2020 Recycled Water Master Plan Update

City of San Diego

Fulfilling the Promise of the Purple Pipe System

June 22, 2020

Acknowledgements

The combined contributions of the San Diego Public Utilities Department Recycled Water project team and the consultant team were invaluable for completing this project.

This page recognizes the effort of the participants who contributed to this effort.

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Acronyms

AADDWF	annual average daily dry weather flow
AADF	average annual daily flow
ADD	average day demand
AF	acre-feet
AFY	acre feet per year
BOD	biochemical oxygen demand
CalTrans	California Department of Transportation
CEC	Constituents of Emerging Concern
CIP	Capital Improvements Plan
CIS	Customer Information System
City	City of San Diego
CSA	Central Service Area
CWA	Clean Water Act
CY	Calendar Year
EDR	electrodialysis reversal
USEPA	United States Environmental Protection Agency
ft	Feet
FY	fiscal year
GAPS	Grove Avenue Pump Station
GIS	geographic information system
gpm	gallons per minute
GSP	Groundwater Sustainability Plan
HVAC	heating, ventilating, air conditioning
HOA	Homeowner association
IDs	identification numbers
I/I	inflow and infiltration
IBWC	International Boundary and Water Commission
IPR	Indirect Potable Reuse
IROC	Independent Rates Oversight Committee
IWCP	Industrial Wastewater Control Program
MADs	Maintenance Assessment Districts
MBC	Metropolitan Biosolids Center
MBR	membrane bioreactor
MDD	maximum day demands
Metro JPA	Metro Wastewater Joint Power Authority
Metro System	Metropolitan Wastewater System
mg	million gallons
mgd	million gallons per day
NCPWF	North City Pure Water Facility
NCWRP	North City Water Reclamation Plant
NPDES	National Pollutant Discharge Elimination System

NPR	non-potable reuse
NSA	North Service Area
O&M	operations and maintenance
OMWD	Olivenhain Municipal Water District
OPRA	Ocean Pollution Reduction Act
OWD	Otay Water District
PA	Participating Agency
PF	peaking factor
PLWWTP	Point Loma Wastewater Treatment Plant
Poway	City of Poway
PQPS	Penasquitos Pump Station
PS	Pump Station
psi	pounds per square inch
PWC	Potable Water Customer
RCTS	Rose Canyon Trunk Sewer
RFC	Raftelis Financial Consultants
RO	reverse osmosis
RW	Recycled Water
RWCWRF	Ralph W. Chapman Water Recycling Facility
RWMP	Recycled Water Master Plan
RWQCB	Regional Water Quality Control Board
SANDAG	San Diego Association of Governments
SBOO	South Bay Ocean Outfall
SBWRP	South Bay Water Reclamation Plant
SDCWA	San Diego County Water Authority
SDG&E	San Diego Gas and Electric
SFID	Santa Fe Irrigation District
SMI	South Metro Interceptor
SPSA	San Pasqual Service Area
SSA	South Service Area
Study	Recycled Water Study
SV	Spring Valley
SWRCB	California State Water Resources Control Board
TAC	Technical Advisory Committee
TDS	Total Dissolved Solids
TM	Technical Memorandum
TSS	total suspended solids
UGRs	unit generation rates
USEPA	U.S. Environmental Protection Agency
UWMP	Urban Water Management Plan

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1 Introduction

In 1989, the San Diego Municipal Code (Chapter 6, Article 4, Division 8) was amended to require the City of San Diego (City) to prepare and adopt a Recycled Water Master Plan (RWMP) to define, encourage, and develop the use of recycled water within its boundaries. Since 1990, in accordance with the Municipal Code, the RWMP has been updated approximately every five years. The latest RWMP Update was developed in conjunction with the City of San Diego Recycled Water Study (Study) in 2012.

1.1 History of the Water Reuse Program

The City has been a pioneer in the field of water recycling. In 1981, the 25,000-gallon per day Aqua I pilot aquaculture plant began operation in Mission Valley with the water produced used to irrigate a sod farm adjacent to Jack Murphy Stadium (now Qualcomm Stadium). In 1984, the Aqua II Water Reclamation Facility, a second, larger pilot research installation, began treating 180,000 gallons per day of wastewater. This water was sold to the California Department of Transportation (CalTrans) for use in irrigating freeway landscaping beginning in 1987. In 1991, the Aqua III Water Reclamation Facility and Aqua 2000 Research Center were located in the San Pasqual Valley, north of the community of Rancho Bernardo, where the Aqua III plant continued to use aquaculture treatment to recycle wastewater. This facility had the capacity to treat 1 million gallons per day (mgd) for agricultural use and landscape irrigation. The Research Center continued to study the concept of advanced water treatment and potable reuse using a variety of treatment methods until 2001 when the project was discontinued.

In 1997, the North City Water Reclamation Plant (NCWRP) was completed as part of the Clean Water Program. Since then the City has been delivering recycled water to customers for irrigation and industrial use on a larger scale. In 2002, the South Bay Water Reclamation Plant (SBWRP) was completed, and in July 2006 began delivery of recycled water to the International Boundary and Water Commission (IBWC), followed by wholesale delivery to Otay Water District (OWD) and retail delivery to CalTrans. The amount of water reused reached a maximum of approximately 13,000 acre-feet per year (AFY) in 2014 to customers within the City's two service areas, as well as outside agencies (or wholesale customers). Since 2014, average annual use has been approximately 6 to 7 percent lower.

The City has made significant progress in expanding recycled water use based on the framework outlined in previous planning efforts. Key planning studies that have guided recycled water system expansions include the *1992 Recycled Water Distribution Master Plans*, the *2000 Updated Water Reclamation Master Plan (Northern and Central Service Areas), 2005 Recycled Water Master Plan Update, 2005 South Bay Recycled Water Feasibility Study, 2006 Water Reuse Study, 2010 Recycled Water Master Plan (final report dated August 2011) and 2012 Recycled Water Study.* An overview of the key findings from the studies dated prior to 2010 was provided in Section 1.3.2 and Appendix A of the 2010 Recycled Water Master Plan.

Since these reports were developed, the City has completed Phase I of the Northern Service Area recycled water system expansion along Black Mountain Road in 2005, and the Phase II expansion, westerly from Black Mountain Road along the State Route (SR)-56 corridor, is substantially complete, with plans to complete all projects by 2020. In addition, City staff has actively pursued connecting the potable water use sites identified as Tier 1 customers which were those that had a

demand greater than 20 AFY and were located immediately adjacent to an existing or planned (Phase I and II) pipeline. Tier 2 customers were identified as having demands ranging from 7 to 20 AFY and located along the existing and Phase I and II recycled water distribution systems. Many of the identified Tier 1 sites and Tier 2 sites, located adjacent to the existing recycled water distribution system, are now being served by recycled water. Several more sites are in the plan review stage. The number of retail recycled water meters in the NSA has increased from 508 in 2010 to 744 in 2018.

In South Bay, potential customers and potential pipeline extension projects were previously identified to serve the Southern Service Area region. However, due to the limited city-owned infrastructure, nearly all new future expansion in demand is within the Otay Water District service area. Therefore, future expansion in the City's Southern Service Area is primarily limited to serving Caltrans and additional Otay demands.

The following discussion briefly recounts some of the key historical events and milestones that have defined the City's recycled water program.

1.1.1 Recycled Water as a Local Water Supply Resource

Most of the City's existing water supply is imported water from the Colorado River and the California State Water Project. Because of this, the City has long recognized the need to develop local water supplies to balance and reduce the dependence on imported water. A diversified water "portfolio" would provide the City needed reliability and local control of its water supply. In 1997, the City prepared the Strategic Plan for Water Supply, a significant initial effort at documenting the diversification needed to address water supply needs through 2015. This report was updated in 2002 with the more detailed Long-Range Water Resources Plan, most recently revised in 2012, outlining a phased approach to satisfy future water supply needs. The 2012 Long-Range Plan recommended continued active water conservation, groundwater resource development and the use recycled water and advanced treated Pure Water to meet future demands and outlined specific goals for recycled water and pure water supply through 2035.

The need for local water supply development has been echoed by the San Diego County Water Authority (SDCWA). Their 2018 Annual Water Supply Report shows plans to increase local supplies (including recycled water and pure water) from 31 percent of regional demands in 2018 to 44 percent of regional demands by 2035. In order to support this goal, the SDCWA offers grant funding to its member agencies to study the development of local resources.

In 2009, the California State Water Resources Control Board (SWRCB) adopted the *Statewide General Waste Discharge Requirements for Landscape Irrigation Uses of Municipal Recycled Water*. This general permit streamlines the permitting process for use of disinfected tertiary recycled water from municipal sources for landscape irrigation projects. Such irrigation projects include parks, greenbelts, school yards, athletic fields, golf courses, and several other public access areas. The general permit requires that the recycled water meet certain treatment and use standards for protecting public health and the environment throughout the state of California.

The SWRCB also adopted a recycled water policy aimed at increasing recycled water usage, minimizing carbon footprint, and promoting sustainable management of surface and groundwater resources. The Recycled Water Policy was first adopted in 2009, and was amended in 2013 and again in 2018. The purpose of the Policy for Water Quality Control for Recycled Water (Policy) is to:

- Encourage the safe use of recycled water from wastewater sources that meets the definition in California Water Code (Water Code) section 13050(n), in a manner that implements state and federal water quality laws and protects public health and the environment.
- Provide direction to the regional water quality control boards (regional water boards), proponents of recycled water projects, and the public regarding the methodology and appropriate criteria for the State Water Resources Control Board (State Water Board) and the regional water boards to use when issuing permits for recycled water projects.
- Fully implement state and federal water quality laws and regulations to enhance the environment and put the waters of the state to the fullest use of which they are capable.
- Describe the circumstances under which permittees may enroll under statewide water reclamation requirements for recycled water use (e.g., State Water Board Order WQ 2016-0068-DDW) or choose an alternate permitting mechanism, such as a master recycling permit. The intent of statewide water reclamation requirements for recycled water use is to expedite the permitting of recycled water projects in a manner that implements state and federal water quality laws while allowing the regional water boards to focus their limited resources on projects that require substantial regulatory review due to unique site-specific conditions.
- Maximize consistency in the permitting of recycled water projects while also preserving sufficient authority and flexibility for the regional water boards to address site-specific conditions.

Although increased conservation and use of captured stormwater is planned, the focus of the policy is to increase the use of recycled water from municipal sources in a manner that complies with California Title 22, and all other applicable state and federal water quality laws and regulations. The policy describes criteria intended to streamline and generate consistency in the permitting of recycled water projects. Topics addressed by the policy include the following:

- Salt and nutrient management plans for groundwater basins and watersheds;
- Streamlined permitting for landscape irrigation projects that use recycled water;
- Recycled water groundwater recharge projects;
- Antidegradation of water quality;
- Contaminants of emerging concern; and,
- Incentives for the use of recycled water.

One of the stated goals of the Policy is to support water supply diversity and sustainability and to encourage the increased use of recycled water in California. In 2018, the SWRCB adopted the following updated goals:

- Increase the use of recycled water from 714,000 AFY in 2015 to 1.5 million AFY by 2020 and to 2.5 million AFY by 2030.
- Reuse all dry weather direct discharges of treated wastewater to enclosed bays, estuaries and coastal lagoons, and ocean waters that can be viably put to a beneficial use. For the purpose of this goal, treated wastewater does not include discharges necessary to maintain beneficial uses and brine discharges from recycled water facilities or desalination facilities.

- Maximize the use of recycled water in areas where groundwater supplies are in a state of overdraft, to the extent that downstream water rights, in stream flow requirements, and public trust resources are protected.

The 2018 update of the Policy also contains new recycled water and wastewater reporting requirements that will accurately track the annual use of recycled water.

In 2019, the State of California issued the California WateReuse Action Plan, a comprehensive set of proposed actions that will more than double the use of water recycling in California and help prepare the state for the impacts of climate change. The Plan identifies four strategic areas for action: research, regulations, regional planning and funding and includes 20 specific recommendations.

1.1.2 Recycled Water and Wastewater Management

In addition to a critical water supply need, wastewater management also drives the need to maximize local water recycling. Since 1963 the City has treated its wastewater at the Point Loma Wastewater Treatment Plant (PLWWTP), which provides advanced primary treatment before disposal via an ocean outfall. In 1972, the federal Clean Water Act (CWA) was adopted which requires that wastewater plants provide a minimum of secondary treatment. Section 301(h) of the CWA allowed facilities that discharge to certain marine waters to apply for a modified National Pollutant Discharge Elimination System (NPDES) permit, waiving secondary treatment requirements. The City originally applied for the modified permit, but then withdrew it. In 1987, the U.S. Environmental Protection Agency (USEPA) and environmental groups sued the City for not meeting the provisions of the CWA. The Ocean Pollution Reduction Act (OPRA) was passed in 1994 to allow San Diego to reapply for the modified permit. The lawsuit was resolved later that year when the modified permit was granted, saving the City an estimated $3 billion in avoided capital costs for additional secondary treatment facilities.

As part of the application for a modified NPDES permit, the City committed to implementing a water reclamation program, known as the Clean Water Program, which would create a system capacity to treat 45 mgd by 2010. The City has fulfilled the treatment capacity requirement with the completion of the 30 mgd NCWRP in 1997 and the 15 mgd SBWRP in 2002. A 1995 federal court order further required the City to construct an “optimized recycled water distribution system” in conjunction with building the NCWRP. The majority of the distribution facilities that comprise the optimized system were installed between 1995 and 1998 to enable delivery of recycled water upon completion of the reclamation plant.

The USEPA provided a grant that helped fund the construction of the NCWRP. Conditions of the grant award are quoted as follows:

> *Upon certification of the NCWRP, flows into the plant will constitute a minimum of 75 percent of the plant’s design capacity (i.e. at least 22.5 mgd). Of these flows the City will beneficially reuse at least 10 percent upon certification and shall attempt to meet the following goals:*
>
> *a. Beneficial reuse of 25 percent of the flows treated at the NCWRP by December 31, 2003.*
>
> *b. Beneficial reuse of 50 percent of the flows treated at the NCWRP by December 31, 2010.*

Based on anticipated flows, the City established reuse goals of 6 mgd by the end of 2003 and 12 mgd by the end of 2010 to fulfill the USEPA grant goals.

Presently, NCWRP treats 22.5 mgd (75 percent of capacity) of wastewater to secondary standards. Tertiary standards are achieved to meet recycled water demands. The USEPA requirement to reuse 10 percent of the treated flows was achieved in 1998, when about 2.4 mgd of recycled water was distributed. Currently, approximately 8,000 AFY (7.4 mgd) of recycled water from the NCWRP is beneficially reused. Through the distribution system expansion, parkland/open space retrofits, and by requiring developers in the NCWRP service area to construct recycled water conveyance systems to new developments, the City has diligently pursued the fulfillment of the water reuse goals.

Regarding the City's application for a new modified NPDES permit in 2000, disagreements arose as to the interpretation of OPRA, primarily over the quantity of suspended solids that could be discharged from the PLWWTP into the Pacific Ocean. These disagreements were the subject of two administrative appeals to the Environmental Appeals Board and a lawsuit. The City appealed the USEPA's application of OPRA to the new modified permit, which would require the City to continue to reduce the quantity of suspended solids each permit period and continue to attain at least 58 percent removal of the biochemical oxygen demand (BOD). Three environmental groups also appealed the new modified permit on a number of issues, including that the quantity of suspended solids should be reduced further. In addition, an environmental group filed an action in Superior Court of San Diego County challenging the State Board's reinstatement of the 15,000 metric tons per year limit of total suspended solids (TSS).

The Superior Court challenge was dismissed and all appeals were stayed as the parties agreed to discuss possible alternative solutions to the OPRA issues. The parties met regularly from January 2003 to March 2004 and agreed on a Settlement Agreement and Joint Stipulation for Withdrawal of Appeals. The Settlement Agreement commits the City to (a) evaluate improved ocean monitoring, (b) pilot test biological aerated filters as a form of technology to increase solids removal, and (c) study increased water reuse.

1.2 Pure Water San Diego Program

In 2008, the USEPA made a decision to grant the City San Diego a modification to its NPDES permit. The permit modification allows the City to continue to operate the PLWWTP as a chemically-enhanced primary treatment facility for five years rather than requiring an upgrade to secondary treatment. The permit modification must be renewed every five years. Members of the environmental community (San Diego Coastkeeper and the San Diego Chapter of the Surfrider Foundation) have traditionally opposed past permit modification issuance, advocating the conversion of the PLWWTP to full secondary treatment and thereby reducing solids loading into the ocean. However, during the 2008-2010 permit modification process and in lieu of such opposition, San Diego Coastkeeper and the San Diego Chapter of Surfrider Foundation entered into a Cooperative Agreement (Agreement) with the City to conduct the Recycled Water Study. In accordance with the Agreement, both of these organizations provided their support to the USEPA's decision to grant the permit modification. The City's responsibility per the Agreement was to execute the Recycled Water Study.

The purpose of the 2012 Recycled Water Study was to evaluate non-potable and indirect potable reuse opportunities to meet the City and project stakeholder goals through a 2035 planning horizon. The 2012 Study developed and clearly presented integrated reuse alternatives so that the public and policy-makers could make informed decisions regarding the future of the reuse program, within the Metropolitan Sewerage System Service Area. The decisions to invest in a water reuse program, or

alternative large-scale wastewater system upgrades, will affect the rates, reliability, and regional assets for decades. Therefore, the fundamental focus of this study was to develop water reuse alternatives and then weigh the alternatives against other options – with particular focus on the water supply benefits and the cost savings through reduced wastewater systems operations and improvements. The resulting program is Pure Water San Diego.

Pure Water San Diego is a phased, multi-year program that will provide one-third of San Diego's water supply locally by 2035. The Pure Water Program:

- Uses proven technology to clean recycled water to produce safe, high-quality drinking water
- Provides a reliable, sustainable, water supply
- Offers a cost-effective investment for San Diego's water needs

The City's 2005 Water Reuse Study recommended an indirect potable reuse project at the North City Water Reclamation Plant (NCWRP) that would deliver water to the San Vicente Reservoir. To begin implementing this project, the City completed construction of the Advanced Water Treatment Facility, a component of the Water Purification Demonstration Project, in 2011 at the NCWRP. This project provided the data on the health, safety, and water quality of advanced treated recycled water needed to move forward with Phase I of the Pure Water San Diego Program. Phase 1 includes several projects that will further treat recycled water to produce 30 mgd of high-quality purified water starting in 2023, reducing the City's dependence on imported water.

1.2.1 Pure Water Phase 1

When implemented, Phase 1 will deliver 30 mgd of purified water to Miramar Reservoir. A series of studies and regulatory approvals for discharge into Miramar Reservoir have saved the City significant conveyance infrastructure costs. The purified water will blend with the City's imported and local water sources before it is treated again at the Miramar Water Filtration Plant and distributed to the public.

1.2.2 Pure Water Phase 2

The City's ultimate commitment to the environmental stakeholders is to expand Pure Water from 30 mgd to 83 mgd by 2035. The City has initiated early planning studies and plans to construct a new pilot plant at the Harbor Drive site by 2025.

1.3 Recycled Water Master Planning Requirements

In 1989, the City of San Diego adopted Ordinance O-17327 that updated the City's Municipal Code Chapter VI, Article 4 by adding Division 8, Sections 64.0801 through 64.0810, relating to establishing a recycled water master plan and implementation of procedures. Section 64.0806 states

> *Upon adoption of this ordinance, the City shall prepare and adopt a Water Reclamation Master Plan to define, encourage, and develop the use of reclaimed water within its boundaries. The Master Plan shall be updated every five years. The Master Plan may be one or more documents covering specific portions of the planning area.*

As stated, the intent of the Master Plan is to define, encourage and develop the use of recycled water within City boundaries. Previous master planning studies include the *1992 Recycled Water Distribution Master Plans*, the *2000 Updated Water Reclamation Master Plan (Northern and Central*

Service Areas), 2005 Recycled Water Master Plan Update, 2005 South Bay Recycled Water Feasibility Study, 2006 Water Reuse Study, 2010 Recycled Water Master Plan and 2012 Recycled Water Study.

After 20 years of planning, the City's recycled water system provides San Diego with a dependable, year-round and locally controlled water resource. To meet future water demands while reducing dependence on imported water, the City of San Diego has built and operates NCWRP, SBWRP, and an extensive recycled water distribution system. The master planning process for recycled water will continue to support the existing recycled water system and identify future opportunities that are aligned with the City's Pure Water Program.

Careful monitoring by City staff, state health officials and water quality control agencies ensures that recycled water produced by the City of San Diego meets all federal, state and local water quality standards. The Master Plan documents the current standards for recycled water quality and approved uses.

The California State Water Resources Control Board (link is external) sets the standards for levels of treatment and types of uses for recycled water. These standards are included in the California Code of Regulations, Title 22 (link is external).

There are extensive rules and regulations regarding the use of recycled water in the City of San Diego. These include making sure all pipes, sprinkler heads, meter boxes, and other irrigation equipment are properly marked or color-coded purple and properly labeled with signage to distinguish them from potable water supplies. The San Diego Public Utilities Department diligently works with customers to ensure they are in compliance with all regulations.

Approved uses of recycled water include the irrigation of:

- Parks
- Playgrounds
- School-yards
- Residential landscaping
- Common areas
- Nurseries
- Freeway landscaping
- Golf courses

Additional approved uses for recycled water include recreational water bodies including fishing/boating, source water for industrial processing, commercial laundries and soil compaction, for creating ponds, dual-plumbing for cooling towers, toilets, and urinals, and ornamental water features. Recycled water is also available for construction purposes under the Recycled Water Tanker Truck Program.

1.4 Master Plan Goals and Objectives

Over the past 20 years, the City of San Diego has successfully implemented a recycled water program that currently offsets over 12,400 AF (4 billion gallons) per year of potable water use and offloads Point Loma Wastewater Treatment Plant ocean outflows. In updating the Recycled Water Master Plan, the City maintains its commitment to beneficial use of a valuable water resource.

As the City proceeds with its Pure Water Program to maximize reuse of the City's wastewater flows, it is critical to keep the non-potable system working smoothly and efficiently for more than 700 (744 in 2018) recycled water retail customers and three wholesale customers (City of Poway, Olivenhain Municipal Water District, and Santa Fe Irrigation District). As such, this updated Master Plan will address the sustainability of the purple pipe system by identifying opportunities to cost effectively optimize the system operations to accommodate variable seasonal demands and provide reliable service to City customers.

The Recycled Water Master Plan update provides a plan to achieve the City's key objectives:

1. Optimize flows treated at the NCWRP and SBWRP.
2. Assess demand patterns and evaluate opportunities to manage peak demands and minimize demand swings through the NCWRP.
3. Seek infill customers that will offset potable water uses and optimize use of recycled water and support the City's Pure Water Program objectives.
4. Perform capacity and condition assessments and recommend capital improvement projects that ensure service levels and a sustainable Recycled Water transmission and distribution system.

1.4.1 Master Plan Organization

This 2020 Recycled Water Master Plan Update is organized as follows:

- Chapter 2 describes the City's existing recycled water system and baseline demands.
- Chapter 3 describes the City's recycled supply sources and the impact of the City's Pure Water Program on availability of supply. (Addressing Goals 1 and 2)
- Chapter 4 describes opportunities to add recycled water customers in the future. (Addressing Goal 3)
- Chapter 5 describes the feasibility of expanding the recycled water system in the future. (Addressing Goals 3)
- Chapter 6 provides an implementation plan for optimization and expansion of the City's recycled water system. (Addressing Goal 4)

2 Baseline Recycled Water System

The City's recycled water system serves two geographically-separated areas, with each area supplied by a reclamation facility. The Northern Service Area (NSA) is supplied with recycled water from the NCWRP, and the Southern Service Area (SSA) is supplied with recycled water from the SBWRP. Figure 2-1 shows the boundaries of the existing recycled water service areas.

The recycled water system was originally planned to consist of four independent recycled water service areas: the NSA, the SSA, the San Pasqual Service Area (via a future San Pasqual WRP), and the Central Service Area (via a future Mission Valley WRP). Currently, only the NSA and the SSA have been built. Subsequent sections of this report discuss the potential of the Southern Service Area (SSA), the Balboa Park/Central San Diego Conceptual Service Area, the San Pasqual Conceptual Service Area as part of market opportunities and infill demand potential.

This chapter describes the City's baseline recycled water system which is defined as existing (2018) facilities and demands, as well as near term planned expansions of the distribution system.

2.1 Northern Service Area

The NCWRP, described further in Section 3.1, supplies recycled water to the NSA serving irrigation and industrial customers within the City and two neighboring agency wholesale customers: the City of Poway (Poway) and Olivenhain Municipal Water District (OMWD).

2.1.1 Distribution System Description

The NSA distribution system consists of a series of pipelines, pump stations reservoirs and appurtenances, as shown on Figure 2-2 and described below.

2.1.1.1 Pipelines

Based on the City's 2018 GIS pipeline database, the existing recycled water system consists of approximately 96 miles of pipeline within San Diego. Approximately one-third of the pipe length represents transmission mains ranging in size from 16-inch to 60-inch diameter. The remainder is primarily 4-inch to 12-inch diameter local distribution pipelines. Pipe materials generally include cement mortar lined and coated (CML&C) steel pipeline for transmission mains and polyvinyl chloride (PVC) for local distribution pipelines, with some ductile iron (DI), and high density polyethylene (HDPE).

Table 2-1 and Figure 2-3 present the City's existing (2018) recycled water pipeline inventory.

Figure 2-1. Existing Recycled Water Service Areas

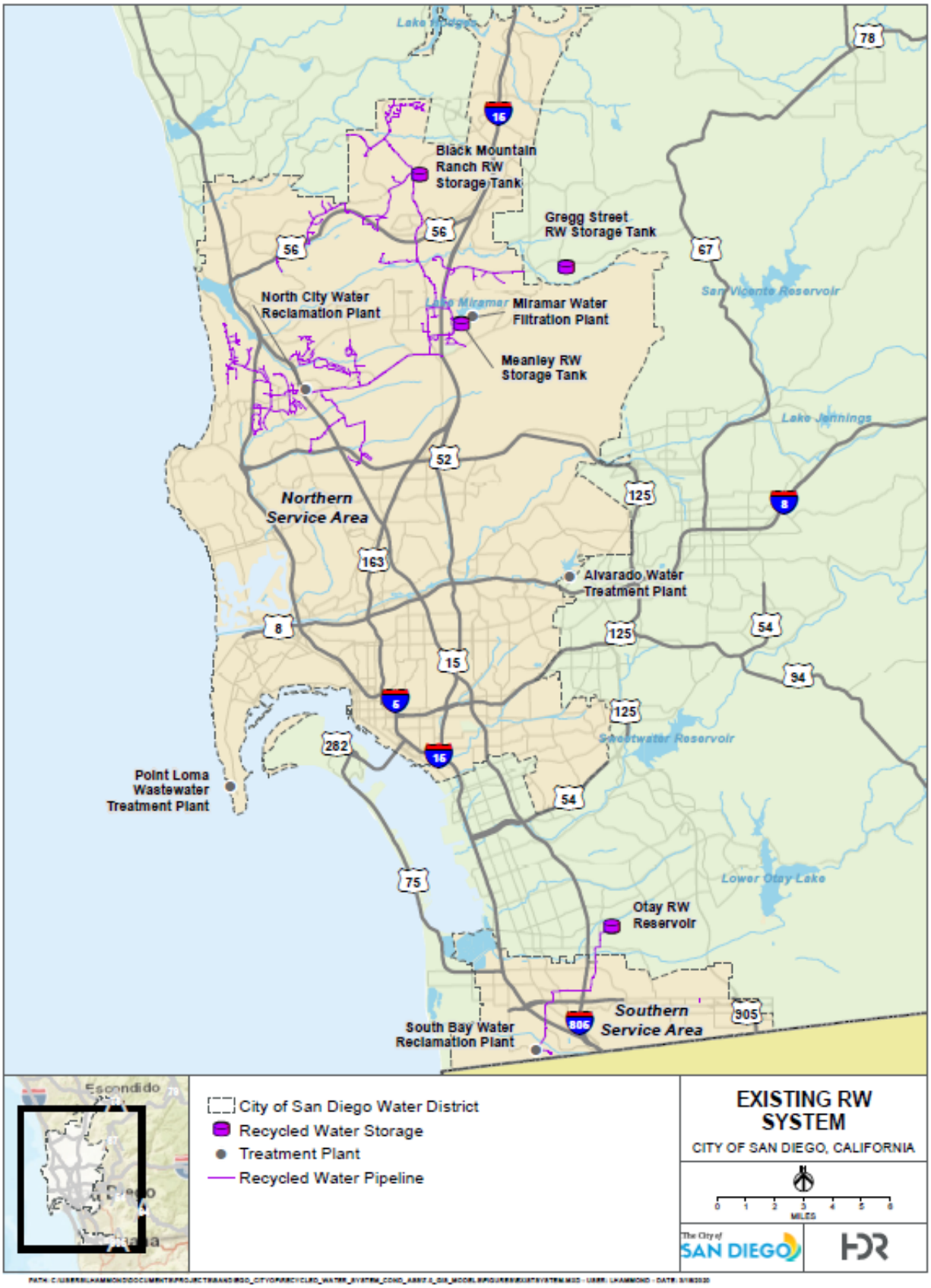

Figure 2-2. Recycled Water Facilities in the NSA

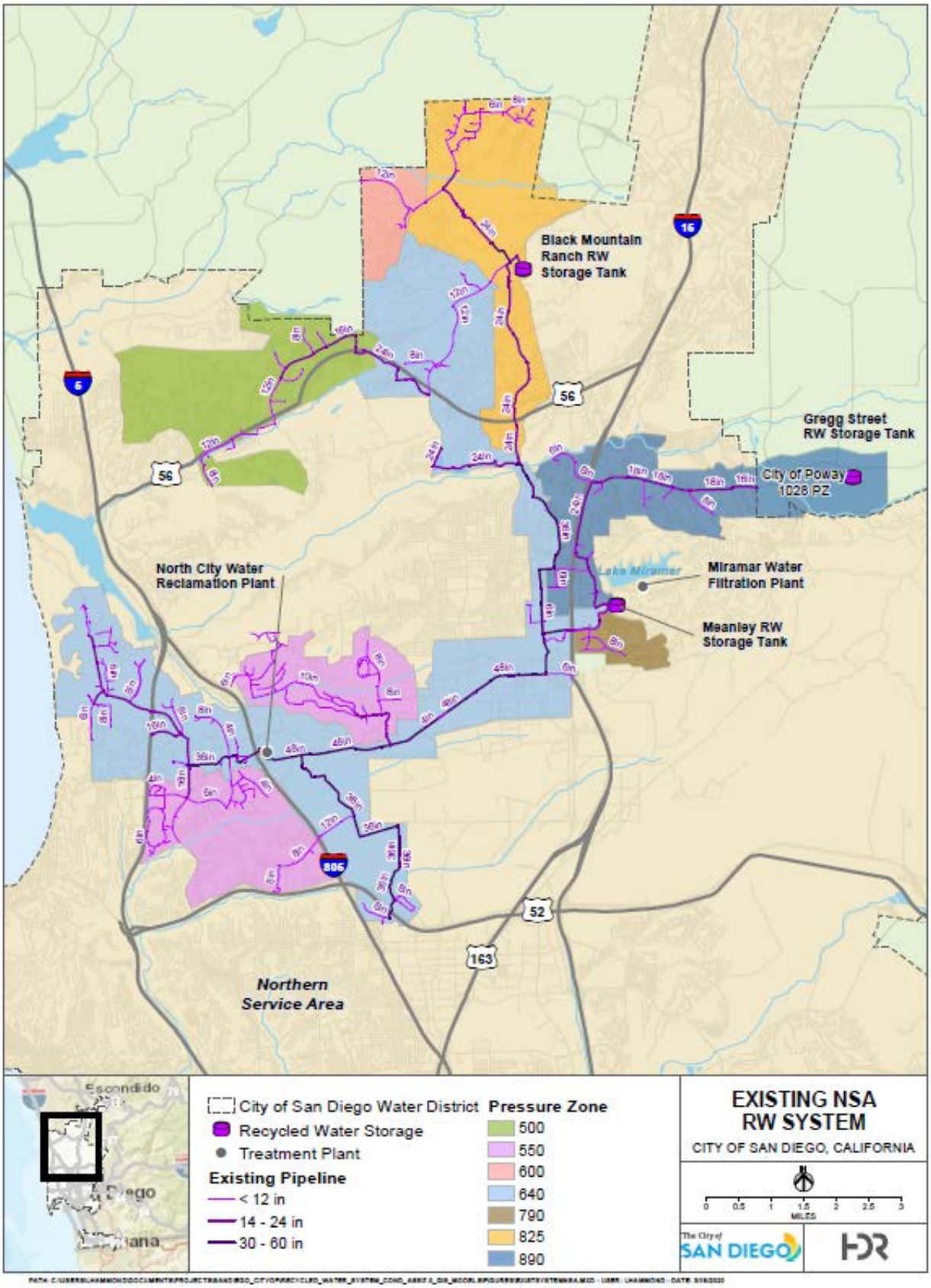

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Table 2-1. NSA Recycled Water Pipelines by Diameter and Material

Diameter (inches)	San Diego Pipeline Length (feet) by Material Class						Total (feet)	Total (miles)
	Polyvinyl Chloride (PVC)	Asbestos Cement	Ductile Iron	High Density Poly-ethylene (HDPE)	Steel	Unknown		
1.5 (service)	0	0	0	0	0	30	30	< 0.1
2 (service)	980	0	170	0	0	100	1,250	0.2
3 (service)	110	0	150	0	0	0	260	<0.1
4	44,080	0	730	0	80	5,190	50,080	9.5
6	87,560	0	950	0	850	130	89,490	16.9
8	96,300	0	4,700	160	1,260	30	102,450	19.4
10	9,700	20	930	0	80	640	11,370	2.2
12	40,830	20	11,500	0	450	4,360	57,160	10.8
14	510	0	60	0	20	0	590	0.1
16	22,970	0	370	0	1,070	1,260	25,670	4.9
18	2,420	0	890	0	11,570	250	15,130	2.9
20	0	0	60	0	3,100	0	3,160	0.6
24	9,160	0	13,760	0	38,970	4,810	66,700	12.6
30	0	0	290	0	2,430	20	2,740	0.5
36	0	0	1,950	0	50,140	210	52,300	9.9
48	0	0	2,370	0	25,110	90	27,570	5.2
60	0	0	1,600	0	0	0	1,600	0.3
Total (feet)	**314,620**	**40**	**40,480**	**160**	**135,130**	**17,120**	**507,550**	**—**
Total (miles)	**59.6**	**< 0.1**	**7.7**	**< 0.1**	**25.6**	**3.2**	**—**	**96.1**

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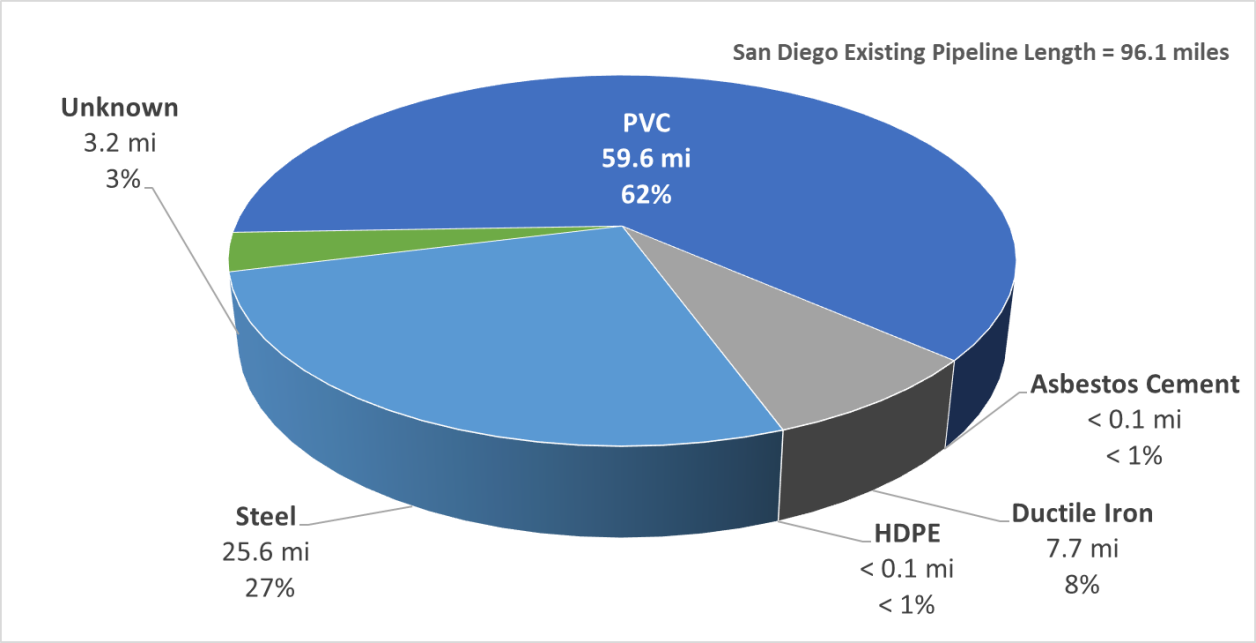
Figure 2-3. Existing Recycled Water Pipelines by Material



2.1.1.2 Pump Stations

The City operates three distribution system pump stations, in addition to the main effluent pump station at the NCWRP. The City of Poway operates the Gregg Street Pump Station. Except for the closed 790 Zone, the other three pump stations deliver to open system and reservoirs with level controls. Table 2-2 provides a summary of the recycled water pump station information.

