Southern California Comprehensive Water Reclamation and Reuse Study
Phase II

Executive Summary

Cooperative Effort Funded And Managed By:

The United States Bureau of Reclamation

In Partnership With:

California Department of Water Resources,
Central Basin and West Basin Municipal Water Districts, City of Los Angeles,
City of San Diego, Metropolitan Water District of Southern California,
San Diego County Water Authority, Santa Ana Watershed Project Authority,
South Orange County Reclamation Authority

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Acronyms

$/ac-ft	Dollars per acre-foot
ac-ft	Acre-foot
ADM	Allocation and Distribution Model
AFY	Acre-foot per year
BPO	Basin Plan Objective
DWR	California Department of Water Resources
EDM	Economic Decision Model
GIS	Geographic information system
Long-term	Planning year 2040
MAFY	Million acre-feet per year
mg/L	Milligrams per liter
MWDSC	Metropolitan Water District of Southern California
O&M	Operation and maintenance
PAC	Project Advisory Committee
P.L.	Public Law
Reclamation	United States Bureau of Reclamation
RWQCB	Regional Water Quality Control Board
SAWPA	Santa Ana Watershed Project Authority
SCCWRRS	Southern California Comprehensive Water Reclamation and Reuse Study
SDCWA	San Diego County Water Authority
Short-term	Planning year 2010
SOCRA	South Orange County Reclamation Authority
STIP	Short-Term Implementation Plan
TDS	Total dissolved solids
Title 22	Title 22 of the California Administrative Code

Executive Summary

Introduction

Water recycling was already well known in southern California when a serious drought hit in the late 1980s. Many water recycling projects were already producing drought resistant water for their customers. In 1992 the drought subsided. However, southern California did not go back to a "water business" as usual. Facing increasing water user competition, growing needs, and no new major water projects, demands were being met by increasingly less reliable supplies. It was during this period that the United States Bureau of Reclamation (Reclamation) at the behest of the United States Congress, proposed to join in partnership with local southern California water and wastewater agencies to identify regional water recycling opportunities. Seven southern California water agencies, the State of California, and Reclamation entered into a 6-year agreement to fully examine the potential and economic viability of regional water recycling projects. Looking long-term, the partners sought water recycling solutions that would span agency jurisdictions and take advantage of economies of scale. The investigation called the Southern California Comprehensive Water Reclamation and Reuse Study (SCCWRRS) is now complete.

This document is a Final Report that presents the story behind the major SCCWRRS recycling planning effort and documents the technical evaluation and analyses comprising it. The content of the report is the culmination of numerous activities and analyses evaluating the feasibility of regional water recycling in southern California. The SCCWRRS process was divided into two phases. Phase I included data collection and analytical model development leading to an examination of the feasibility of a single regional water recycling project crossing the watersheds and hydrologic basins in southern California. In Phase II, the focus shifted to evaluating the feasibility of a number of basin-specific, multi-agency regional and single-agency geographically localized recycling projects. The SCCWRRS has taken more than 6 years to complete, which has mandated the incorporation of the element of time into the analyses. Local agencies have continued to move forward with their own recycling programs and the SCCWRRS process incorporated these plans. Thus, Phase I results have continued to evolve and change throughout Phase II. This dynamic process has proven to be beneficial to participating agencies. They both benefited the study by their continued participation as well as benefited from it through their coalition building and regional vision. The projects identified in this report would not be possible without the cooperative spirit of these agencies working together.

The Phase I analyses continue to be significant because of the analytical tools developed that were subsequently used in Phase II. The Phase I data and conclusions have become outdated in the face of more recent regulations, environmental considerations, public perception issues, and changing pressures on local and imported water supplies. In addition, water and wastewater agencies have continued to meet the needs of their customers and evolved in their own plans and approaches to water recycling. Thus, Phase II is more important and contemporary in its evaluation of current southern California water recycling opportunities.

This Final Report focuses on Phase II of SCCWRRS, but represents the "final report" for the entire SCCWRRS process. Contained within the report are three major components:

- Executive Summary of the Final Report.
- The Final Report, which discusses the tools, processes, analyses, and results for the SCCWRRS.
- The Short-Term Implementation Plan, which presents detailed implementation plans for multiple water recycling projects developed in the course of the SCCWRRS. Many of these projects are now underway.

Project Background

Increasing demands and limited supplies of fresh water have led southern California water policymakers to realize that the water supply of the area must be diversified to ensure reliability. One of the most dependable, abundant, and underutilized supplies of water in southern California is reclaimed water. Reclaimed water is wastewater, originating from municipal, industrial, or agricultural activities, that has been treated to a quality suitable for beneficial reuse. Reclaimed water can be used for a number of applications, including irrigation, industrial processes, groundwater recharge, and environmental enhancement.

In 1993, Reclamation, in conjunction with eight state and local agencies, adopted a Plan of Study to evaluate the feasibility of regional water recycling in southern California. Regional planning takes advantage of potential surpluses in recycled water by reallocating it to needs in areas throughout the region. The Plan of Study called for a 6-year comprehensive effort to examine recycled water opportunities from a regional perspective, and to develop a long-term planning strategy to develop recycled water supplies for southern California. This activity was authorized by Title XVI of Public Law (P.L.) 102-575, The Reclamation Wastewater and Groundwater Study and Facilities Act of 1992. Title XVI directs Reclamation to conduct a study to assess the feasibility of a comprehensive water recycling and reuse system in southern California. The need for such a study, called the SCCWRRS, is based on the premise that the increased use of recycled water will reduce pressures on imported water supplies and provide a continuous and dependable local source of supplemental water for southern California.

Prior to the initiation of the SCCWRRS, a preplanning committee was formed to develop the Plan of Study and bring together local and regional entities interested in southern California water recycling. This committee then evolved into the non-Federal coalition of state and local water agencies that made the financial commitment to conduct this comprehensive regional planning effort in partnership with Reclamation. These eight agencies represent a variety of water recycling interests in southern California and include the following:

- California Department of Water Resources (DWR)
- Central Basin and West Basin MWD
- City of Los Angeles
- City of San Diego
- Metropolitan Water District of Southern California (MWDSC)
- San Diego County Water Authority (SDCWA)
- Santa Ana Watershed Project Authority (SAWPA)
- South Orange County Reclamation Authority (SOCRA)

Plan of Study

The SCCWRRS was organized into Phase IA, Phase IB, and Phase II. During Phase IA, the cost-sharing partners, along with Reclamation, developed an extensive database of existing and potential recycled water demands and supplies, land use, environmental assets, and local water and wastewater agency recycling plans. During Phase IB, a set of sophisticated planning tools was developed with which to analyze the data and evaluate the benefits of regional water recycling strategies. During Phase II, the cost-sharing partners opened the planning process to all southern California water and wastewater agencies, to work together in partnership using the tools and database from Phase I.

Phase IA

The primary purpose of Phase IA was to compile available information on supply and demand for both fresh and recycled water throughout southern California. This effort resulted in a database that evolved further in Phase IB, and demonstrated the great potential for reusing large quantities of recycled water.

Using water supply and demand information from DWR Bulletin 160-93, California Water Plan Update, the Phase IA analysis concluded that without increased water recycling, the water supply would remain relatively constant through the year 2040, while demand will increase. Without increased supply, shortages could approach approximately 3 million AFY (MAFY) by 2040.

Phase IA also concluded that the water demand shortfall in the near term could be met with recycled water if the projected recycled water supplies are put to beneficial uses. To accomplish this, however, additional recycled water markets need to be identified to offset total water demands and eliminate the projected shortfall of freshwater supplies expected to occur sometime after the year 2010.

Phase IB

As a reconnaissance-level endeavor, Phase IB examined the study area from the "big-picture" perspective and provided a basis to begin evaluating alternatives that could be analyzed further in Phase II. The Phase IB analysis sought to optimize recycled water use from the regional perspective and, in the process, to identify constraints to maximizing reuse. The SCCWRRS regional planning process was not intended to challenge local agency planning or projects and other ongoing efforts. Instead, it was an opportunity to evaluate local efforts in a regional context. Additionally, various opportunities for recycling were considered. Groundwater recharge with recycled water and surface storage augmentation constitute tremendous opportunities to maximize recycled water use; however, many institutional, regulatory, and public acceptance issues surround these types of projects, potentially affecting implementation. In Phase IB, these implementation issues were not considered so that the analysis could instead focus on maximizing reuse by asking the question "what if" in order to develop an array of alternatives. The alternatives were evaluated to identify candidate projects for the Phase II feasibility analysis.

The major conclusion reached during the Phase IB analysis was that a regional water recycling project that spans the entire study area does not appear practical at this time; however, sub-regional systems warranted further evaluation. The sub-regional areas evaluated in the Phase IB analyses were grouped into geographical regions that facilitated the development of reclamation systems to meet the regional recycling goals. These four

regions include the Los Angeles Basin Region, Orange County Region, San Diego Region, and Inland Empire Region.

Phase II

Phase II of the SCCWRRS focused on developing a long-term regional recycling strategy and identifying short-term opportunities for implementing the strategy. Using the data and planning tools developed in Phase I, comprehensive regional water recycling opportunities were examined. Unlike typical master planning activities, the SCCWRRS analyses examined two distinct time horizons, which were defined as 2010 (short-term) and 2040 (long-term).

The processes used in Phase II for establishing objectives and decision criteria, as well as for evaluating and selecting alternatives, were developed to achieve two goals:

- Develop regional water recycling plans and projects in conjunction with affected local agencies.
- Form cooperative local partnerships as an integral part of an implementation process aimed at overcoming obstacles to the long-term regional recycling strategy.

In Phase I, participation was limited to Reclamation and the eight cost-sharing partners. In Phase II, participation was expanded to include local agencies potentially affected by the implementation of projects arising from the SCCWRRS. In response to the invitation to join the process, more than 70 local agencies from across southern California became active participants in the development and analysis of regional water recycling projects. The local agencies were integral participants in the decision-making process of Phase II.

Making Good Decisions

Making good decisions in response to complex problems can be a challenging process, especially when multiple agencies are involved and the issues under consideration include a wide spectrum of complex political, regulatory, engineering, and economic characteristics. In the SCCWRRS, a decision analysis process was established to provide the framework for directing the analyses and to evaluate the results. The local agencies were involved in the process of developing, evaluating, and selecting projects for short-term implementation and for the long-term regional recycling strategy. As a result of the decision-making process, the SCCWRRS developed robust, cost-effective projects within a regional context. In addition, coalitions of local agencies were formed in support of the projects they had been involved in developing. Thus, the SCCWRRS planning process provided an opportunity to incorporate local and regional interests and issues into the solutions.

The decision analysis framework consisted of assembling coalitions of stakeholders to direct the required analyses and to evaluate and select alternatives in a workshop setting. Representatives from the local agencies attended facilitated workshops. Workshop attendees developed criteria and analytical objectives that were subsequently used to develop water recycling alternatives using the planning tools from Phase IB. The alternatives were presented at later workshops where the participants reviewed the results and provided direction for revising the analysis. The process was iterative, with the local agencies directing the progress and development of the short-term projects.

The SCCWRRS planning process allowed for the evaluation of recycling opportunities that historically have been overlooked due to issues that include perceived physical, institutional,

or economic planning barriers. The decision analysis framework facilitated exploration of common benefits that might help remove those barriers and, as a result, identified a regional recycling strategy consisting of the most cost-effective regional and single-agency projects.

Regional Cooperation Resolves Differences and Makes for Better Projects

For the SCCWRRS Phase II analyses, the study area was divided into four geographic regions, as shown in Figure ES-1.

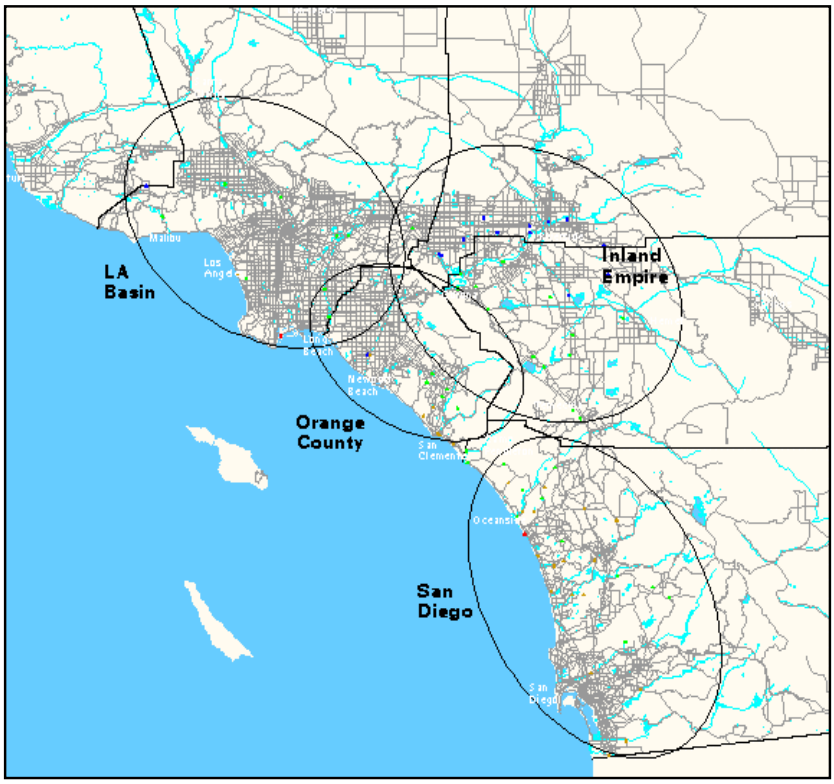


FIGURE ES-1
Project Advisory Committee Regions

The regions include the following:

- Los Angeles Basin – Los Angeles County and eastern Ventura County
- Orange County
- San Diego
- Inland Empire – Western portions of San Bernardino and Riverside Counties

For each region, a Project Advisory Committee (PAC) was formed. Each PAC consisted of representatives from the local agencies located within the PAC area. Table ES-1 provides a listing of the various agencies involved in the PAC process. These agencies played an important role in the decision-making process.

