIR 7-11, 7-13, and 7-15, C-3)
Surface Water Hydrology and Water Quality	Cumulative impacts could result in substantial additional sources of erosion, sedimentation, and turbidity for runoff entering the Santa Ana River. These impacts would be mitigated to less than significant by implementation of sedimentation and erosion control plans. **(LTS)** (SAR DEIR, 6-19, SW-1) Cumulative projects could result in higher water surface elevations behind Seven Oaks Dam increasing the	Cumulative projects would decrease flow in the river in a manner that could change sediment transport trends. This river segment typically does not contribute gravel and cobble to downstream locations and thus this decrease in flow would not likely result in a change to geomorphologic processes in this river segment. Project effects within this segment are extremely small, and then the only measurable difference between the No Project any Project Scenario occurs in flow ranges of	The areas where OBMP programs have a potential to cause local cumulative impacts include: contributions to increased cumulative runoff and flood hazards (mitigated to a level of non-significance); violation of area-wide Basin Plan water quality objectives and beneficial uses (mitigated to a level of non-significance); contributions to subsidence (mitigated to a level of non-	Cumulative diversions would reduce the annual volume of water that would otherwise reach the ocean. However storm flows would continue to bypass the OCWD diversion points and reach the ocean. **(LTS)** (OCWD DEIR 7-8 through 7-11)
Surface Water	potential for erosion within the reservoir.	200 to 300 cfs Therefore this is a less	significance); preventing a loss of safe	

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Cumulative Effects of All Projects (con't)

	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
Hydrology and Water Quality (cont.)	However, fluctuation of the reservoir would be minimal and wave action and resulting erosion would also be minimal. The nature of the geology of the reservoir and the infrequency of increased water surface elevation it is unlikely that stored water would create scouring activity resulting in benches. This is a less than significant impact. **(LTS)** (SAR DEIR, 6-20, SW-3) Cumulative impacts could produce an increase risk of anaerobic conditions in Seven Oaks Reservoir and downstream. These impacts would be mitigated to a less than significant level. **(LTS)** (SAR DEIR, 6-21, SW-4) Cumulative impacts could produce an increase risk of seiche conditions in Seven Oaks Reservoir and downstream. These impacts would be mitigated to a less than significant level. **(LTS)** (SAR DEIR, 6-21, SW-5) Cumulative impacts could produce an increase risk of mudflow conditions in Seven Oaks Reservoir and downstream. These impacts would be mitigated to a less than significant level. **(LTS)** (SAR DEIR, 6-21, SW-6) Cumulative impacts decrease river flow and could degrade water quality downstream of Seven Oaks Dam. The "worst-case" analysis found very little	than significant impact. **(LTS)** (SAR DEIR, 6-25, SW-9)	yield, on the order of 40,000 acre-feet (a beneficial impact); and maintaining water quality throughout the Basin at or better than current conditions (a beneficial impact). Implementation of the proposed OBMP is not forecast to cause any cumulative significant adverse environmental impacts with implementation of the recommended mitigation. **(LTS)** (OBMP PEIR, 4-168)	
Surface Water Hydrology and Water Quality (cont.)	change in concentration levels. Therefore, while diversions by the Project and related projects could cause changes in water quality, this change			

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	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
	would be less than significant. **(LTS)** (SAR DEIR, 6-22, SW-7) Cumulative projects would significantly decrease non-storm flow. Various potential mitigation measures involving changes in the timing, pattern, and volume of diversions were assessed. However, no feasible mitigation measures were identified that would avoid a significant change in river flow on non-storm days while still allowing a consistent and reliable diversions of applicants. These impacts would remain significant. **(S)** (SAR DEIR, 6-22, SW-8) Cumulative projects would decrease flow in the river in a manner that could change sediment transport trends. This river segment typically does not contribute gravel and cobble to downstream locations and thus this decrease in flow would not likely result in a change to geomorphologic processes in this river segment. Therefore this is a less than significant impact and no mitigation is required. **(LTS)** (SAR DEIR, 6-24, SW-9) Cumulative projects would decrease the area that is inundated by flood flows (overbank flow areas). The overbank velocity and water depth in this area would not be perceptibly			
Surface Water Hydrology and Water Quality (cont.)	affected by cumulative projects. Therefore, this is a less than significant impact, and no mitigation is required. **(LTS)** (SAR DEIR, 6-25, SW-10)			

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	UPSTREAM of PRADO BASIN			DOWNSTREAM of PRADO BASIN
	Upstream of Seven Oaks Dam to RIX-Rialto Effluent Outfall	**RIX-Rialto Outfall to Prado Flood Control Reservoir**	**Chino Basin to Prado Flood Control Reservoir**	**Prado Flood Control Reservoir to Pacific Ocean**
Transportation	No cumulative impact would occur since there are no transportation resources associated with this portion of the Santa Ana River. **(NI)**	No cumulative impact would occur since there are no transportation resources associated with this portion of the Santa Ana River. **(NI)**	The addition of up to 100 permanent jobs in support of OBMP activities result in a *de minimus* contribution to an area that is forecast to generate approximately 2 million trips per day at present and into the future. Implementation of the OBMP will accommodate, but not cause, cumulative traffic growth as is forecast to occur as the affected jurisdictions are built out. Therefore, under the current conditions, the proposed project is not forecast to contribute to cumulative significant traffic impacts within the Chino Basin area. **(LTS)** (OBMP PEIR, 4-307)	Due to the temporary nature of construction, no significant cumulative traffic impacts would occur. **(NI)** Recharge basins would not add to a cumulatively significant traffic impact since recharge basins would generate few daily trips. **(NI)** Construction of the proposed off-river storm water storage reservoirs could significantly add to cumulative impacts to regional traffic congestion. **(S)** (OCWD DEIR 7-12, 7-14, and 7-15, C-3)