Table 2-2. Existing Recycled Water System Pump Stations

Pump Station[c]	No. of Pumps	Capacity Per Pump (gpm)	Total Capacity (gpm)	Firm Capacity[a] (gpm)	Suction Zone or Facility	Discharge Zone / Facility
NCWRP	3	6,000	18,000	12,000	NCWRP	640 Zone / Meanley Tank
Meanley Drive 790	4	550	2,200	1,650	Meanley Tank	790 Zone
Meanley Drive 890	3	1,250	3,750	2,500	Meanley Tank	890 Zone / Gregg Street Tank
Canyonside	3	3,000	9,000	6,000	640 Zone / Meanley Tank	825 Zone / Black Mountain Tank

Table 2-2. Existing Recycled Water System Pump Stations

Pump Station[c]	No. of Pumps	Capacity Per Pump (gpm)	Total Capacity (gpm)	Firm Capacity[a] (gpm)	Suction Zone or Facility	Discharge Zone / Facility
Gregg Street (Poway)[b]	3	1,500	4,500	3,000	Gregg Street Tank	1028 Zone

Notes:

[a] Firm Capacity is the pump station capacity with the largest pump on standby or out of service.

[b] The Gregg Street Pump Station is owned and operated by the City of Poway and serves the Poway 1028 Zone from the Gregg Street Tank.

[c] The City's Parks and Recreation Department owns booster pump stations downstream of the meters at Torrey Pines South and North Golf Courses to increase pressures and supply. These are not part of the public distribution system.

2.1.1.3 Reservoirs

The City operates three distribution system reservoirs to provide operational storage. As noted above, these reservoirs serve as forebays for the City's three pump stations. The reservoirs establish the three major pressures zones in the NSA: the 640, the 790 and the 890 pressure zones. Table 2-3 includes a summary of the reservoir data. The Gregg Street Tank is owned and maintained by the City of Poway, however the facility is fully integrated with the City of San Diego's recycled water distribution system.

Table 2-3. Existing Recycled Water System Storage Tanks

Storage Tank	Volume (MG)	High Water Level (feet)	Low Water Level (feet)
Black Mountain Ranch	3.0	825	795
Gregg Street (Poway)[a]	2.0	890	858
Miramar	9.0	643	620

Notes:

[a] The Gregg Street Tank is owned by the City of Poway and includes operational storage for both the City and Poway.

2.1.1.4 Pressure Reducing Stations

The City operates pressure reducing stations (PRS) to manage service pressures in various portions of the system due to the varying topography. Typically, a PRS includes a main valve for high flow rates and a smaller bypass valve for low flows. Several stations also include a pressure relieve valve. The PRS service areas vary in size, serving over 100 meters to only serving a handful of meters.

Table 2-4 includes a summary of the PRS data, including the downstream pressure zone served based on a nominal hydraulic grade line that was established by the City in its original master plan work. As part of the field condition assessment conducted in March 2019, each of the PRS sites were visited and downstream pressures were recorded.

Hydraulic model pressures are also listed in Table 2-4 and represent the nominal pressure setting for the pressure zone. In several cases the hydraulic model pressure settings differ from the pressures observed in the field, indicating that the reduced zone may be operating at a slightly lower

or higher pressure than planned. These differences are normal especially when multiple PRS's feed a single pressure zone, to ensure PRS supplies have primary, and then secondary feeds to a zone and avoid the stations from fighting each other. The City may want to review these field settings relative to the nominal pressure zone and confirm this is most desirable based on customer pressures in the system, as the field settings all appear to be adequate. A summary of operations and recommendations is discussed in more detail in Section 6 of this report.

Table 2-4. Existing Recycled Water System Pressure Reducing Stations

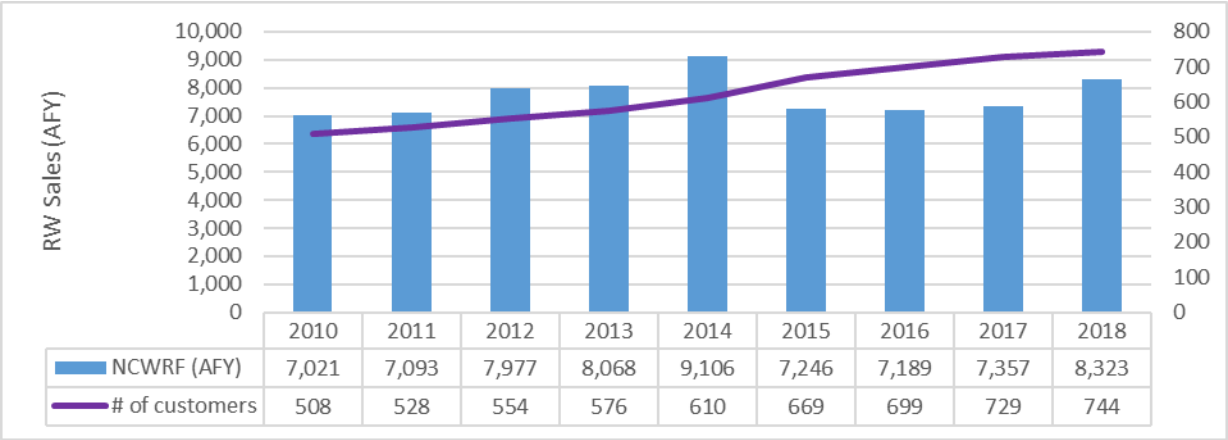
Pressure Reducing Station	High PZ	Low PZ	Pressure Reducing Station Elevation (feet)	Hydraulic Model Pressure Setting (psi)	Field Observed Pressure (psi)
Camino Del Sur	825	600	409	82	99
Carmel Valley Rd	825	640	523	50	59
Erma Rd	890	850	513	75	94
Governor Dr	640	550	358	83	67
Meadows Del Mar	640	450	265	80	70
Meanley Dr	890	850	557	65	55
Production Ave	640	550	392	68	56
Regents Rd	640	550	354	85	71
San Dieguito Road	600	400	274	54	—
Scripps Lake Dr	890	850	486	65	—
Scripps Ranch	890	850	553	65	—
Scripps Ranch Blvd.	890	850	550	65	62
Town Centre Dr	640	550	368	79	70

Notes:
Field settings based on condition assessment field investigation conducted in March 2019. PRS elevations and pressure settings provided by City in the existing Hydraulic Model.

2.1.2 NSA Historical Demands

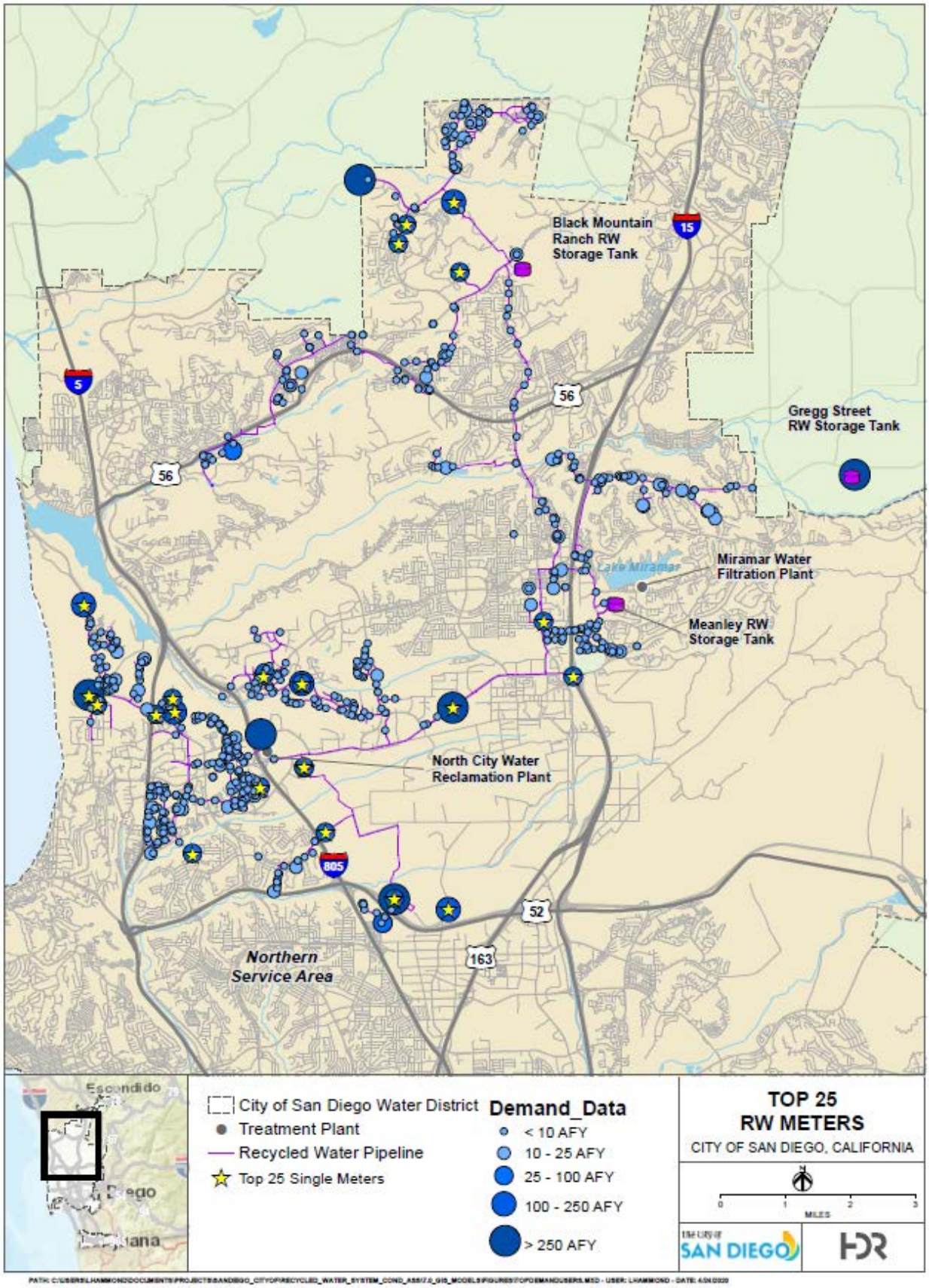
Recycled water consumption data was obtained for each recycled meter in the NSA system for the purposes of establishing a baseline demand for the existing system. Historical annual usage within the NSA is shown on Figure 2-4.

Figure 2-4. Historical Recycled Water Use in NSA



Since the last Master Plan update, the number of retail recycled water meters for the NSA increased to approximately 744 customers in 2018. The NSA accounts for about two-thirds of the City's total annual reuse demand. Most of the retail and wholesale customers use the water for landscape irrigation, and a few customers use the water for industrial purposes, such as cooling towers.

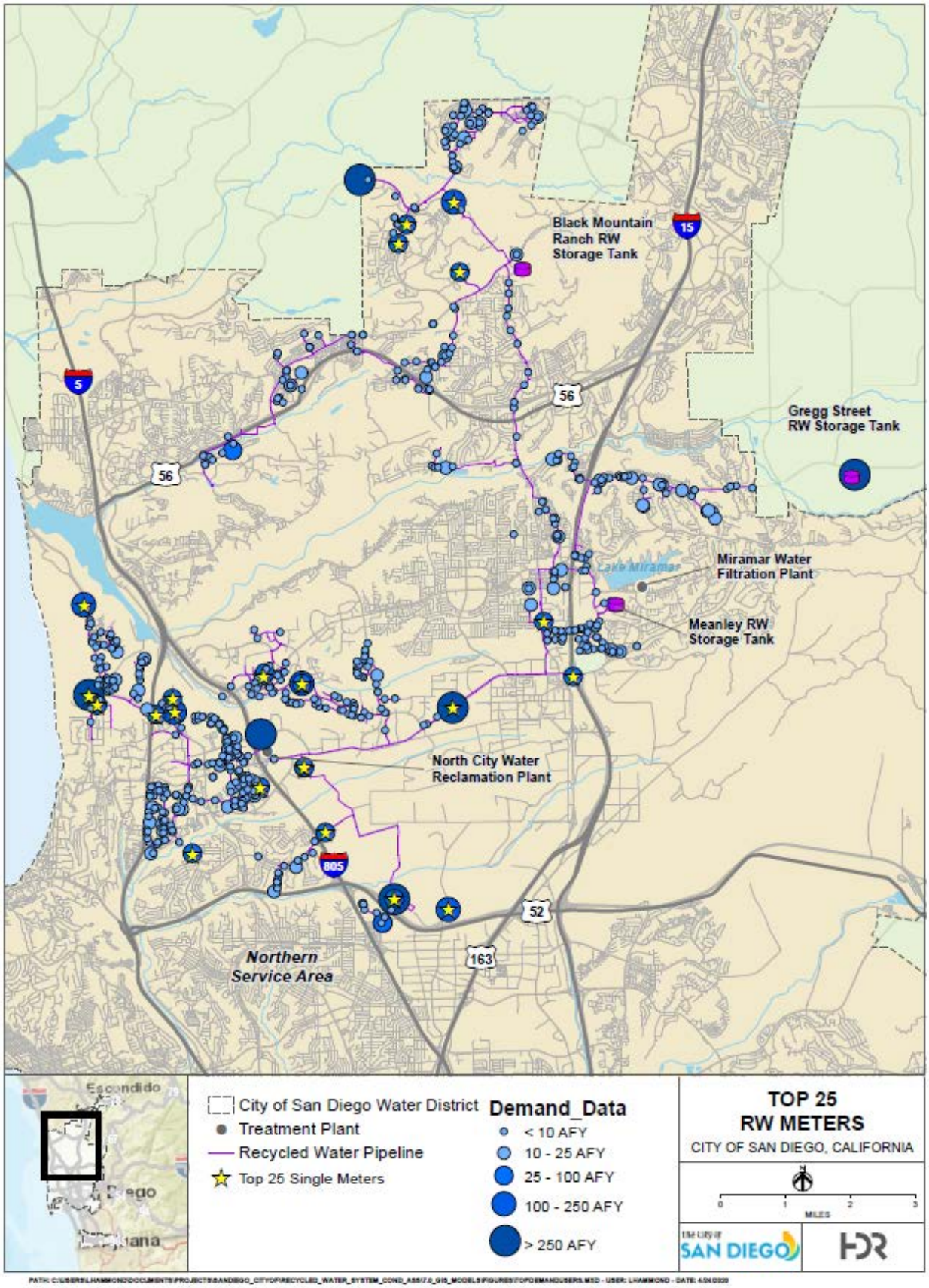
Figure 2-5. Recycled Water Meters in NSA



illustrates the location of the recycled water meters in the NSA system, including the ten largest use

recycled water meters. Nearly half of the customers in the NSA are located in close proximity to the NCWRP. The highest concentration of irrigation customers are located in the Scripps Ranch, Santa Luz, Sorrento Valley, and University Town Center/Golden Triangle areas of the City. Figure 2-6 illustrates the types of recycled water customers served in the NSA, as documented in the City's Annual Recycled Water Report to the San Diego Regional Water Quality Control Board.

For the purposes of this Master Plan, 2017 was used as the baseline year for recycled water demands, as it reflected average climate conditions. In 2017, the top 25 retail meters used 2,590 AFY, which was 35 percent of the total NSA demand of 7,357 AFY. The location of the top 25 NSA retail recycled water single meters in 2017, are indicated with stars on Figure 2-5. Recycled Water Meters in NSA



and their usage is listed in Table 2-5. (Note that this list of customers does not include wholesale

customers, which are discussed in the following section, nor does it include in plant usage at the NCWRP.)

Figure 2-5. Recycled Water Meters in NSA

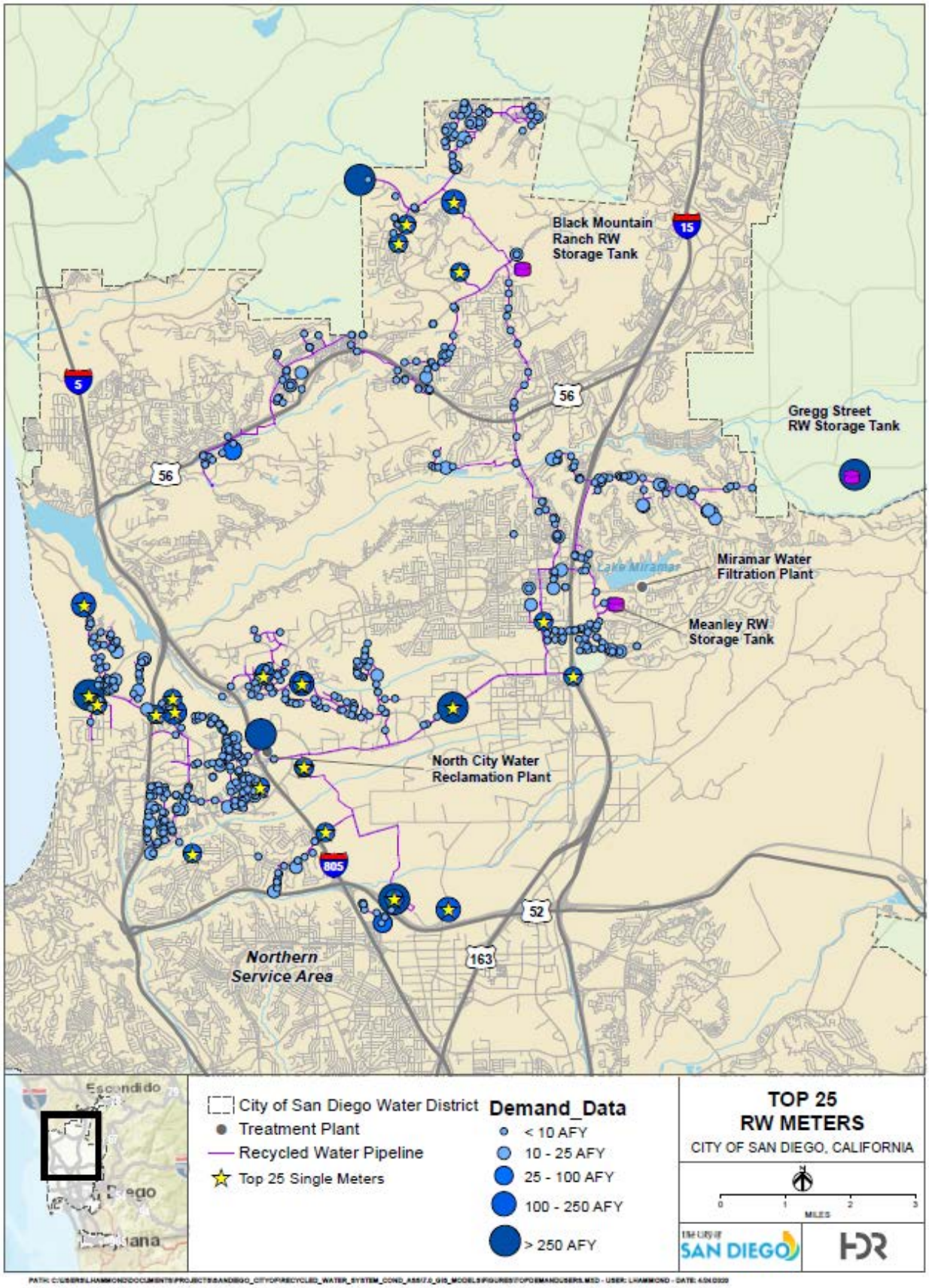


Table 2-5. Top 25 NSA Retail Customer Single Meter Demands in 2017

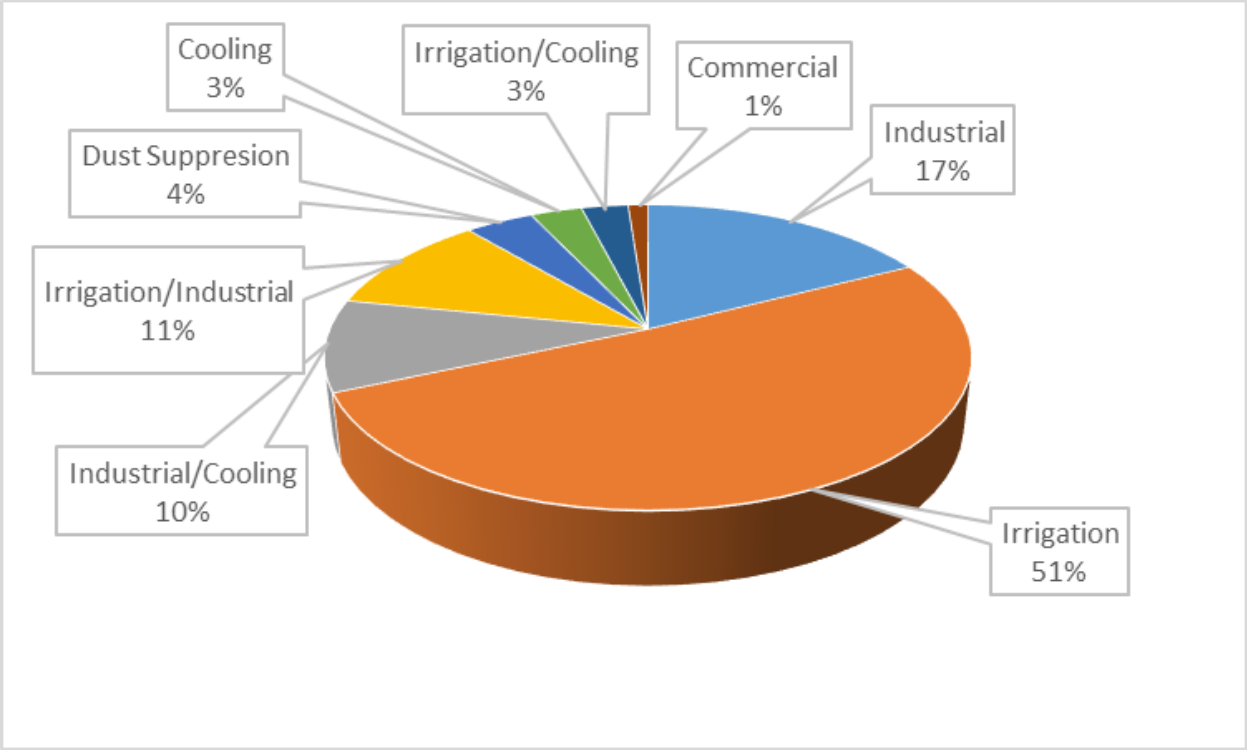
Customer Site	Meter Address	2017 Total (HCF)	Annual Demand (AFY)	Class
MWWD (Biosolids Center)	5248 CONVOY ST	196,891	452.0	Industrial
Torrey Pines Golf Course-South	10259 N TORREY PINES RD	112,167	257.5	Irrigation
Marine Corp Air Station Miramar	7935 1/2 MIRAMAR RD	109,902	252.3	Industrial/ Cooling
Torrey Pines Golf Course-North	11520 1/2 N TORREY PINES RD	87,250	200.3	Irrigation
University of California, San Diego (UCSD)	9700 CAMPUS POINT DR	66,080	151.7	Irrigation
The Santaluz Golf Club	8213 RUN OF THE KNOLLS	62,291	143.0	Irrigation
El Camino Memorial Park	5600 1/2 CARROLL CANYON RD	52,185	119.8	Irrigation/Industrial
San Diego Waste Management / Metro Biosolids Facility	5272 CONVOY ST	46,043	105.7	Dust Suppression
University of California, San Diego (UCSD)	3415 NORTHPOINT DR	41,513	95.3	Irrigation
El Camino Memorial Park	5600 1/2 CARROLL CANYON RD	39,901	91.6	Irrigation/ Industrial
University of California, San Diego (UCSD)	9298 REGENTS	38,246	87.8	Irrigation
Qualcomm	5555 1/2 MOREHOUSE DR	34,717	79.7	Cooling
MWWD (Biosolids Center)	5242 CONVOY ST, NW AREA OF MBC	28,401	65.2	Irrigation/ Industrial
Village Nurseries	5310 1/2 GOVERNOR DR	25,003	57.4	Irrigation
Verrezzano HOA	14796 1/2 VIA BETTONA	23,348	53.6	Irrigation
The Santaluz Golf Club	8110 DOUG HILL	20,735	47.6	Irrigation
San Diego Community College District	9408 GOLD COAST DR	19,471	44.7	Irrigation
University of California, San Diego (UCSD)	3415 NORTHPOINT DR	19,166	44.0	Irrigation
Scripps Medical Offices	9900 GENESEE AVE	18,121	41.6	Irrigation/ Cooling
The Santaluz Golf Club	14979 ½ CAMINO DEL SUR	16,727	38.4	Irrigation
Caltrans	9829 MIRAMAR RD	16,553	38.0	Irrigation
Fort Rosecrans Cemetery	5795 1/2 NOBEL DR	13,765	31.6	Irrigation
Illumina	8877 JUDICIAL DR	13,416	30.8	Commercial

Table 2-5. Top 25 NSA Retail Customer Single Meter Demands in 2017

Customer Site	Meter Address	2017 Total (HCF)	Annual Demand (AFY)	Class
Alexandria Real Estate	10303 1/2 CAMPUS POINT DR	13,242	30.4	Irrigation/ Cooling
Fort Rosecrans Cemetery	5795 1/2 NOBEL DR	12,589	28.9	Irrigation

Source: City of San Diego Recycled Water Annual Report 2017

Figure 2-6. Types of NSA Recycled Water Customers



Source: City of San Diego Recycled Water Annual Report 2017

2.1.3 Northern Service Area Wholesale Customers

Olivenhain Municipal Water District (OMWD) and the City of Poway (Poway) are the City's two existing wholesale customers served from the NSA.

OMWD has two connections to the City's NSA. In 2017, OMWD used 400 AFY of recycled water. OMWD's agreement with the City for the original connection (on San Dieguito Road) is 400 AFY through 2019 and then reduces to 300 AFY up to 2024. The agreement is also structured as a take or pay arrangement and therefore each fiscal year OMWD plans to take an allotment early in the financial year to ensure they meet their obligations.

The Poway system is integrated into the City system with the Gregg Street Tank directly supplied by the City's Meanley 890 Pump Station. A two-way wholesale meter is located at the City boundary to

measure total flow delivered to Poway. In 2017 Poway used approximately 490 AFY. Poway periodically supplements its system with potable water in part to manage water quality in its potable water system, discharging potable water into the Gregg Street Tank and thereby reducing its annual recycled water purchases from the City of San Diego.

Poway's existing agreement with the City allows for the purchase of up to 750 AFY; however, it appears Poway has generally maximized its uses of recycled water and is unlikely to expand their system further. The City may want to consider reducing its commitment to supply more recycled water to the City of Poway than is being used, as the San Diego Pure Water Program is implemented.

2.2 Southern Service Area

The SBWRP, described further in Section 3.2, supplies recycled water to the SSA. Tertiary treated, Title 22 recycled water is produced to meet daily demand and the remaining wastewater is treated to secondary standards and discharged through the South Bay Ocean Outfall (SBOO).

2.2.1 Southern Service Area Distribution System Description

The SSA distribution system, shown on Figure 2-7, consists of approximately 3 miles of City owned and maintained pipeline that conveys recycled water to customers along the way before delivering directly to OWD, the City's largest wholesale customer. The OWD point of delivery is located at the north end of Dairy Mart Road, where a City-owned meter was installed. From the point of delivery, OWD's six mile pipeline extends north and east to their 450-1 Reservoir. The OWD transmission main travels through the City's service area before reaching the 450-1 Reservoir. Therefore, Section 10.4 of the 2003 Agreement between the City of San Diego and OWD allowed for the City to utilize up to 1 mgd of transmission capacity to serve recycled water customers within its service area. Currently Caltrans is the only City customer that is served from the OWD transmission main.

From the 450-1 Reservoir, the recycled water is conveyed through a series of pump stations and reservoir to a portion of the City of Chula Vista. OWD also receives recycled water from its 1.3 mgd Ralph W. Chapman WRF. Figure 2-8 from the 2015 OWD Water Facilities Master Plan Update (OWD Master Plan) illustrates the recycled water delivery, pumping and storage system within OWD.

The OWD Master Plan also developed updated projections for future recycled water use based primarily on planned development in the City of Chula Vista (Otay Ranch area). OWD's demand projections and their impacts to the City system are discussed in Section 2.2.3.

Figure 2-7. Recycled Water Facilities in the SSA

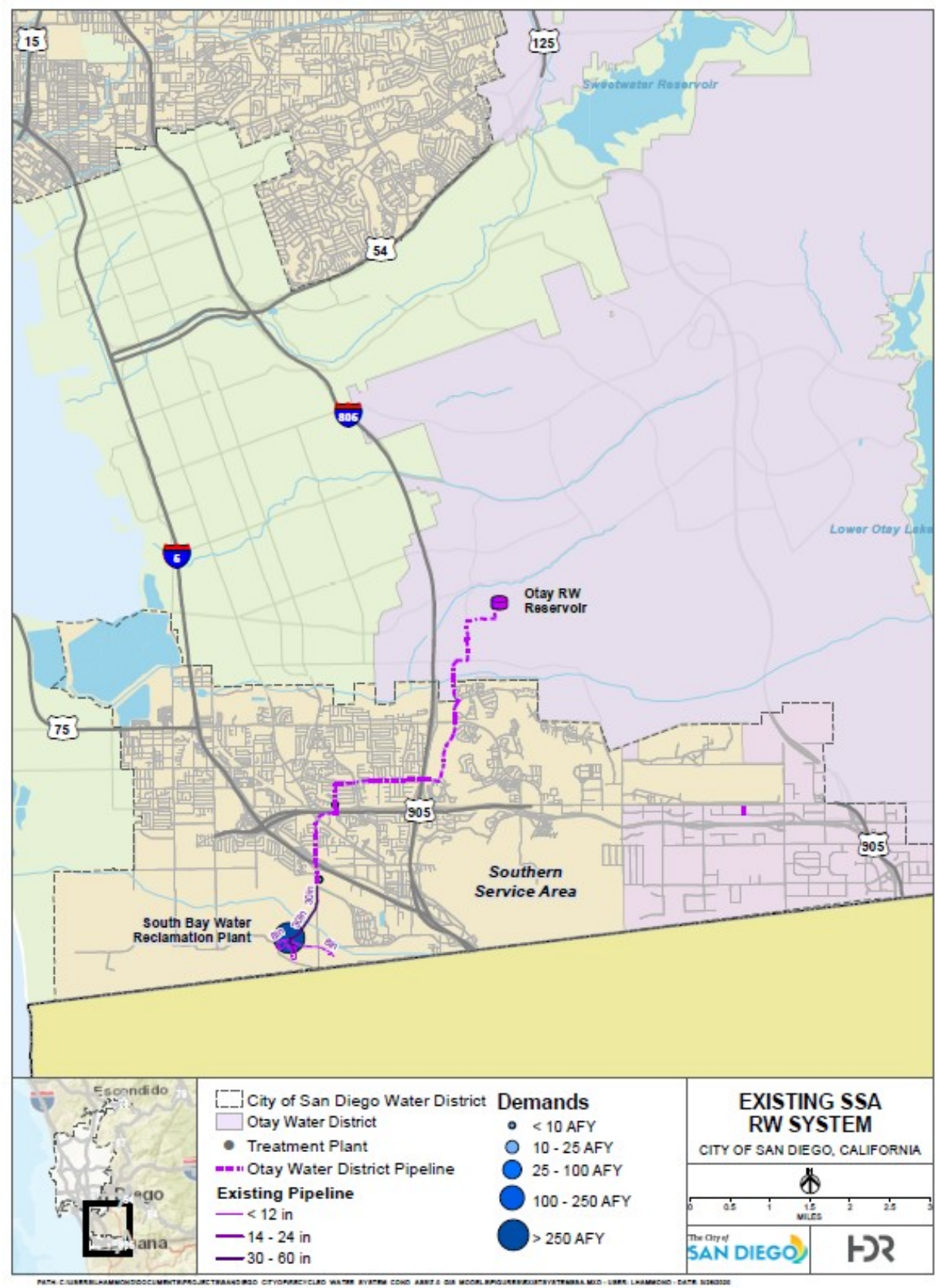


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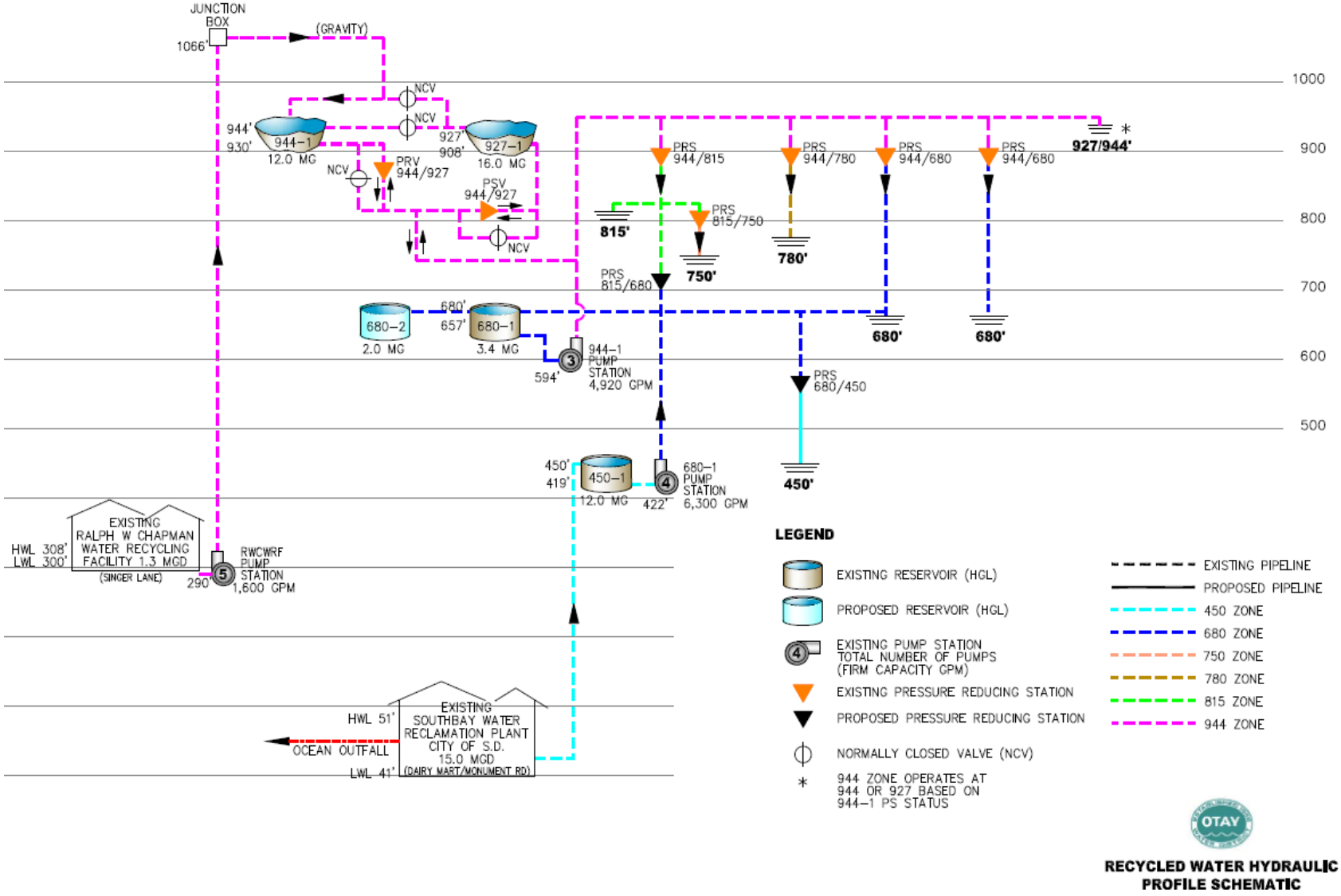
Figure 2-8. OWD Recycled Water System Hydraulic Profile



Source: OWD 2015 Water Facilities Master Plan

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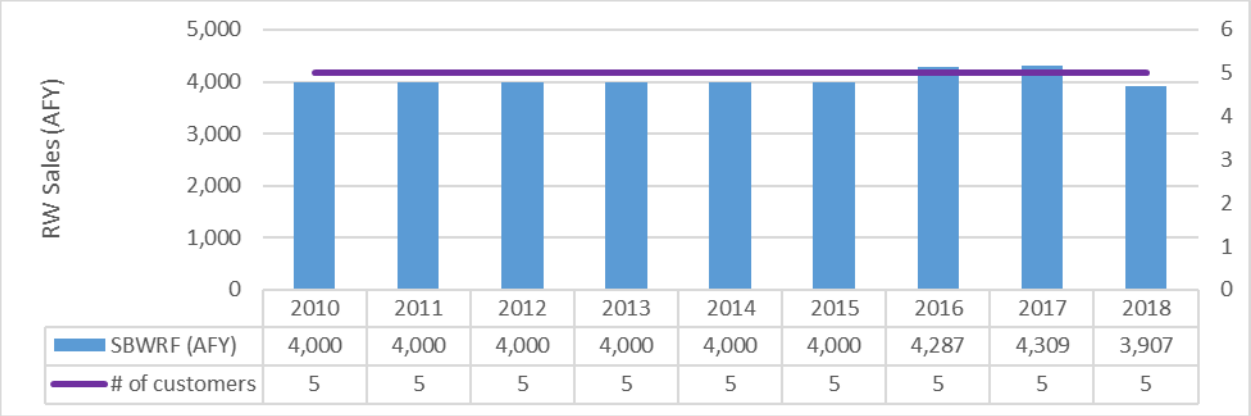
2.2.2 Southern Service Area Historical Demands

Recycled water consumption data was obtained for each recycled meter in the SSA system for the purposes of establishing a baseline demand for the existing system. Historical annual usage within the SSA is shown on Figure 2-9.