TABLE ES-1
Agencies Involved in the PAC Process

Los Angeles	Orange County	Inland Empire	San Diego
California Department of Water Resources	Aliso Water Management Agency	Big Bear Area Regional Wastewater Agency	California Department of Water Resources
Calleguas Municipal Water District	California Department of Water Resources	California Department of Water Resources	Carlsbad Municipal Water District
Camrosa Water District	City of Anaheim	Chino Basin Watermaster	City of Escondido
Central Basin Municipal Water District	City of San Juan Capistrano/Capo Valley Water District	City of Corona	City of Oceanside
City of Burbank	County Sanitation Districts of Los Angeles County	City of Redlands	City of Poway
City of Glendale	El Toro Water District	City of Rialto	City of San Diego Metropolitan Wastewater Department
City of Long Beach	Irvine Ranch Water District	City of Riverside	City of San Diego Water Department
City of Los Angeles Department of Public Works	Los Alisos Water District	City of San Bernardino	Fallbrook Public Utility District
City of Los Angeles Department of Water and Power	Marine Corps Base Camp Pendleton	Eastern Municipal Water District	Leucadia County Water District
City of Santa Monica	Metropolitan Water District of Southern California	Elsinore Valley Municipal Water District	Marine Corps Base Camp Pendleton
County Sanitation Districts of Los Angeles County	Moulton Niguel Water District	Fallbrook Public Utility District	Metropolitan Water District of Southern California
Crescenta Valley Water District	Municipal Water District of Orange County	Inland Empire Utilities Agency	Olivenhain Municipal Water District
Foothill Municipal Water District	Orange County Public Facilities and Resources Department	Marine Corps Base Camp Pendleton	Otay Water District
Las Virgenes Municipal Water District	Orange County Sanitation District	Metropolitan Water District of Southern California	Padre Dam Municipal Water District
Los Angeles County Department of Public Works	Orange County Water District	Pechanga Indian Reservation	San Diego County Water Authority
Metropolitan Water District of Southern California	Santa Ana Watershed Project Authority	Running Springs Water District	San Elijo Joint Power Authority
Southern California Water Company	Santa Margarita Water District	San Bernardino Valley Municipal Water District	Sweetwater Authority
Three Valleys Municipal Water District	South Orange County Reclamation Authority	Santa Ana Watershed Project Authority	Tia Juana Valley County Water District
U.S. Bureau of Reclamation	U.S. Bureau of Reclamation	The Nature Conservancy	U.S. Bureau of Reclamation
U.S. Bureau of Reclamation Native American Affairs Office		Three Valleys Municipal Water District	U.S. Bureau of Reclamation Native American Affairs Office
Water Replenishment District		U.S. Bureau of Indian Affairs	Valley Center Municipal Water District
West Basin Municipal Water District		U.S. Bureau of Reclamation	
		U.S. Bureau of Reclamation Native American Affairs Office	
		Western Municipal Water District	

Sophisticated Planning Tools Aid in Identifying the Best Projects

The analysis used two principal planning tools to assist the planning team and PAC members in reaching robust decisions. First is the Allocation and Distribution Model (ADM). The ADM is a geographic information system-based model (GIS) that processes large volumes of data, developing potential corridors for allocating recycled water and the associated costs for constructing the proposed system. The ADM allowed the planning team and PAC members to examine the least-costly systems for meeting recycled water demands in southern California. Detailed information about the ADM, including the cost assumptions and operation of the model, is presented in Appendix A, Engineering Costs and Assumptions. The second tool is the Economic Decision Model (EDM), which is an economic spreadsheet-based calculation engine. The EDM provides for a cost-benefit analysis to permit consistent quantitative comparisons to account for inflation, real growth, different interest rates faced by agencies, and different discount rates for total society, for agencies, and for customers. Most importantly, the EDM identifies the net benefit (benefits minus costs) of the regional projects from the perspectives of the local agency and the broader public beyond the ratepayer service area. Detailed information about the EDM is presented in Appendix B, Economic Methods, Structure, Data, and Assumptions.

While the ADM and EDM are empirical tools, much of the analysis has occurred during discussions with local agency representatives who identified candidate opportunities for reuse. The tools enabled the PAC members to streamline the process of setting priorities and objectives, as well as focusing the decision-making process at a regional level. This regional approach to the Phase II process made the crossing of institutional boundaries and linking of systems more obtainable. Moreover, using the planning tools in concert with PAC member discussions allowed local agencies to explore regional project economics that were unattainable to agencies acting alone.

Development of Projects is an Iterative Process

The Phase II analyses consisted of the following:

- Review and update the database of information for supplies and demands.
- Develop short-term projects using the planning tools and direction from the PAC.
- Develop the long-term strategy based upon the short-term projects.

Each of these analyses required input and direction from the local agencies. A series of workshops with the PACs were scheduled around the analyses, providing a forum for the local agencies to review the database, assess the analyses, and provide feedback and direction for revising the analyses. These efforts resulted in the development of the long-term regional recycling strategy and identification of projects for short-term implementation. Figure ES-2 provides a diagram of the Phase II analyses and agency participation process.

Water Quality Plays a Major Role in the SCCWRRS Projects

Water quality is a significant component of the SCCWRRS analysis. Salinity was selected as the constituent of concern as representative for the reuse types and supplies. The costs associated with water quality are based on meeting the specified targets for each demand. Title 22 of the California Administrative Code (Title 22) specifies a range of treatment

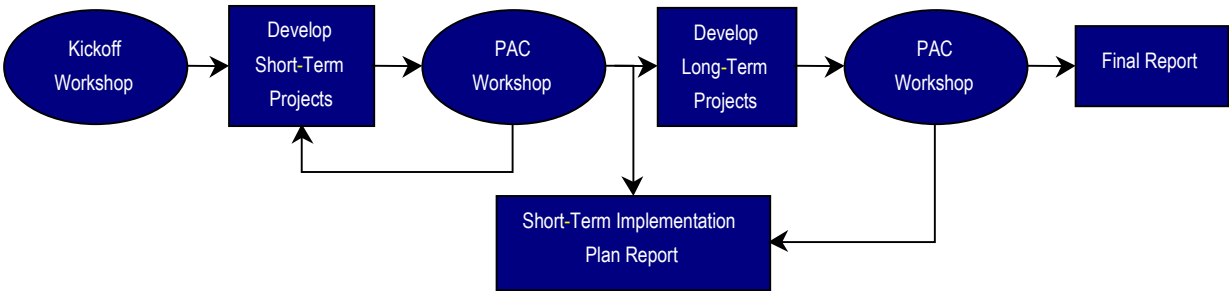


FIGURE ES-2
Phase II Analytical and Agency Participation Process

options for varying degrees of public contact. For the purposes of the analysis, recycled water supplies are assumed to meet a minimum of full Title 22 requirements for disinfected tertiary recycled water. Note that "full Title 22 treatment" corresponds to the most stringent degree of public contact, including irrigation of food crops, irrigation of parks and playgrounds, etc. For disinfected tertiary recycled water, Title 22 requires that the level of wastewater treatment include biological oxidation (secondary treatment), filtration, and disinfection. Most of the identified municipal treatment facilities included in the SCCWRRS analysis provide a minimum of secondary treatment and many treatment facilities provide tertiary treatment for some or all of their flow.

To sell recycled water, recycled water quality must also meet the standards set by the regulatory agencies. The California Water Code provides for the California Regional Water Quality Control Boards (RWQCB) to establish water quality standards that protect surface and groundwater quality. These requirements are typically identified in a document commonly referred to as the "Basin Plan." Beneficial uses are designated in the Basin Plan with water quality objectives established to protect the most sensitive beneficial use. The SCCWRRS primarily covers areas under jurisdiction of the Los Angeles, Santa Ana, and San Diego RWQCBs.

In addition to the Basin Plan Objectives (BPO), state and Federal recycling guidelines recommend average maximum salinity concentrations for uses such as irrigation and landscaping. These guidelines generally recommend less than 1,000 milligrams per liter (mg/L) of total dissolved solids (TDS); however, customer needs typically dictate the ultimate TDS target concentration. Coastal treatment plants typically have a higher TDS concentration than treatment plants located inland. Many users located along the coast have adapted to using higher salinity water, while inland customers are accustomed to lower TDS concentrations associated with their recycled water supplies.

In Phase II, the analysis also included salinity management issues. The SCCWRRS recognized the potential impact of salinity on groundwater due to groundwater recharge with recycled water. As a result, opportunities for reducing the salinity of recycled water, as well as pipelines for exporting brine, were incorporated into the analysis. Desalters and regional brine lines represent major components of several of the short-term projects, as a result of issues associated with salinity management.

Short-Term Implementation Plan

The objective of the Phase II analyses was to develop regional water recycling plans and projects in conjunction with the affected local agencies. The analyses examined opportunities for short-term and long-term implementation. The Short-Term Implementation Plan (STIP) Report presents the results of the short-term analysis. Through the short-term analysis, local recycled water project initiatives were evaluated for opportunities to incorporate a visionary regional component into them.

As a result of the analysis, 34 projects distributed across southern California were identified for short-term implementation, and a STIP was developed for each of the projects. The locations of these 34 projects are illustrated in Figure ES-3. These projects were not compared against each other, nor were they selected from a list of alternatives. Rather, the components evolved from the specific plans of the local agencies as presented during 1999, with consideration for the long-term planning horizon. Where deemed feasible by the PAC participants, the short-term projects include potential opportunities to expand recycling toward a comprehensive regional system.

Of these projects, 15 projects were identified as regional projects. The regional projects include a number of agencies, both water and wastewater, cooperating regionally to produce and deliver recycled water. Because of the increased complexity associated with the regional projects, the PAC directed additional analyses for each of the 15 projects, which included more detailed evaluation of the cost estimates, as well as examination of implementation issues potentially affecting these projects. This information is included in each of the regional project STIPs. The regional STIPs include the following:

- Calleguas
- East San Gabriel
- West Basin
- Central Basin
- North Orange County
- Central Orange County
- Upper Oso
- San Juan
- Encina
- San Pasqual Valley
- North City
- South Bay
- Chino Basin
- San Bernardino
- Eastern

Figures ES-4 through ES-18 present the proposed layouts of the 15 regional projects contained in the STIP Report.

The remaining 19 projects were determined to be more economically beneficial as single-agency projects. The projects categorized as “single-agency” represent the most optimal and feasible opportunities to meet recycled water demands, despite the fact that these projects are not regional in scope and in many cases they are proposed for implementation by a single agency. The Phase II analysis determined that the benefits of these projects could not be improved by linking them regionally. To the extent that these projects reduce


San Fernando Valley
Calleguas
Burbank
Los Angeles
Glendale
East San Gabriel
Chino Basin
Running Springs
Big Bear
Redlands
Yucaipa
Riverside
Beaumont
San Bernardino
Corona
March
Central Basin
West Basin
Long Beach Wetlands
North Orange County
Eastern
Long Beach
Alamitos
Central Orange County
Upper Oso
San Juan
Fallbrook
Camp Pendleton
Oceanside
San Pasqual
Encina
Rancho Santa Fe
North City
Santee Basin
South Bay
Figure ES-3
Identified Short-Term Implementation Plan Projects
0 5 10 Miles
N
Modeled Reclaimed Water Routes
Potential Supply
Water Bodies
Short-Term Implementation Projects
Roads
Major Rivers