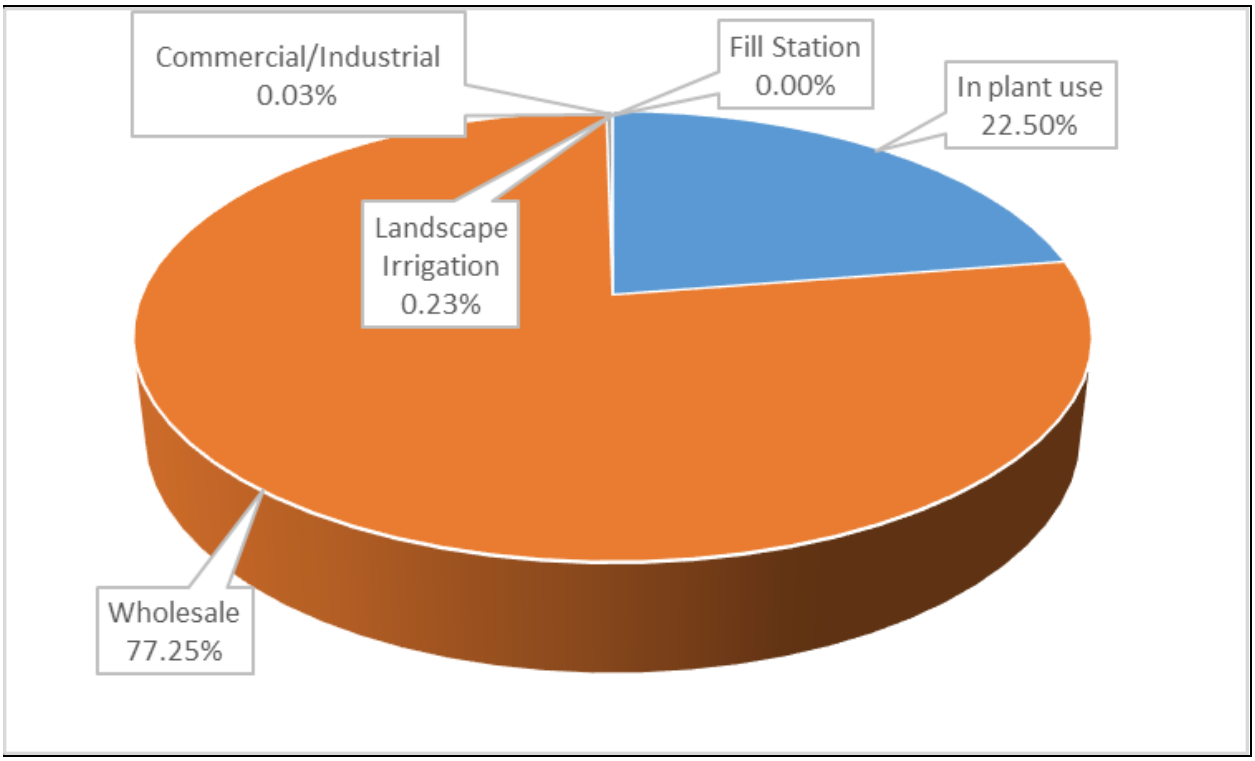
Figure 2-9. Historical Recycled Water Use in SSA



As shown in Figure 2-10, the majority of recycled water from the SBWRP is currently being used by the City's wholesale customer, OWD, which had a reported annual demand of 4.2 mgd (4,700 AFY) in the 2015 OWD Master Plan. During dry summer months, irrigation demands within the OWD service area can approach 7 mgd and are met by combined recycled water supplies from the SBWRP and OWD's Ralph W. Chapman WRF.

In addition to the SBWRP in-plant demands, there are currently a two retail recycled water meters within the SSA, namely CalTrans and the International Boundary and Water Commission (IBWC) Wastewater Treatment Plant.

Figure 2-10. Types of SSA Recycled Water Customers



Source: City of San Diego Recycled Water Annual Report 2017

2.2.3 Southern Service Area Wholesale Customers

OWD is the single wholesale customer for the SBWRP and has an agreement with the City through 2026. The agreement calls for an annual average flow rate in AFY that increases year by year to 5,847 AFY (5.2 mgd) in 2026. The agreement also includes maximum day recycled water flow rates of 6.0 mgd, which may be required to meet maximum month demands. Because the City's contract with OWD extends through 2026, this contractual flow rate is assumed in the baseline flows and it anticipated to be reached with the anticipated growth throughout the City of Chula Vista.

The OWD 2015 Water Facilities Master Plan Update provided flow projections through 2050, which included a total average annual demand increasing to 5.8 mgd and maximum day demands of 8.0 mgd. Assuming approximately 1.0 mgd will continue to be supplied by OWD's Chapman WRF, OWD would likely require an additional 1.0 to 2.0 mgd from the SBWRP. The timing of future supply requirements will also depend on the continued growth in OWD recycled system as well as continued steady use of recycled water for irrigation. Further water conservation could reduce OWD's ultimate supply needs from the City.

2.3 Summary of Annual Recycled Water Demands

A summary of each service area's annual recycled water sales and customers (or number of meters) is shown in Table 2-6. Note that customers and sales of recycled water have grown moderately in the NSA but remained fairly constant in the SSA. Values are based on the City's annual reports to the San Diego Regional Water Quality Control Board.

Table 2-6. Annual Recycled Water Sales and Customers

Calendar Year	NCWRP (AFY)	# of customers	SBWRP (AFY)	# of customers	Total Sales (AFY)	Total Customers
2010	7,021	508	4,000	5	11,021	513
2011	7,093	528	4,000	5	11,093	533
2012	7,977	554	4,000	5	11,977	559
2013	8,068	576	4,000	5	12,068	581
2014	9,106	610	4,000	5	13,106	615
2015	7,246	669	4,000	5	11,246	674
2016	7,189	699	4,287	7	11,476	706
2017	7,357	729	4,309	5	11,666	734
2018	8,323	744	3,907	5	12,230	749

2.3.1 Demands by Pressure Zone

As part of the hydraulic model update, individual meter demands were allocated and distributed in the existing recycled water system. The existing pressures zone boundaries in the NSA were shown previously on Figure 2-2. Table 2-7 presents the average annual demands by pressure zone in the NSA, including Poway's pumped 1028 Zone from the Gregg Street Tank. The City's backbone 640 Zone from the NCWRP supplying the Miramar Tank represents the largest pressure zone in the system. The SSA operates within a single pressure zone.

Table 2-7. NSA Existing Average Demands by Pressure Zone

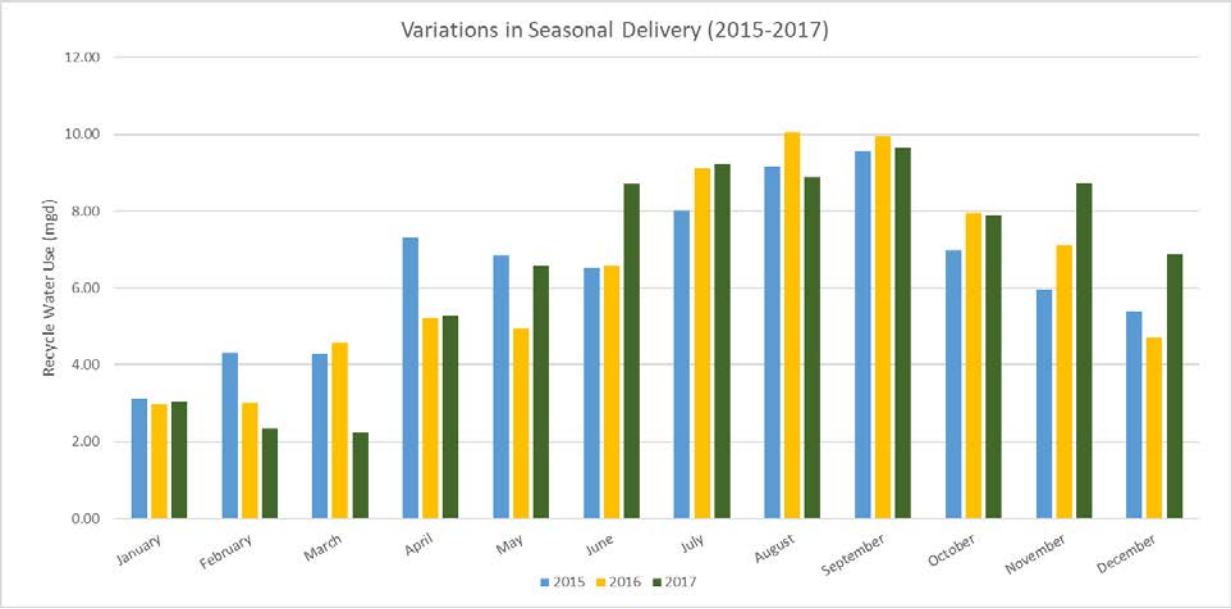
Pressure Zone	Existing Average Day Demand (mgd)
500	0.17
550	1.11
600	0.47
640	3.63
790	0.14
825	0.34
890	0.38
1028	0.42

2.3.2 Seasonal Demands and Peaking Factors

The recycled water demands are highly variable throughout the year. Figure 2-11 illustrates the seasonal variability over the past three years. As a majority of the demand is for irrigation, the monthly demands are highly dependent on wet weather patterns. As the driest months in San Diego, August and September generally represent the maximum month demands and range from 1.5 to 1.6

times the average annual demand. January, typically a wet month, historically has the lowest month demand.

Figure 2-11. Variations in Seasonal Demands within NSA



Based on review of the seasonal peaking and data from the NCWRP, a recommended maximum day peaking factor was estimated at 1.7 and is shown in Table 2-8 for the purposes of estimating maximum day by pressure zone. This NSA demand is the currently required supply to be met by the NCWRP. A slightly higher maximum day peaking factor of 2.0 is required in the SSA, as identified in the 2015 OWD Master Plan.

Table 2-8. Maximum Day Demand by Pressure Zone

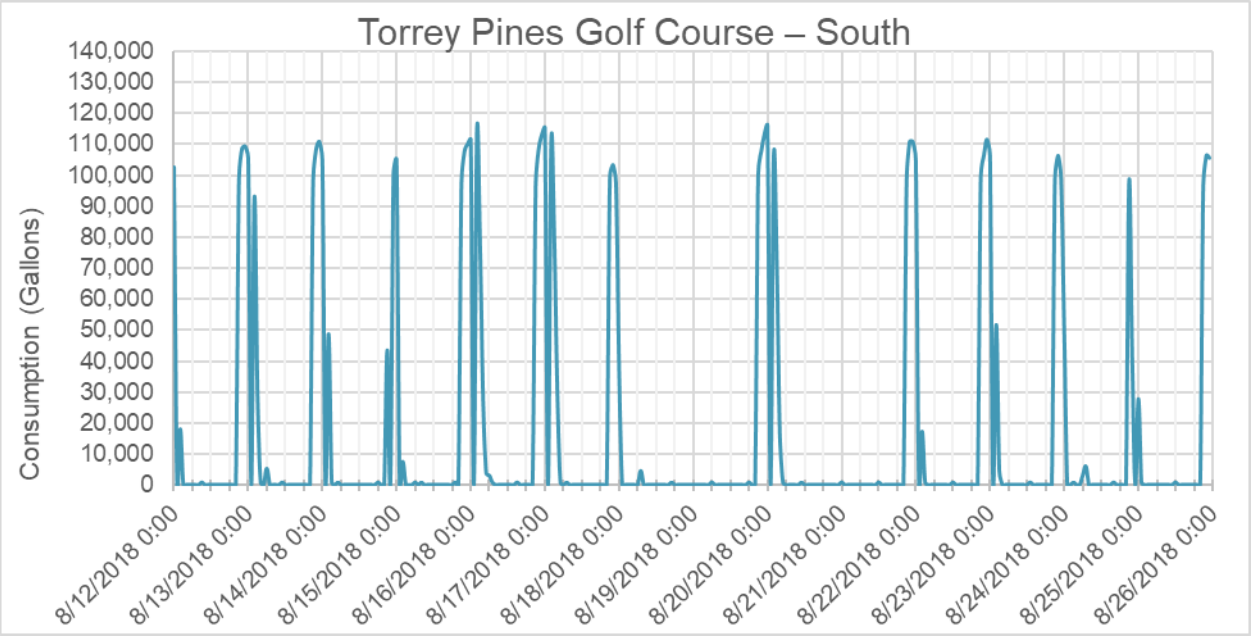
Pressure Zone	Existing Average Day Demand (mgd)	Maximum Day Peaking Factor	Existing Maximum Day Demand (mgd)
Northern Service Area			
500	0.17	1.7	0.28
550	1.11	1.7	1.89
600	0.47	1.7	0.81
640	3.63	1.7	6.17
790	0.14	1.7	0.23
825	0.34	1.7	0.58
890	0.38	1.7	0.64
1028	0.42	1.7	0.72
Total	**6.66**	**—**	**11.32**
Southern Service Area	**—**	**2.0**	**—**

2.3.3 Diurnal Demands and Potential Optimization

As part of developing a dynamic hydraulic model and evaluating peak hour irrigation use, AMI data was obtained from the City of San Diego for the 28 largest demand meters within the NSA system. Hourly data was recorded over a two-week period between August 12, 2018 and August 26, 2018. Below on Figure 2-12 and Figure 2-13 are two examples of typical usage periods throughout the day.

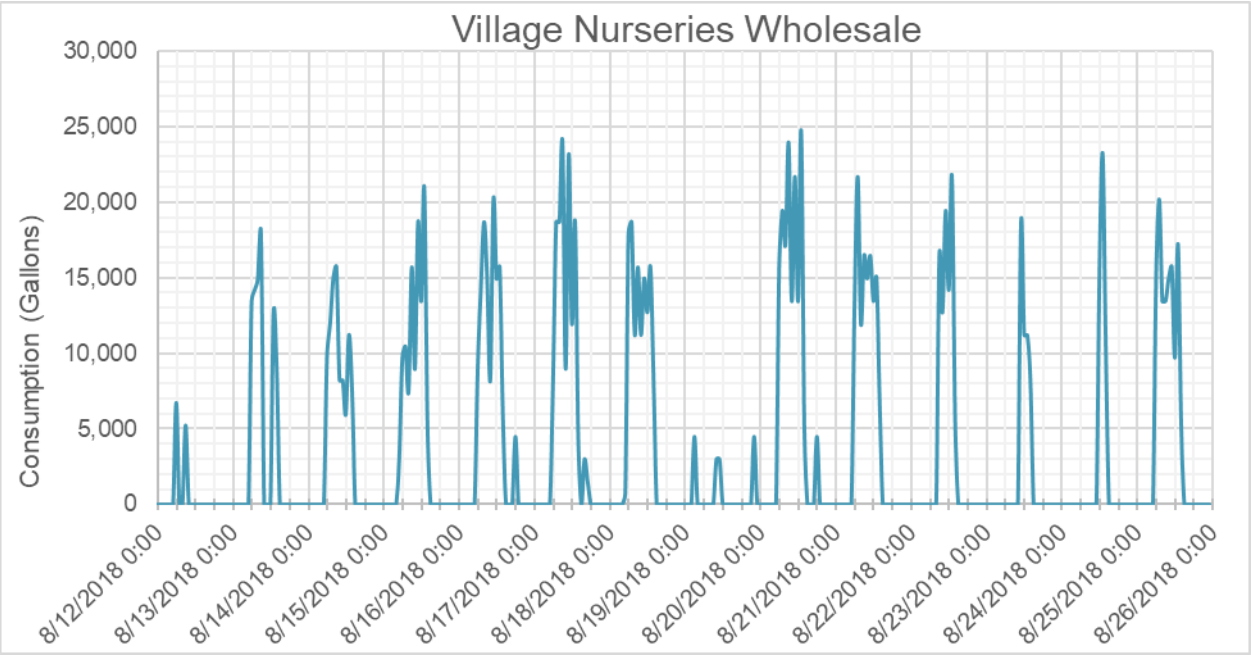
1. The Torrey Pines South Golf Course hourly meter data provides an example of typical nighttime usage with large peaks occurring within just a few hours each night.

Figure 2-12. Hourly Recycled Water Use at Torrey Pines South Golf Course in August 2019



2. Village Wholesale Nurseries provides an example of a customer that uses recycled water during the daytime hours, as it has limited exposure to the general public when its irrigation system is operating.

Figure 2-13. Hourly Recycled Water Use at Village Nursery in August 2019



There were a number of irrigation users, similar to Torrey Pines Golf Course that peak over a short irrigation window starting at 10 pm and continued for only 3 to 4 hours. Ideally some of these customers could extend their irrigation over a longer period (6 to 8 hours) to reduce overlapping peak hour demands within the NSA. Consulting with several of the larger users to better manage demand in anticipation of future Pure Water supplies could help treatment plant operators better manage flows. A summary of operations and recommendations are discussed in more detail in Chapter 6 of this report.

2.4 Summary of Baseline Operations

This section provides a brief overview of the City's recycled water system operations. For a detailed description of all facility and appurtenance operations, the City has developed a Recycled Water Operations and Maintenance Manual, which has been updated as part of this 2020 Master Plan project and included as Appendix A of this report.

2.4.1 Overview of System Operations

The recycled water system is operated based on seasonal demand patterns. Pump operations are triggered based on water elevations in the recycled water storage tanks, which differ in summer and winter month system demand periods, as shown in Table 2-9 and Table 2-10, respectively. Water elevations in the tanks provide sufficient pressures in most pressure zones, with the exceptions of the 790 and 1028 pressure zones, which are closed pumped zones. Recycled water is produced 24 hours per day, but primarily used between 10 pm and 6 am for irrigation. Tanks are generally filled after the watering period has ended.

Historically, the City has operated the recycled water system by simply monitoring the Meanley Tank level from the NCWRP and ensuring tank levels are maintained. From the Meanley Tank, the City recycled water operators then operate the remaining portion of the distribution system with tank controls at Poway's Gregg Street and the City's Black Mountain Ranch tanks.

The Canyonside Pump Station was designed based on projected ultimate demands that were never realized and therefore has more than sufficient capacity. Only one pump has to operate at Canyonside Pump Station to adequately replenish the Black Mountain Ranch Tank. The 890 Pump Station generally operates one or two pumps based on the seasonal demand in the system and can also sufficiently refill the Gregg Street Tank. Operating two pumps in parallel can greatly increase the fill rate and reduce pump run times, so the tank is full and ready for the next irrigation cycle.

One of the more challenging system operating conditions is the initial start of the watering period between 10 pm and 1 am. These high peak hour demands result in the need to increase pump capacity at NCWRP to keep up with the increased tank emptying rates in the system. Many of the large to medium customers have scheduled their respective irrigation controllers to start right at 10 pm. In some cases, the user completes their entire irrigation in only a few hours. Because of the location of the Meanley Tank is remote from these peak demands, the system does not equalize during this short irrigation time period, requiring more pumping in the system. The City may want to request that customers shift some of the larger demands, where possible, by a few hours in the watering period to better smooth out system hourly demands.

Despite these large demand swings at the start of the watering periods, overall the system maintains acceptable residual pressures. The North Torrey Pines Golf Course sees some of the largest pressure swings due to the size of the dead-ended main and peak irrigation cycle, however, they have managed the lower pressures with their own booster pump operations. In summary, the pressure zones established in late 1990s provide adequate operating pressures throughout the distribution system.

Table 2-9. Recycled Water Operational Tank Levels in Summer Months

Tank No.	Name of Tank	Tank Inner Diameter	Tank Height	Hydraulic Grade Line	Low Water Level	High Water Level	Spill Level	Remarks
1	9 MG Meanley Tank at Meanley Drive, San Diego	260'	23'	640'	19'	20'	643' HGL	From NCWRP
2	3 MG Black Mountain Ranch Tank at Carmel Valley/Black Mtn Road	132'	32'	825'	20'	25'	30' (at 825' HGL)	From NCWRP
3	2 MG Gregg Street Tank at Gregg Street, Poway	107'	30’	890'	18'	20'	890’ HGL	From NCWRP
4	12 MG Otay Water District Tank at Maxwell Road, Chula Vista	257'	31'	450'	15'	28'	450' HGL	From SBWRP

Table 2-10. Recycled Water Operational Tank Levels in Winter Months

Tank No.	Name of Tank	Tank Inner Diameter	Tank Height	Hydraulic Grade Line	Low Water Level	High Water Level	Spill Level	Remarks
1	9 MG Miramar Tank at Meanley Drive, San Diego	260'	23'	640'	19'	22'	643' HGL	From NCWRP
2	3 MG Black Mountain Ranch Tank at Carmel Valley/Black Mtn Road	132'	32'	825'	20'	25'	30' (at 825' HGL)	From NCWRP
3	2 MG Gregg Street Tank at Gregg Street, Poway	107'	30'	890'	20'	22'	890' HGL	From NCWRP
4	12 MG Otay Water District Tank at Maxwell Road, Chula Vista	257'	31'	450'	15'	28'	450' HGL	From SBWRP

2.4.2 Recycled Water System Design Criteria

The City's recycled water system was designed based on the criteria included in Table 2-11. The criteria remains the same except for updated peak hour factors, based on current demand patterns.

Table 2-11. Recycled Water Design Criteria

Description	Criterion
Irrigation Time	10 pm to 6 am (8 hours)
Pressure	
Maximum Static (psi)	125
Minimum Static (psi)	65
Minimum Operating (psi)	50
Maximum Operating (psi)	100
Typical Service Pressure Range (psi)	60 to 80
Pipelines	
Maximum Velocity (fps)	8 to 10
Desirable Velocity (fps)	3 to 5
Maximum Allowable Head loss (ft/1000 ft)	10
Hazen Williams Coefficient (C)	120
Peaking Factors	
Average Day	1.0
Maximum Month	1.5
Maximum Day	1.7

Table 2-11. Recycled Water Design Criteria

Description	Criterion
Peak Hour	9.0 (average), actual 1.1 to 18.0
Operational Tank Storage	Typically stores 2/3 Peak Day Demand.
Pump Station - Minimum No. of Pumps	3
Pump Station Capacity	
Open System	24-hour Maximum Day Demand
Closed System	Peak Hour

2.4.3 Evaluation of Storage and Pumping Capacity

Based on design criteria, the availability of sufficient storage and pumping capacity by pressure zone was evaluated. Table 2-12 summarizes the available storage capacity in the NSA. Table 2-13 summarizes the available pumping capacity in the NSA. The evaluation indicates that there is currently excess storage and pumping capacity within the NSA, exceeding the needs for existing system demands.

This evaluation was not conducted for the SSA, as the storage and pumps are operated based primarily on demand patterns within the OWD service area.

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Table 2-12. Existing NSA Storage Capacity Analysis

Pressure Zone	Existing Zone ADD (gpm)	Existing Zone ADD (mgd)	Max Day PF	Maximum Day Demand (MDD) (ADD x PF) (gpm)	Maximum Day Demand (MDD) (ADD x PF) (mgd)	Number of Tanks	Capacity by Tank (MG)	Total Required Storage (MG) (2/3 x MDD)	Available Storage (MG)	Surplus/ (Deficit) (MG)
NCWRP/Meanley Tank										
550	770	1.11	1.7	1,310	1.88	—	—	1.3	0.0	(1.3)
640	2,410	3.47	1.7	4,100	5.90	1	9.0	3.9	9.0	5.1
790	100	0.14	1.7	160	0.24	—	—	0.2	0.0	(0.2)
Subtotal	**3,280**	**4.72**	**—**	**5,570**	**8.03**	**1**	**9.00**	**5.35**	**9.0**	**3.65**
Canyonside PS / Black Mountain Ranch Tank										
500	120	0.17	1.7	200	0.29	—	—	0.2	0.0	(0.2)
600	330	0.48	1.7	560	0.81	—	—	0.5	0.0	(0.5)
640	110	0.16	1.7	180	0.27	—	—	0.2	0.0	(0.2)
825	240	0.35	1.7	410	0.59	1	3.0	0.4	3.0	2.6
Subtotal	**800**	**1.15**	**—**	**1,350**	**1.96**	**1**	**3.0**	**1.31**	**3.0**	**1.69**
Gregg Street Tank										
890	260	0.37	1.7	440	0.64	—	—	0.42	0.0	(0.4)
1028	290	0.42	1.7	500	0.71	1	2.0	0.47	2.0	1.5
Subtotal	**550**	**0.79**	**—**	**940**	**1.35**	**1**	**2.0**	**0.90**	**2.0**	**1.10**
Total	**4,630**	**6.67**	**—**	**7,860**	**11.32**	**3**	**14.0**	**7.56**	**14.0**	**6.44**

Table 2-13. Existing NSA Pumping Capacity Analysis

Pump Station	Number of Pumps	Rated Capacity Design (per pump)		Firm Capacity		Zone Serviced	Zone AAD	Max Day Demand	Surplus/ (Deficit) (calculated)
		(gpm)	(mgd)	(gpm)	(mgd)		(gpm)	(gpm)	
Canyonside Pump Station	3	3000	4.3	6000	8.6	500, 600, 640*, 825	800	1,360	4,640
Meanly Drive 890 Pump Station	3	1250	1.8	2500	3.6	890, 1028	550	935	1,565
Meanly Drive 790 Pump Station	4	550	0.8	1650	2.4	790	100	600	1,050
North City Water Reclamation Plant	3	6000	8.6	12000	17.3	550, 640*	3180	5,406	6,594

Notes:

* The 640 Zone is currently split and served by two different pump stations.

In the near term, it is anticipated that the City will complete a section of recycled water main through Canyonside Park, connecting the Canyonside Pump Station with the pipeline at the new Merge 56 development along the south side of SR-56 at Camino Del Sur. Upon completion of construction of the Merge 56 Pipeline, the 640 Zone will be one integrated system supplied by one pump station, as shown on Figure 2-14.

With the completion of the pipeline loop the 640 Zone demands to the west no longer need to be supplied by the Black Mountain Ranch Tank. The net result is an increase in available storage in the 825 Zone. The added benefit to the City is that there is no longer a need to pump the westerly 640 Zone demands to a hydraulic grade elevation of 825 feet; there is only the need to reduce service pressures back to 640 foot elevations. Comparing Table 2-12 and Table 2-13 with Table 2-14 and Table 2-15, respectively, the new pipeline increases surplus capacity at the Black Mountain Ranch Tank and Canyonside Pump Station and reduces surplus capacity at the Meanley Tank and the NCWRP pump station.

Figure 2-14. Merge 56 Pipeline Connection Location

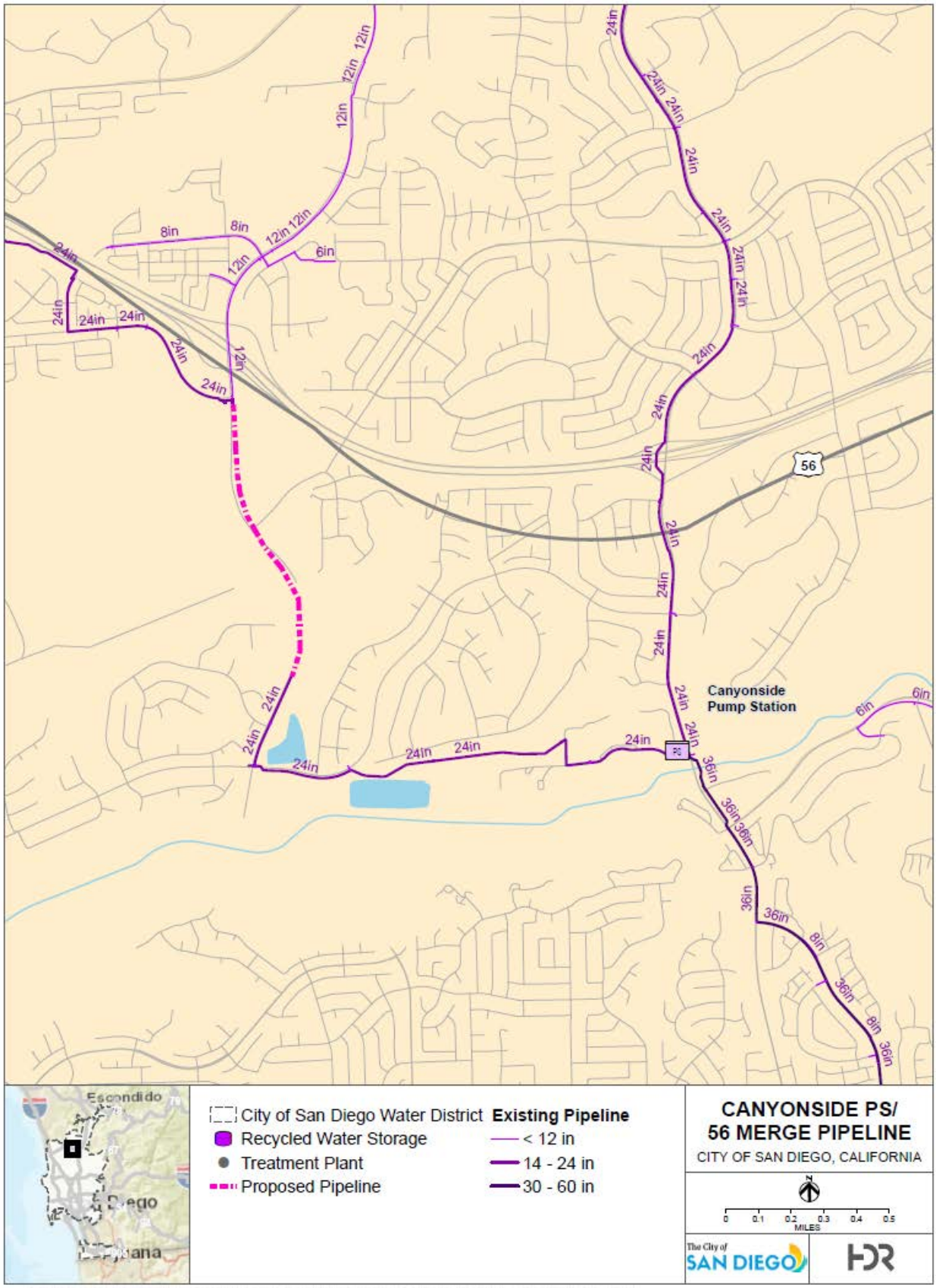

Table 2-14. Existing Storage Capacity with Merge 56 Pipeline Loop (640 Zone)

Pressure Zone	Existing Zone ADD (gpm)	Existing Zone ADD (mgd)	Max Day PF	Maximum Day Demand (MDD) (ADD x PF) (gpm)	Maximum Day Demand (MDD) (ADD x PF) (mgd)	Number of Tanks	Capacity by Tank (MG)	Total Required Storage (MG) (2/3 x MDD)	Available Storage (MG)	Surplus / (Deficit) (gpm)
NCWRP/Meanley Tank										
500	120	0.17	1.7	200	0.29	—	—	0.2	0.0	(0.2)
550	770	1.11	1.7	1,310	1.88	—	—	1.3	0.0	(1.3)
640	2,520	3.63	1.7	4,100	6.17	1	9.0	4.1	9.0	4.9
790	100	0.14	1.7	160	0.24	—	—	0.2	0.0	(0.2)
Subtotal	**3,510**	**5.05**	**—**	**5,770**	**8.59**	**1**	**9.00**	**5.73**	**9.0**	**3.27**
Canyonside PS / Black Mountain Ranch Tank										
600	330	0.48	1.7	560	0.81	—	—	0.5	0.0	(0.5)
825	240	0.35	1.7	410	0.59	1	3.0	0.4	3.0	2.6
Subtotal	**570**	**0.82**	**—**	**970**	**1.40**	**1**	**3.0**	**0.93**	**3.0**	**2.07**
Gregg Street Tank										
890	260	0.37	1.7	440	0.64	—	—	0.42	0.0	(0.4)
1028	290	0.42	1.7	500	0.71	1	2.0	0.47	2.0	1.5
Subtotal	**550**	**0.79**	**—**	**940**	**1.35**	**1**	**2.0**	**0.90**	**2.0**	**1.10**
Total	**4,630**	**6.67**	**—**	**7,680**	**11.06**	**3**	**14.0**	**7.56**	**14.0**	**6.44**

Table 2-15. Existing Pump Station Capacity with Merge 56 Pipeline Loop (640 Zone)

Pump Station	Number of Pumps	Rated Capacity Design (per pump) (gpm)	Rated Capacity Design (per pump) (mgd)	Firm Capacity (gpm)	Firm Capacity (mgd)	Zone Serviced	Zone AAD (gpm)	Max Day Demand (gpm)	Surplus/ (Deficit) (calculated)
Canyonside Pump Station	3	3,000	4.3	6,000	8.6	600, 825	570	969	5,031
Meanly Drive 890 Pump Station	3	1,250	1.8	2,500	3.6	890, 1028	550	935	1,565
Meanly Drive 790 Pump Station	4	550	0.8	1,650	2.4	790	100	170	1,480
North City Water Reclamation Plant	3	6,000	8.6	12,000	17.3	500, 550, 640	3,410	5,797	6,203

2.4.4 Summary of Operating Pressures

Historically, the City Water Division operated the recycled water system, primarily starting from the Meanley Tank, whereas the City Wastewater staff operated the recycled water pump station at NCWRP and established the controls by monitoring the Meanley Tank. Today, the City has dedicated recycled water system operations division and has more integrated system controls with the NCWRP, which has improved overall communication and operations of the recycled system, especially with regard to tank and pump station controls.

Overall the recycled water system meets the minimum pressure goals originally intended by the pressure zones established in the late 1990s and currently established by the City. In some cases, the City sees higher than desired operating pressures due to the reservoir elevations, which were a result of limited reservoir site availability in the service area.

In new recycled systems, it is desirable to parallel the potable water system with slightly lower pressures in the recycled water system and construct recycled water pipelines below the potable water pipes, as a caution against accidental cross-connection. However, given the limited number of pressure zones, topographical variability, and size of the City service area, this is not always possible. In a few cases the potable water system is 30 to 40 psi higher, and as a result the City installed local PRSs to reduce pressures to a handful of users. This was primarily done near the Meanley Tank area.

The City has an established irrigation window from 10 pm to 6 am for irrigation of recycled water as established in its rules and regulations. One noticeable impact is large users manage their demand starting on the 10 pm hour and peak over a relative shorter window, in some cases of 3 to 4 hours. The result is the City experiences extremely higher peak hour demands (an average of 9.0) compared to the original design criteria (of 6.0). Some larger users. e.g. Torrey Pines Golf Course, peak on the order of 12 to 14 times their average day demand. As a result, large pressure swings on the extremities of its system served by dead-end pipelines are observed. This also requires the need for peaking off the NCWRP, rather than the storage tanks, to meet pressures.

It is recommended that the City work with several of the larger users to explore the possibility of demand management by staggering irrigation start times or irrigating at a lower rate for longer periods to smooth peak demands. This will help the City in the future in managing the Pure Water system demands at NCWRP.

3 Recycled Water Supply

Source water for the recycled water system is supplied through the City's wastewater collection system. The City owns and operates the Metropolitan Wastewater System (Metro System) that serves a 450-square-mile area that includes incorporated areas of the City and the Participating Agencies (PAs):

- City of Chula Vista
- City of Coronado
- City of Del Mar
- City of El Cajon
- City of Imperial Beach
- City of La Mesa
- Lemon Grove Sanitation District
- City of National City
- Otay Water District
- Padre Dam Municipal District
- City of Poway
- San Diego County Sanitation District

The majority of the collection system relies on gravity to transport wastewater to treatment facilities, but pump stations are required to lift the wastewater at certain locations throughout the collection system. There are currently 83 pump stations throughout the City's collection system. The two largest pump stations are Pump Station No. 1 (PS1) and Pump Station No. 2 (PS2). PS1 collects wastewater from the southern portion of the Metro System service area and pumps it northward to PS2 via the South Metro Interceptor (SMI). PS2 pumps wastewater collected from the Metro System to the Point Loma Wastewater Treatment Plant (PLWWTP) via two 87-inch force mains. The PLWWTP is the City's largest treatment facility, treating the majority of the wastewater generated within the service area. Two other treatment facilities, the NCWRP and the SBWRP, provide an additional 30 mgd and 15 mgd of treatment, respectively. Figure 3-1 presents a schematic of the Metro System's interceptors and trunk sewers.

The NCWRP and SBWRP are the two water reclamation plants that produce recycled water for beneficial use within the City of San Diego. This chapter provides an overview of the current and projected recycled water supplies from the City's two water reclamation facilities. The integration of Pure Water Phase 1 in the NSA is presented, as well as the City's plan for the SBWRP to serve potential increased demand in OWD. The City's commitment to Pure Water, includes a new Phase 2 program, which may provide the City with new recycled water supply source, depending on the preferred tertiary treatment plant location.

3.1 NCWRP

The NCWRP, commissioned in 1997, is a reclamation facility that treats wastewater generated in the northern San Diego region, including the City of Del Mar, City of Poway, and northern San Diego communities. After undergoing tertiary treatment and disinfection, the recycled water is distributed to surrounding communities primarily for irrigation and industrial uses. Figure 3-2 illustrates the current NCWRP treatment process schematic.

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Figure 3-1. Metropolitan Wastewater Collection System Schematic

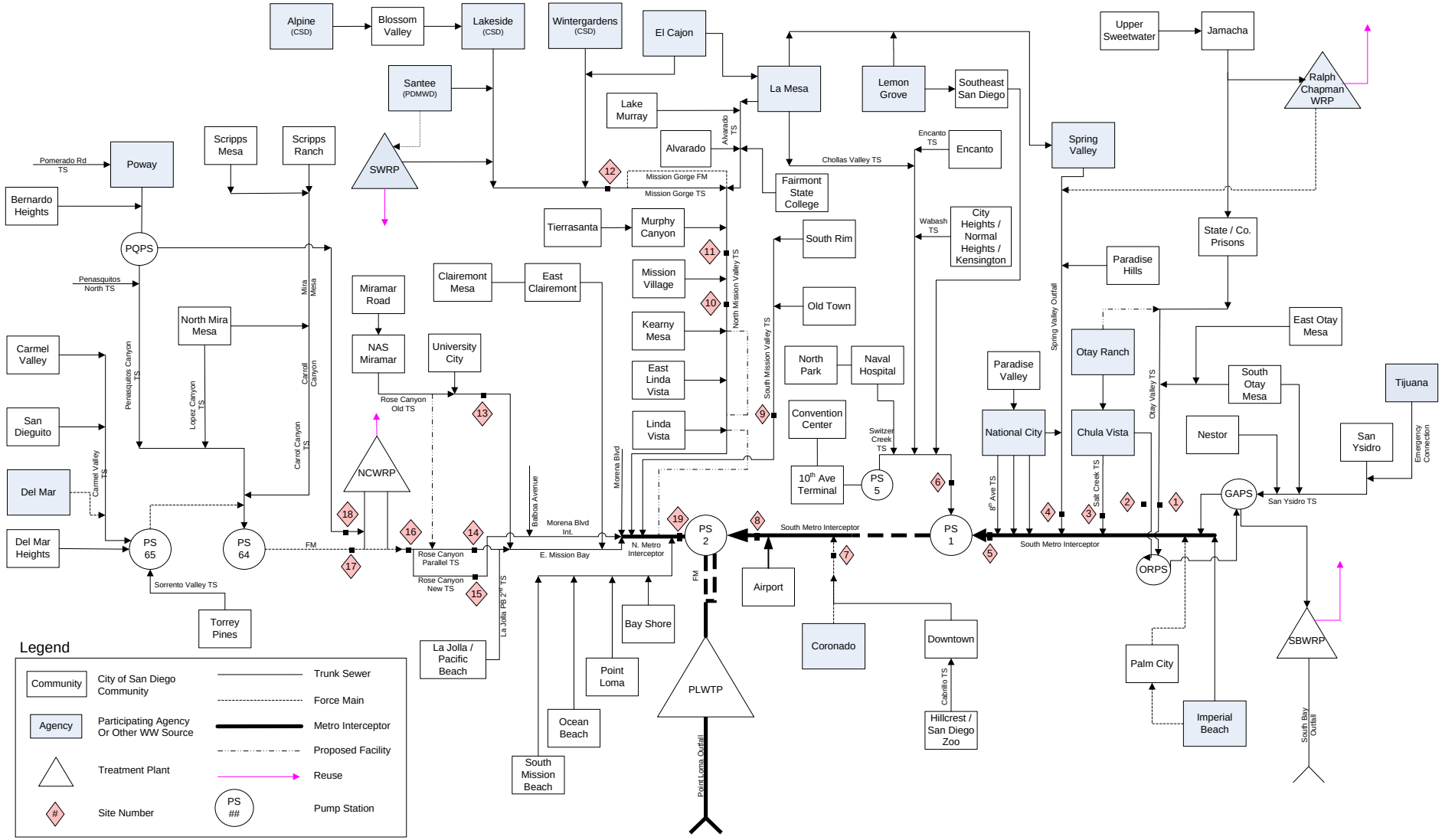

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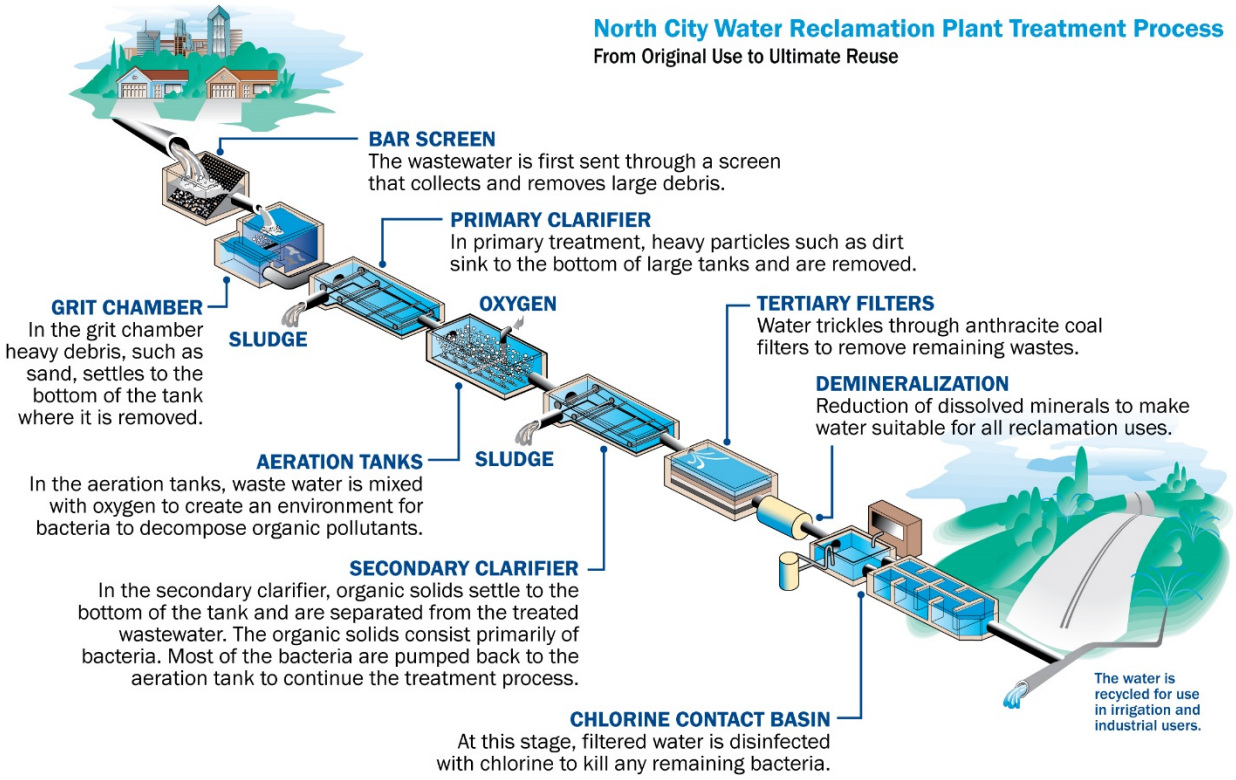
Figure 3-2. NCWRP Process Schematic

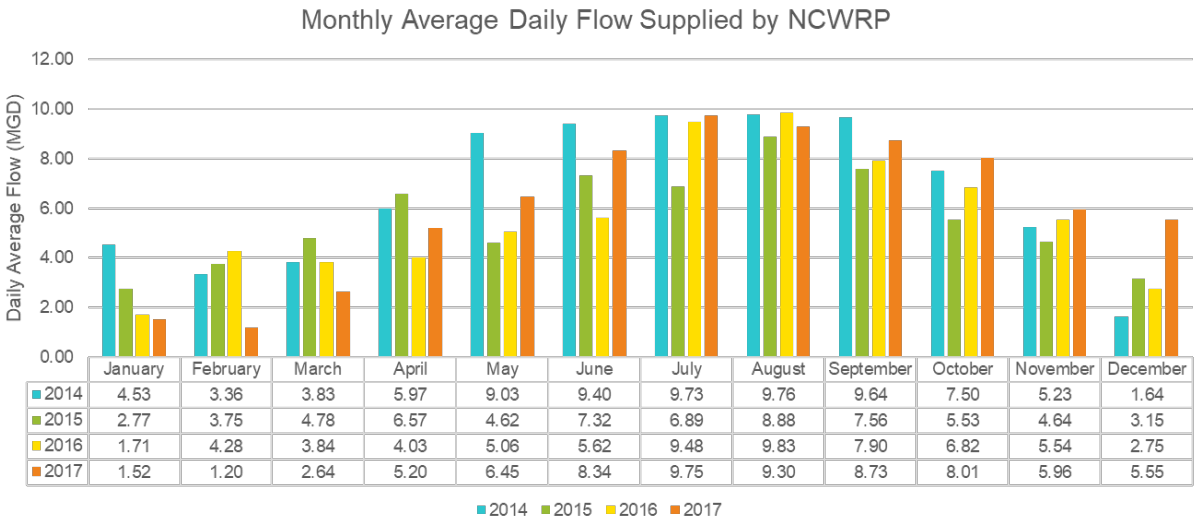


The current NCWRP capacity is 30 mgd average annual daily flow and was designed for expansion to 45 mgd of tertiary-treated water and is currently designed to increase treatment capacity to 52 million gallons per day (mgd) for the Pure Water Program. Excess secondary or tertiary effluent from the NCWRP is discharged back to the Metro System where it combines with the raw wastewater and flows to the PLWWTP for re-treatment. A portion of the tertiary effluent flow is currently demineralized at the NCWRP to maintain recycled water total dissolved solids (TDS) concentration at or below 1,000 milligrams per liter (mg/L); however, this process will be replaced in the future with blended Pure Water directly from the new North City Pure Water Facility (NCPWF).With the implementation of Pure Water Phase 1, tertiary flows not supplied to the NSA recycled water system, will be conveyed to the NCPWF instead of the PLWWTP.

3.1.1 Current Supply

The existing NCWRP is operated to deliver the required recycled water supply of the NSA system, while meeting the permit requirements for secondary treatment. As presented in Chapter 2, the seasonal recycled water demand can be highly variable. Figure 3-3 illustrates the monthly recycled water supplied by the NCWRP over the past four years. The maximum month supply for the baseline year 2017 was 9.75 mgd and the minimum month supply was only 1.52 mgd. Based on an average recycled water demand of 6.64 mgd, the maximum month peaking factor is about 1.5.

Figure 3-3. NCWRP Monthly Recycled Water Supply (2014 – 2017)

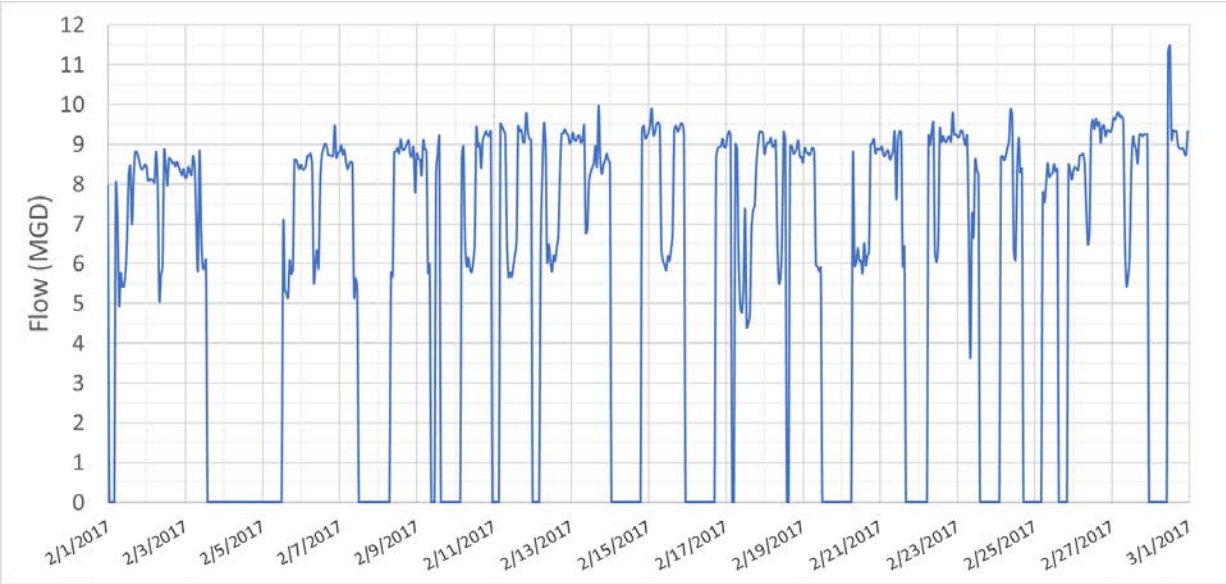


	January	February	March	April	May	June	July	August	September	October	November	December
2014	4.53	3.36	3.83	5.97	9.03	9.40	9.73	9.76	9.64	7.50	5.23	1.64
2015	2.77	3.75	4.78	6.57	4.62	7.32	6.89	8.88	7.56	5.53	4.64	3.15
2016	1.71	4.28	3.84	4.03	5.06	5.62	9.48	9.83	7.90	6.82	5.54	2.75
2017	1.52	1.20	2.64	5.20	6.45	8.34	9.75	9.30	8.73	8.01	5.96	5.55

NCWRP daily production data from 2014 through 2017 was reviewed, including maximum day supplies to the recycled water system. In 2017, the City had to supplement the NSA system with potable water due to a facility out of service, so actual recycled water supply data from NCWRP was lower than normal. It is also reported that Poway periodically supplements potable water into their system as part of their systems management. In 2017, the NCWRP supplied a maximum day flow of 12.2 mgd from NCWRP. Based on an average recycled water demand of 6.64 mgd, the maximum day flow represents a maximum day peaking factor between 1.7 and 1.8. As some of the recycled water supply may have been placed in storage, and not necessarily used by customers, and potable water supplements may also have occurred, therefore a peaking factor of 1.7 is recommended for maximum day conditions.

In contrast during winter periods, especially wet years, the recycled water system may require little supply, and in fact demand can be met by existing storage for several days, as many of the irrigation users may not require any recycled water. The NCWRP tertiary filters were designed to maintain a constant flow through the NCWRP. The tertiary flow through the plant, during the wet winter months, is spilled over a weir and diverted to the PLWWTP. Figure 3-4 shows the tertiary daily flows diverted to PLWWTP during the month of February 2017, an extended wet weather period. As shown in the figure, the City continued to operate the tertiary filters and, every few days, pumped recycled water to storage in the NSA to reduce wet weather flows to PLWWTP.

Figure 3-4. NCWRP flows to PLWWTP in February 2017



The NSA distribution system has long transmission mains and all operational storage located to the east. Coupled with high peak hour demands in the west when the 10 pm watering period starts, the system relies on the NCWRP to deliver adequate flows and pressure during peak periods. Ideally, the City would deliver a constant maximum day supply of 12 mgd (8,300 gpm) and the variable daily system demands could be supplied by local storage.

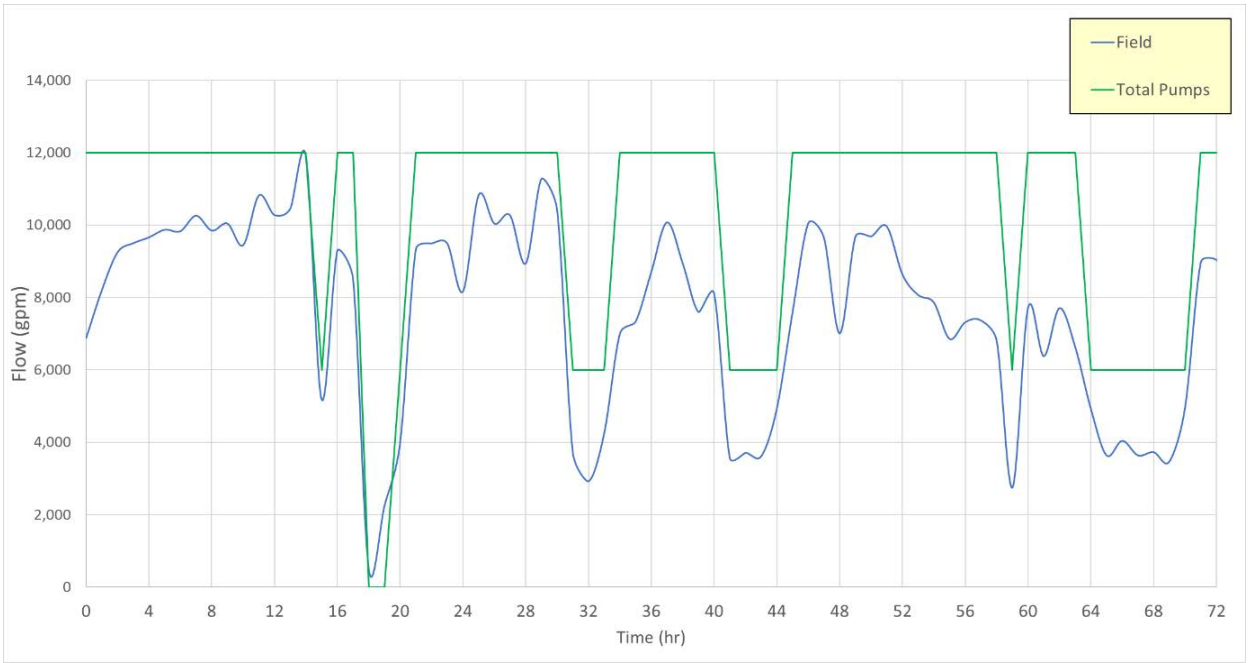
The City operates three variable frequency drive (VFD) pumps at the NCWRP, all sized and installed as part of the original plant design (ultimate 45 mgd plant capacity). Each NCWRP pumping unit has a nominal capacity of 5,000 gpm (7.2 mgd). Typically two pumps are needed during the summer months to meet peak hour demands, and occasionally all three pumps to meet extremely high peak demands.

Figure 3-5 illustrates the variability of pump flows at NCWRP during a 72-hour maximum day demand. Pump flows are shown in gpm over the period and vary from 4,000 gpm to 12,000 gpm. The City has flexibility at NCWRP with all the pumps operating on VFDs and operators can adjust speeds to maintain pressures as flows increase.

In summary, the City manages the recycled water supply at the NCWRP with the following operational priorities to:

- Meet permit flows for Secondary Treatment
- Control primary pump based on Meanley Tank levels
- Adjust pump speeds based on pressure changes associated with increased demands
- Operate two pumps at same speeds during maximum day

Figure 3-5. NCWRP Pump Flows (gpm) during a 72-hour Maximum Day Demand



As Pure Water Program is initiated, it will be important to have a more uniform flow to the NCPWF. Therefore, the City may institute demand management of these large users, at the start of the nightly irrigation period, to potentially operate at a more constant flow and avoid large flow swings through NCWRP.

3.1.2 Projected Supply

The City's commitment and implementation of Pure Water has resulted in a new plan to only focus future recycled water customer demands along the existing distribution system, this includes infill demand with conversion of potable water meters and a handful of new planned development projects. The result, as discussed in Chapter 4, is a projected increase of about 2 mgd of average annual recycled water demand.

This demand will result in an increase in required tertiary supply at NCWRP during maximum day demand by about 3.5 mgd to 15.5 mgd. Projected available recycled water supply at NCWRP during maximum day, in coordination with the Pure Water program, is anticipated to be around 16 mgd.

3.1.3 Pure Water Impact on Supply

The Pure Water Program includes the Morena Pump Station and Pipelines project, which is designed to increase wastewater flows to the NCWRP to 52 million gallons per day (mgd) to meet both Pure Water and recycled water needs.

The City's planned Pure Water Program requires a tertiary expansion at NCWRP to accommodate a new constant supply of Pure Water year round. The City plans to expand NCWRP from 30 mgd to 52 mgd and convey 30 mgd of tertiary water over to the NCPWF, the City's new advanced water purification facility.

The City's NCWRP expansion design was based on a maximum day recycled water supply of 20 mgd. Currently, the maximum day demand within the NSA is approximately 12.5 mgd, leaving

potential expansion within the NSA for 7.5 mgd of maximum day demand. Figure 3-6 illustrates schematically the complete system to deliver increased wastewater to NCWRP and supply the NSA system and a new NCPWF.

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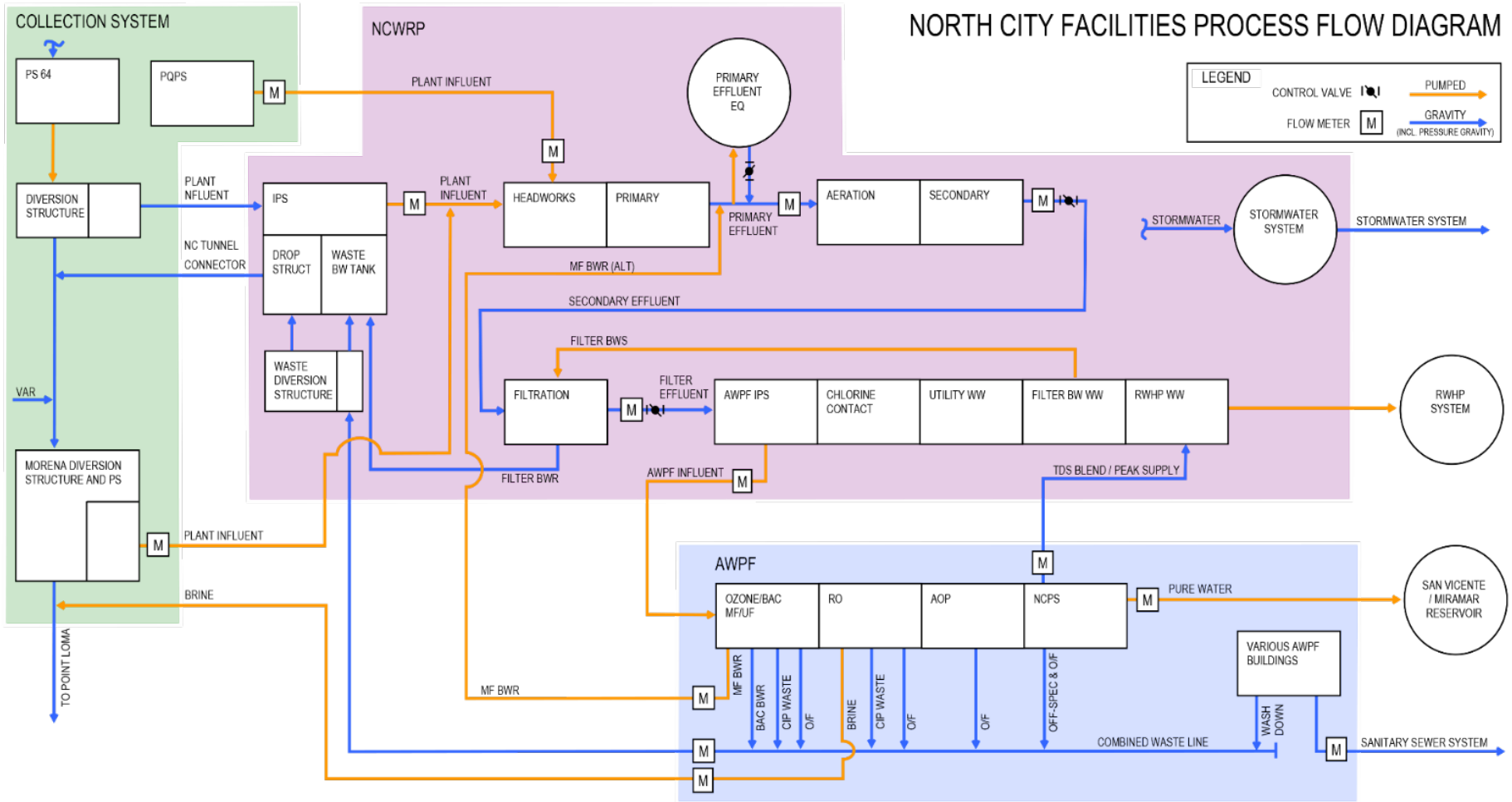
Figure 3-6. NCWRP and Pure Water (NCPWF) Process Schematic



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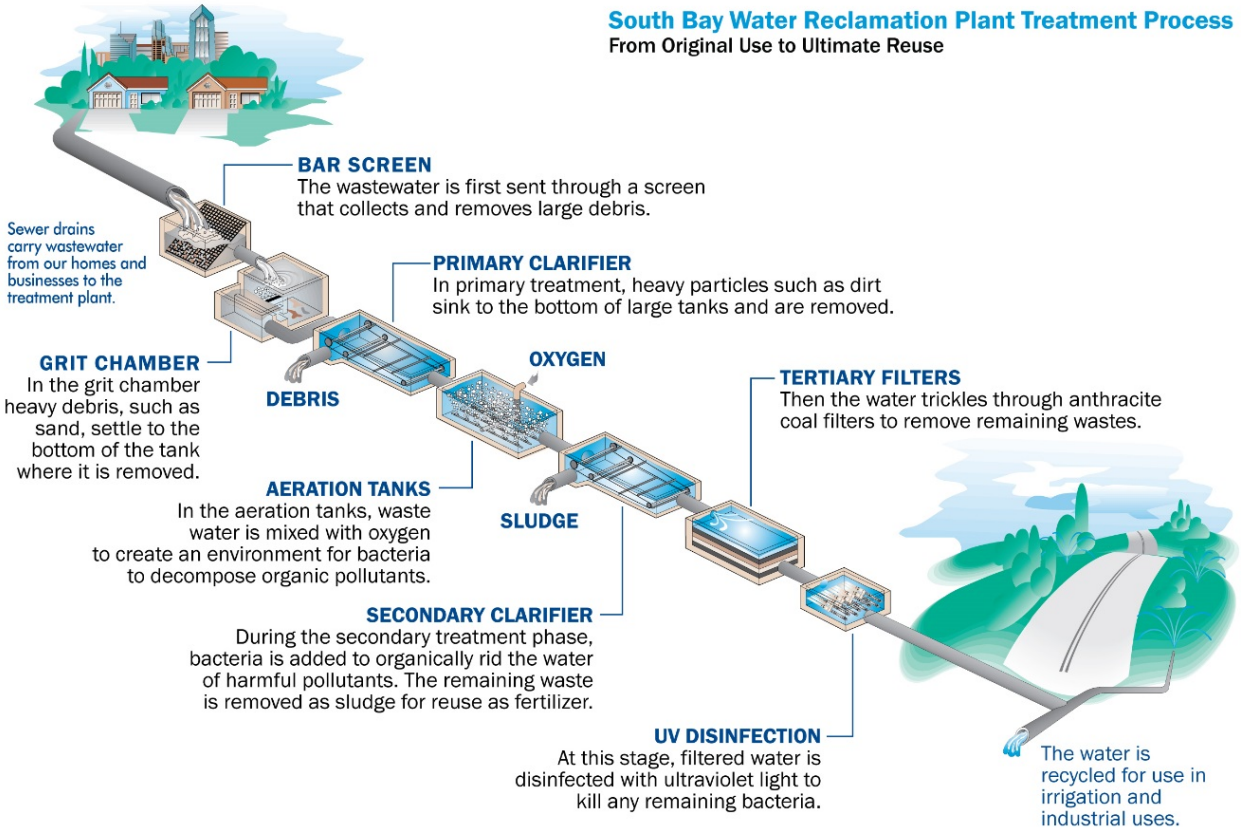
3.2 SBWRP

The SSA is supplied recycled water by the SBWRP, a tertiary treatment plant. Title 22 recycled water is produced to meet daily demand and remaining wastewater is treated to secondary and discharged through the South Bay Ocean Outfall (SBOO).

In 2002, the SBWRP began treating approximately 4.6 mgd of wastewater from the South Bay area, conveyed to the plant via the Grove Avenue Pump Station (GAPS). In the summer of 2006, the plant began increasing the amount of wastewater treated at SBWRP by approximately 4 mgd to a total of 8.6 mgd. The increase was done to meet the increased recycled water demand from the OWD, which had just completed an extension of their recycled water distribution system. Figure 3-7 illustrates the current SBWRP treatment process schematic.

Figure 3-7. SBWRP Process Schematic



3.2.1 Current Supply

The SBWRP is operated primarily to meet the requirements set forth in the OWD recycled water agreement. This includes supply capacity of up to 6 mgd of recycled water demand, per the City's agreement with OWD. Sufficient wastewater is diverted at GAPS to also serve smaller recycled water demands within the City, including irrigation along CalTrans right of way. OWD places a reclaimed water order to the SBWRP operators every two weeks. These orders are variable depending on the season and typically range between 2.5 mgd (Winter) to 6.0 mgd (Summer). The average summer order is 5.0 mgd. In the summer, treated flows are typically between 6.5 and 7

mgd. Production rates are brought down when OWD orders are less, to maintain an average flow to the outfall of 1 mgd.

3.2.2 Potential Supply

Although the SBWRP has a design capacity of 15 mgd, plans to expand recycled water production in the SSA have been put on hold, as it is challenging to divert additional wastewater flow to the SBWRP for treatment. In the 2010 Master Plan, projected 2035 SBWRP production from existing facilities, including the Grove Avenue Pump Station, was estimated to be between 10.5 to 11.5 mgd, with wastewater sources coming from existing tributary areas. The projected flows were considered sufficient to meet baseline demands in the long-term, however since the imposition of mandatory water conservation in 2014 and 2015, wastewater flows have significantly decreased. The maximum production at SBWRP, due to the lack of source water for the plant, is approximately 9 mgd. Additional wastewater flow diversions would be required to meet potential identified demands for OWD in the future. Expanding wastewater flow diversions to SBWRP.

Increases in total dissolved solids in local wastewater have also been observed, requiring additional salt removal treatment processes to be employed at the SBWRP prior to distributing recycled water for irrigation purposes. Trailers housing electrodialysis reversal (EDR) equipment are being used to reduce the TDS in a side stream of recycled water to approximately 500 mg/L. This water is then used for blending to reduce the overall TDS of the recycled water to between 900 to 950 mg/L. Operation of the EDR units, which use an extensive amount of energy, is expensive.

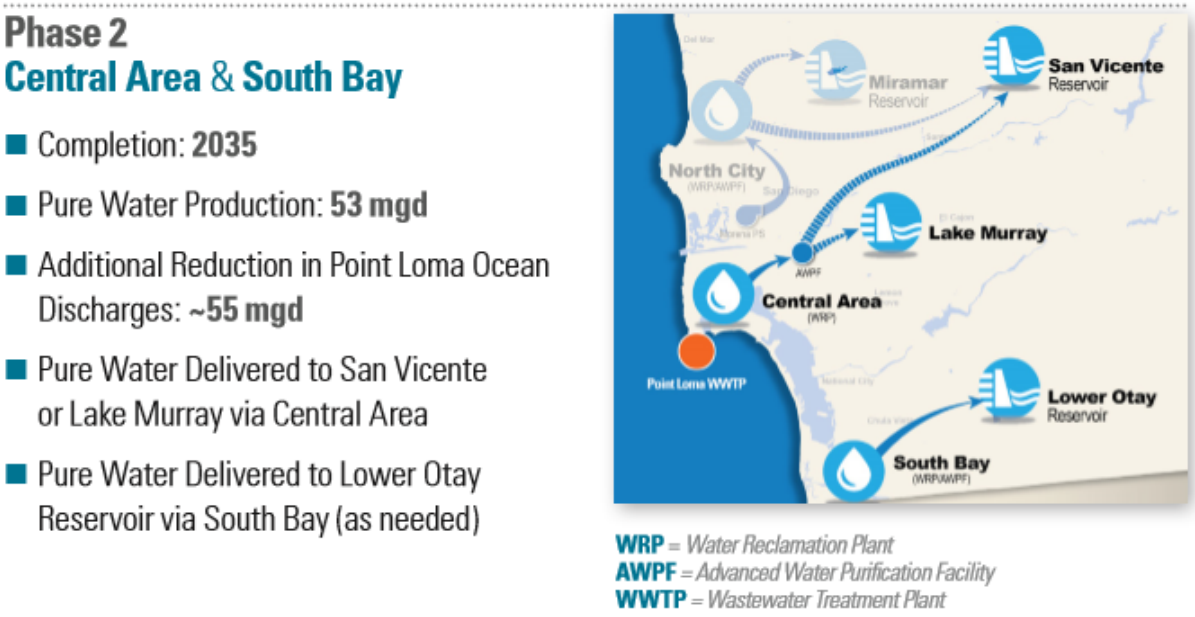
Phase 2 of Pure Water Program considers the potential for treating excess flows at the SBWRP for drinking water, if needed. Pure Water Phase 2 is discussed further in the following section.

3.3 Pure Water Phase 2

A majority of the Metro System wastewater flows collect at the City's Pump Station No. 2 on Harbor Drive before being pumped to the PLWWTP. In Phase 2 of the Pure Water Program, conceptually illustrated on Figure 3-8, the City is considering diverting wastewater flows from this site, building a new advanced water treatment facility in the Central Area of San Diego and sending the repurified water to either Lake Murray or San Vicente Reservoir to augment the regional drinking water supplies. Similarly, in the South Bay, an advanced water treatment facility could be constructed at the SBWRP and the repurified water sent to Otay Lakes to augment that regional drinking water supply source.