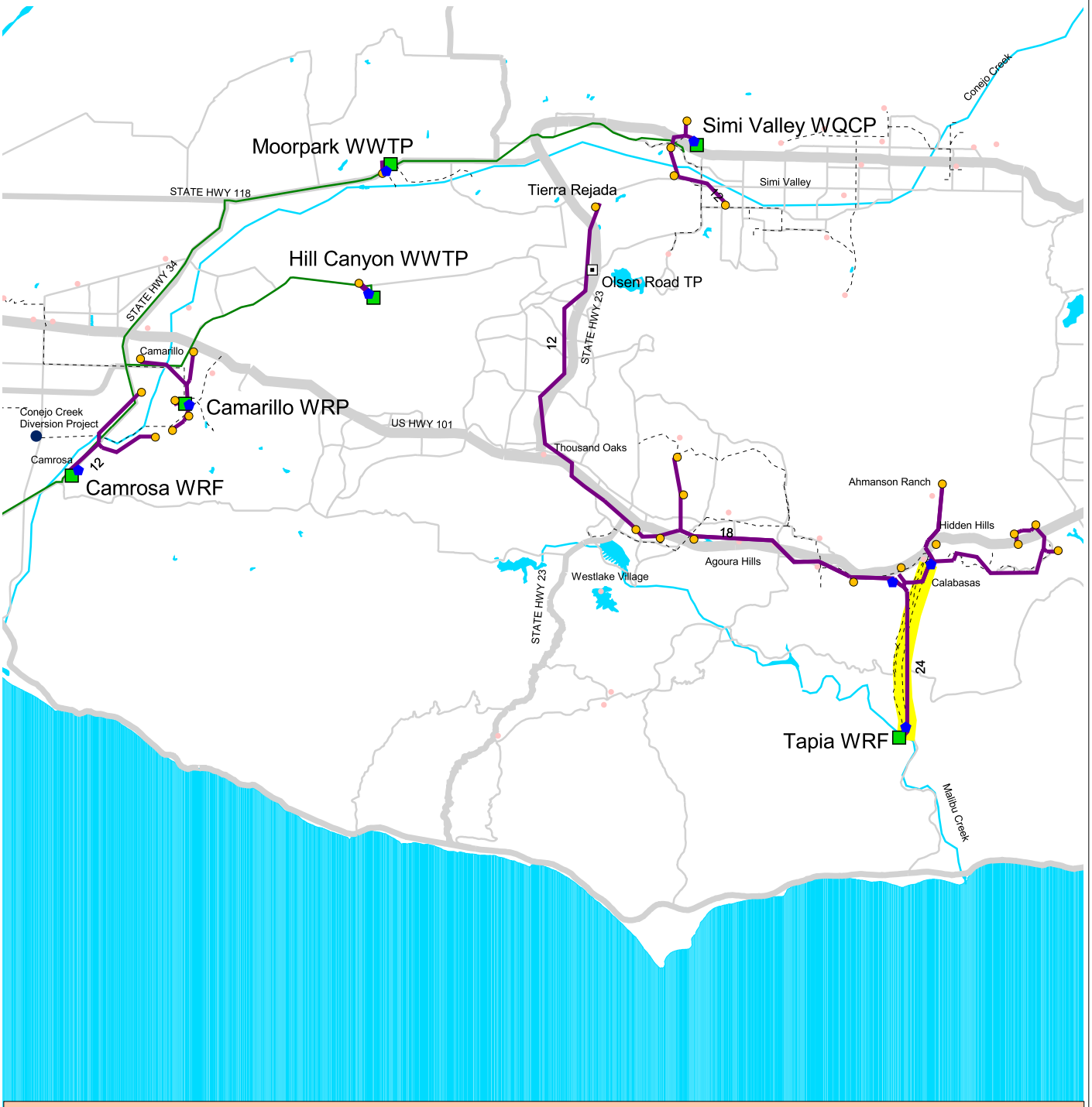


Figure ES-4
Identified 2010 Project
Calleguas

0 2 4 Miles

N

- Supply in Analysis
- Supply Not in Analysis
- Connected Demands
- Unconnected Demands
- Pump Stations
- Modeled Reclaimed Water Routes (with diameter = or >12 inches indicated)
- Existing/Planned Pipelines
- Pipelines with Available Capacity
- Planned Brine Line
- Roads
- Major Body of Water
- Major Rivers

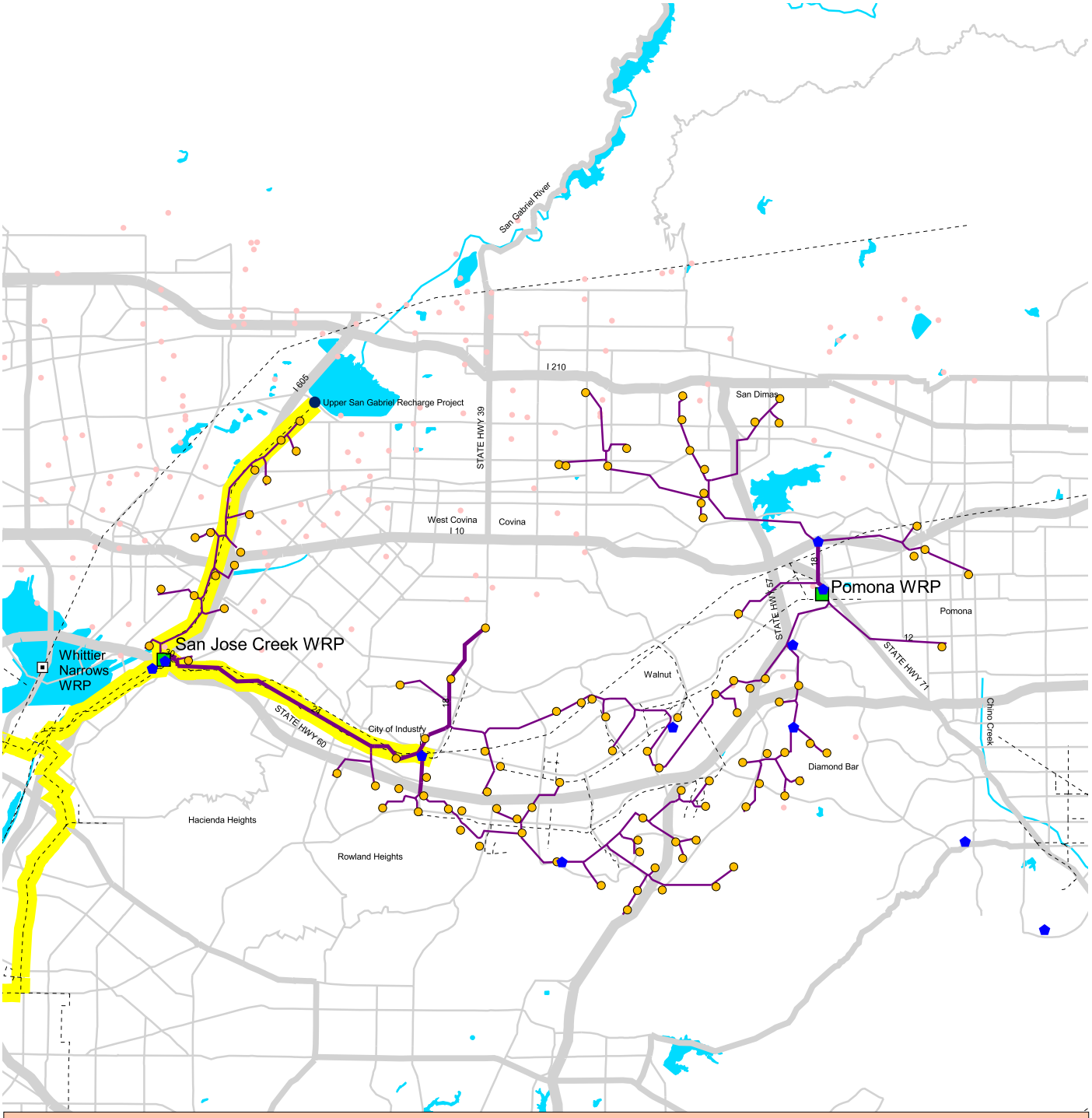


Figure ES-5
Identified 2010 Project
East San Gabriel

0 2 4 Miles

N

- Supply in Analysis
- Supply Not in Analysis
- Connected Demands
- Unconnected Demands
- Pump Stations
- Modeled Reclaimed Water Routes (with diameter = or >12 inches indicated)
- Existing/Planned Pipelines
- Pipelines with Available Capacity
- Roads
- Major Body of Water
- Major Rivers

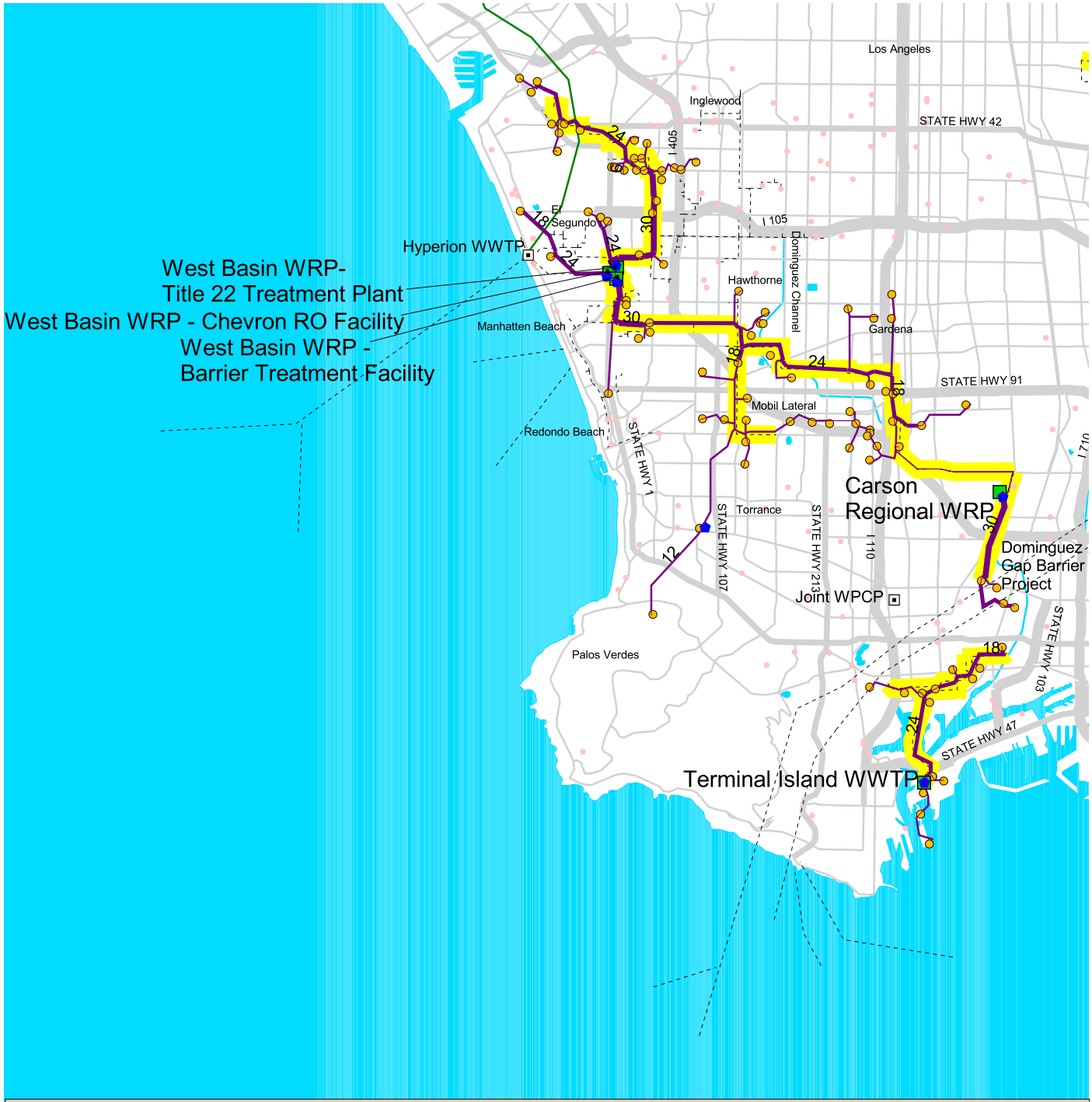


Figure ES-6
Identified 2010 Project
West Basin

0 2 4 Miles

N

- Supply in Analysis
- Supply Not in Analysis
- Connected Demands
- Unconnected Demands
- Pump Stations
- Modeled Reclaimed Water Routes (with diameter = or >12 inches indicated)
- Existing/Planned Pipelines
- Pipelines with Available Capacity
- Planned Brine Line
- Roads
- Major Body of Water
- Major Rivers

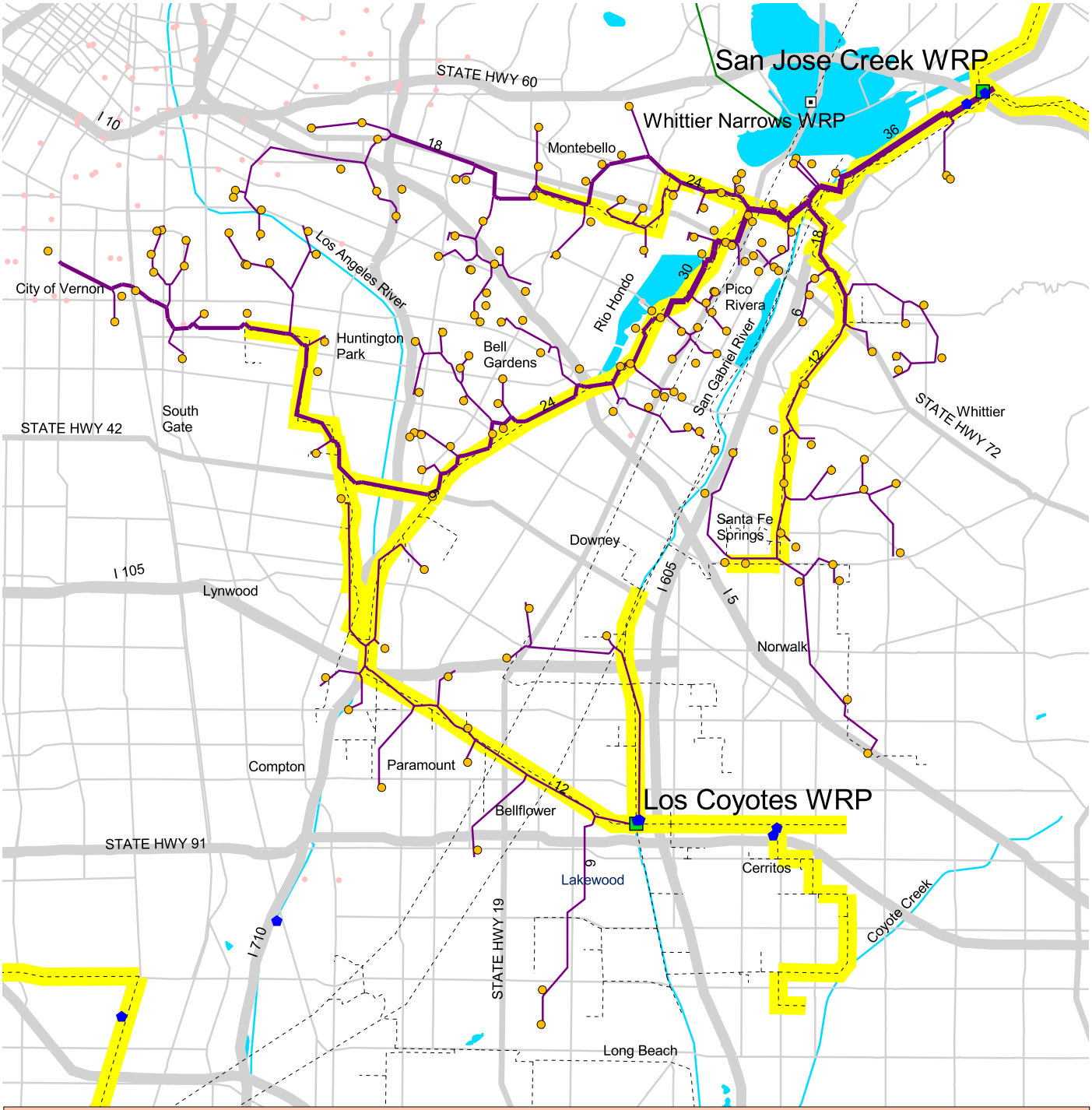


Figure ES-7
Identified 2010 Project
Central Basin

0 2 4 Miles

N

- Supply in Analysis
- Supply Not in Analysis
- Connected Demands
- Unconnected Demands
- Pump Stations
- Modeled Reclaimed Water Routes (with diameter = or >12 inches indicated)
- Existing/Planned Pipelines
- Pipelines with Available Capacity
- Planned Brine Line
- Roads
- Major Body of Water
- Major Rivers

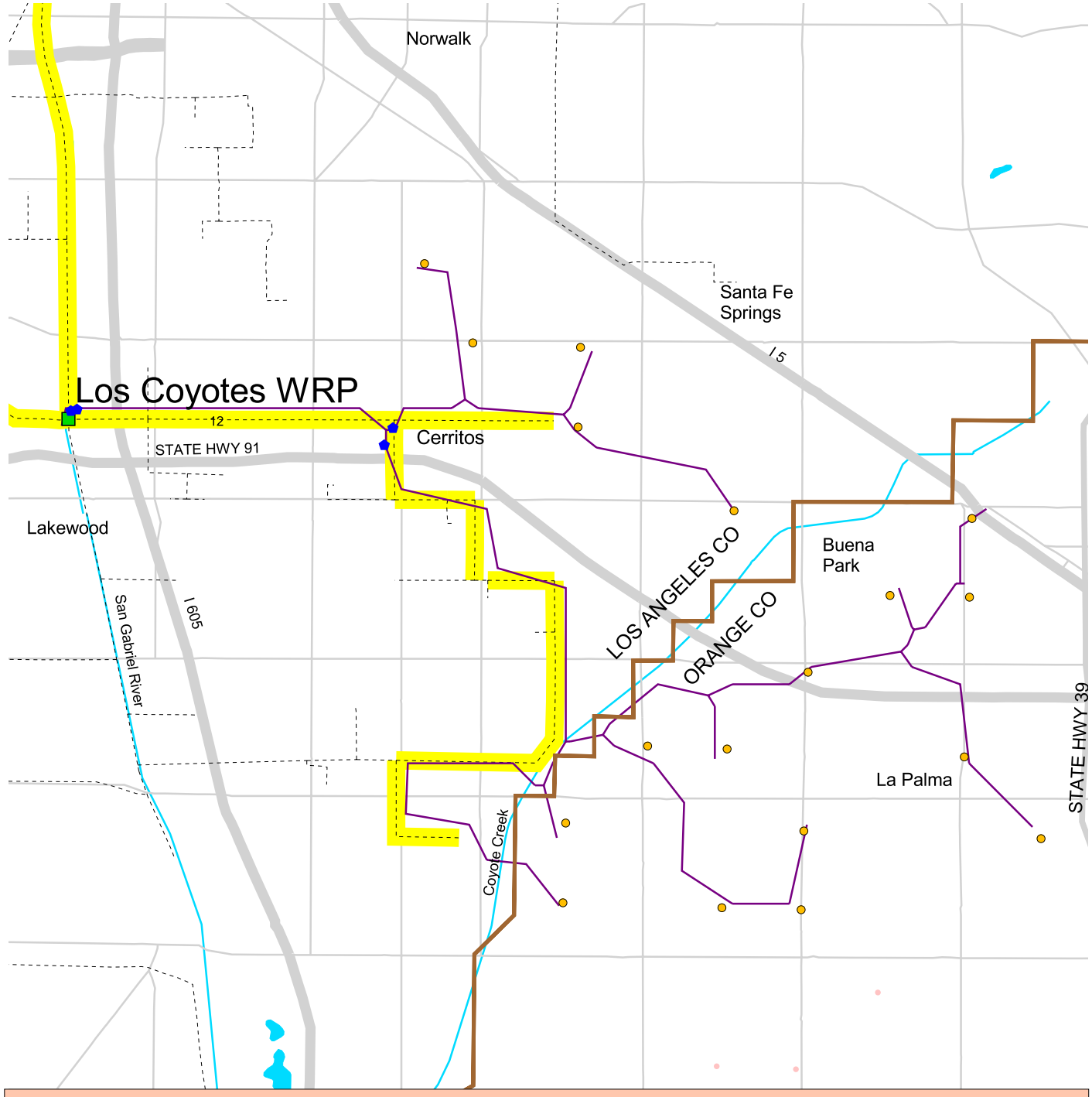


Figure ES-8
Identified 2010 Project
North Orange County

0 0.5 1 Miles

N

- Supply in Analysis
- Connected Demands
- Unconnected Demands
- Pump Stations
- Modeled Reclaimed Water Routes (with diameter= or >12 inches indicated)
- Existing/Planned Pipelines
- Pipelines with Available Capacity
- Roads
- County Line
- Major Body of Water
- Major Rivers

Figure ES-9
Identified 2010 Project
Central Orange County

0 2 4 Miles

N

- Supply in Analysis
- Supply Not in Analysis
- Connected Demands
- Unconnected Demands
- Pump Stations
- Modeled Reclaimed Water Routes (with diameter= or >12 inches indicated)
- Existing/Planned Pipelines
- Pipelines with Available Capacity
- Roads
- Major Body of Water
- Major Rivers

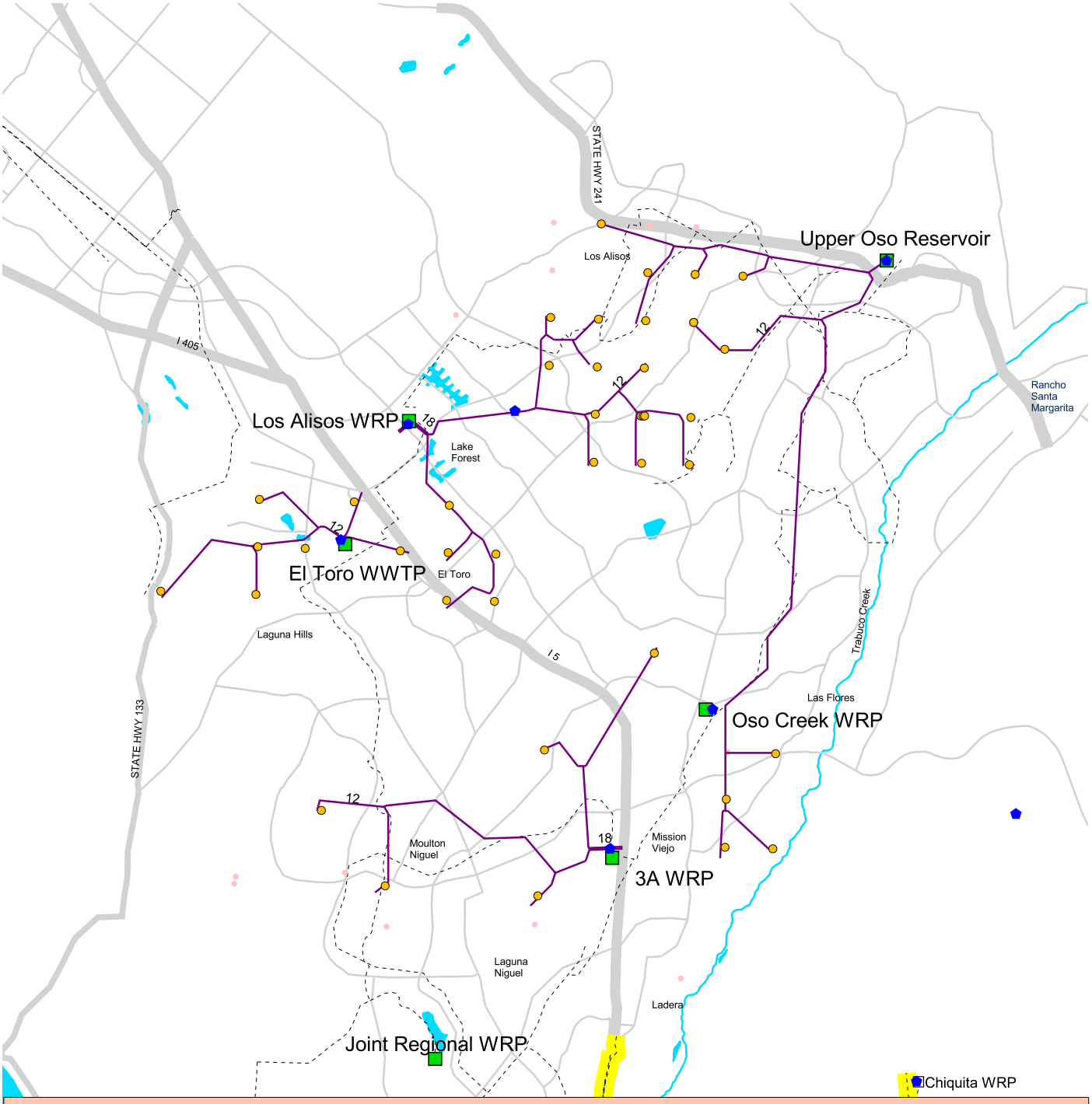


Figure ES-10
Identified 2010 Project
Upper Oso

0 1 2 Miles

N

Supply in Analysis	Pump Stations	Roads
Supply Not in Analysis	Modeled Reclaimed Water Routes (with diameter= or >12 inches indicated)	Major Body of Water
Connected Demands	Existing/Planned Pipelines	Major Rivers
Unconnected Demands	Pipelines with Available Capacity	