In the Central Service Area (CSA), which currently does not have a source of recycled water, it is possible that a new treatment facility could produce tertiary treated water to serve untapped irrigation and industrial customers in the Mission Valley, Interstate 8 corridor and possibly Balboa Park. While there is a cost savings associated with not having to treat all of the diverted wastewater to an advanced treatment level, investment in a purple pipe delivery system to the new recycled water customers, as well as on site retrofits to accommodate a dual plumbed system, would be required.

Figure 3-8. Pure Water Phase 2 Facilities Map



3.4 San Pasqual Recycled Water Supply

In December 2016, the City completed a study of water supply options that would be mutually beneficial to the San Pasqual Groundwater Basin stakeholders. While considering a proposed joint-use water supply project for the San Pasqual Valley and surrounding area, conceptual options of potentially available effluent and a proposed advanced treatment facility in the San Pasqual-Escondido area were studied. A reuse project could mutually benefit multiple stakeholders with a new local supply and enhance the groundwater quality in the Basin, utilizing joint-use and cost participation agreements for the shared facilities to optimize project costs. Ultimately, the project could serve as a component of an overall City of San Diego Groundwater Management Plan and Sustainability Plan (GSP) for the San Pasqual Basin. The San Pasqual GSP is currently underway as a joint project between the City and the County of San Diego.

The City of Escondido is looking to expand its reuse program and may offer the potential development of a new local water supply, including recycled water. One potential option was to increase utilization of the City of Escondido's reuse project and serve recycled water to the Rancho Bernardo area, which was formerly served by the City's abandoned San Pasqual Plant. A new reuse project could potentially expand further to serve existing golf courses. Figure 3-9 illustrates this concept to extend recycled water south from Escondido.

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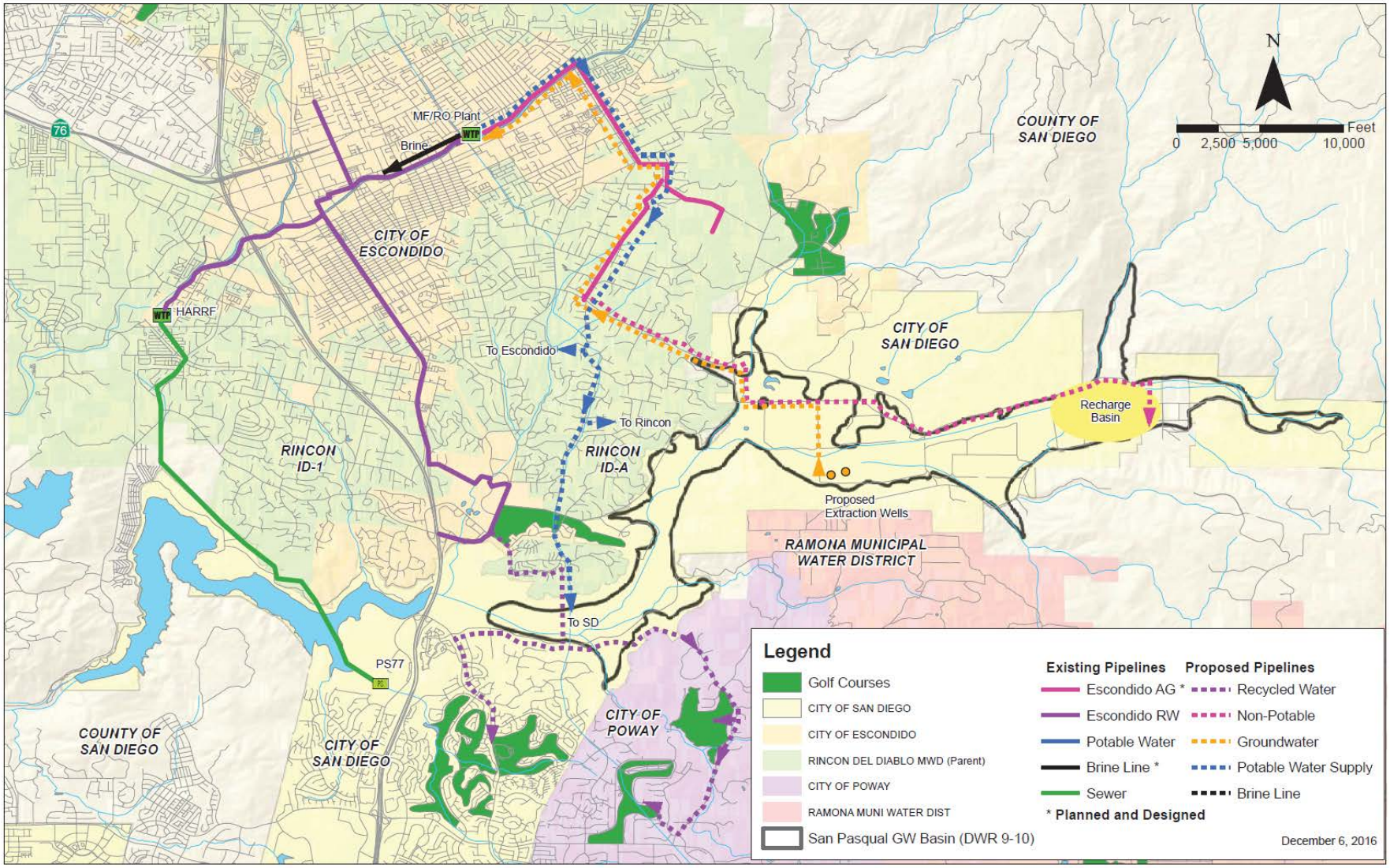
Figure 3-9. San Pasqual/Escondido Reuse Concept



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4 Recycled Water System Infill Opportunities

As part of the 2020 Master Plan Update, opportunities to increase recycled water use within the existing service areas, without impacting the City's Pure Water Program plans, were evaluated.

Infill opportunities considered include those in the NSA, generally north of State Route (SR) 52 and supplied by the NCWRP, the SSA served by the SBWRP, the Balboa Park/Central San Diego Conceptual Service Area, and the San Pasqual Conceptual Service Area.

The recycled water infill market assessment approach followed the steps listed below.

1. Review prior recycled water market assessments and current customer usage
2. Update status of previously identified potential recycled water customers
3. Meet with government agency customers (e.g. neighboring water districts and CalTrans) to discuss future recycled water demands
4. Identify future potential customers and evaluate feasibility of connecting, including existing large customers with large business campuses and sustainability goals
5. Adjust future demand estimates for probability of connecting, climate change and unintended consequences of potable water conservation messaging

4.1 Northern Service Area

This section of the report provides infill opportunities in the NSA generally including the portion of the City of San Diego north of SR 52 and served by the NCWRP. There are infill opportunities in the Torrey Pines, Sorrento Valley, Mira Mesa, Scripps Ranch and Rancho Penasquitos communities, Marine Corp Air Station (MCAS) Miramar, and the SR 56, SR 52, SR 163, and I-805 freeway corridors.

As noted in Chapter 3, the City proposed to expand the NCWRP to 52 mgd of tertiary-treated capacity, with 30 mgd being supplied to the NCPWF. The design of the NCWRP expansion was based on the assumption that a maximum day supply of 20 mgd would be reserved for the City's recycled water customers, primarily during the peak summer months. Based on a current maximum day demand of 12.5 mgd, this leaves approximately 7.5 mgd of capacity available during peak demand (summer) months. This equates to approximately 4.5 mgd of average annual demand (5,000 AFY) that could be connected within the NSA in the future, without impacting the Pure Water Program.

4.1.1 Previous Market Assessment

The 2010 Master Plan completed a comprehensive market analysis without any limitations on recycled water supply. Initially, the 2010 Master Plan identified all customers who were planned for connection by 2015, as shown in Table 4-1. The total projected usage was reduced by 30 percent, based on a historically observed rate of 70 percent of prior potable water use.

Table 4-1. 2010 Master Plan NSA Planned Recycled Water Customers by 2015

Project Type	Planned Project Demands by 2015 (AFY)
City Property Retrofits	28
2005 Master Plan Projects	1,096
Planned Pipeline Extensions	900
New Development	772
Recycled Water Plan Review	270
Subtotal	3,096
Adjustment Factor (-30%)	-929
Total	**2,167**

As shown on Figure 2-4, recycled water use increased by approximately 2,000 AFY between 2010 and 2014, as these planned recycled water customers came on line.

To identify potential new customers, the 2010 Master Plan reviewed the potable water customer database for irrigation customers and the Industrial Wastewater Control Program (IWCP) database for cooling tower customers. A market assessment survey was then sent to large potable water users not classified in the potable water database as irrigation. A market assessment survey was also sent to all agencies in the Metropolitan Wastewater System (Participating Agencies) to gauge their interest in becoming wholesale customers.

For an initial market assessment:

- Potable water irrigation meter customers were listed,
- Customers planned to be connected by 2015 were removed to avoid double counting,
- Adjustment factors were applied depending on the type of use, and
- Customers identified through the survey were added.

This process identified 6,684 irrigation-only customers City-wide with an estimated annual demand of 25,284 AFY. A review of the IWCP database identified 158 potential City-wide cooling tower customers with a demand of 2,170 AFY. The majority of these customers were located in the NSA.

The City of Poway indicated additional recycled water demands of 1,100 AFY through a northern connection in Rancho Bernardo. With an assumed connection factor of 77 percent, this equated to 847 AFY. Santa Fe Irrigation District (SFID) indicated a demand of 850 AFY that could be served by the City or the San Elijo Joint Powers Authority. With a 50 percent adjustment factor to account for the uncertainty of the source, a demand of 425 AFY was assumed.

A summary of the 2010 Master Plan initial market assessment for the NSA is presented in Table 4-2, below. This represented the potential annual demand within the service area of 27,247 AFY or approximately 24 mgd and a maximum day demand well over 40 mgd.

Table 4-2. 2010 Master Plan Potential Non-Potable Use in the NSA

Type of Use	Number of Connections	Annual Demand (AFY)
Irrigation	6,476	24,391
Cooling Towers	118	1,584
Wholesale	2	1,272
Total	**6,596**	**27,247**

Using meter records for potable water customers, a density map was created visually showing concentrated potential demands. Individual records were plotted as dots on maps with increasing dot size indicating larger demands. From the density map, focus areas were identified for expansion of the recycled water distribution system. For the NSA, the focus areas included:

- Infill Customers
- Carmel Valley West
- Mira Mesa
- Rancho Bernardo / I-15 Corridor
- Kearny Mesa
- Mission Valley / Mission Bay

A refined market assessment was then developed through the following steps:

1. Develop distribution layout concepts by extending pipe to customers with demands greater than 20 AFY, or anchor points, or to concentrated areas of multiple low-demand customers.
2. Calculate the total demand along pipelines for infill customers within 0.25 miles of the pipeline.
3. Refine demands using probability of connection factors, based on an analysis of existing and planned customers, and potential customers within both 0.05 and 0.25 miles of an existing or planned pipeline. The analysis also takes into account customer demand ranges. For customers with 0.05 miles, the percent capture ranged from 43 percent (0 to 1 AFY) to 77 percent (100+ AFY). For customers within 0.25 miles, the percentages ranged from 23 to 71 percent, for the same demand range.

The results of the refined market assessment by focus area are shown in Table 4-3 and Figure 4-1 (Figure I-1 of the 2010 Master Plan), below. Focusing on just the Infill, Mira Mesa, and Carmel Valley West areas near the existing recycled water system (circled on Figure 4-1), updated water use data was requested for the customers identified for conversion in 2011.

Table 4-4 provides an update of those demands. As indicated, by 2018 some of those demands, approximately 488 AFY, had been converted to recycled water or removed from service. Others have no reading, indicating that the meter still exists but has no demand associated with it. The remaining meters that were not yet converted by 2018 are indicated in green with a 2018 demand of 360 AFY. Note that these remaining customers were using 228 AFY less water in 2018 than was reported in 2010. CalTrans was a notable customer with greatly reduced usage due to policy changes limiting potable water irrigation.

Table 4-3. 2010 Refined NSA Market Assessment

Focus Area	Total Demand (AFY)	Demand within 0.25 miles of existing recycled pipeline (AFY)	Demand within 0.25 miles x Probability of Connection (AFY)
Infill	5,812	5,082	2,693
Carmel Valley West	1,772	1,267	546
Kearny Mesa	2,643	1,227	539
Mira Mesa	884	688	294
Mission Valley/Mission Bay	3,141	2,306	1,146
Rancho Bernardo/ I-15	5,750	4,589	2,643
Total	**20,002**	**15,159**	**7,861**

Figure 4-1. NSA Refined Market Assessment Focus Areas

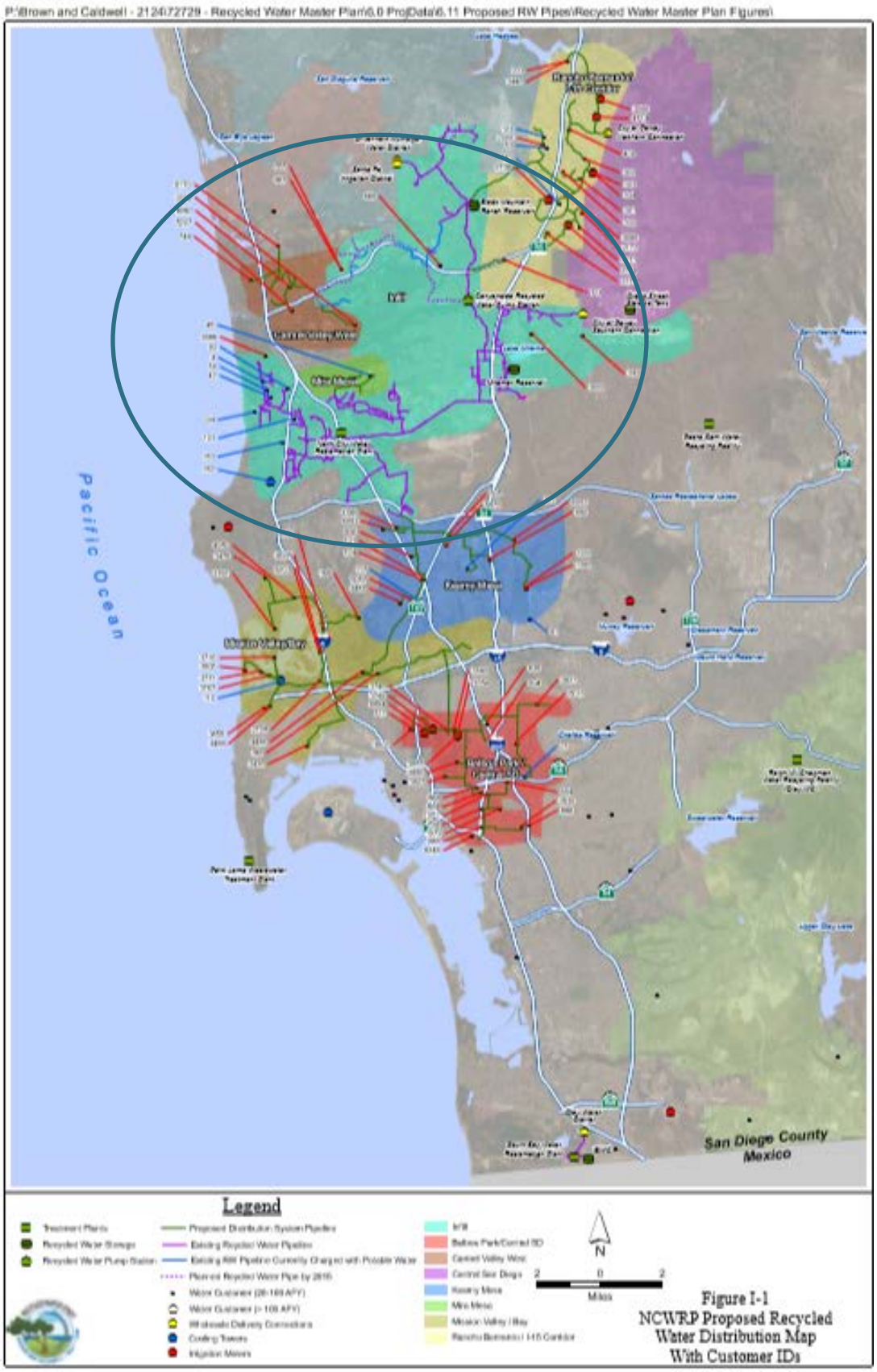

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Table 4-4. NSA Refined Market Assessment Customers Updated Demands

Type of Use	Focus Area	Map ID (from 2011 MP, Fig I-1)	Meter No.	Customer Name	Site Address	2011 Demand (AFY)	Converted or removed from service	2017 Demand (AFY)	Difference between 2011 and 2017
Cooling Towers	infill	4	02-0434	Advanced BioHealing	10933 N Torrey Pines Road, Ste 200	29.5	29.5		
Cooling Towers	infill	42	02-0059	General Atomics	3550 General Atomics Ct	27.5		37.4	9.9
Cooling Towers	Mira Mesa	45	03-0777	Gen Probe Inc	10210 Genetic Center Drive	51.5		29.1	-22.4
Cooling Towers	infill	74	09-0752	Novartis Institute	10675 John Jay Hopkins Drive	37.5		55.7	18.2
Cooling Towers	infill	82	02-0756	Pfizer La Jolla Laboratories	10777 Science Center Drive	26.6		5.7	-20.9
Cooling Towers	infill	94	02-0033	Salk Institute for Biological Studies	10010 N Torrey Pines Road	70.7	70.7		
Cooling Towers	infill	103	02-0040	Scripps Memorial Hospital	9888 Genesee Avenue	35.2		119.9	84.7
Cooling Towers	infill	152	02-0112	University of California San Diego	9500 Gilman Drive	232.2	232.2		
Cooling Towers	infill	156	04-0002	VA San Diego Healthcare System	3350 La Jolla Village Drive, Ste 138	31.7	31.7		
Irrigation	infill	555	30064232	CALTRANS	12910 CARMEL VALLEY RD	35.9		1.0	-34.9
Irrigation	infill	567	30064233	CALTRANS	12890 CARMEL VALLEY RD	30.3		0.4	-29.9
Irrigation	infill	569	57074879	CALTRANS	8231 CARMEL MTN RD	28.1		6.7	-21.4
Irrigation	infill	714	97521066	CALTRANS	9910 AZUAGA ST	36.2		0.0	-36.2
Irrigation	CV west	744	95408373	CALTRANS	2502 DEL MAR HEIGHTS RD	38.2		9.3	-28.9
Irrigation	CV west	3326	68171528	PARDEE HOMES	5853 CARMEL MTN RD	90.2		0.0	-90.2

Table 4-4. NSA Refined Market Assessment Customers Updated Demands

Type of Use	Focus Area	Map ID (from 2011 MP, Fig I-1)	Meter No.	Customer Name	Site Address	2011 Demand (AFY)	Converted or removed from service	2017 Demand (AFY)	Difference between 2011 and 2017
Irrigation	CV west	3430	96376032	PARK & REC/COMM PARK I	11470 CYPRESS CANYON RD	22.1		22.4	0.3
Irrigation	infill	3851	17003984	PARK & REC/GOLF CRSE OPER	11580 NORTH TORREY PINES RD	13.1		12.0	-1.1
Irrigation	infill	3853	59642732	PARK & REC/GOLF CRSE OPER	11502 NORTH TORREY PINES RD	0.4	0.4		
Irrigation	infill	3855	89541943	PARK & REC/GOLF CRSE OPER	11520 NORTH TORREY PINES RD	36.6	36.6		
Irrigation	infill	3858	91003234	PARK & REC/GOLF CRSE OPER	11726 NORTH TORREY PINES RD	0	0		
Irrigation	infill	3882	32704434	PARK & REC/OPEN SPACE	11554 SCRIPPS RANCH BL	21.2		16.3	-4.9
Irrigation	CV west	5207	12580782	SAN DIEGO JEWISH ACADEMY	11860 CARMEL CREEK RD	28.2		27.0	-1.2
Irrigation	CV west	5250	98398007	SAN DIEGUITO UNION HIGH	3800 MYKONOS LN	65.9		16.9	-49.0
Irrigation	CV west	6170	87608763	UKEGAWA BROTHERS	13622 EL CAMINO REAL	86.5	86.5		
					Total	1,075.3	487.6	359.8	(227.9)

4.1.2 Recently Connected Recycled Water Customers

City staff identified recently connected customers, all of which are in the NSA. Table 4-5 lists customers connected between June 1, 2018 and November 1, 2019. This list was valuable to compare against the 2010 Master Plan infill market assessment for potential customers that were anticipated to connect in the near term, but were not captured in the 2017-2018 recycled water billing data. These new customers are projected to use approximately 130 AFY of recycled water. Of note, not many of these new customers, especially those with less than 1 AFY in projected usage, were identified in the 2010 Master Plan, indicating that new development and potential conversions can be difficult to forecast.

Table 4-5. NSA Recycled Water Customers Connected Between June 2018 and November 2019

Meter Number	Customer Name As Listed in CCS Billing System	Meter Address	Type of Use[a]	Projected Annual Demand (AFY)[b, c]
16507818	Alexandria Real Estate (N25)	3013 Science Park Road	I	0.46
16284805	Alexandria Real Estate	3033 Science Park Road	CT	0.72
16284801	BD Cooling Tower (N22)	10020 Pacific Mesa Blvd	CT	1.11
13583232	CalTrans	9951 Genesee Avenue	IO	7.54
13568039	CalTrans	10052 Genesee Avenue	IO	1.53
13568025	CalTrans	10052 Genesee Avenue	IO	1.49
13568028	Del Sur Neighborhood Park	Paseo Montenero	I	1.23
12851172	Garden Communities	9015 ½ Judicial Drive	I	NA
16284798	Mandolin Homeowners Association	15776 Paseo Montenero	I	0.27
12851459	Pardee Homes	13635 1/3 Lopelia Meadows Place	I	NA
13581422	Park & Recreation Open Space	17765 San Dieguito Road	IO	0.33
13581444	Park & Recreation Open Space	17929 San Dieguito Road	IO	0.54
16507815	University Town Center Association	4545 La Jolla Village Drive	I	0.24
16507814	University Town Center Association	4545 La Jolla Village Drive	I	1.72
16507811	Vertex Pharma	3215 Merryfield Row	I	0.67
13568031	Vertex Pharma	3215 Merryfield Row	CT	0.12
16507621	PHR Unit 17	13569 Pacific Highlands Parkway	IO	NA
16284800	Watermark	10159 Scripps Gateway Court	I	0.34
TBD	Mitchel 1	16067 Babcock	I	NA
16507405	PHR Unit 28A	6730 Terrazo Court	IO	NA
16507835	Biolegend	8999 Biolegend Way	I	0.36
16507390	PHR Parkway	13679 Pacific Highlands Parkway	1/O	0.18
16507368	PHR Unit 27	6731 Azul Luna Way	1/O	0.18
16179300	La Terra at PHR HOA	5992 E. Village Center Loop	I	0.16
18507392	PHR Unit 26	6698 Soltera Vista Parkway	I/O	NA

Table 4-5. NSA Recycled Water Customers Connected Between June 2018 and November 2019

Meter Number	Customer Name As Listed in CCS Billing System	Meter Address	Type of Use[a]	Projected Annual Demand (AFY)[b, c]
16507408	Meadowwood 2	6642 Carmel Valley Road	I/O	0.55
16179299	Deer Canyon Mitigation	12880 Carmel Valley Road	I/O	0.55
16507366	PHR Unit 26A	6820 Soltera Vista Parkway	I/O	0.21
16307392	PHR Unit 26B	6698 Soltera Vista Parkway	I/O	NA
16284824	UTC Residential Tower	8800 Lombard Place	I	NA
			Total	**126.48**

Notes:

[a] I = Irrigation with potable water on site for domestic, CT = Cooling Tower, IO, I/O = Irrigation Only

[b] Projected Annual demand based on September 2019 potable water demand data discounted by a percentage to account for increased efficiencies associated with conversion to recycled water (discounts were assumed to be 18% of annual demand for irrigation, or 8 % of annual demand for cooling tower use)

[c] NA – no data available

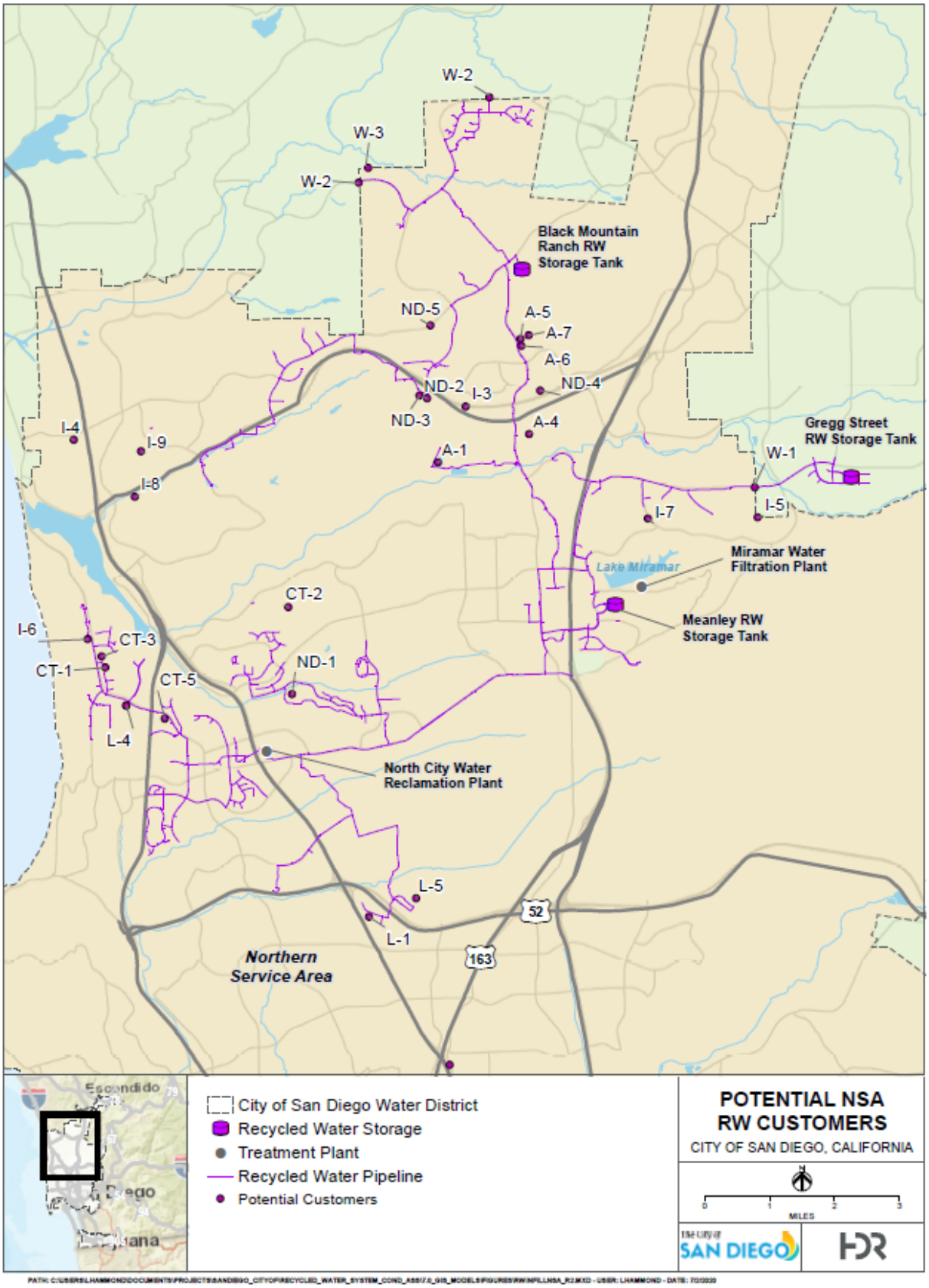
4.1.3 Updated Market Assessment (Infill Only)

For this 2020 market assessment, it was recognized that the City's investment in the Pure Water San Diego program will ensure an expanded, year-round demand for advanced treated recycled water and the need to expand the purple pipe non-potable recycled water distribution system to maximize use of this resource is no longer necessary. However, there are still opportunities where using non-potable recycled water, without having to expand the existing recycled water distribution system, is more cost effective than treating the water for potable reuse. Therefore, the following approach was used to identify potential recycled water infill customers:

- **Previously Identified NSA Infill Customers:** Review the recommended infill customers previously identified in the 2010 Master Plan to identify those that had not yet been converted and assess current potable water demands. (Table 4-6)
- **Large Wholesale or Retail Customers:** Meet with or contact existing and potential wholesale customers, and other large customers, to review existing and future demands. (Table 4-7)
- **New Developments**: Review new developments conditioned to use recycled water, as provided by City staff. (Table 4-9)
- **Additional Opportunities:** Identify any additional irrigation opportunities along existing recycled water pipelines. (Table 4-10)

Figure 4-2 shows the locations of the potential customers identified in this section and the results of the assessment are discussed and shown in Table 4-6 through Table 4-10, below.

Figure 4-2. NSA Potential RW Customers



4.1.3.1 Previously Identified NSA Infill Customers

Table 4-6 lists the potential infill customers originally identified in the 2010 Master Plan that have not yet been converted to recycled water (previously highlighted in Table 4-4). These customers have the potential to connect to the recycled water system due to their proximity to the existing distribution system. Of note, the potential demand for cooling towers (noted with "CT" in the ID), which benefit the City by having a more constant year-round demand than irrigation customers (noted with "I" in the ID), represents 70 percent of the demand for these previously identified customers that have yet to be connected.

Table 4-6. NSA Potential Infill Customers Previously Identified

Customer Type/ ID	Customer Name	Site Location	Potential Ultimate Demand (AFY)
CT-1	General Atomics [1]	3550 General Atomics Ct	37.40
CT-2	Gen Probe Inc	10210 Genetic Center Drive	29.10
CT-3	Novartis Institute [1]	10675 John Jay Hopkins Drive	55.70
CT-5	Scripps Memorial Hospital	9888 Genesee Avenue	110.70
I-3	CalTrans	8231 Carmel Valley Road	6.70
I-4	CalTrans	2502 Del Mar Heights Road	9.30
I-5	Park & Rec/ Comm Park I	11470 Cypress Canyon Road	22.40
I-6	Park & Rec/ Golf Course Operation	11580 North Torrey Pines Road	12.00
I-7	Park & Rec/ Open Space	11554 Scripps Ranch Blvd	16.30
I-8	San Diego Jewish Academy	11860 Carmel Creek Road	27.00
I-9	San Dieguito Union High Carmel Valley Middle School	3800 Mykonos Lane	16.90
		Total	**343.50**

[1] Customer has been connected to the recycled water system following this master plan baseline demand year of 2017.

Large Wholesale and Retail Customers

There are a number of wholesale (noted with "W" in the ID) and large retail customers (noted with "L" in the ID) who have indicated a desire to increase their recycled water demand, which could increase the City's year-round baseline recycled water demand. These include the City of Poway, OMWD, SFID, CalTrans, Marine Corp Air Station Miramar (MCAS Miramar) and University of California, San Diego (UCSD). Table 4-7 below provides a summary of those customers and their potential demand increase.

Table 4-7. NSA Large and Wholesale Customers

Customer Type/ ID	Customer Name	Site Location	2017 Baseline Demand (AFY)	Maximum Contract Demand (AFY)	Potential Ultimate Demand (AFY)	Net Increase (Ultimate – Baseline) (AFY)
W-1	City of Poway	Wholesale Meter - Scripps Poway Parkway	380	750	950	570
W-2	OMWD	Wholesale Meter - San Diegito Road/Paso Del Sur	600	400	800	200
W-3	SFID	Wholesale Meter - San Dieguito Road	0	0	850	850
N/A	Caltrans	35 meters - throughout NSA	155	N/A	290	135
L-1	CalTrans	Copley Drive, south of 52 serving I-805 and SR-163	0	N/A	66	66
L-2	CalTrans	Interstate 8, between SR-163 and I-15	0	N/A	105	105
L-3	MCAS Miramar	Master Meter - Miramar Road	252	N/A	440	188
L-4	UCSD	4 Master Meters (>60 submeters)	379	N/A	670	291
L-5	Metro Biosolids Center	Convoy Road	517	N/A	2,517	2,000
					Total	**4,405**

CITY OF POWAY

In 1998, the City of Poway entered into an agreement with the City of San Diego to purchase up to 750 AFY through 2004, potentially expanding its service to 1,200 AFY in 2005 with the expansion of the Scripps Poway Parkway Recycled Water pump station. Poway converted their 2 MG Gregg Street Reservoir from potable water to recycled water for diurnal storage needed to maximize irrigation uses in the South Poway Business Park. The wholesale recycled water use is metered, using a bidirectional measuring system for recording the quantity of recycled water delivered to Poway and returned to City of San Diego customers along the Scripps Poway Parkway corridor. Poway's net use is reported quarterly to San Diego. This agreement expired on June 30, 2018.

In 2018, the City executed a new agreement with the City of Poway for the purchase of 750 AFY and providing an option for Poway to purchase an additional 200 AFY, as needed. This lower estimated annual use was reflective of the type and volume of existing irrigation demand. At times, Poway may operate the 895 recycled water zone system independently of the San Diego 890 recycled water zone. This 20 year agreement expires in June 2038. In 2018, Poway purchased 380 AF of recycled water from San Diego, about 40 percent of their maximum agreement capacity of 900 AFY. However, in a meeting with the City of Poway, Poway staff confirmed their assessment of future recycled water demand within the City of Poway based on the 2018 agreement. It is likely that Poway would need to see a new business or industry with high demand for recycled water in order to see a large increase in usage.

OLIVENHAIN MUNICIPAL WATER DISTRICT (OMWD)

OMWD currently collects wastewater from 4S Ranch and Rancho Cielo areas, which enters the recycling process at its 4S Ranch Water Reclamation Facility. The facility produces over 1 MGD of recycled water, which is delivered to irrigation customers in the southeastern portion of OMWD's service area for use at HOA common areas, schools, parks, streetscapes, and golf courses. OMWD supplements the recycled water it produces with recycled water purchased from Rancho Santa Fe Community Services District and the City of San Diego.

In 2004, the City entered into an agreement to sell recycled water to OMWD. The annual contract amount was specified as 500 AFY through 2009, reducing to 400 AFY from 2010 through 2019, and reducing again to 300 AFY from 2020 through 2024. The contract is a take or pay agreement, in that OMWD must pay for the annual contract amount of recycled water whether they use it or not. The total capacity reservation of 8,000 AF was established over the 20 year period of the agreement. However, this capacity reservation could be exceeded without breach of contract if the recycled water is available.

OMWD receives recycled water from San Diego at two locations – one at San Dieguito Road and another at Paseo del Sur. In 2018, San Diego delivered 550 AF at the San Dieguito Road point of connection and 50 AF at the Paseo del Sur point of connection. As the agreement is take or pay, OMWD tends to purchase most of this water in the summer months when demands are high.

In fall of 2019, OMWD began providing recycled water to Surf Cup Sports, which operates soccer and polo fields within the City, adjacent to the OMWD service area. As the City does not have recycled water service in this part of the city, OMWD installed a new 1,400-foot pipeline to connect the property to its system. This recycled water expansion project is part of the regional North San Diego County Regional Recycled Water Project, receiving Proposition 84 funding. Irrigating approximately 55 acres of grass sports fields with recycled water will save up to an estimated 300 AFY of potable water. OMWD has indicated that they would be interested in obtaining this new 300 AFY recycled water demand from the City.

City staff are currently working with OMWD to revise and update their recycled water purchase agreement. There is capacity available in the City's recycled water distribution system to provide increases in supply to OMWD, and this increase in supply, especially during winter months, could improve turnover in the City's recycled water reservoirs and improve water quality during off peak demand months.

SANTA FE IRRIGATION DISTRICT

SFID provides potable and recycled water to a portion of the City of Solana Beach as well as the Rancho Santa Fe and Fairbanks Ranch communities in northern San Diego County, along the northern border of the City of San Diego. SFID is currently purchasing recycled water from neighboring agencies (OMWD and San Elijo Joint Powers Authority) and retailing approximately 500 AFY of recycled water within its service area. They are also exploring other recycled water delivery opportunities to expand its recycled customer base. SFID was identified in the 2010 Master Plan as a potential wholesale customer with a meter on San Dieguito Road. Purchase of recycled water from the City was also mentioned in SFID's Eastern Service Area Recycled Water Study. SFID was contacted for updated information and their staff expressed an interest in discussing a possible agreement for a recycled water supply of up to 850 AFY from the City.