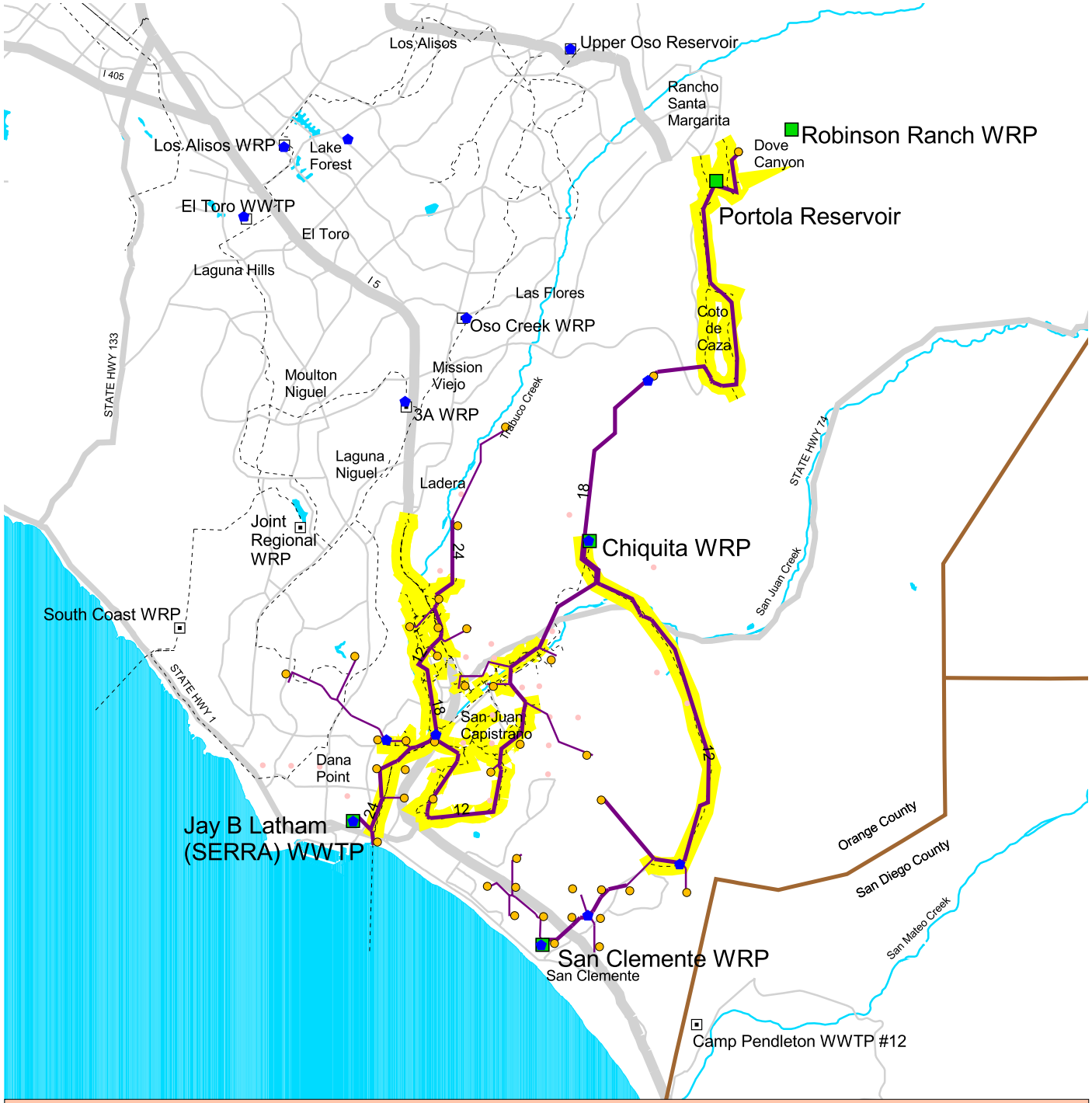


Figure ES-11
Identified 2010 Project
San Juan

0 2 4 Miles

N

- Supply in Analysis
- Supply Not in Analysis
- Connected Demands
- Unconnected Demands
- Pump Stations
- Modeled Reclaimed Water Routes (with diameter= or >12 inches indicated)
- Existing/Planned Pipelines
- Pipelines with Available Capacity
- Roads
- Major Body of Water
- Major Rivers
- County Line

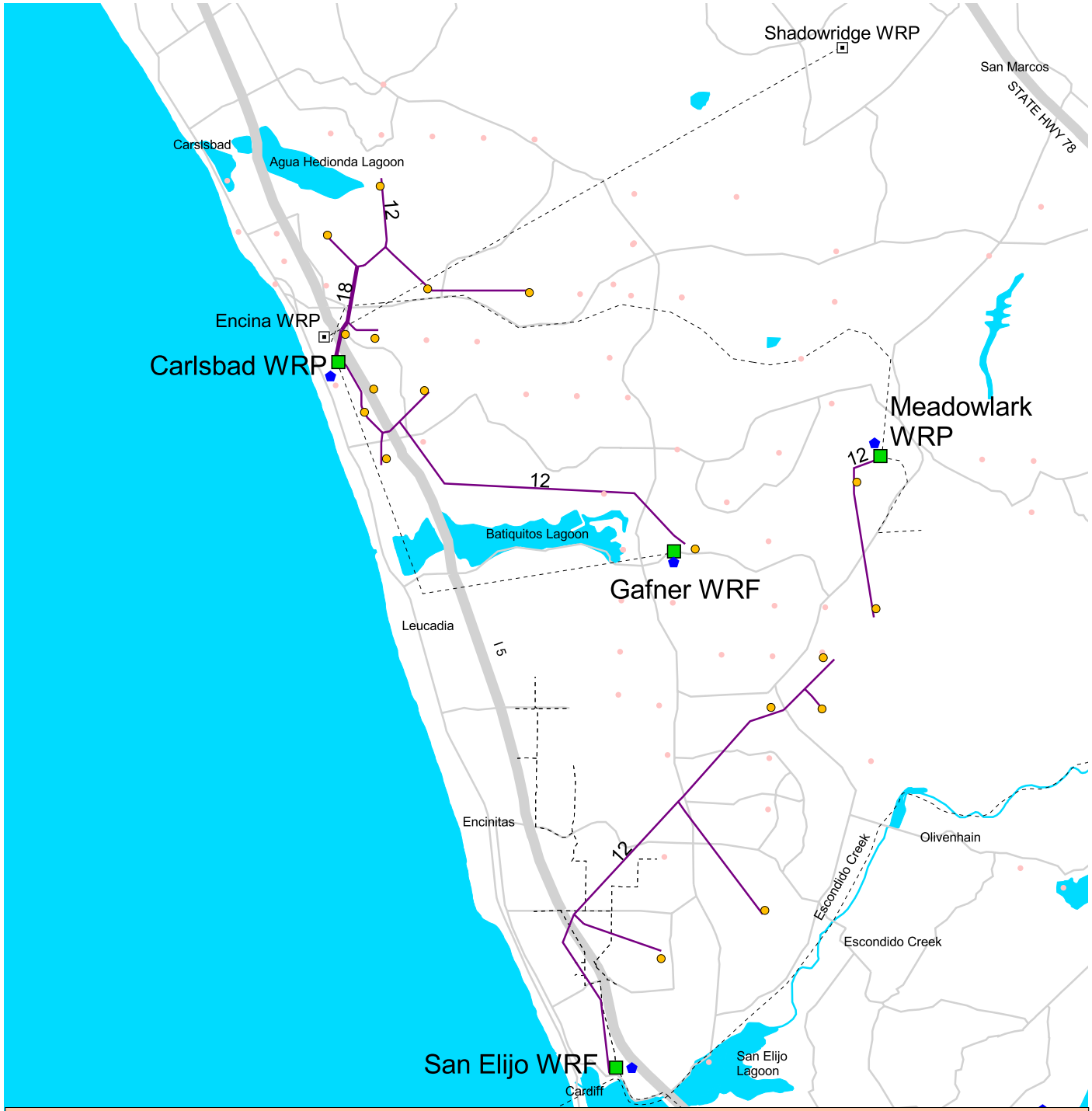


Figure ES-12
Identified 2010 Project
Encina

0 1 2 Miles

N

Supply in Analysis	Pump Stations	Roads
Supply Not in Analysis	Modeled Reclaimed Water Routes (with diameter = or >12 inches indicated)	Major Body of Water
Connected Demands	Existing/Planned Pipelines	Major Rivers
Unconnected Demands	Pipelines with Available Capacity	

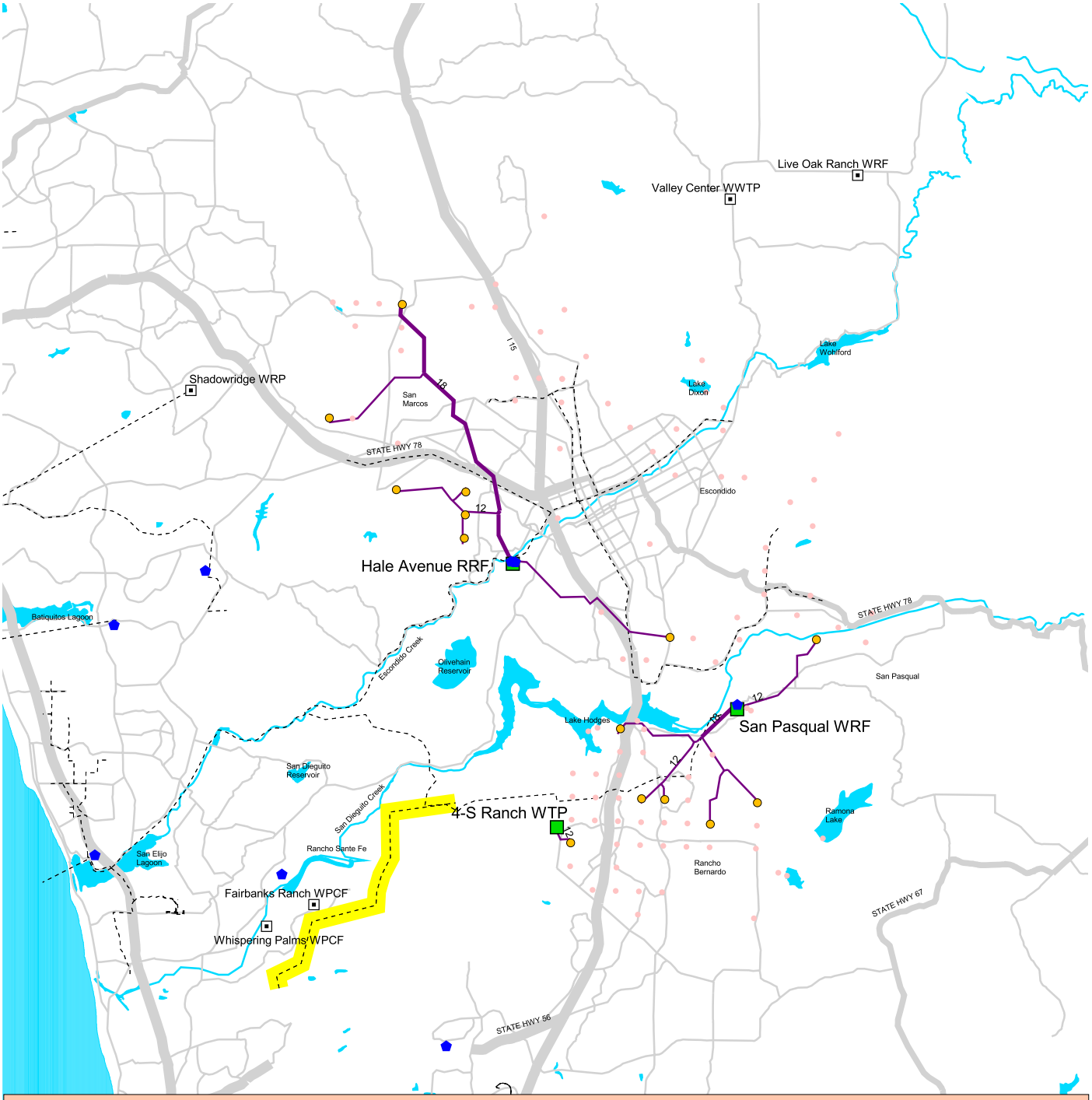


Figure ES-13
Identified 2010 Project
San Pasqual Valley

0 2 4 Miles

N

- Supply in Analysis
- Supply Not in Analysis
- Connected Demands
- Unconnected Demands
- Pump Stations
- Modeled Reclaimed Water Routes (with diameter = or >12 inches indicated)
- Existing/Planned Pipelines
- Pipelines with Available Capacity
- Roads
- Major Body of Water
- Major Rivers

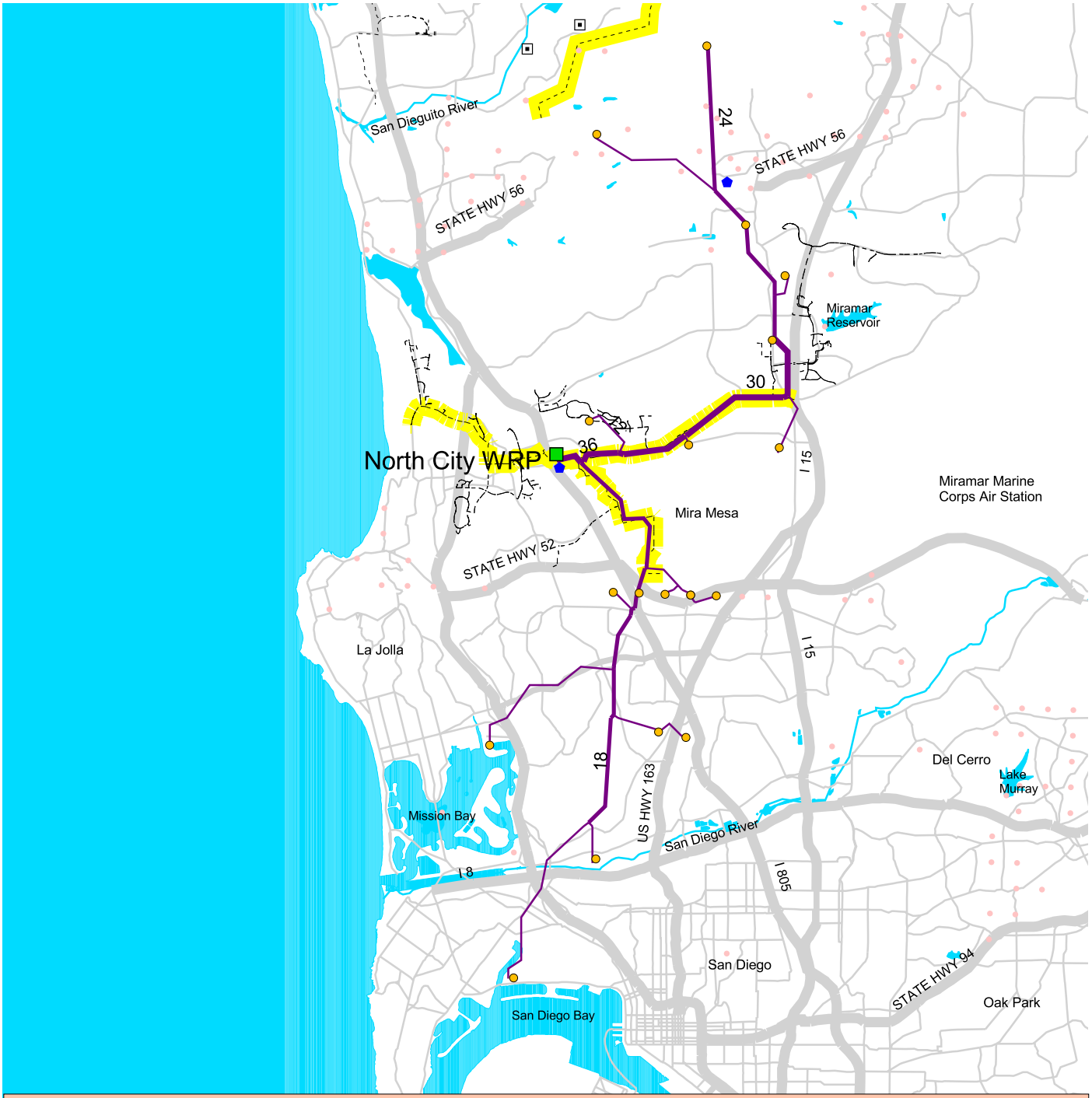


Figure ES-14
Identified 2010 Project
North City

0 2 4 Miles

N

Supply in Analysis	Pump Stations		Roads
Supply Not in Analysis	Modeled Reclaimed Water Routes (with diameter = or >12 inches indicated)		Major Body of Water
Connected Demands	Existing/Planned Pipelines		Major Rivers
Unconnected Demands	Pipelines with Available Capacity		

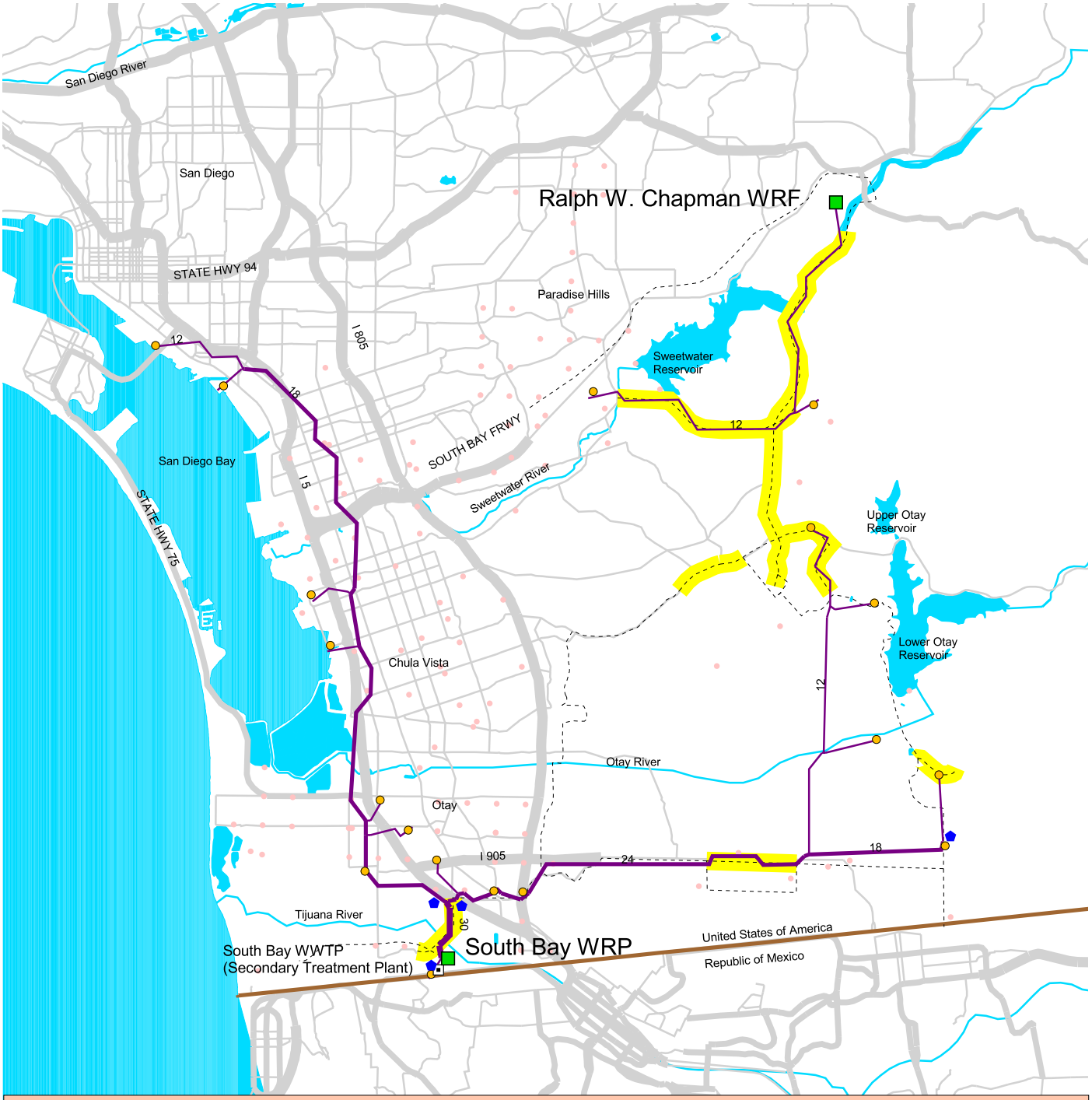


Figure ES-15
Identified 2010 Project
South Bay

0 2 4 Miles

N

Supply in Analysis	Pump Stations		Roads
Supply Not in Analysis	Modeled Reclaimed Water Routes (with diameter = or >12 inches indicated)		Major Body of Water
Connected Demands	Existing/Planned Pipelines		Major Rivers
Unconnected Demands	Pipelines with Available Capacity		International Boundary

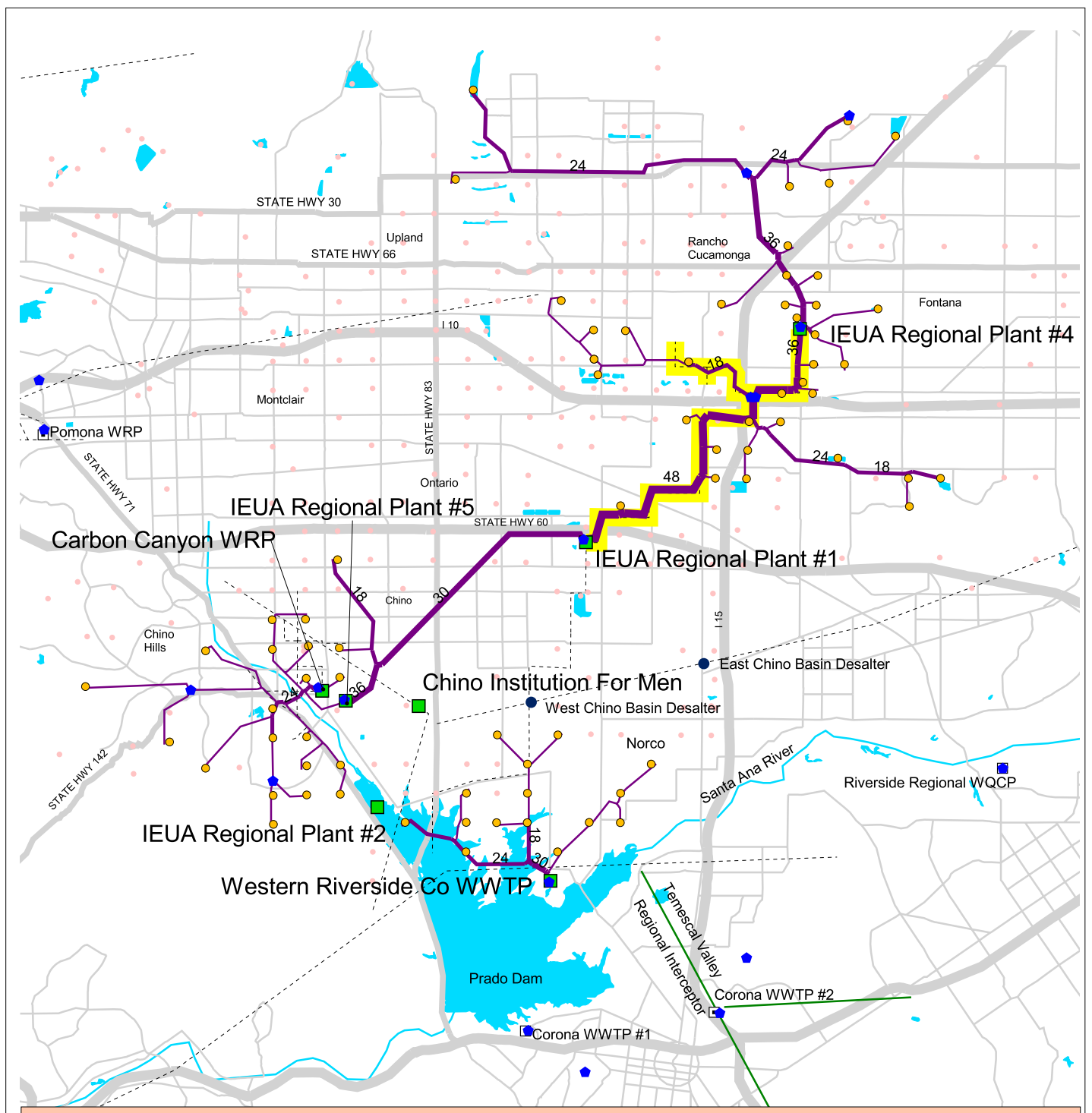


Figure ES-16
Identified 2010 Project
Chino Basin

0 2 4 Miles

N

- Supply in Analysis
- Supply Not in Analysis
- Connected Demands
- Unconnected Demands
- Pump Stations
- Modeled Reclaimed Water Routes (with diameter = or >12 inches indicated)
- Existing/Planned Pipelines
- Pipelines with Available Capacity
- Planned Brine Line
- Roads
- Major Body of Water
- Major Rivers