CALTRANS

A state law enacted in 1986 required the California Department of Transportation (CalTrans) to stop using tap water for landscaping “as soon as practical.” In 2015, California’s governor signed a third executive order proclaiming a continued state of emergency throughout California due to the ongoing drought. The executive order directed all urban water users to reduce water consumption by 25 percent compared to amounts used in 2013. CalTrans set a goal of 50 percent reduction of potable water consumption by using recycled water and reducing water use.

Wherever fiscally feasible, CalTrans is attempting to bring recycled water transmission lines to the highway right-of-way and modify associated existing irrigation systems to operate properly with recycled rather than potable water. In response to the drought and the Governor’s order, CalTrans explored alternative means of connecting and serving recycled water to existing landscaped freeways throughout San Diego County. CalTrans has also eased restrictions on allowing recycled water purveyors longitudinal encroachment with their right-of-way. This restriction has prevented many segments of CalTrans freeways from accessing recycled water.

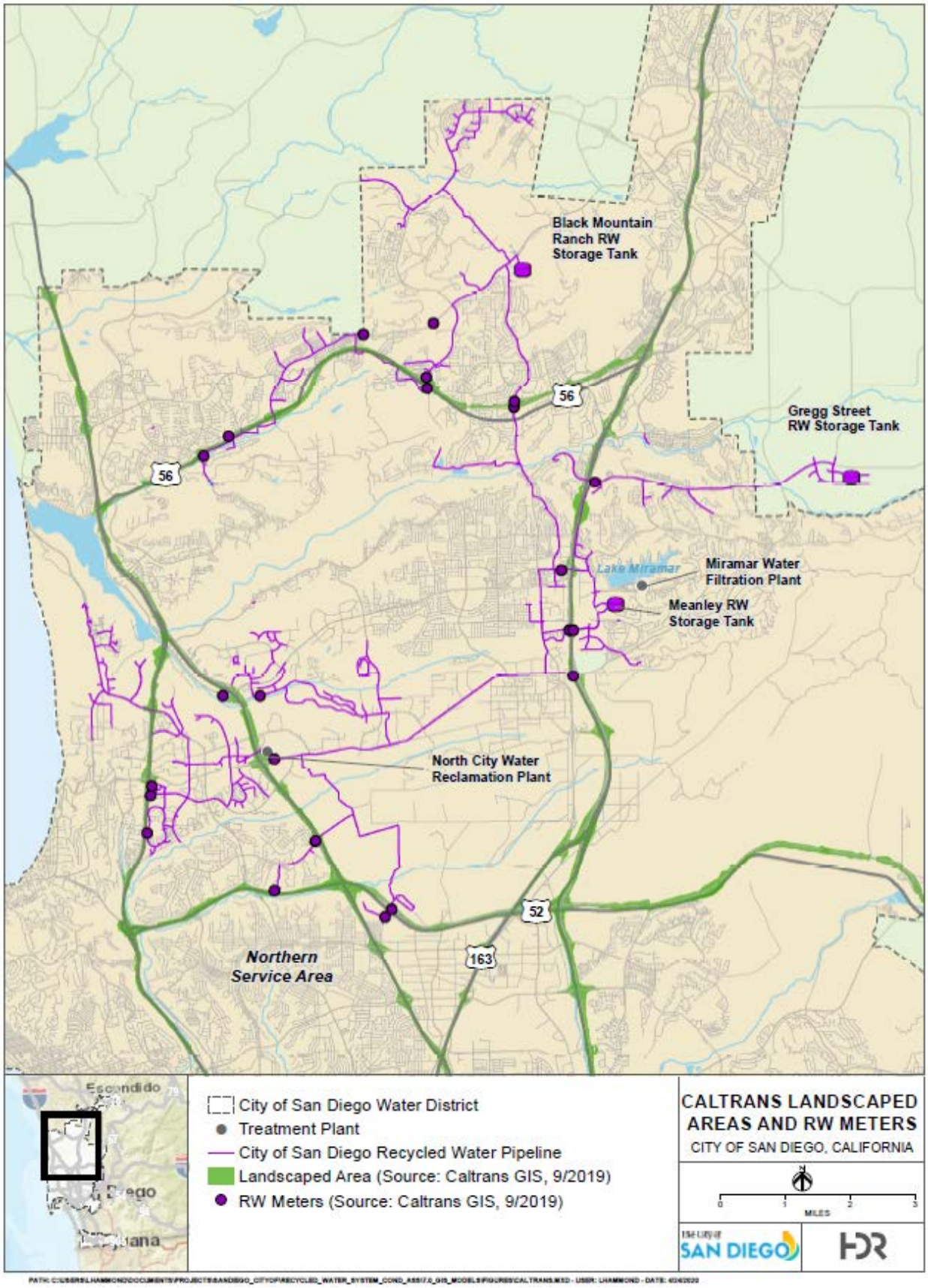
In the NSA, CalTrans uses recycled water from the NCWRP along Interstate 5 (I-5) north to Sorrento Valley, west along SR 52, west and east along SR 56 from Black Mountain Road (except for a gap on the north side between Del Sur and Carmel Mountain Road overpass), and from SR 52 south along I-805 and SR 163, to Friars Road. There are no booster stations within CalTrans’ North City distribution system; however, there are pressure reducing stations.

In 2015, CalTrans purchased 158 AF of recycled water at 18 points of connection in the NSA. Over the following two years, although the number of meters increased to 26, recycled water usage decreased to 140 AF in 2016 and 151 AF in 2017, under state mandated water conservation orders.

In 2018, CalTrans’ total number of meters in the NSA increased to 29 and usage increased to 290 AF, primarily associated with the expansion of the recycled water irrigation system west along SR 56, east along SR 52 and south of SR 52, along the I-15, I-805 and SR 163 corridors to Friars Road.

Figure 4-3 provides an exhibit of the CalTrans landscaped areas along freeways in the NSA and the location of their recycled water meters. CalTrans’ potable water meters along I-805 and SR 163 were retired in late 2018 and the system is now fed by an 8-inch master meter recycled water connection at Copley Drive south of SR 52. For the first 6 months of operation (September 2018 through March 2019) the demand was 9,000 HCF or 20 AF. Assuming only one-third of the annual demand occurs during these wet winter months, the anticipated annual demand for these meters is 60 AFY. Additional opportunities in the NSA include landscaped areas along I-8, between SR 163 and I-15.

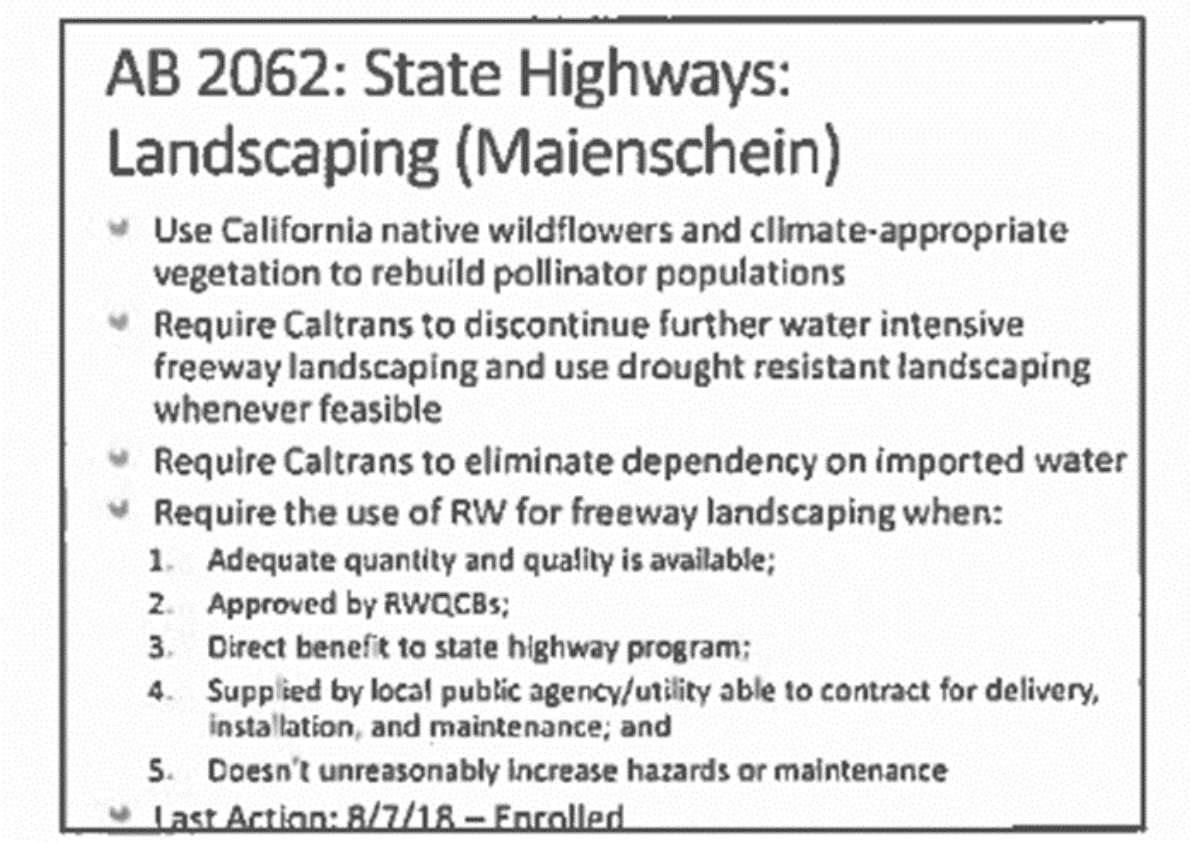
Figure 4-3. CalTrans Extension of Recycled Water Service in NSA



Future expansion opportunities include filling the gap on SR 56 and extension along the I-8 corridor. The average annual application rate that CalTrans uses for estimating irrigation water use is 1.75 feet per acre per year. However, CalTrans staff have indicated that the future direction of landscaping within CalTrans right-of-way is “water-wise”; using native plants and only irrigating to sufficiently establish landscaping, and then backing off from watering regularly.

In August 2018, Assembly Bill (AB) 2062 State Highways: Landscaping regulations were passed. These new requirements are summarized on Figure 4-4.

Figure 4-4. AB 2062 State Highway Landscaping Regulations



As shown in Table 4-6, potential recycled water demands totaled 17.4 AFY in 2017 for four previously identified CalTrans potable meters along SR-56 at Carmel Valley, Carmel Mountain and Del Mar Heights Roads. The City’s records indicate that recycled water meters have been installed at the two Carmel Valley Road sites, but the site meters recorded little or no recycled water or potable water use in 2017. The remaining two CalTrans sites have the potential for 16 AFY of recycled water use.

In addition CalTrans anticipates the extension of recycled water use east along I-8 between SR 163 and I-15; approximately 60 acres of freeway landscaping could be irrigated with recycled water. This constitutes an annual demand of approximately 105 AFY.

MARINE CORP AIR STATION (MCAS) MIRAMAR

MCAS Miramar has been receiving recycled water from the City since 2007. Originally the base used the recycled water to irrigate their golf course, shown on Figure 4-5, but over the years their

uses have expanded. Served by a single 10-inch meter along Miramar Road, recycled water is used for both irrigation and industrial processes on base.

Figure 4-5. MCAS Miramar Golf Course

In 2018, MCAS Miramar received a customer of the year award from the WateReuse Association. In 2014, they created a Water Conservation Board which established a centralized irrigation control system, aircraft and vehicle recycled water wash stations and identified additional potential reuse applications. In 2017, MCAS connected recycled water for dual plumbing at their Theatre, Museum, and Brig, and for irrigation along Miramar Way. In 2018, MCAS Miramar used 307.5 AF of recycled water; an increase of 7 percent since 2016 but less than the peak use of 408 AFY in 2014, prior to mandatory water conservation efforts statewide and federal mandates to reduce potable water use at federal facilities.

MCAS Miramar continues to convert to recycled water use on base where possible, including the new flight simulator building that is under construction. Having achieved 35 percent (308 AFY) of the base's total water use supplied by recycled water, it is anticipated that meeting the goal of 50 percent of the base's water use would increase recycled water use on base to 440 AFY by 2030.

> ***Recycled Water Expansion*** *- MCAS Miramar realized a significant reduction in potable water use through a multifaceted water conservation program. Since 2009 Miramar has had an internally-managed distribution system for recycled water used for irrigation, construction, dual-plumbed buildings, and street sweeping. Utility expansion projects during FY17 and FY18 converted a significant number of major irrigation sites on the installation to recycled water, increasing recycled water infrastructure by more than 5 miles, and totaling a 47% conversion to recycled water irrigation.*
>
> *Future expansion will include recycled water connections into evaporative cooling towers. An additional project converted all of Miramar's vehicle and aircraft wash racks to isolated recirculated water systems, resulting in a savings of 75% of potable water at these facilities. Additional best practices implemented in FY17and FY18 include using central irrigation controls for reliable conservation, installing thousands of low- or no-flow water fixtures, and providing water conservation educational resources to base personnel. Potable water use at Miramar has decreased over 54% since 2009, and as of 2017, the base's total water use was 35% recycled water. The station is on track to meet its goal of 50% recycled water use by 2030.*

Excerpt from 2019 Secretary of Defense Environmental Award Sustainability - Non-Industrial Installation Marine Corps Air Station Miramar[1]

UNIVERSITY OF CALIFORNIA, SAN DIEGO

Since the inception of the City's recycled water system, UCSD has expressed interest in converting its irrigation and cooling tower potable water uses to recycled water to reduce campus potable water usage, save the campus money, and help to lower the overall demand on California's limited water supplies. In 2010, UCSD prepared a draft Preliminary Reclaimed Water Study for its main campus, west of I-5. The estimated the peak month demands, based on data from July 2009, are shown in Table 4-8. In 2013, updated information was gathered to estimate peak month water usage. The July 15, 2013 data from the City's Modeling Group and Nasland Engineering, provided updated demand assumptions for potential recycled water use on campus. Peak month usage had decreased overall, but expansion of the recycled water system to the East Campus was added. These areas are shown on Figure 4-6.

Table 4-8. UCSD Main Campus Irrigation and Central Energy Plant Water Usage

Neighborhood	2010 Estimated Peak Month Usage (GPD)	July 15, 2013 Actual Water Use (GPD)
North Campus	89,635	76,820
Eleanor Roosevelt College	24,908	18,301
Muir College	63,306	60,289
Revelle College	33,560	16,431
Theatre District	6,533	4,912
University Center	35,006	28,449
School of Medicine	61,037	40,965
Warren College	26,903	22,764
Sixth College	57,771	34,059
Thurgood Marshall College	11,843	13,683
Campus Service Complex	8,927	0
East Campus	0	70,661
Subtotal	**419,429**	**387,334**
Estimated Annual Demand (AFY)[a]	**235**	**220**
Central Energy Plant	400,000	400,000
Average Annual Central Energy Plant (AF)	450	450
Total	**819,429**	**787,334**
Estimated Annual Demand (AFY)[a]	**685**	**670**

Notes:

[a] The calculation of average annual usage is based on an assumption that peak month irrigation demands are twice the average month and that the Central Energy Plant Demands do not vary seasonally.

[1] Reference: https://www.denix.osd.mil/awards/2019secdef/sustainability-non-industrial-installation/marine-corps-air-station-miramar-california/

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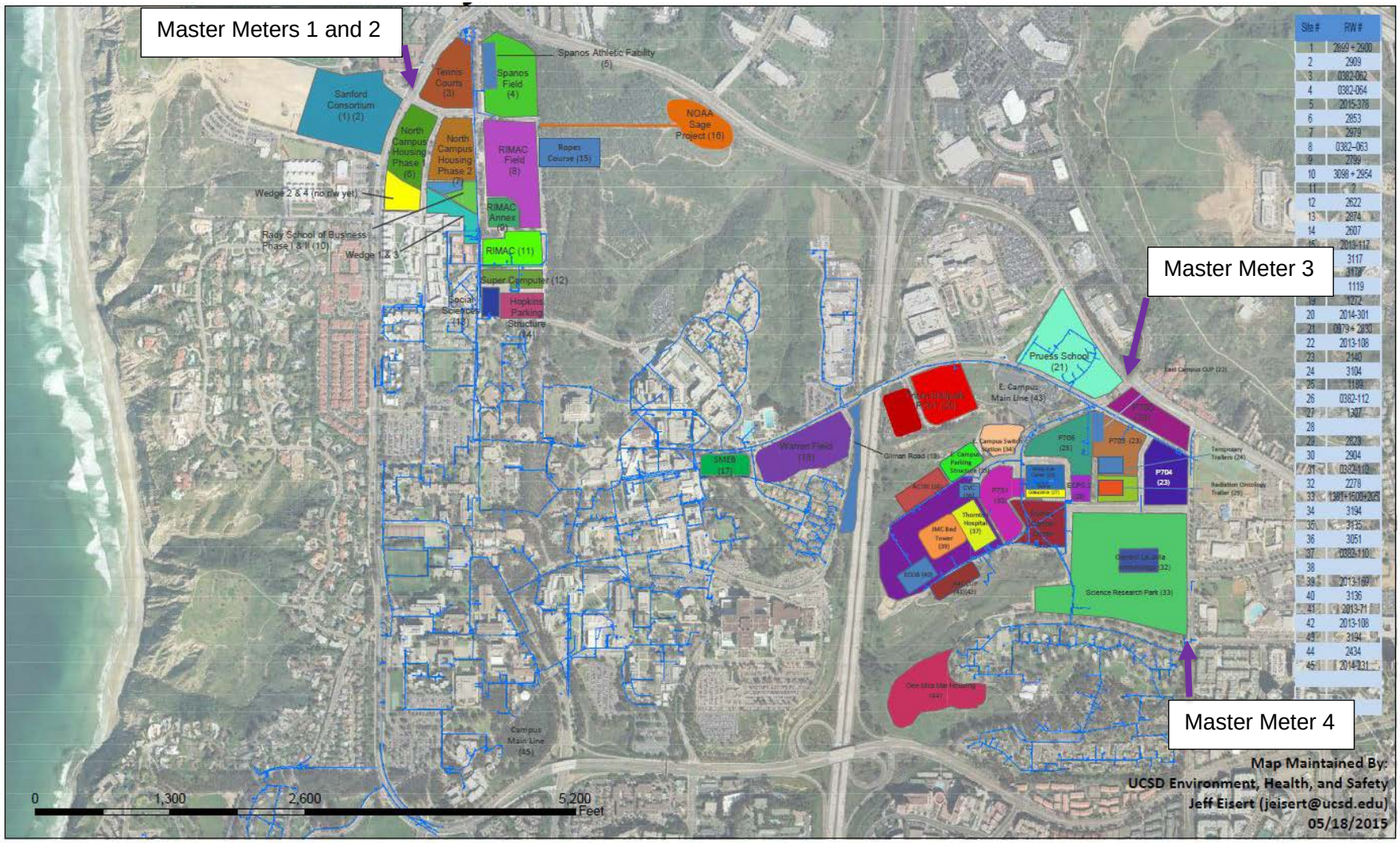
Figure 4-6. UCSD Campus Recycled Water Sites – North and East Campuses



Source: https://blink.ucsd.edu/_files/safety-tab/general/UCSD_Recycled_Water_Areas.pdf

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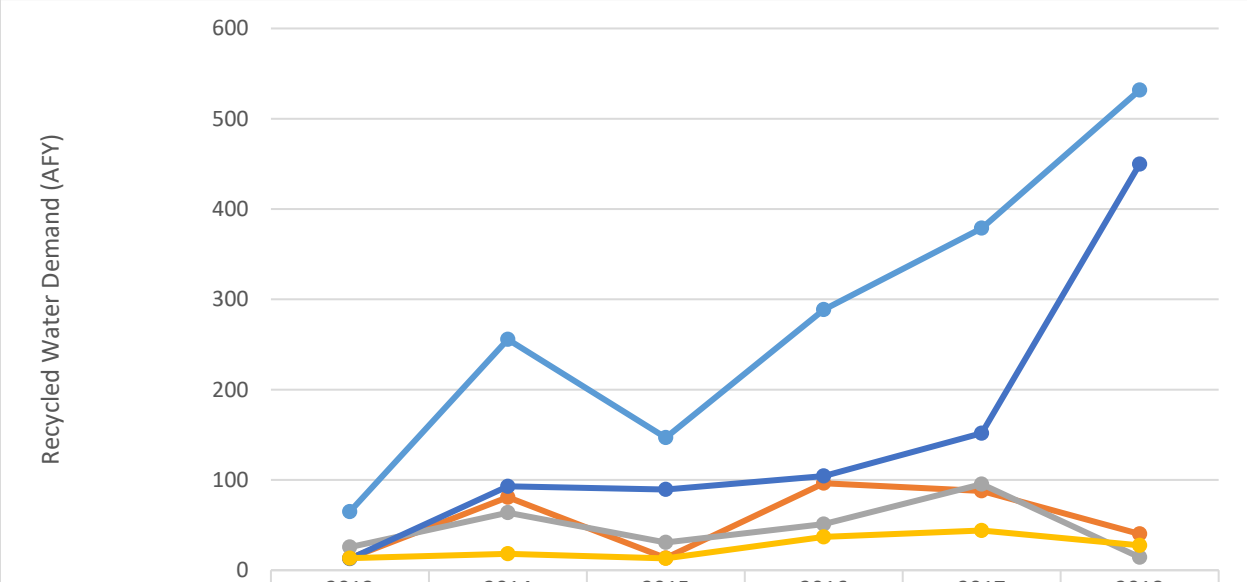
UCSD receives recycled water via four master meters. Master Meters 1 and 2 are located near North Torrey Pines Road and North Point Drive, serving the northwest portion of the campus including the Eleanor Roosevelt and Thurgood Marshall Colleges. Master Meter 3 is located on Campus Point Drive south of Genesee Drive and serves the eastern portion of the campus between I-5 and Regents Road, which has experienced the largest growth in campus development. The distribution system extends across I-5 to serve Warren Field, the Structural Materials Engineering Building, and the Osler Parking Structure area. Master Meter 4 is on Miramar Street just west of Regents Road and serves the same easterly portion of the campus. These master meters serve approximately 40 sub-meters throughout campus.

Figure 4-7 shows the growth in demand from the UCSD master meter data from 2013 through 2018. For the west portion of the campus, demands grew in 2014 but experienced cutbacks in 2015 during state-mandated water conservation, and continue to level off. For the east portion of the campus, served at Campus Point Drive, there was some growth in 2014, leveling off during the 2015 state-mandated conservation period and then additional growth from 2016 through 2018. At 532 AFY, the UCSD campus has achieved 80 percent of its projection of 670 AFY of recycled water use.

Figure 4-7. UCSD Recycled Water Demands from 2013 through 2018



	2013	2014	2015	2016	2017	2018
Master Meter 1	13.3	80.8	13.5	96.3	87.8	40.2
Master Meter 2	25.6	63.7	30.8	51.1	95.3	14.3
Master Meter 3	12.7	92.9	89.4	104.3	151.7	449.8
Master Meter 4	13.3	18.2	13.1	36.9	44	27.5
Totals	64.9	255.6	146.8	288.6	378.8	531.8

Source: City of San Diego Recycled Water Annual Reports (2013-2018)

TECHNOLOGY FIRMS AND REAL ESTATE COMPANIES

Sorrento Valley and Torrey Pines Science Park is home to several major companies involved in computer and life science technology and real estate. These firms, many with large campuses, have embraced the use of recycled water to meet their corporate sustainability goals. These firms include

Alexandria Real Estate, Illumina, The Irvine Company, Kilroy, Lusk Industrial Park, and Qualcomm. These corporate sites often have large irrigation and cooling tower water uses, many of which have already converted to recycled water.

Other than those already listed in Table 4-6, there are no additional recycled water uses identified at this time. However, as these businesses grow and expand to additional sites, the City can expect to see continued interest from these willing customers, exploring new opportunities to connect to the NSA recycled water system, potentially at their own cost, to meet best management practices and sustainability goals.

CITY OF SAN DIEGO METRO BIOSOLIDS CENTER

The City Metro Biosolids Center (MBC) is a large customer for recycled water. Located on 39 acres adjacent to the Miramar Landfill, the MBC is the City's state-of-the-art regional biosolids treatment facility. Biosolids are the nutrient-rich, processed organic material produced by the wastewater treatment process. The facility, which began operation in 1998, is an essential component of the region's wastewater treatment system. In 2017 and 2018, the MBC processing used approximately 520 AFY of recycled water from the NCWRP.

The City is considering advancing its biosolids treatment to Class A, which would require an additional average day demand of 1.8 mgd or 2,000 AFY of recycled water for processing.

New Developments

Five near term development (noted with "ND" in the ID) projects have been identified as potential infill customers for recycled water in the NSA and have been conditioned by the City to include recycled water within their developments to offset potable water use. These developments are discussed below. Table 4-9 below provides a summary of these developments and their proposed demands.

Table 4-9. New Development Demands

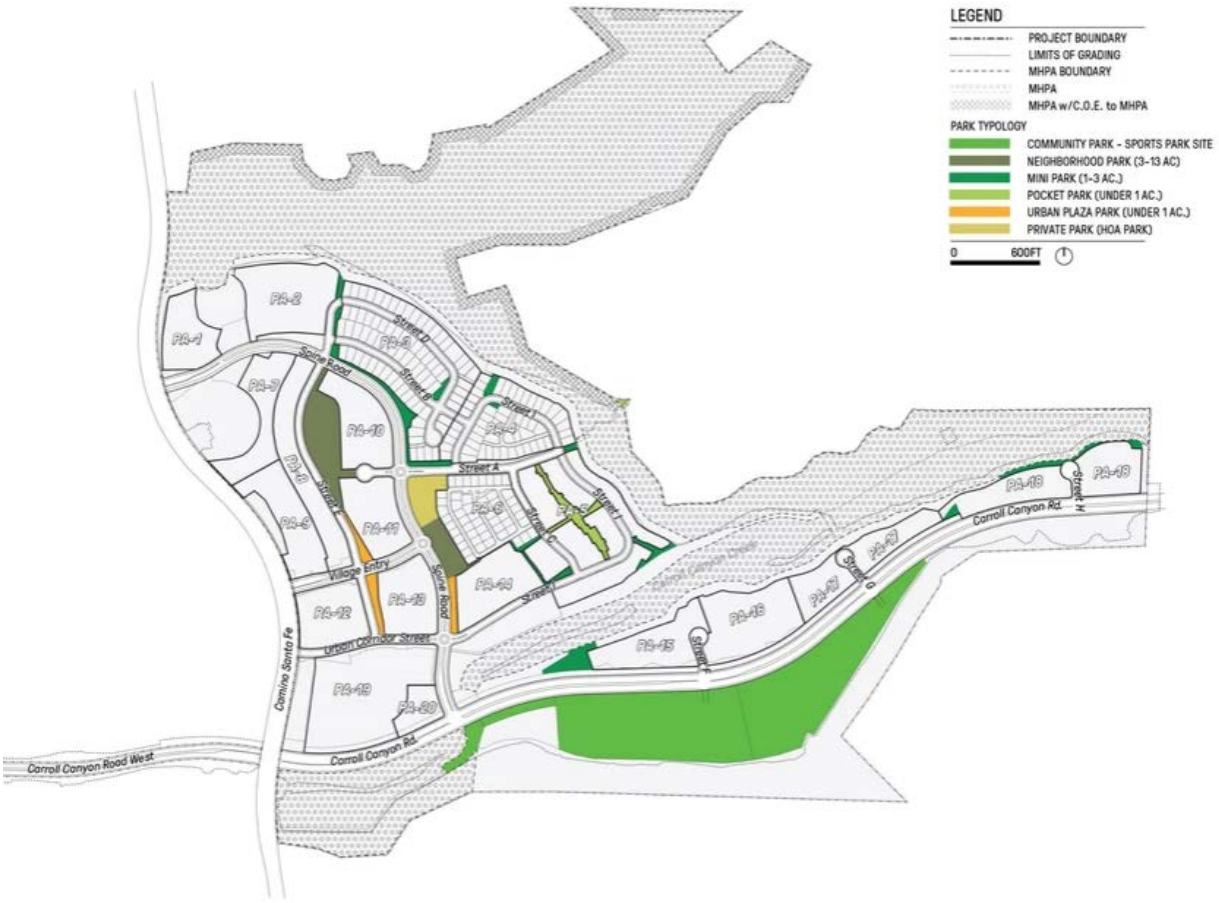
Customer Type/ ID	Customer Name	Site Location	Potential Ultimate Demand (AFY)
ND-1	3Roots	Carroll Canyon, south of Mira Mesa Blvd	342
ND-2	Merge 56	South of SR-56 west of Camino del Sur	32
ND-3	Preserve at Torrey Highlands	South of SR-56 east of Camino del Sur	8
ND-4	Penasquitos Casa Blanca	North of SR-56 east of Black Mountain Rd	33
ND-5	Fairbanks Highlands	North of SR-56 west of Camino del Sur	33
		Total	**448**

3ROOTS

3Roots is the new community planned for the former Hanson Quarry in Carroll Canyon, south of Mira Mesa Boulevard, north and east of the intersection of Carroll Canyon Road and Camino Santa Fe. The 3Roots development includes nearly 40 acres of parks, 200 acres of preserved open space, 8 miles of trails, 1,800 new homes, and commercial spaces including new restaurants, shops, and gathering spaces. The development will double the amount of park acreage originally conceived in the 1994 Carroll Canyon Master Plan.

Per communication with City staff, the developer projects its recycled water demand at 2025 to be 342 AFY. This assumes 76 acres of total irrigated area, as shown on Figure 4-8.

Figure 4-8. 3Roots Development Site Map



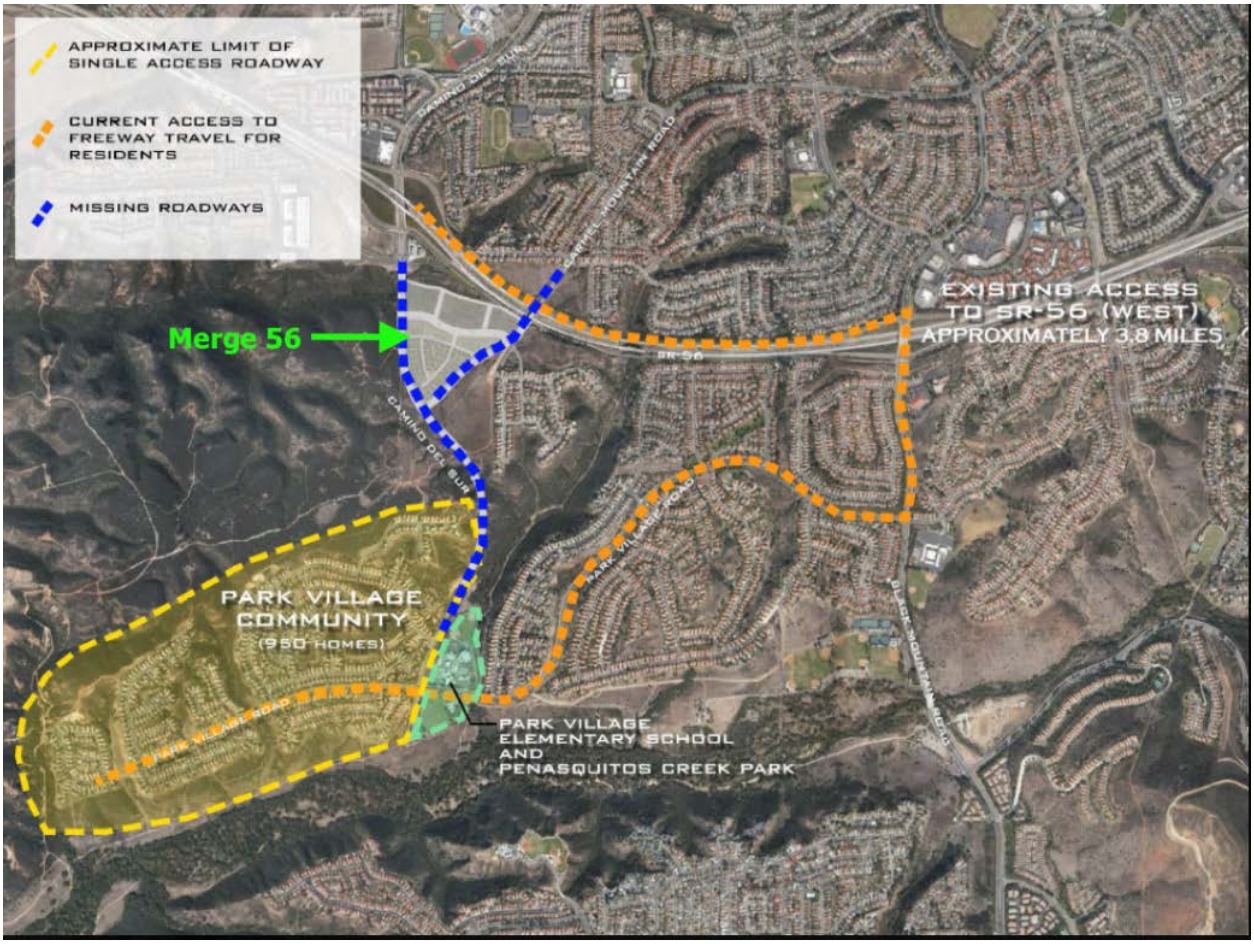
MERGE 56

Merge 56 will be built on vacant land just west of Rancho Peñasquitos and east of the Del Mar Mesa Preserve. The 72-acre mixed use project is located south of SR 56, east of I-5 and west of I-15. Expected to be completed by 2021, Merge 56 is planned as a densely built, walkable community that will include 242 residential units in three-story buildings, office buildings six stories high, retail shops, a hotel and a movie theater. This development replaces the Rhodes Crossing project, proposed in 2004, which was a larger 147-acre project that was to have been a more standard suburban development, including a big-box retail store surrounded by a lot of parking. This project will also connect Torrey Highlands to the Park Village neighborhood by extending Camino Del Sur through the canyon. Recycled water would be provided by connections along the new recycled water pipeline in Camino del Sur, south of SR-56. As shown on Figure 4-9, the projected demand for recycled water is 32 AFY by 2021.

Figure 4-9. Merge 56 Development Site Plan and Recycled Water Use Areas

The City has conditioned the project to use recycled water and, in addition, coordinated and developed an agreement with Merge 56 for the construction of a critical recycled water transmission pipeline within the missing roadway (blue dotted line on Figure 4-10, west and south of Merge 56) that will connect the 640 zone system that extends into the Park Village neighborhood from Black Mountain Road at Canyonside Park to the existing recycled water pipeline in Camino Santa Fe.