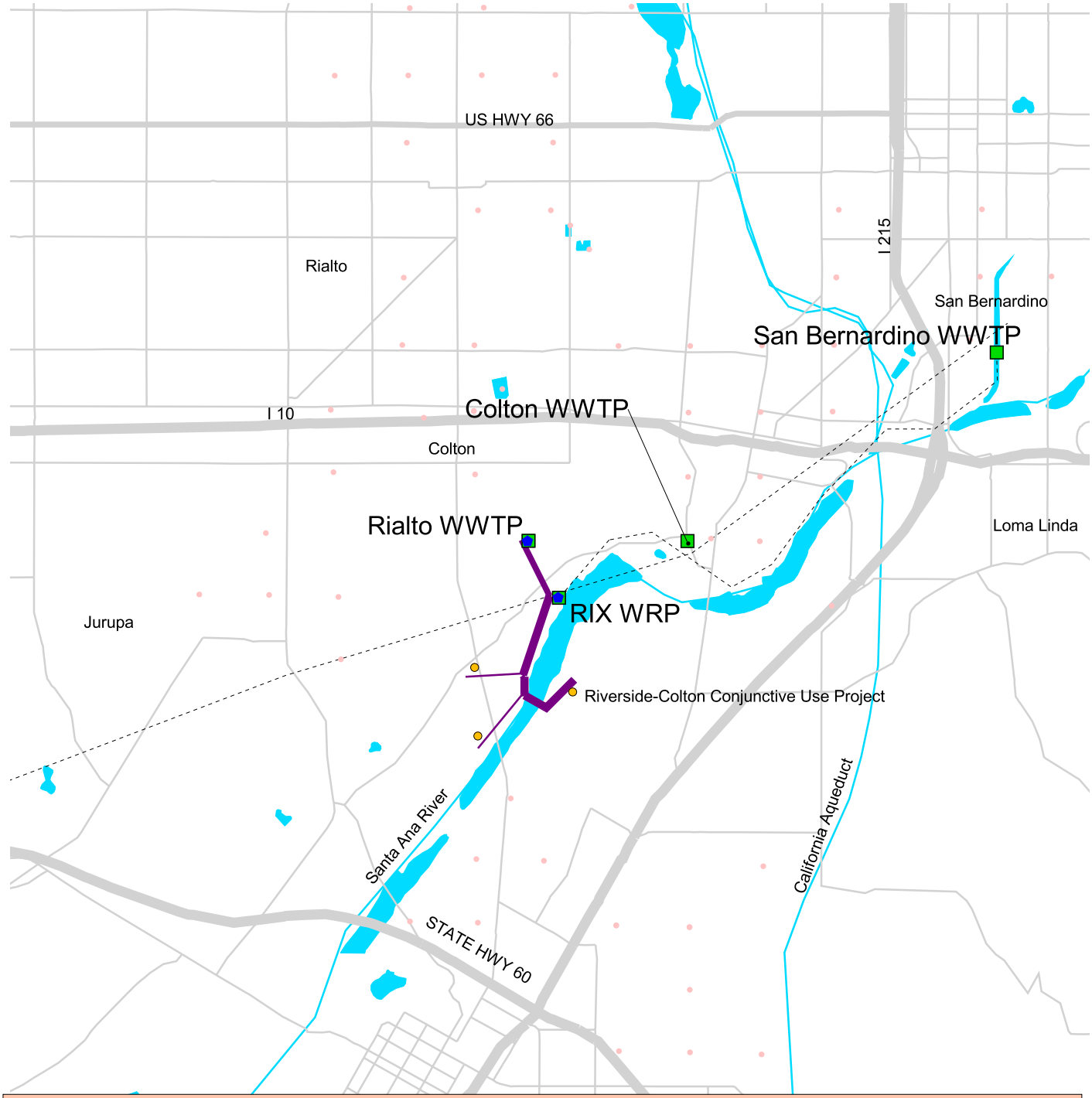
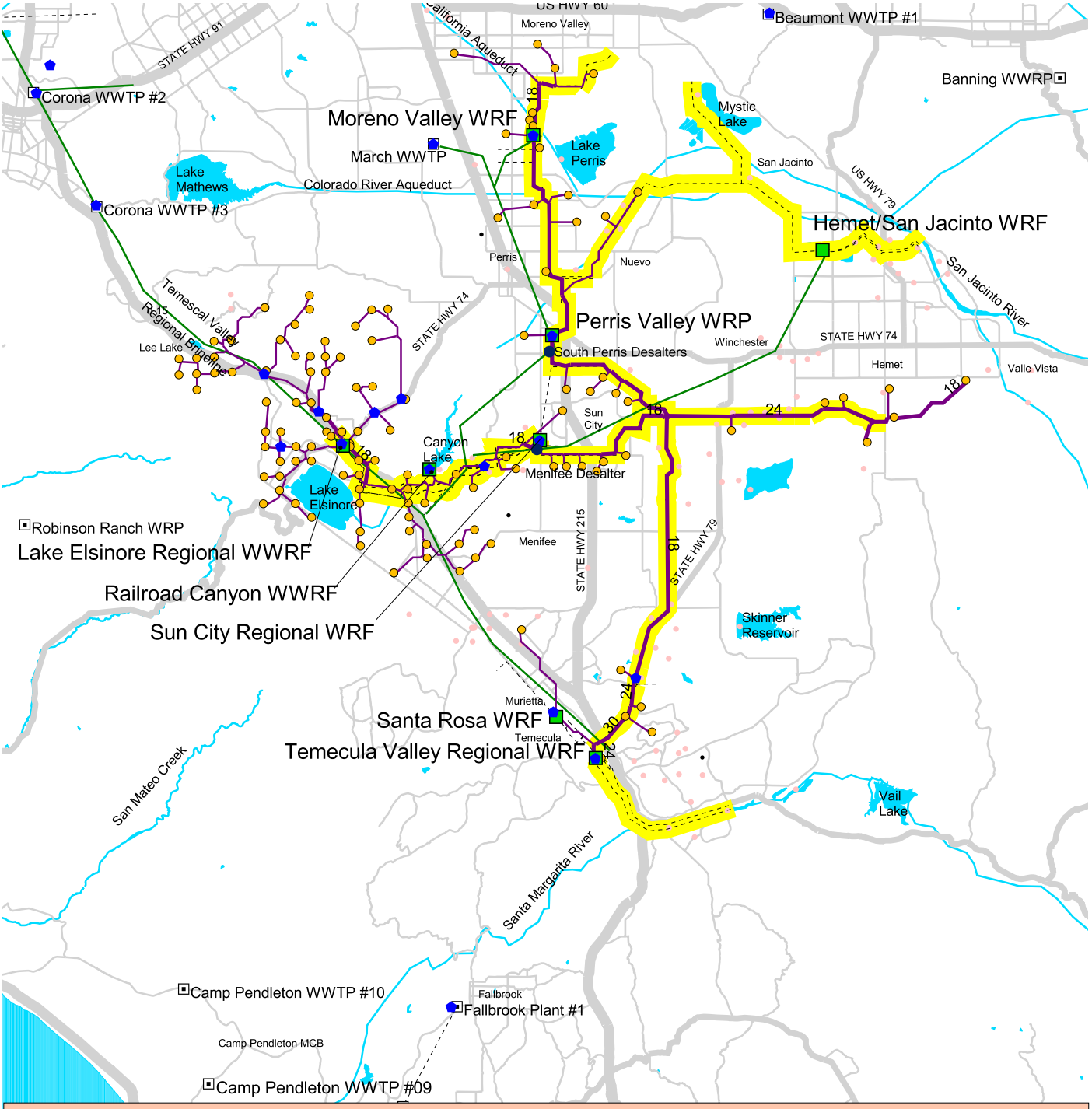


Figure ES-17
Identified 2010 Project
San Bernardino

0 1 2 Miles

N

- Supply in Analysis
- Connected Demands
- Unconnected Demands
- Pump Stations
- Modeled Reclaimed Water Routes (with diameter = or >12 inches indicated)
- Existing/Planned Pipelines
- Pipelines with Available Capacity
- Roads
- Major Body of Water
- Major Rivers


US HWY 60
Moreno Valley
Beaumont WWTP #1
California Aqueduct
STATE HWY 91
Corona WWTP #2
Banning WWRP
Moreno Valley WRF
Mystic Lake
March WWTP
Lake Perris
San Jacinto
US HWY 79
Lake Mathews
Colorado River Aqueduct
Corona WWTP #3
Hemet/San Jacinto WRF
Perris
Nuevo
San Jacinto River
Temescal Valley Regional Brineline
STATE HWY 74
Perris Valley WRP
Winchester
STATE HWY 74
Lee Lake
South Perris Desalters
Hemet
Valle Vista
Sun City
Canyon Lake
Menifee Desalter
Lake Elsinore
Robinson Ranch WRP
Lake Elsinore Regional WWRF
Menifee
STATE HWY 215
STATE HWY 79
Railroad Canyon WWRF
Sun City Regional WRF
Skinner Reservoir
Murietta
Santa Rosa WRF
Temecula
Temecula Valley Regional WRF
San Mateo Creek
Vail Lake
Santa Margarita River
Camp Pendleton WWTP #10
Fallbrook
Fallbrook Plant #1
Camp Pendleton MCB
Camp Pendleton WWTP #09
Figure ES-18
Identified 2010 Project
Eastern Limited
0 2 4 Miles
N
Supply in Analysis
Supply Not in Analysis
Connected Demands
Unconnected Demands
Pump Stations
Modeled Reclaimed Water Routes
(with diameter = or >12 inches indicated)
Existing/Planned Pipelines
Pipelines with Available Capacity
Planned Brine Line
Roads
Major Body of Water
Major Rivers

the need for groundwater or imported supplies, the potential production from these projects would enhance water supply reliability in southern California. The single-agency projects include the following:

- Los Angeles Basin Region:
  - Alamitos
  - Burbank
  - LA/Glendale
  - Long Beach
  - Long Beach Wetlands
  - San Fernando Valley
- San Diego Region:
  - Camp Pendleton
  - Fallbrook
  - Oceanside
  - Rancho Santa Fe
  - Santee Basin
- Inland Empire Region:
  - Beaumont
  - Big Bear
  - Corona
  - March
  - Redlands
  - Riverside
  - Running Springs
  - Yucaipa

Figures ES-19 through ES-21 present the proposed layouts of the 19 single-agency projects contained in the STIP Report.

Together, the 34 STIPs form the building blocks of the long-term regional recycling strategy for southern California. The results of the short-term analysis are presented in Appendix C. Table ES-2 presents the yield; capital, operation and maintenance (O&M) costs, and unit costs; and net benefit for the projects. The 15 regional projects are listed separately, while the single-agency projects are aggregated as one line at the bottom of the table.

As shown in Table ES-2, implementation of all 34 projects represents a potential increase in the amount of recycled water used by approximately 451,500 AFY. The total project capital cost is approximately $2.25 billion and O&M cost is $134.1 million. The estimated unit cost ranges from $600 per acre-foot (ac-ft) to $700 per ac-ft. The economic analyses concluded that the benefits of regional water recycling projects are diverse. The 34 projects include broader societal benefits as well as benefits to their ratepayers and local communities. Avoided alternative water supply costs, avoided waste discharge costs, and the associated avoided environmental impacts all contribute to the broader societal benefits of both the regional, as well as the single-agency recycled water projects. The total net benefit for the Total Society perspective is $2.56 billion.

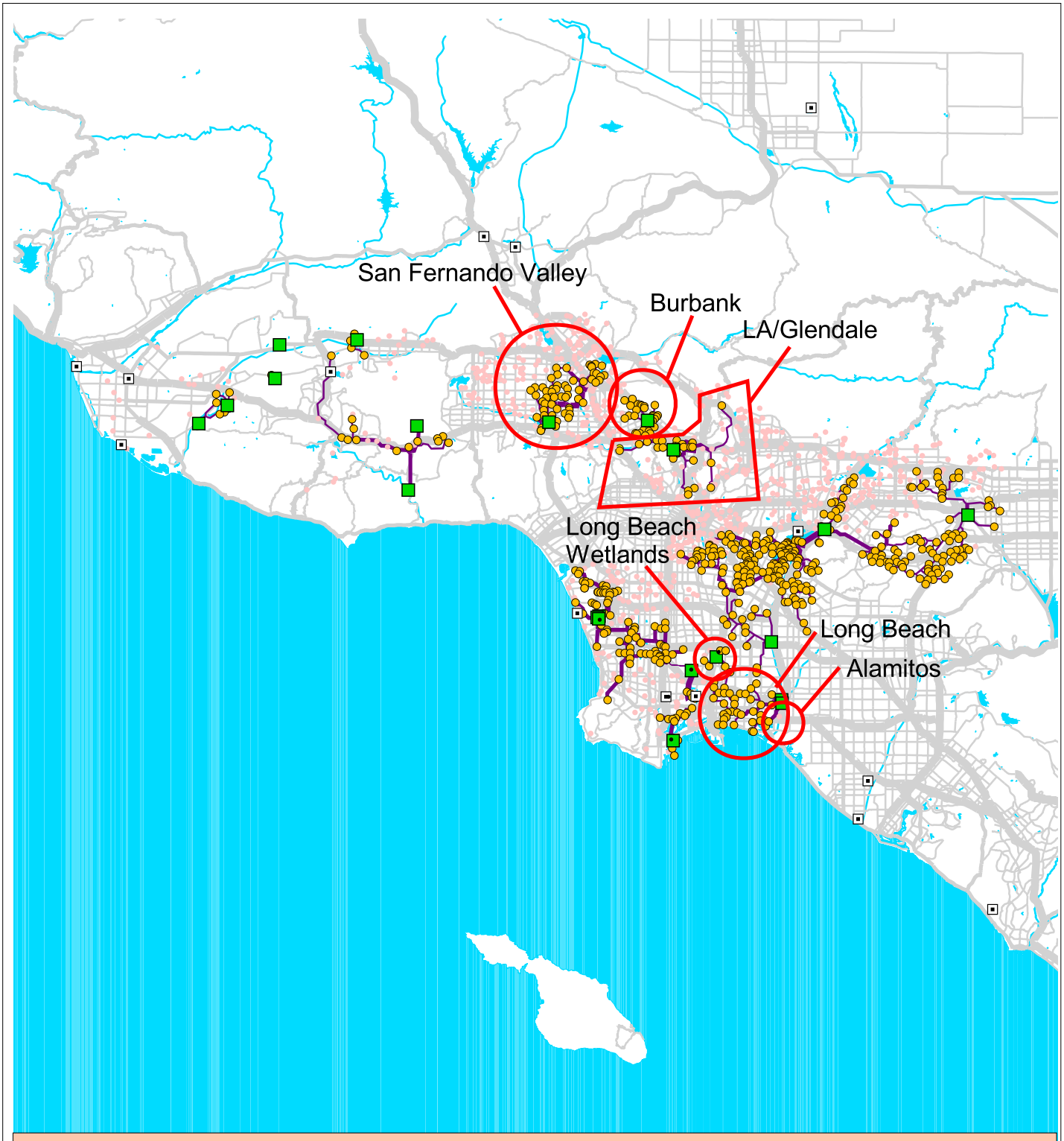


Figure ES-19
Identified 2010 Single-Agency Projects
Los Angeles Basin Region

0 6 12 Miles

N

Supply in Analysis
Supply Not in Analysis
Connected Demands
Unconnected Demands
Modeled Reclaimed Water Routes
Roads
Major Body of Water
Major Rivers