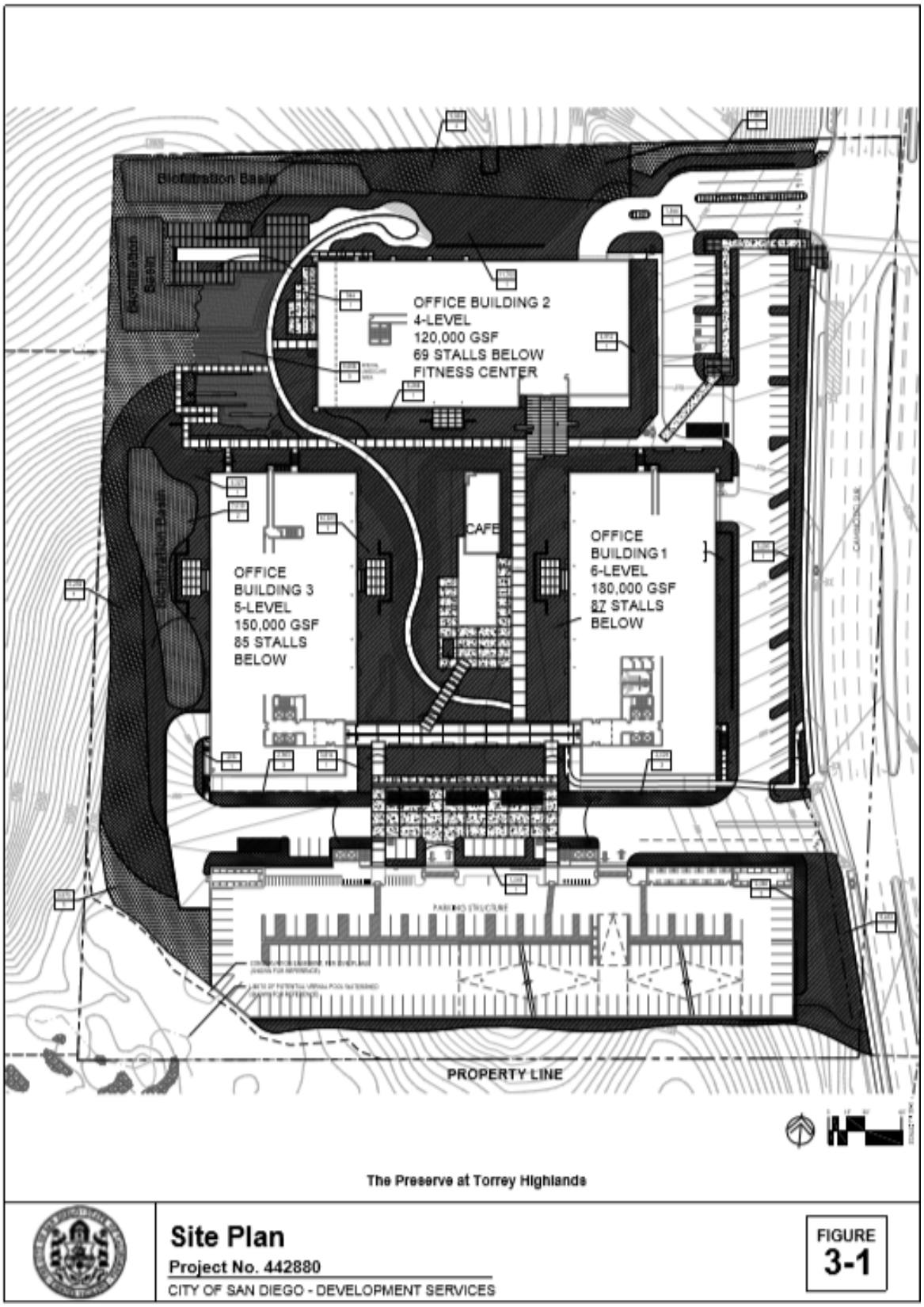
Figure 4-10. Merge 56 Development Area Map



PRESERVE AT TORREY HIGHLANDS

Located west of Merge 56, the Preserve at Torrey Highlands will include three new office buildings totaling 420,000 square feet (SF), a 3,850 SF café, a fitness center and parking. Figure 4-11 provides a site map of the proposed development. Approximately 8 AFY is estimated for irrigation demands with recycled water.

Figure 4-11. Preserve at Torrey Highlands Site Map



Additional Opportunities

A number of City parks and Poway Unified School District (PUSD) campuses were not included in the 2010 Master Plan. Some may not have been developed at the time and others are in close proximity to a major transmission main, potentially requiring a pressure reducing station and connecting laterals. For this master plan update, these sites have been reconsidered due to their proximity to existing recycled water infrastructure. Other City parks and PUSD sites do have recycled water service in the area. Table 4-10 provides the potential recycled water demand for each site. The Park Village Elementary School site was previously identified in the 2010 Master Plan. Additional school and park sites (noted with "A" in the ID) in the Carmel Valley and Scripps Ranch areas of the City are included in Table 4-6 and not repeated in this section.

Table 4-10. Additional Opportunities in NSA

Customer Type/ ID	Customer Name	Site Location	Potential Ultimate Demand (AFY)
A-1	PUSD	PUSD Park Village Elementary School	7
A-2	PUSD	PUSD Mesa Verde Middle School	7
A-3	PUSD	PUSD Adobe Bluffs Elementary School	12
A-4	PUSD	PUSD Canyonview Elementary School	7
A-5	PUSD	PUSD Black Mountain Middle School and soccer fields	28
A-6	PUSD	PUSD Sunset Hills Elementary School	16
A-7	PUSD	PUSD Mount Carmel HS and baseball Fields	28
A-8	PUSD	PUSD Sundance Elementary	9
A-11	HOA	Del Mar Mesa	0
		Total	**114**

As shown on Figure 4-12, these sites are located in two different pressure zones: the 640 zone that delivers recycled water east through Canyonside Park before it reaches the Canyonside PS, and the 825 zone that delivers water from the Canyonside PS north along Black Mountain Road. Areas noted in light purple are already served with recycled water; areas in red have the potential to be converted to recycled water and are within a half mile to existing recycled water pipelines. Once the connection of recycled water piping in the 640 zone occurs, linking the recycled water system at Camino del Sur at SR-56, there will be less demand on the 825 zone and available capacity in the Black Mountain Road transmission main.

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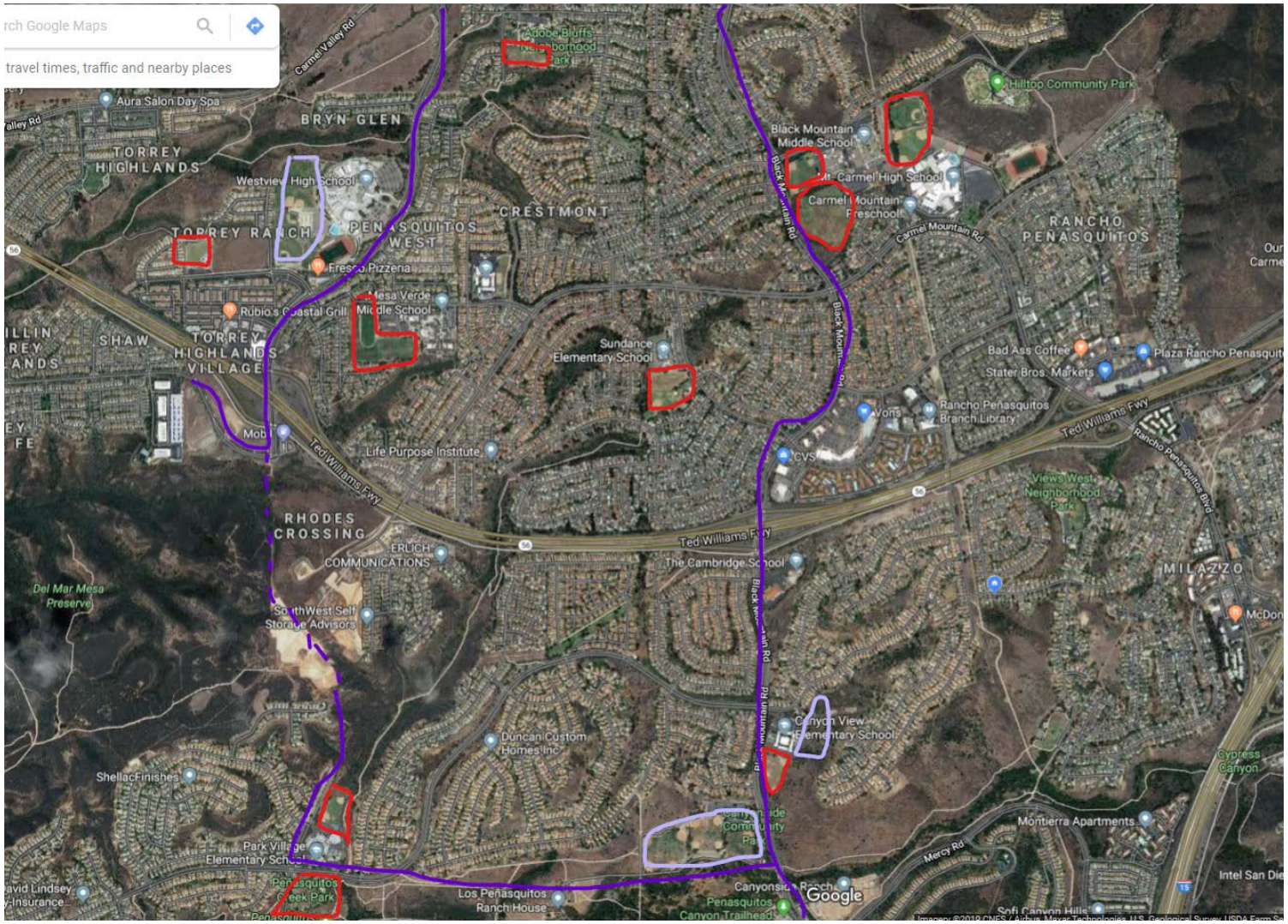
Figure 4-12. Additional Recycled Water Opportunities in Parks and School Sites in NSA



Notes:
In purple – Westview HS, Canyonside Elementary Mitigation area and Canyonside Community Park
In red – potential future customers – PUSD/City Parks (Penasquitos Creek Park and Torrey Meadows Neighborhood Park have been connected to the recycled system prior to completion of this Master Plan.)

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4.1.4 Summary of NSA Infill Customers

It is anticipated that upon the completion of the City's Pure Water program, there will be up to 7.5 mgd of additional peak demand capacity to serve recycled water customers. This equates to approximately 4.5 mgd of average annual demand (5,000 AFY) that could be connected within the NSA in the future.

Table 4-11 provides a summary of the potential infill customers in the NSA. The Customer ID number corresponds with the location shown previously on Figure 4-2. These customers have the potential to add up to almost 5,400 AFY of additional demand. A little more than a third of this demand is reserved for future expansion of the City's Metro Biosolids Center, with a projected demand of 2,000 AFY.

4.1.5 Impact on Seasonal Demand Curve

A goal of the optimization portion of this Master Plan is to reduce the daily and seasonal variation in demand to make operations more efficient and cost effective. Irrigation customer demand is based on weather patterns which vary seasonally; it can be difficult to reduce the seasonal variation in their demands. Industrial demands vary much less on a seasonal basis and therefore are valuable infill customers. The proposed cooling tower infill customers and the City's Metro Biosolids Center are ideal customers for expansion of the NSA system, as they will dampen the seasonal peak demands on the NCWRP.

Table 4-11. Summary of Potential NSA Infill Customers

Customer Type/ ID	Customer Name	RW Site Location	Recycled Water Demand (AFY)			
			Baseline Demand (2017)	Maximum Contract Demand	Potential Ultimate Demand	Net increase (Ultimate - Baseline)
Recently Connected (2018-2019)			—	—	—	**126.50**
Previously Identified Infill Customers that have not connected			—	—	—	—
CT-1	General Atomics [1]	3550 General Atomics Ct	0.00	—	37.40	37.40
CT-2	Gen Probe Inc	10210 Genetic Center Drive	0.00	—	29.10	29.10
CT-3	Novartis Institute [1]	10675 John Jay Hopkins Drive	0.00	—	55.70	55.70
CT-5	Scripps Memorial Hospital	9888 Genesee Avenue	9.20	—	119.90	110.70
I-3	CALTRANS	8231 CARMEL MTN RD	0.00	—	6.70	6.70
I-4	CALTRANS	2502 DEL MAR HEIGHTS RD	0.00	—	9.30	9.30
I-5	PARK & REC/COMM PARK I	11470 CYPRESS CANYON RD	0.00	—	22.40	22.40
I-6	PARK & REC/GOLF CRSE OPER	11580 NORTH TORREY PINES RD	0.00	—	12.00	12.00
I-7	PARK & REC/OPEN SPACE	11554 SCRIPPS RANCH BL	0.00	—	16.30	16.30
I-8	SAN DIEGO JEWISH ACADEMY	11860 CARMEL CREEK RD	0.00	—	27.00	27.00
I-9	SAN DIEGUITO UNION HIGH – Carmel Valley Middle School	3800 MYKONOS LN	0.00	—	16.90	16.90
					Subtotal - Previously Identified Infill Customers	**343.50**
Large and Wholesale Customers						
W-1	City of Poway	Wholesale Meter - Scripps Poway Parkway	380.00	750.00	950.00	570.00
W-2	Olivenhain MWD	Wholesale Meters - San Dieguito Road/Paso Del Sur	600.00	400.00	800.00	200.00
W-3	SFID	Wholesale Meter - San Dieguito Road	0.00	0.00	850.00	850.00
	CalTrans	35 meters - throughout NSA	155.00	—	290.00	135.00

Table 4-11. Summary of Potential NSA Infill Customers

Customer Type/ ID	Customer Name	RW Site Location	Recycled Water Demand (AFY)			
			Baseline Demand (2017)	Maximum Contract Demand	Potential Ultimate Demand	Net increase (Ultimate - Baseline)
L-1	Caltrans	Copley Drive, south of 52 serving I-805 and SR-163	0.00	—	66.00	66.00
L-2	Caltrans	Interstate 8, between SR-163 and I-15	0.00	—	105.00	105.00
L-3	MCAS Miramar	Master Meter - Miramar Road	252.00	—	440.00	188.00
L-4	UCSD	4 Master Meters (>60 submeters)	379.00	—	670.00	291.00
L-5	Metro Biosolids Center	Convoy Road	517.00	—	2,517.00	2,000.00
					Subtotal - Large and Wholesale Customers	**4,405.00**
New Developments						
ND-1	3Roots	—	0.00	—	342.00	342.00
ND-2	Merge 56	South of SR-56 west of Camino de Sur	0.00	—	32.00	32.00
ND-3	Preserve at Torrey Highlands	South of SR-56 east of Camino de Sur	0.00	—	8.00	8.00
ND-4	Penasquitos Casa Blanca HOA	North of SR-56 east of Black Mountain Rd	0.00		33.00	33.00
ND-5	Fairbanks Highlands HOA	North of SR-56 west of Camino del Sur	0.00		33.00	33.00
					Subtotal - New Developments	**448.00**
Additional Opportunities						
A-1	PUSD	PUSD Park Village Elementary School	0.00	—	7.00	7.00
A-2		PUSD Mesa Verde Middle School	0.00	—	7.00	7.00
A-3		PUSD Adobe Bluffs Elementary School	0.00	—	12.00	12.00

Table 4-11. Summary of Potential NSA Infill Customers

Customer Type/ ID	Customer Name	RW Site Location	Recycled Water Demand (AFY)			
			Baseline Demand (2017)	Maximum Contract Demand	Potential Ultimate Demand	Net increase (Ultimate - Baseline)
A-4		PUSD Canyonview Elementary School	0.00	—	7.00	7.00
A-5		PUSD Black Mountain Middle School and soccer fields	0.00	—	28.00	28.00
A-6		PUSD Sunset Hills Elementary School	0.00	—	16.00	16.00
A-7		PUSD Mount Carmel HS and baseball Fields	0.00	—	28.00	28.00
A-8		PUSD Sundance Elementary	0.00	—	9.00	9.00
A-11	HOA	Del Mar Mesa	0.00	—	—	—
Subtotal - Additional Opportunities						**114.00**
Grand Total - Potential NSA Infill Customers						**5,437.00**

[1] Customer has been connected to the recycled water system following this master plan baseline demand year of 2017.

4.2 Southern Service Area

This section of the report provides infill opportunities in the Southern Recycled Water Service Area (SSA) generally including the southern portion of the City of San Diego (San Ysidro and Otay Mesa communities), adjacent to the international border with Mexico, and OWD, as supplied by the South Bay Water Reclamation Plant (SBWRP).

4.2.1 Infill Market Assessment Approach

This Master Plan Update reviewed existing and potential wholesale customers, and other large customers, to determine potential future demands. However, opportunities to expand recycled water use in the SSA are limited, due to the challenge in diverting additional wastewater from the Grove Avenue Pump Station to supply the SBWRP, and an increasing level of total dissolved solids in the wastewater influent.

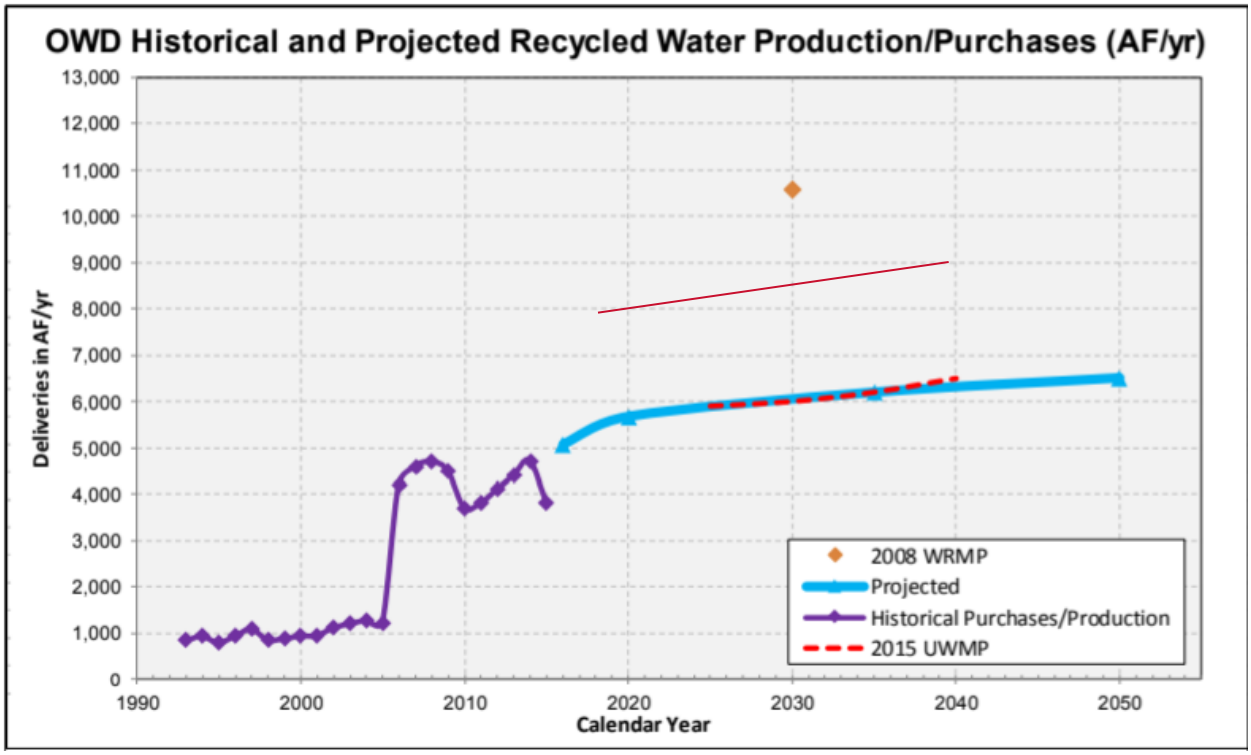
4.2.1.1 International Boundary and Water Commission

The International Boundary and Water Commission operates a wastewater treatment plant at a site adjacent to the SBWRP. The South Bay International Wastewater Treatment Plant treats sewage originating in Tijuana, Mexico and discharges it to the Pacific Ocean via the South Bay Ocean Outfall, which is shares with the SBWRP. For many years, the plant used recycled water from the SBWRP for utility water on site. However, it is no longer needed and the recycled water demand for this customer has ceased. No future demand is anticipated.

4.2.1.2 Otay Water District

OWD completed an update to its Water Facilities Master Plan in 2015. The study anticipated a 1.8 mgd (1,800 AFY) increase in recycled water demand, from 4 mgd (4,500 AFY) in 2013 to 5.8 mgd (6,500 AFY) in 2050. This projected growth, shown on Figure 4-13, was projected to come primarily from OWD's central service area, which still is one of the largest remaining residential areas to develop in San Diego County. Because of OWD's policy requiring developers to install recycled water pipelines for irrigation uses, larger developments in the City of Chula Vista's Otay Ranch community will continue to expand the recycled water system over the next decade.

Figure 4-13. OWD Recycled Water Projections



Source: Otay Water District Water Facilities Master Plan Update, 2015

This planned expansion did not include service to OWD's southern service area, Otay Mesa. OWD has abandoned any future plans to use recycled water in the Otay Mesa area, a large area of undeveloped industrial lands, due to the high cost to extend the transmission system. As a result, in September 2014, OWD's Board issued a moratorium on requiring recycled water expansion in Otay Mesa to serve future development. A majority of the planned industrial development in Otay Mesa continues to be warehouse and distribution type uses with minimal water demand.

In 2015, mandatory restrictions on water use were imposed throughout the state of California. This impacted OWD's annual use of recycled water, which dipped to under 4,000 AF that year, as shown on Figure 4-14. In 2017, OWD purchased approximately 3,300 AF of recycled water from the City of San Diego. Assuming OWD continued to use 1 mgd (1,120 AF) from the Ralph W. Chapman WRF, their total use of recycled water has remained below 4,500 AFY (4 mgd). OWD anticipated that these demands would rebound, but in fact they have returned only by half (500 AFY). If we project that out to 2050, OWD's ultimate demands will be 6,000 AFY, not 6,500 AFY, as shown by the red line on Figure 4-14. In 2040, OWD's demands would be approximately 5,500 AFY (4.9 mgd) and 1 mgd would be supplied by the Ralph W Chapman WRF, so OWD would require 3.9 mgd, under 4,500 AFY, from the SBWRP. Under the current contract, OWD can purchase up to 5,847 AFY. By 2040, under maximum day conditions, OWD could require in excess of the daily maximum contracted flow of 6 mgd from SBWRP.

OWD's agreement to purchase recycled water from the City expires in December 2026. OWD will need to amend the agreement to allow 6,000 AFY or more of recycled water to be delivered to meet OWD's 2050 demands, if source water to the SBWRP is available to expand recycled water production, and extend the term beyond December 2026. While additional supply to OWD is technically feasible with future diversion of wastewater flows to SBWRP, the City and OWD are in

the process of resolving an issue related to wholesale pricing of recycled water that is putting on hold any additional purchase of recycled water from the City.

4.2.1.3 Cal American Water District

In 2017, Cal American Water prepared a recycled water planning study for their service area which includes the southern portion of the City, Imperial Beach, U.S. Navy facilities, and the City of Coronado, which could include two golf courses. This report identified up to 1 mgd of demand, approximately half of which included the Coronado Golf Course and the Naval Air Base Golf Course. The remainder of the potential demand included parks and school yards in the cities of San Diego, Coronado and Imperial Beach. The study evaluated the potential for tapping into the OWD recycled water transmission main and building a 16-inch transmission main that would feed the Coronado Golf Course pond.

The 2017 planning study recommended the following next steps:

- Institutional issues be addressed for the purchasing and purveyance of recycled water within the Cal American service area;
- Preliminary alignments of pipelines be further investigated to identify any conflicts or right of way issues, such as CalTrans or railway crossings;
- Environmental and regulatory permitting requirements be identified and potential impacts ascertained; and
- A financial study be developed to provide planning level cost estimates and life cycle analysis.

In the meanwhile, the City of Coronado has been developing plans to construct its own 1 mgd recycled water treatment facility to serve its local golf course. The recycled water produced at the proposed Satellite Recycled Water Facility will provide Coronado with a locally produced and controlled drought proof water supply that will ensure that the golf course, parks and medians stay green. The project is planned to deliver recycled water as early as 2022.

As Coronado is moving forward with its recycled water project, it seems unlikely that a large transmission main project by Cal American to the Coronado golf course pond would be feasible, as the proposed system would lose a large anchor customer. Therefore no future demand from Cal American was assumed in this market assessment.

4.2.1.4 CalTrans

CalTrans currently takes recycled water from the OWD transmission main in the vicinity of I-5, I-805 and SR-905 freeways. In 2015, CalTrans planned to invest $2.07 million to extend recycled water in the NSA from the I-805 freeway south of the SR-52 (as discussed in Section 4.1.3), and convert landscaped areas in the SSA to recycled water, east of the interchange with the I-805 and SR-905 freeways.

The 2017 South Bay Recycled Water Project Initiation report, developed by CalTrans, noted that the current irrigation systems serve approximately 320 acres with potable water due to the distance of existing CalTrans meter locations from recycled water pipelines. The project proposed service connections to the City's recycled water system at the following three locations:

- EA 42890 – Dairy Mart Road/I-5
- EA 42880 – Del Sol Boulevard/I-805

- EA 42870 – Palomar Street/I-805

These connections would be metered and a distribution line would be installed within CalTrans right-of-way to allow for new points of connection to the irrigation system to serve I-805 and portions of SR-905. The first two connections could be served from the OWD transmission main, but the third connection at Palomar Street would have to be served from OWD's recycled water distribution system. Also further extension of the recycled water system along SR-905, east of the City boundary within the OWD service area, would require an agreement with OWD.

OWD at one time planned to serve the Otay Mesa area but has put a moratorium on requiring recycled water pipelines in the area due to the high cost to extend the transmission system. CalTrans is currently under construction with the final extension of SR-905 to the International Border (future Port of Entry (POE)) to be known as SR-11. The project includes improvements to the SR-126 and SR-905 interchange. As OWD no longer has plans to connect Otay Mesa to their recycled water system, CalTrans could extend recycled water pipelines along SR-905 to serve the area, including the future POE, however they do not currently have plans to do so.

In summary, CalTrans has estimated nearly 560 AFY (0.50 mgd) of average annual potential recycled water demand within the City's SSA that could be served.

4.2.2 Previous Market Analysis

The 2010 Master Plan market assessment was not extensive for the SSA, as OWD purchased the majority of the recycled water produced. The assessment did not include Cal American Water, the City of Coronado, or the Navy because it was assumed that a new water reclamation facility would be built to supply these customers. In addition, it was noted that IBWC was planning to phase out its demand. There were no confirmed expansion customers or focus areas for the SSA in the 2010 Master Plan.

4.2.3 Updated Market Assessment (Infill Only)

For this 2020 market assessment, the updated demand potential for existing SSA customers is listed in Table 4-12. Note that the SBWRP uses approximately 1,000 AFY of recycled water for in-plant use and that is not expected to change.

Table 4-12. Summary of Potential SSA Recycled Water Customers

Customer Type/ ID	Customer Name	RW Site Location	Recycled Water Demand (AFY)			
			Baseline Demand (2017)	Maximum Contract Demand	Potential Ultimate Demand	Net increase (Ultimate - Baseline)
Wholesale and Large Customers						
W-1	Otay Water District	At existing point of connection	3310.70	5847.00	5847.00	2536.30
W-2	Cal American Water	New point of connection	0.00	—	0.00	0.00
L-1	SBWRP	In plant use	1000.00	—	1000.00	0.00
L-2	CalTrans	Various points of connection	0.00	—	560.00	560.00
L-3	IBWC	At existing point of connection	14.30	—	0.00	-14.30
Grand Total - Potential SSA Infill Customers						3082.00

4.3 Central Service Area

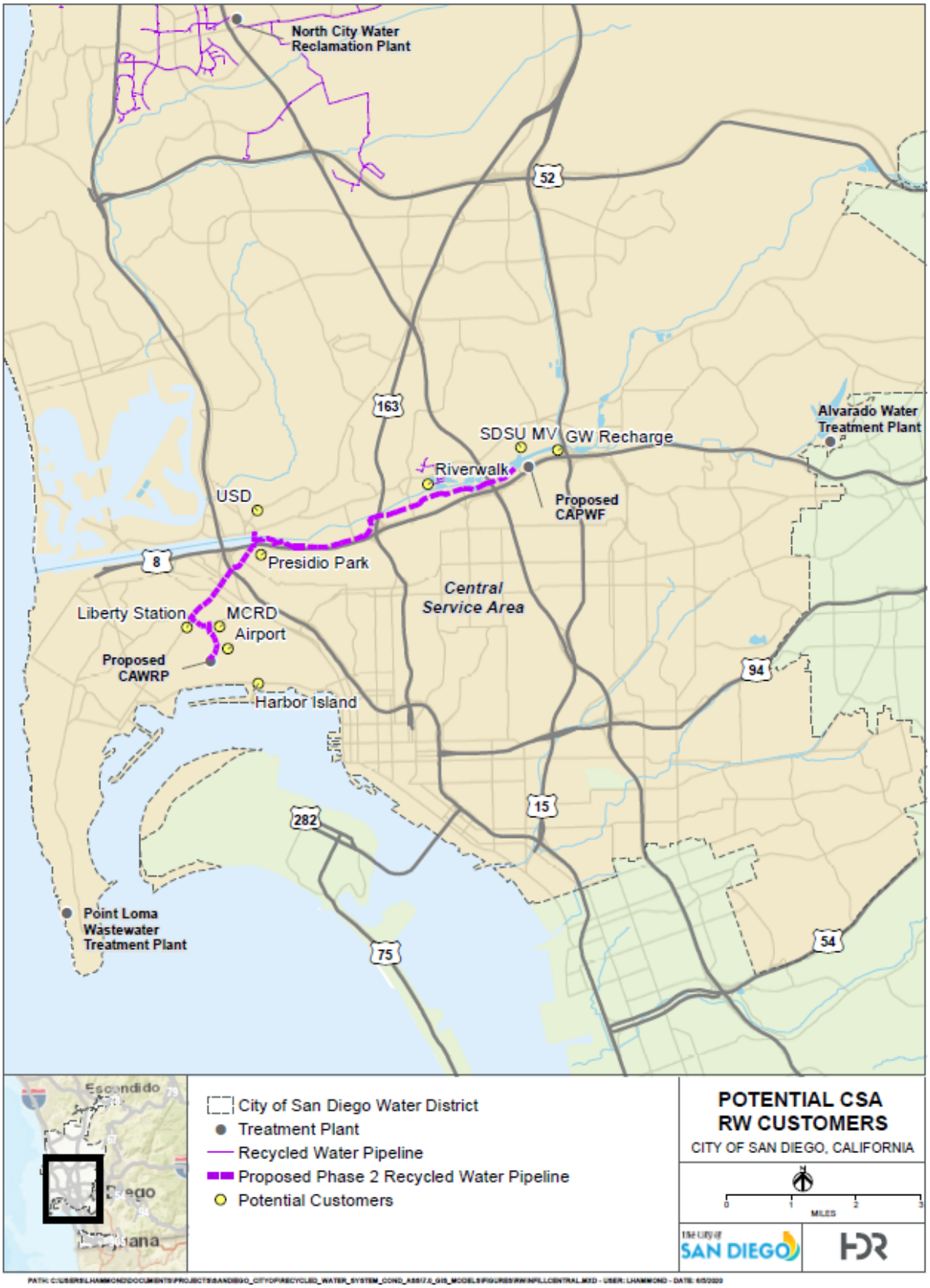
The 2010 Master Plan market assessment included the evaluation of the Mission Valley/Mission Bay and Balboa Park / Central San Diego focus areas as potential markets for the proposed Central Service Area (CSA), assuming the construction of a satellite water reclamation plant in the vicinity.

- Mission Valley/Mission Bay: This focus area is located primarily around Mission Bay and extends to San Diego County Credit Union (SDCCU) Stadium (formerly Qualcomm Stadium). Recycled water could potentially come from the NCWRP or from a satellite plant located near the stadium.
- Balboa Park / Central San Diego: This focus area is located south of I-8 and in close proximity to Balboa Park. Recycled water can be provided either from the NCWRP or from a satellite plant located near Balboa Park.

The implementation of Phase 2 of the City's Pure Water Program plans to add an additional 53 mgd of pure water production by 2035. The program is considering six alternative combinations of water reclamation plants (WRP), conveyance pipelines, and purified water facilities (PWF). Three of the alternatives locate a WRP (tertiary treatment) at Harbor Drive and pump tertiary-treated recycled water along the I-8 corridor to a PWF in Mission Valley.

The recycled water would be conveyed, from the proposed Central Area Water Reclamation Plant (CAWRP) near Harbor Drive to the proposed Central Area Pure Water Facility (CAPWF) near SDCCU Stadium, via a large, low pressure transmission main through Mission Valley. Branching off of that conveyance system, recycled water could feasibly be delivered within the CSA, extending the recycled water system to serve customers along the I-8/Friars Road corridor in Mission Valley. However, booster pump stations may be required to serve customers. The proposed alignment of the conveyance pipeline and potential customers are shown on Figure 4-14.

Figure 4-14. CSA Recycled Water Conveyance and Potential Customers



The tentative schedule for the Phase 2 Pure Water Program includes the following milestones:

- Validation of Preferred Alternatives – February 2020
- Completion of 10 Percent Design - July 2024
- Environmental Permitting – July 2024 to July 2029
- Production - 2035

For the purposes of this Master Plan Update, this service area is not considered an “infill” project for the City’s existing recycled water system. However, as described above, it could be served as part of the Pure Water Program, Phase 2.

It should be noted that the City has made a commitment to produce 83 MGD of wastewater for advanced water purification supply as part of the ultimate Pure Water program. Diverting tertiary treated, recycled water from the final process to serve CSA customers, the City may be reduce the ultimate target for potable water production.

4.3.1 CSA Market Assessment Update

The following paragraphs describe the recycled water potential customers within the CSA, with high level planning estimates for their potential for recycled water use. Balboa Park was not included in this market assessment due to the challenge that significant irrigation system improvements would be anticipated to be required to perform any retrofits.

4.3.1.1 Marine Corps Recruit Depot Landscape Irrigation

Marine Corps Recruit Depot (MCRD) is located north of Lindbergh Field, San Diego International Airport, and south of Pacific Highway and Barnett Avenue. MCRD is close to the proposed site for the Pure Water Phase 2 CAWRP. It is also close to the proposed tertiary effluent pipeline (Tertiary Pipeline) alignment to the Pure Water Phase 2 CAPWF near the current site of the stadium site. Reviewing satellite imagery, there are a number of areas that appear to be irrigated, ranging from 1.4 to 20 acres in size. Altogether, the irrigated area is estimated to be approximately 40 acres. Assuming 2.5 acre-feet per acre per year, the recycled water demand could be approximately 100 AFY. MCRD produces recycled water onsite for toilet flushing and possibly irrigation. MCRD does have a football field and one other large field near the barracks that are artificial turf. A brief review of Appendix G from the 2010 Master Plan did not list MCRD as a potential irrigation recycled water customer. Appendix H of the 2010 Master Plan did list MCRD with an annual cooling tower demand of 14 AFY.

4.3.1.2 Liberty Station (former Naval Training Center)

Like MCRD, the Liberty Station Development at the former Naval Training Center is located close to the proposed CAWRP and a proposed recycled water pipeline alignment. Reviewing satellite imagery, there are a number of parks, medians, plazas, gathering areas, and an executive (9-hole) golf course at the Loma Club, which appear to be irrigated. Altogether, the irrigated area is estimated to be approximately 50 acres. Assuming 2.5 acre-feet per acre per year, the recycled water demand could be approximately 125 AFY. Appendix G from the 2010 Master Plan identified several irrigation meters in the Liberty Station area, as shown below in Table 4-13, totaling 286 AFY in water use. As much of this area has now been developed, the lower estimate of 125 AFY potential recycled water use is used for this market assessment.

Table 4-13. 2010 Master Plan Potential Recycled Water Use at Liberty Station

2010 Master Plan ID No.	Name	AFY
73-77	Admiralty Row/Beacon Pt HOA	30.1
2197-2198	Huntington Hospitality	4.6
2541-2542	Liberty Station 7 Association	26.8
2543-2575	Liberty Station Community	169.2
2772-2775	McMillan Naval Training Center LLC	35.6
3047-3048	Naval Medical Center	7.8
3440	SD Park & Rec	8.1
5038	SD Unified School District	3.0
6029	The Rock Church	0.9
	Total	**286.1**

4.3.1.3 San Diego International Airport and Grand Central Station (Central Mobility Hub)

In January 2020, the San Diego International Airport (Airport) certified its Project Environmental Impact Report (EIR) and approved an expansion to the Airport which includes the full replacement of Terminal 1, new roadways, and airside improvements. The EIR includes a description of a proposed innovative storm water capture and reuse system to serve non-potable water for cooling towers, rental car washdown, irrigation and possibly dual plumbing of Terminal 1. Currently, the Airport captures storm water at the Terminal 2 parking structure and reuses the water for its cooling tower. The Airport is able to supply up to 70 percent of their cooling tower demands through the stormwater capture program. The reuse program also includes proposed underground storage reservoirs to capture the storm events and reduce discharges to San Diego Bay.

While 80 percent of the Airport's water demand is for non-potable use such as washing, toilet flushing, cooling towers, and irrigation (Airport Development Plan EIR, SDIA, 2019), the Airport does not anticipate and has not planned to receive recycled water supplies from the City. The Airport continues to implement water conservation and efficiency measures throughout their site. However, given the limited annual rainfall in San Diego, stormwater capture may not fulfill all to the Airport's non potable water needs. The City may consider approaching the Airport to discuss the potential for using recycled water, especially if the Phase 2 recycled water conveyance system planning moves forward.