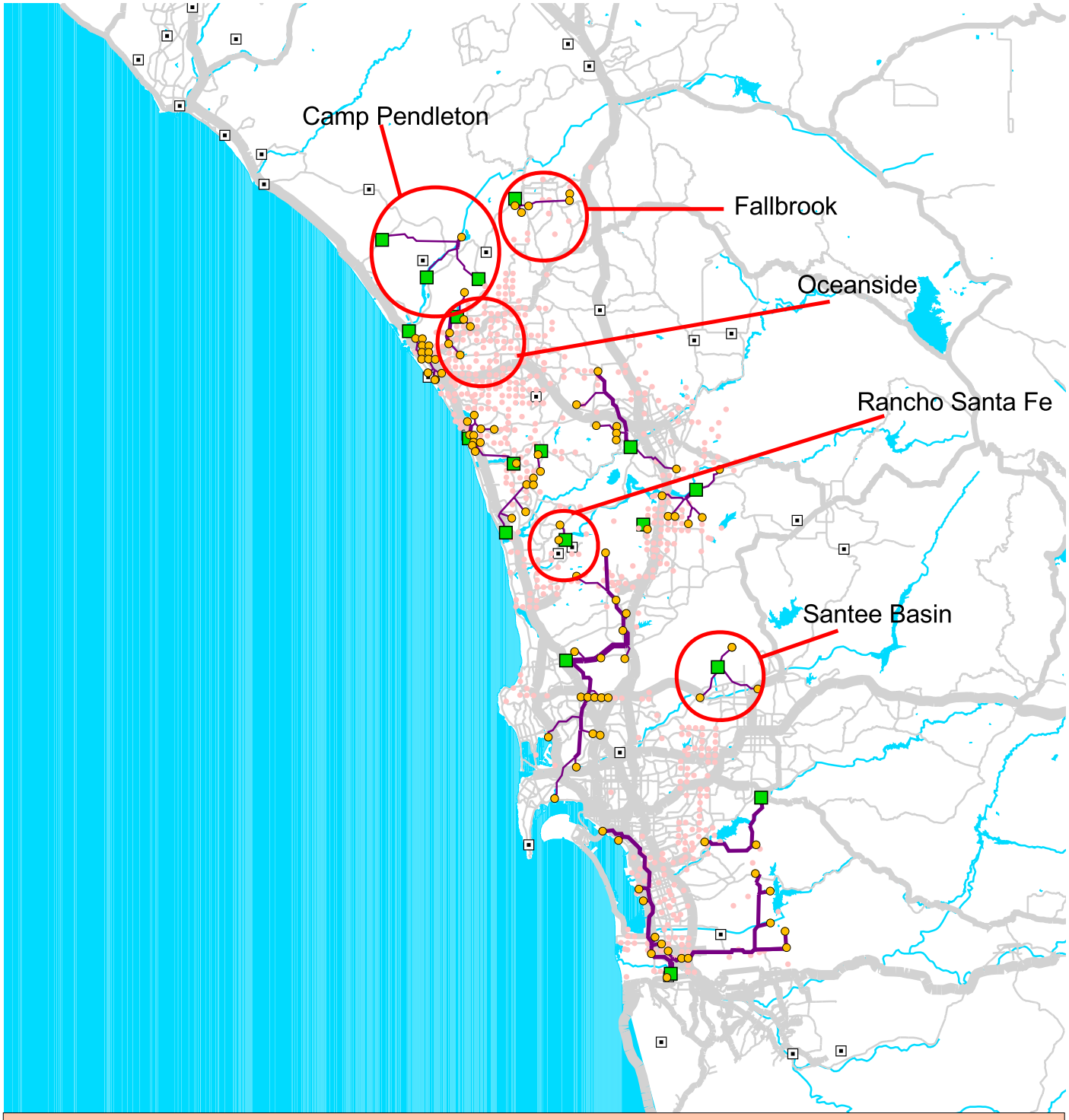


Figure ES-20
Identified 2010 Single-Agency Projects
San Diego Region

0 3 6 Miles

N

Supply in Analysis
Supply Not in Analysis
Connected Demands
Unconnected Demands
Modeled Reclaimed Water Routes
Roads
Major Body of Water
Major Rivers

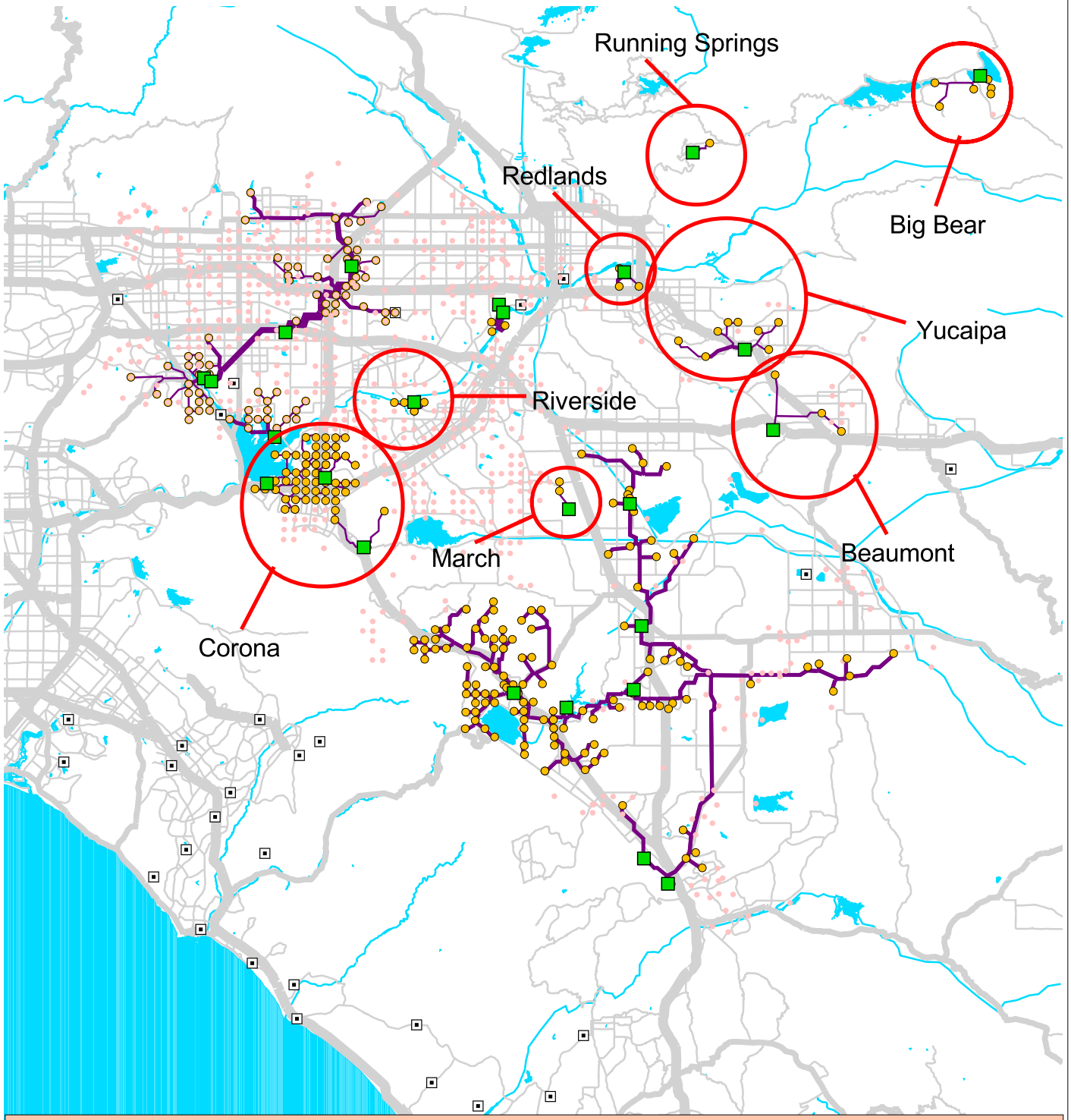


Figure ES-21
Identified 2010 Single-Agency Projects
Inland Empire Region

0 5 10 Miles

N

Supply in Analysis
Supply Not in Analysis
Connected Demands
Unconnected Demands
Modeled Reclaimed Water Routes
Roads
Major Body of Water
Major Rivers

TABLE ES-2
Summary of Short-Term Implementation Plan Projects (Real 2000$)

Name	Yield (AFY)	Cost			Net Benefit[3] (Million $)
		Capital (Million $)	Annual O&M[1] (Million $)	Unit Cost[2] ($/ac-ft)	
Calleguas[4]	24,900	112.7	3.7	400 - 500	219.6
East San Gabriel	6,700	74.2	1.5	800 - 1,000	12.8
West Basin	42,600	199.0	31.4	1,000 - 1,300	65.8
Central Basin	16,700	104.7	1.2	400 - 500	139.9
North Orange County	1,100	10.1	0.1	700 - 800	5.0
Central Orange County[4]	93,100	546.5	25.9	600 - 800	467.6
Upper Oso	4,100	38.7	0.9	800 - 1,000	10.2
San Juan	16,300	98.8	3.8	600 - 700	90.6
Encina[4,5]	3,500	31.4	1.6	1,000 - 1,200	1.7
San Pasqual	8,200	58.1	3.2	800 - 1,000	41.1
North City	9,600	71.7	3.8	800 - 1,000	21.3
South Bay	15,600	83.0	6.2	700 - 900	54.7
Chino Basin	66,100	219.6	10.0	300 - 400	567.7
San Bernardino	51,600	83.2	19.7	500 - 600	314.2
Eastern-Limited	23,300	174.4	7.5	700 - 900	64.8
Single-Agency Projects[6]	68,100	346.7	13.6	500 - 600	482.8
Total	**451,500**	**2,252.8**	**134.1**	**600 - 700**	**2,559.8**

Footnotes:

[1]Capital and O&M costs are without contingency.

[2]Unit costs are based on a 30-year period of analysis, 2% inflation rate, and a real discount rate of 4.779%. The high-end unit costs reflect an additional 25% overall project contingency. The total unit cost is computed using the sum total of the projected yield, capital cost, and O&M costs.

[3]Economic calculations are based on a 30-year period of analysis, 2% inflation rate, and a real discount rate of 4.779% for the Total Society perspective.

[4]These projects are authorized Title XVI projects, which represent approximately 109,500 AFY of recycled water that is included in the projected total yield.

[5]An earlier phase of this project is an authorized Title XVI project. The proposed single-agency project reflects an expansion of the previously planned project.

[6]Single-Agency Projects consist of the following: Alamitos[4], Beaumont, Big Bear, Burbank, Camp Pendleton, Corona, Fallbrook, LA/Glendale, Long Beach[4], Long Beach Wetlands, March, Oceanside, Rancho Santa Fe, Redlands, Riverside, Running Springs, San Fernando Valley, Santee Basin[4], Yucaipa. Details for these projects are presented in Appendix C, *The Short-Term Implementation Plan*.

Long-Term Regional Recycling Strategy

The development of the long-term regional recycling strategy was the final step in the SCCWRRS process. The long-term analysis consisted of a conservative evaluation of future levels of recycling based upon the current plans of local agencies. The planning tools were used to generate regional reclamation distribution systems and the product of this analysis is the proposed long-term regional recycling strategy. The analysis used planned treatment facility expansions as potential sources of recycled water and allocated the recycled water to demands projected to be available by the year 2040. The potential long-term demand included the demand that was not allocated supply in

the short-term analysis, as well as any projected new demand. The result of this analysis is a conservative estimate of the level of recycling that can reasonably be achieved by the year 2040 as an outgrowth of implementing the STIPs.

The planning tools were used to develop the long-term project alternatives. The results of the short-term analysis were used as a starting point for the long-term analysis, and the result was a conservative estimate of recycled water use over the next 40 years. The planning tools were used to develop proposed reclamation distribution systems, as well as to estimate engineering and economic costs and benefits of the projects. The results of the long-term analysis are included in Table ES-3. As shown in Table ES-3, an additional 296,300 AFY of new demand is potentially satisfied by 2040, resulting in a total increase through both planning horizons of approximately 747,800 AFY.

TABLE ES-3
Results of the Long-Term Analysis

Region	Demand Satisfied by 2010 (AFY)[1]	Additional Demand Satisfied By 2040 (AFY)[2]	Total Demand Satisfied (AFY)
Los Angeles Basin	128,100	96,400	224,500
Orange County	114,600	52,500	167,100
San Diego	50,300	65,200	115,500
Inland Empire	158,500	82,200	240,700
Total	**451,500**	**296,300**	**747,800**

Footnotes:

[1]New demand satisfied by allocating recycled water as part of the short-term analysis.

[2]New demand satisfied in the long-term analysis. The demand includes only the demand connected in the long-term analysis and is incremental to the demand that was satisfied in the short-term analysis.

[3]Cumulative demand satisfied by the year 2040, which is a summation of the demand satisfied by 2010 and by 2040.

Given the uncertainties of a 40-year planning horizon, additional iterations to further refine the long-term regional networks were not conducted. Instead, the SCCWRRS analysis examined additional potential opportunities to expand upon the projected level of recycling. These alternatives were compared to the baseline, conservative estimate of long-term recycling. Other long-term recycling opportunities were overlaid on the baseline condition to project increases in future recycled water use, as well as to develop estimated costs associated with these opportunities. The alternatives analysis focused on maximizing reuse through additional reuse types, such as groundwater recharge and surface storage augmentation.

The alternatives analysis consisted of two separate reuse scenarios. One scenario examined increasing recycled water demand through indirect potable reuse, while the other scenario evaluated increasing recycled water supplies by reusing wastewater supplies with effluent with historically high salinity concentrations. The analysis of indirect potable reuse examined using additional groundwater recharge sites, as well as the implementation of surface storage augmentation. For the analysis of supplies with effluent with historically high salinity concentrations, treatment facilities with high

recycled water treatment costs due to high salinity concentrations were utilized as potential supply sources.

Summary

The cooperative effort demonstrated by the many participants of SCCWRRS has generated 34 projects for implementation by 2010, as well as the development of a long-term regional recycling strategy for projects through 2040. The short-term projects have a total potential yield of approximately 451,500 AFY of additional recycled water, which represents a significant commitment to recycling by southern California water and wastewater agencies. The excitement and motivation of the local agencies for these projects will be demonstrated by their ability to continue as a regional coalition to implement the short-term projects and to identify additional opportunities to expand the use of recycled water. Reclamation supports their efforts to continue that work, and to identify funding opportunities. Reclamation will continue to facilitate the regional partnership to investigate further recycled water projects, and the continuing dialogue and evaluation of the long-term plans.