A report on an airport connectivity analysis (SANDAG, 2019) includes the proposal for an airport transit center at the Naval Information Warfare Systems Command (NAVWAR) site near Old Town. Proposed site renderings of the station include drought tolerant landscaped areas that could potentially use recycled water for irrigation. The project is underway with land use alternative planning, anticipating an approved NEPA document at the end of 2020. The U.S. Navy is the lead agency for this effort.

4.3.1.4 Presidio Park and Presidio Hills Golf Course

The Presidio Park and Golf Course are located in the Old Town area of the City, in the south east quadrant of the I-8 and I-5 interchange. Old Town is approximately 0.5 miles east of the probable

location of the City's proposed recycled water pipeline alignment. Reviewing aerial imagery, the park and golf course have approximately 15 acres that could be irrigated with recycled water. Assuming 2.5 acre-feet per acre per year, the park and golf course could use approximately 38 AFY of recycled water. The Appendix G of the 2010 Master Plan lists several City Park and Recreation irrigation meters in the Old Town area but the usage is almost zero. There are ten meters dedicated to the State of California, which operates the Old Town San Diego State Historic Park, that total 6.3 AFY. Conservatively, 10 AFY of recycled water demand was estimated for this area.

4.3.1.5 Riverwalk Development

The project is located south of Friars Road and west of Fashion Valley Road on the current site for the Riverwalk Golf Course and adjacent to the Tertiary Pipeline alignment. The project's water study (West Coast Civil, 2019) shows 106 acres of park with a demand of 4,000 gpd per acre (4.5 acre-feet per acre per year), for an annual demand of 475 AFY. This estimate appears to be conservatively high and the development may use some groundwater for irrigation. Using a more conservative use factor of 2.5 acre-feet per acre per year, the 106 acres could use approximately 265 AFY of recycled water. The existing golf has historically been partially irrigated with groundwater sources to supplement potable water.

4.3.1.6 University of San Diego

The University of San Diego (USD) is located north of Linda Vista Road and west of Via de las Cumbres, approximately one-half mile north of the proposed recycled water pipeline alignment and at a significantly higher elevation that Mission Valley. Reviewing aerial imagery, there are irrigated areas throughout the USD campus including parks, medians, plazas, gathering areas, and athletic fields ranging in size from one to two- and one-half acres in size. In 2017, USD developed a Campus Master Plan that included proposed improvements to its landscaped areas using drought tolerant landscaping, shown on Figure 4-15. The master plan addresses water conservation as one of its sustainability design goals:

> *To better preserve and utilize scarce water resources and to reduce or eliminate the use of potable water for irrigation, projects are encouraged to provide alternative irrigation sources through the use of gray water, rainwater harvesting, or future municipal recycled water (also known as purple pipe).*

The total irrigated area is estimated to be approximately 11 acres. Cooling towers may also be potential use of recycled water on campus. Assuming 2.5 acre-feet per acre per year, the recycled water demand for landscape irrigation would be approximately 28 AFY. Appendix G of the 2010 Master Plan listed ten USD irrigation meters with a total demand of 50.5 AFY. For this market assessment, the more conservative estimate of 28 AFY was used.

Figure 4-15. USD Campus Landscape Projects

4.3.1.7 San Diego State University Mission Valley Redevelopment Project

This San Diego State University Mission Valley (SDSU-MV) redevelopment project is located at the current site of the SDCCU Stadium. The City's proposed recycled water pipeline alignment is adjacent to the site and the proposed CAPWF will be located in the vicinity of the site. The SDSU-MV water system analysis report (Dexter Wilson, 2019) shows 31 net acres of park with a demand of 4,000 gpd per acre or 4.5 acre-feet per acre per year, totaling 139 AFY. For this market assessment, a more conservative use factor of 2.5 acre-feet per acre per year was used, resulting in approximately 77.5 AFY of potential recycled water use.

4.3.1.8 Mission Valley Groundwater Basin Recharge

The Mission Valley Groundwater Basin is adjacent to SDCCU Stadium, the City's proposed recycled water alignment, and the proposed site of the CAPWF. The City completed a groundwater feasibility study of the Stadium Reach of this groundwater basin in 2017 (Gillingham Water and CH2M Hill, 2017). The study approach was to recharge the basin at a sustainable rate of between 1.2 to 2.4 mgd. At the time of the study, the City was planning to use the available wastewater effluent as a source for Pure Water and, as such, recycled water was not considered as a recharge source for this basin. In addition, it is likely that the basin would currently be classified as groundwater from a regulatory standpoint and not under the direct influence of surface water. Recharge with recycled water would change this classification and require additional treatment for an already expensive source of potable water. For this discussion, groundwater recharge was considered as a potential use for recycled water, at a rate of 2,000 AFY.

4.3.1.9 Harbor Island

Harbor Island is located south of the San Diego International Airport, in close proximity to a proposed CAWRP. The Port of San Diego maintains Harbor Island Park and Spanish Landing Park,

which account for approximately 15 acres of irrigated area and an estimated water use of 37.5 AFY, using a 2.5 acre feet per acre per year use factor.

4.3.2 Summary of CSA Market Assessment

A summary of potential recycled water demands for the CSA that could be served by the proposed Pure Water Phase 2 Program are presented in Table 4-14.

Table 4-14. Summary of Potential CSA Recycled Water Customers

Customer Type/ ID	Customer Name	RW Site Location	Recycled Water Demand (AFY)			
			Baseline Demand (2017)	Maximum Contract Demand	Potential Ultimate Demand	Net increase (Ultimate - Baseline)
Cooling Tower and Irrigation Customers						
I-1	MCRD	As shown on Figure 4-13	—	—	100.00	100.00
CT-1	MCRD	As shown on Figure 4-13	—	—	14.00	14.00
I-2	Liberty Station	As shown on Figure 4-13	—	—	125.00	125.00
I-3	San Diego Airport	As shown on Figure 4-13	—	—	0.00	0.00
I-4	Presidio Park and Golf Course	As shown on Figure 4-13	—	—	10.00	10.00
I-5	Riverwalk Development	As shown on Figure 4-13	—	—	265.00	265.00
I-6	USD	As shown on Figure 4-13	—	—	28.00	28.00
I-7	SDSU- MV Development	As shown on Figure 4-13	—	—	77.50	77.50
I-8	Mission Valley Groundwater Recharge	As shown on Figure 4-13	—	—	2000.00	2000.00
I-9	Harbor Island	As shown on Figure 4-13	—	—	37.50	37.50
Grand Total - Potential CSA Infill Customers						**2657.00**

4.4 San Pasqual Conceptual Service Area

When the City constructed the Aquaculture III Reclamation Facility/Aqua 2000 Research Center (Facility) in the San Pasqual Valley, approximately 3 miles of 16-inch recycled water pipeline was constructed in Highland Valley Road between the Facility and the Rancho Bernardo Community Park on the west side of I-15. The pipeline alignment is shown on Figure 4-16. While the facility was operational, recycled water was delivered to the park and several other irrigation customers. Since the Facility was closed in 2001, the pipeline has been charged with potable water.

The 2010 Master Plan estimated the total recycled water demand in the Rancho Bernardo/ I-15 area to be 5,750 AFY, which included 3 golf courses, one of which has since closed.

In 2016, in a Technical Memorandum on San Pasqual Valley Groundwater Recharge Options (CH2M Hill, December 2016), the City considered recharging the San Pasqual Groundwater Basin with recycled water from the City of Escondido as part of a long term sustainability plan. The study also considered a connection from the Escondido Recycled Water System, in the vicinity of the Vineyard at Escondido Golf Course, to the City's 16-inch recycled water pipeline in Highland Valley Road. This connection, shown on Figure 4-17, would require in excess of 10,000 feet of new pipeline and a crossing of the San Dieguito River, upstream of Lake Hodges, and the San Pasqual Valley, but would provide a source of recycled water for the City, assuming available capacity within Escondido's recycled water system.

The City currently has no plans to resurrect the San Pasqual Aquaculture III Facility and the nearest existing source of recycled water is nearly two miles away in Escondido, requiring the crossing of a sensitive habitat and potable water source. Therefore, the San Pasqual Valley portion of the Rancho Bernardo/ I-15 market area is not currently a feasible recycled water expansion project for the City.

The City and County of San Diego have partnered and are preparing a Groundwater Sustainability Plan as part of State of California Sustainable Groundwater Management Act (SGMA) requirements for the San Pasqual Basin. The results of this study are expected to be available in 2021-2022.

Figure 4-16. San Pasqual Service Area

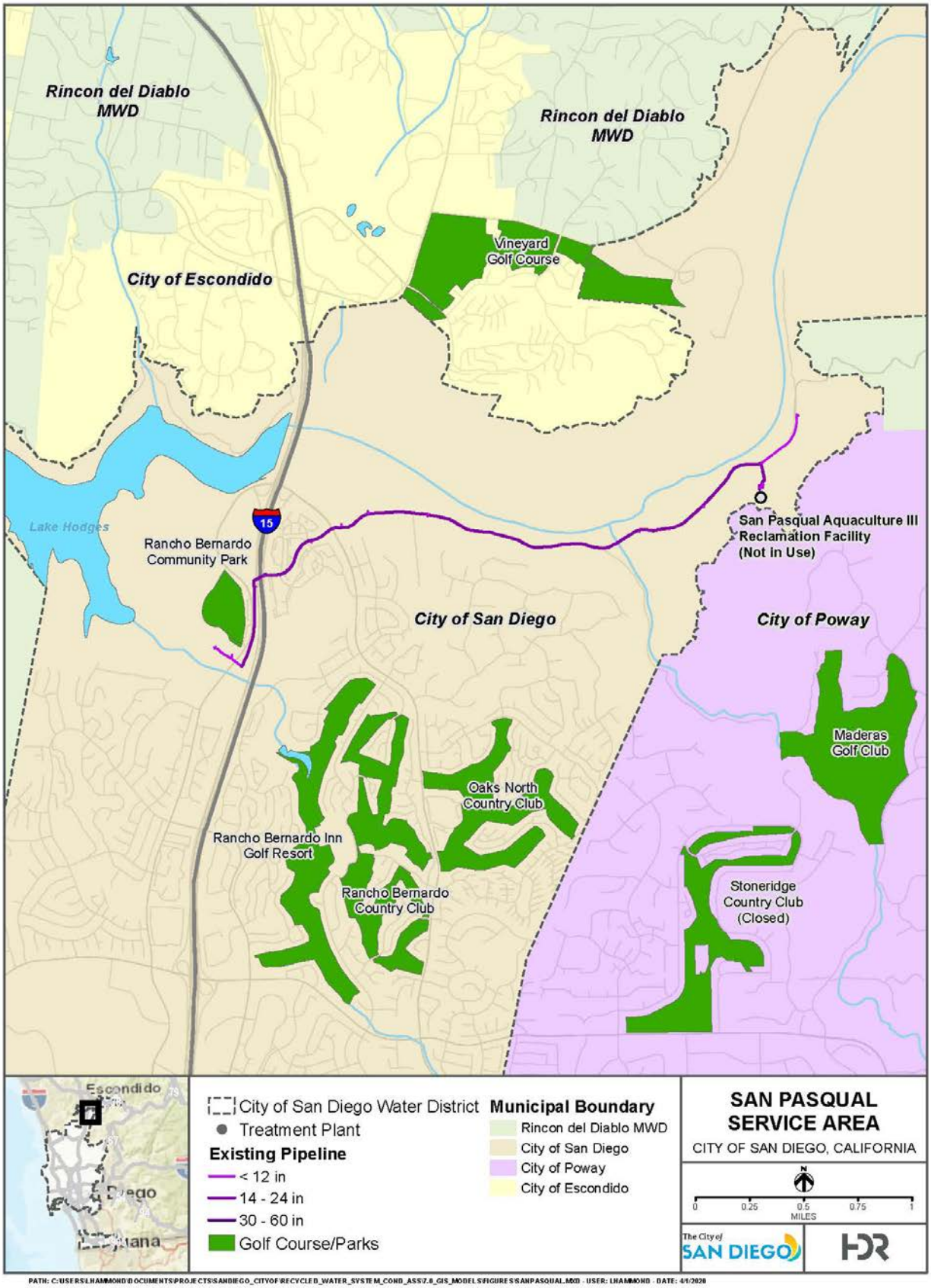


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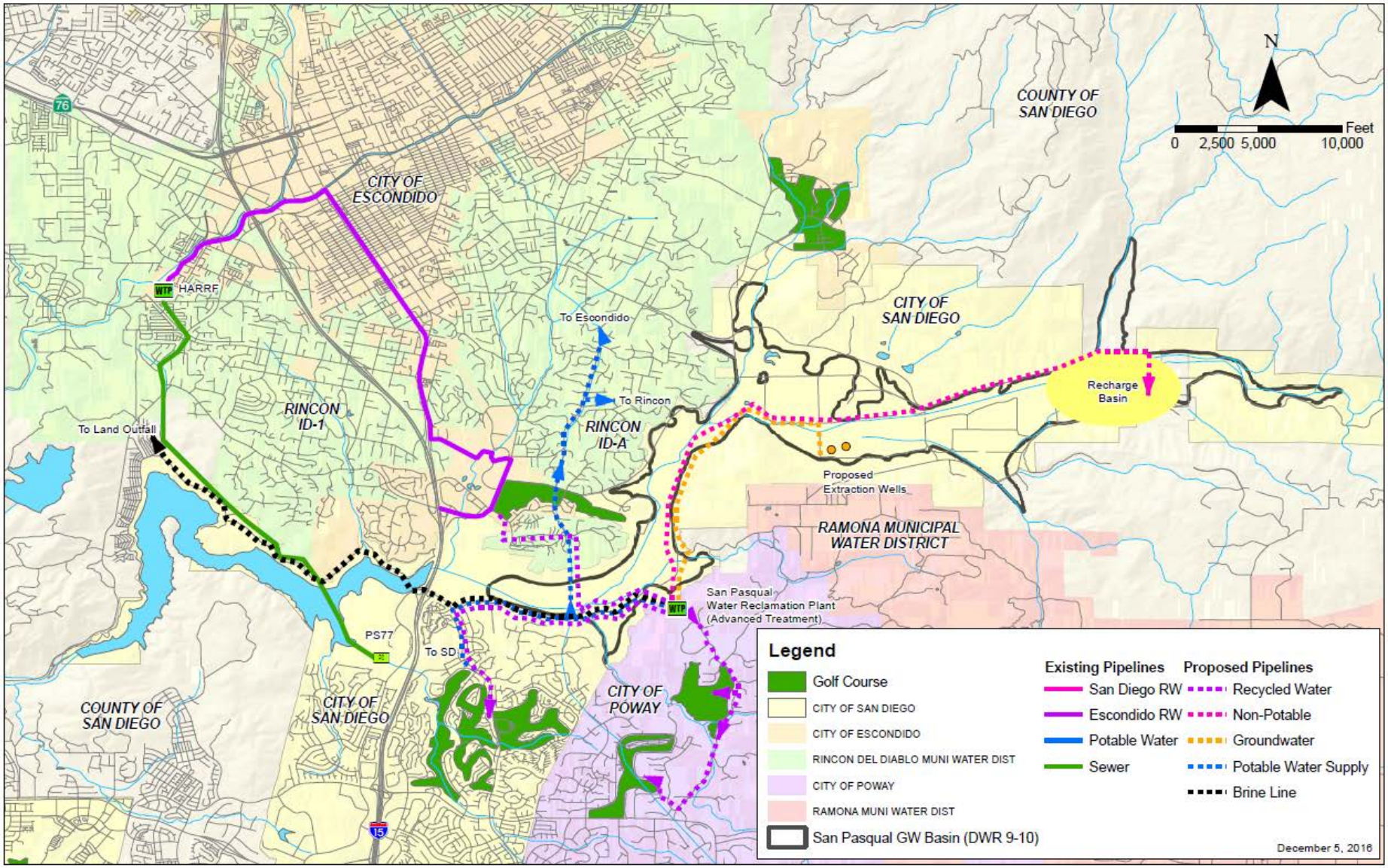
Figure 4-17. San Pasqual Recharge with Escondido Recycled Water



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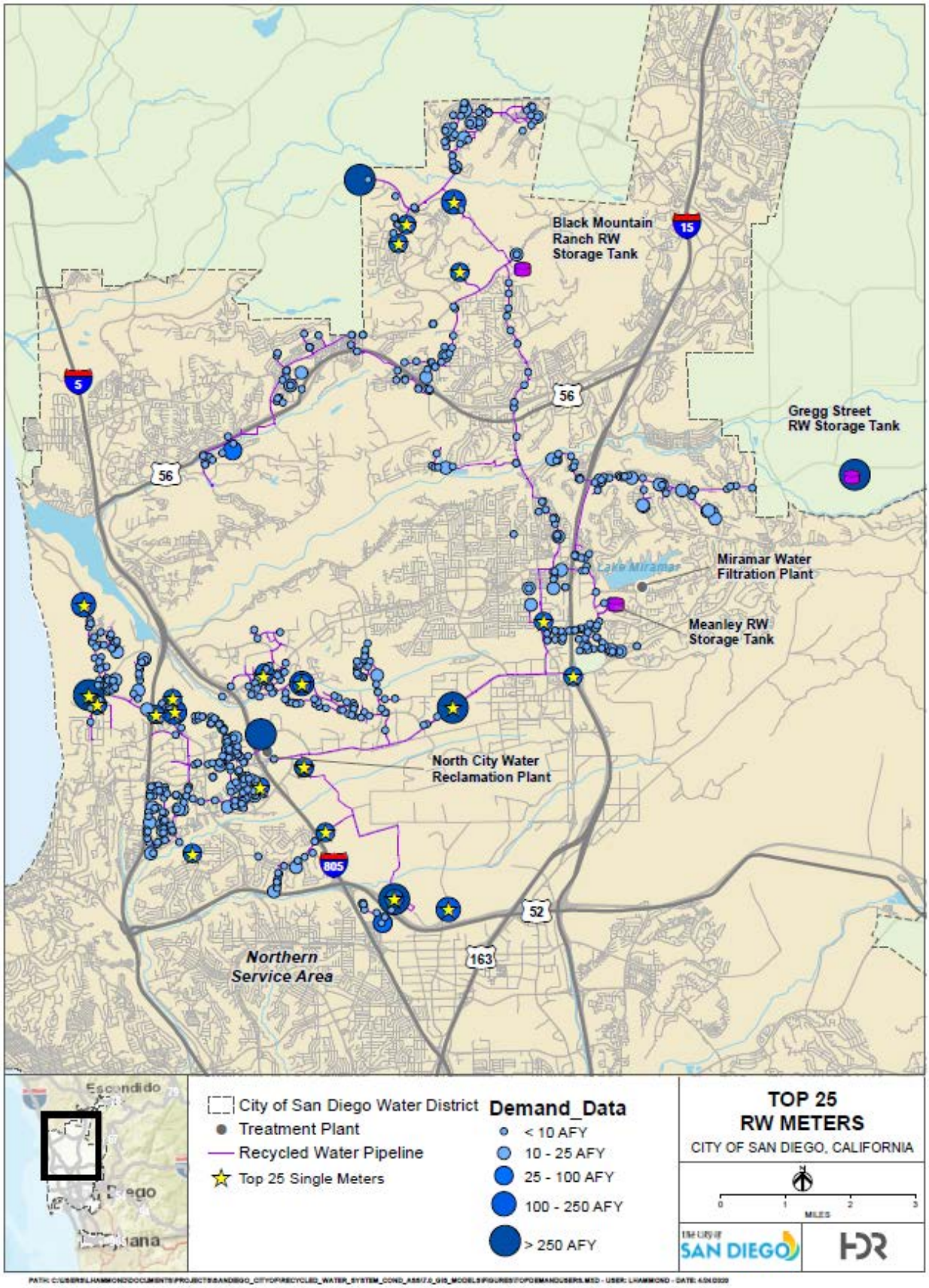
4.5 Historical and Projected Recycled Water Sales

The City requested an estimate of short term revenue from the sales of recycled water that could be integrated into the City's financial plan and near-term rate case. To support this request, the number of recycled water customers and sales for 2010 through 2018 were summarized and the increase or decrease in customers and sales per year was calculated from data collected as part of this update.

Utilizing the historic recycled water demands shown on Figure 2-4 and Figure 2-5. Recycled Water Meters in NSA



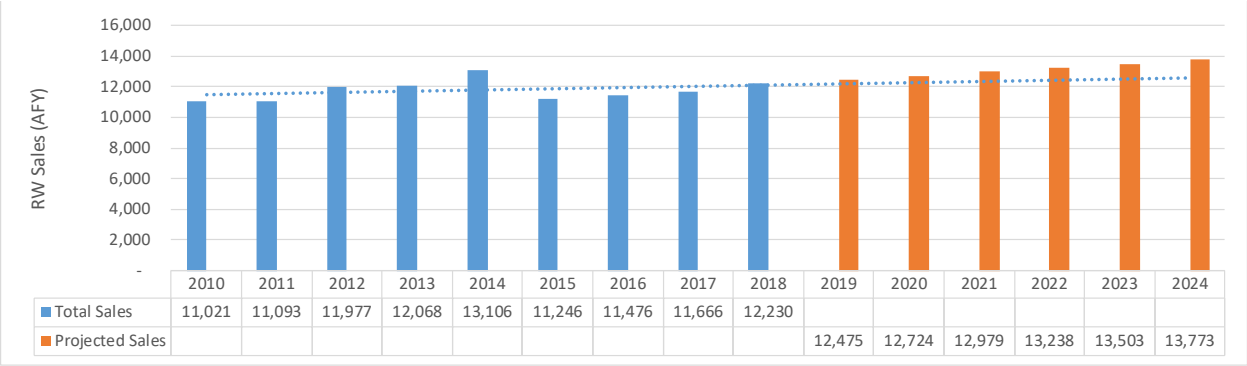
, Figure 4-18 illustrates overall sales in the City's recycled water program since 2010. The highest

average annual use was approximately 13,100 AFY (11.7 mgd) in 2014, reflective of lower recycled water costs and pre-drought cut backs. Recycled water use in 2017 was approximately 11,700 AFY or 10.4 mgd. Recycled water sales increased from 1 to 9 percent per year over the nine years, except in 2015 when sales decreased by more than 14 percent. This reduction in annual recycled water sales after 2014 may be attributed to customer cutbacks in outdoor water use during the state mandated water conservation of potable water usage, as well as recent price increases in recycled water. In 2018, there was approximately 5 percent increase in recycled water sales.

As shown on Figure 2-9, the number of Customers and recycled water use in the SSA has stayed relatively constant between 2010 and 2018. As shown in Figure 2-4, the number of customers increased from 2 to 10 percent per year over the same nine-year period, but the growth was greatest in 2015 and has since been slowing down with only 2 percent growth in 2018. Among the City's 738 total customers, 66 customers had zero usage, 30 customers had 63 percent of the total sales, and the remaining 642 customers averaged 4.8 AFY.

Figure 4-18 shows the historical sales from 2010 through 2018, and sales projections based on an assumed conservative annual growth of 2 percent, or 250 to 270 AFY. The dotted line on Figure 4-18 represents an average trend line for growth in recycled water sales over the entire 15 year period shown.

Figure 4-18. Historical and Projected Recycled Water Sales



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total Sales	11,021	11,093	11,977	12,068	13,106	11,246	11,476	11,666	12,230						
Projected Sales										12,475	12,724	12,979	13,238	13,503	13,773

This near term projected growth may come from several smaller customers, or one or two larger customers. The Cantera 3Roots project in the NSA, for example, has an estimated irrigation demand of 342 AFY. USD is anticipated to increase is usage over the next several years as well. CalTrans may increase irrigation demands by approximately 100 AFY over the next five years. OWD may increase its use of recycled water in the SSA, as development continues in the eastern area of the City of Chula Vista.

4.5.1 Adjustment of Recycled Water Demand for Climate Change

This section describes how the market assessment demands may be adjusted for future irrigation demands based on anticipated climate change, although, as evidenced in 2015, this increase in outdoor water demand can be offset by customer behavior.

In updating the recycled water market assessment for this 2020 Master Plan update, the effects of climate change were considered. Climate change forecasts include increased temperature and evapotranspiration, as well as changes to the amount and monthly distribution of precipitation, all of which will affect irrigation rates of recycled water.

The need to conserve water during times of drought have resulted in state mandated water conservation requirements. In the past, public water conservation messages have influenced recycled water customers who also reduce consumption, although they are not required to conserve as they are not using a potable source of water. State mandated water conservation in 2014-2015 resulted in both potable and recycled water customers reducing or even eliminating outdoor watering. As shown previously on Figure 2-4, although the number of City's recycled water customers in the NSA increased in 2015, the volume of water consumed decreased. Very little rebound in demand was observed after the conservation mandate was lifted.

The City's 2015 Climate Action Plan (CAP) references CWA's 2015 Urban Water Management Plan (UWMP) in their discussion of maintaining water supply and services under climate change. CWA is the wholesale agency for imported potable water in San Diego County. The CAP also includes a discussion of the Pure Water Program, which will significantly reduce the City's use of imported water and the energy associated with conveying it to southern California.

In its assessment of future water demands, the City's UWMP references the CWA UWMP, which used two global models to evaluate the impact of climate change on demands. Both models concluded that climate change caused a significant increase in demands but that by applying conservation of 20 percent, demands would be lower than the baseline condition. This analysis includes conservation of both indoor and outdoor demands. Recycled water is used mostly for outdoor irrigation and so it will be more affected by climate change and less affected by conservation, as its use is generally not subject to conservation requirements.

CWA's 2015 UWMP considered five climate change scenarios including Warm/Wet, Warm/Dry, Cool/Wet, Cool/Dry, and Moderate. The UWMP concluded the following:

> *No dramatic shifts in seasonal patterns of precipitation and average maximum daily temperature for the San Diego Region were observed under any of the five scenarios. However, on average, annual amounts of precipitation tend to be more concentrated in the winter, with lesser proportions of the total annual precipitation occurring in the spring and fall.*

This means that more rain falls in the winter when recycled water demands are already low and, seasonally, that is not expected to change significantly. The five climate scenarios were used as input to the CWA's demand forecasting model. The UWMP concluded that:

> *the results suggest that more significant water demand impacts associated with the forecasted trend toward warmer and drier climate conditions may occur on a time-step beyond the 2015 UWMP planning horizon" (Year 2040).*

The CWA 2013 Regional Water Facilities Optimization and Master Plan Update also included an analysis of potential future climate effects on water demands. This Master Plan used potential evapotranspiration (PET) as the primary physical process influencing outdoor demand, such as the use of recycled water for irrigation. Master plan projections suggested increases in local annual demand by 0.7 to 2.7 percent between 2011 and 2035, which varied from previous projections using rates from the historical period between 1971 and 2000. The analysis concluded that the overall anticipated change in average annual PET for the City of San Diego was 1.7 percent.

Planned updates to these UWMPs and the City's Long Range Water Resources and Sustainability Plans are anticipated in 2021 and may offer additional information regarding climate change.

In summary, these documents indicate a negligible to small increase in irrigation demand due to climate change. Since 2014, customers have reduced their demand for recycled water as well as

potable water under regulatory mandates for water conservation. Those demands have not rebounded since the lifting of the mandate. Therefore, for this assessment, it was assumed that any climate change increase in demand may be offset by water conservation behaviors, so no adjustment for climate change was made to future annual demand estimates. The City may find, however, that future annual weather patterns may impact historical peak and low demand periods, and seasonal demand patterns may shift.

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5 Feasibility Assessment of Non Potable System Expansion

This chapter describes the feasibility of expanding the City's recycled system in the NSA and CSA with the proposed implementation of Pure Water. The SSA future recycled system is also evaluated in this chapter, although there is limited potential for expansion.

5.1 Northern Service Area

The NSA system is the largest distribution system operated by the City and is further described in the following sections.

5.1.1 NSA Existing Distribution System Model

As part of this master plan update, HDR developed an updated hydraulic model for the City's NSA. The City Public Utilities Department maintains an extended period calibrated hydraulic model of the recycled water system in a Synergi modeling software format. During an initial review of the model, the system model was found to be overly controlled with nearly all pipes (including pipes and laterals smaller than 4-inch diameter) and valves (gate and butterfly valves) included in the model, which is not typical in a simulation model network. This section summarizes several areas of the model that were simplified to improve future model performance and use as a planning and operational tool. A more detailed description of model updates was presented in a User Model Technical Memorandum, included as Appendix B in this report.

The City exported the proprietary Synergi model to an EPANET file, which was then converted to an Innovyze InfoWater model (Version 12.4). The existing version of the Synergi model contained the NSA and the SSA. The SSA model network was removed from the InfoWater model to focus on the NSA system capacity evaluation and optimization. System geometry, elevations, pumps, and storage tanks were reviewed for accuracy and updated based on the City's existing GIS data and as-built drawings.

5.1.1.1 Pipes

The Synergi model contained all of the pipes currently in the public distribution system, including 1.5, 2, and 3-inch pipes. These pipes were removed from the model so that only pipes with a diameter of 4-inch and larger were left in the model to reflect the backbone distribution system and not service laterals. The remaining pipes were verified and corrected using GIS data obtained from the City. A pipe network was added to the model to incorporate the City of Poway's recycled water distribution system, which is supplied directly by the City through the NSA recycled water system.

5.1.1.2 Pumps and Storage

The Synergi model contained all the pump stations within the City's NSA recycled water system. The City of Poway's Gregg Street Pump Station, which serves a closed zone with three pumps, was added to the InfoWater model based on information provided by the City of Poway. All storage tank volumes and elevations in the model were reviewed and verified for accuracy based on as-built drawings.

5.1.1.3 Meter Data and Demands

All recycled water demands were updated in the InfoWater model. Monthly meter data was obtained from the City and from the City of Poway. Using the monthly meter data, demands were then allocated to individual nodes in the model and updated demand patterns were developed based on pump station flows and tank levels.

Recycled water consumption data was obtained for each meter in the system from the City. Three years of data were reviewed: 2015, 2016, and 2017. After reviewing the data, it was determined that 2017 was a critical year with low precipitation and high recycled water use; therefore, the 2017 consumption data was used to allocate demands in the model and serves as the existing baseline condition.

5.1.1.4 EPS Model Calibration

The model was calibrated for extended period simulation (EPS) by comparing observed changes in water levels in the system's storage tanks with model-simulated water level changes over time. Observed flows at the system's pump stations were also compared to model-simulated flows at those pump stations during the same time period. The water levels and pump station flows during a three day period were graphed and compared to the modeled tank levels and pump flows produced during the EPS. Pump operation and the pressure zone demand patterns were slightly adjusted, absent diurnal demand curves for every user, and tank levels were adjusted to align more closely with the observed tank levels.

5.1.2 NSA Existing System Analysis

The City's existing NSA system was designed at a time when the City anticipated a larger ultimate recycled water program (over 30,000 AFY of annual demand compared to the existing demand of less than 10,000 AFY). As a result, the City's main supply and pumping facility was sized to deliver nearly 30 mgd of recycled water and the 48-inch backbone transmission main from the NCWRP was designed for an even larger capacity. Some of the backbone facilities are oversized for current flow conditions and, as a result, bring operational challenges and concerns. However, for some operating schemes the excess capacity provides the City with some system benefits. One benefit is that the City has excess supply capacity that can be utilized for its tertiary operations and in the future Pure Water.

On the other hand, large diameter pipelines often experience water quality issues (low chlorine residual) and aging recycled water and this is observed at times through the City system (note: the pipeline between NCWRP and the Meanley Tank is equivalent to just over 3 MG of pipeline storage). As previously noted, the City's main transmission pipelines typically have minimal pressure loss (headloss) being oversized.

Another observation is the City's oversized pumps and current method of operating one pump at a time may not be as efficient as the original design compared to running multiple pumps. With excess pumping capacity, the City does have flexibility to manage their system energy costs. While the overall system may not operate at a constant flow as designed, by having excess pump capacity the City has the ability to off-peak pump and meet peak demands. The constant flow operations will become more desirable when Pure Water is implemented and on-line. It appears that large demand users do not manage their peak periods due to the system's capacity as the NSA system does routinely see high hourly peaks (exceeding peak hour design criteria) at the beginning of the 10 pm

irrigation period. To achieve a more constant flow, demand management of these large customers could be instituted.

The NSA existing system capacity analysis was based on the calibrated model presented above and the design criteria presented in Table 2-11. The next several sections summarize the capacity analyses and findings.

5.1.2.1 Pump Stations

This section recaps the distribution system pump stations capacities presented in Chapter 2 and verified by the hydraulic model. The pumps at the NCWRP pump to the Meanley Tank, the Meanley Drive Pump Stations pump to customers in the 790 and 890 zones, and the Canyonside Pump Station pumps to the Black Mountain Ranch Tank. The City of Poway operates the Gregg Street Pump Station located at the Gregg Street tank, which serves a closed pressure zone serving most of South Poway Business Park. The City's pump stations, except for the 790 Zone, deliver to an open system with reservoir level controls.

Table 2-2 provides a recap of the existing recycled water pump station information presented in Chapter 2. In summary, pump stations are primarily sized to deliver the maximum day demand of the area directly served, including any higher pressure zones. For closed pressure zones, pump stations are sized to serve peak hour demand.

As shown in Table 5-1, the NSA has surplus pumping capacity during maximum day demands (MDD) at all its pump stations. Surplus capacity is measured by subtracting the MDD from the pump station's firm capacity. The firm capacity represents the maximum pumping capacity with one pump out of service. During non-peak demands, or average day demands (ADD), the City has system flexibility in operating pumping stations. The model simulation confirmed that none of the pump stations need to operate at firm capacity during peak demands to serve the system.

Table 5-1. Existing Recycled Water System Pump Station Analysis

Pump Station[c]	No. of Pumps	Capacity Per Pump (gpm)	Total Capacity (gpm)	Firm Capacity[a] (gpm)	Zones Served	ADD (gpm)	MDD (gpm)	Surplus/ Deficit (gpm)
Canyonside	3	3,000	9,000	6,000	500, 600, 640[d], 825	800	1,360	4,640
Meanley Drive 890	3	1,250	3,750	2,500	890,1028	550	935	1,565
Meanley Drive 790	4	550	2,200	1,650	790	100	600	1,050
NCWRP	3	6,000	18,000	12,000	540, 640[d]	3,180	5,406	6,594
Gregg Street (Poway)[b]	3	1,500	4,500	3,000	1028	300	510	2,490

Notes:

[a] Firm Capacity is the pump station capacity with one pump on standby or out of service.

[b] The Gregg Street Pump Station is owned and operated by the City of Poway and serves the Poway 1028 Zone from the Gregg Street Tank.

[c] The City's Parks and Recreation Department owns booster pump stations downstream of the meters at Torrey Pines South and North Golf Courses to increase pressures and supply. These are not part of the public distribution system.

[d] The 640 Zone is currently split and served by two different pump stations.

5.1.2.2 Reservoirs

This section and Table 2-3 provides a recap of the reservoir capacities presented in Chapter 2. The reservoirs establish the three major pressures zones in the NSA: the 640, 825, and the 890 pressure zones. The Gregg Street Tank is owned and maintained by the City of Poway; however, the facility is fully integrated with the City of San Diego's NSA recycled water distribution system.

Based on Table 2-3, the NSA has excess storage capacity per the City's design criteria. Storage for pressure reduced zones is included in the next higher zone. Closed zones have operational storage allocated to the nearest reservoir supplying the zone. The model simulation confirmed the available of storage capacity in the existing system.

Table 5-2. Existing Recycled Water System Storage Tank Analysis

Storage Tank	Zone Served	Zone ADD (mgd)	MDD (ADD x 1.7)	Tank Capacity (MG)	Storage Required (2/3 x MDD)	Total Storage Requirement (MG)	Surplus/ Deficit
Black Mountain Ranch	500	0.17	0.29	3.0	0.2	1.3	1.7
	600	0.48	0.81		0.5		
	640	0.16	0.27		0.2		
	825	0.35	0.59		0.4		
Meanley	550	1.11	1.88	9.0	1.3	5.4	3.6
	640	3.47	5.90		3.9		
	790	0.14	0.24		0.2		
Gregg Street (Poway)[a]	890	0.37	0.64	2.0	0.42	0.9	1.1
	1028	0.42	0.71		0.47		

Notes:

[a] The Gregg Street Tank is owned by the City of Poway and includes operational storage for both the City and Poway.

5.1.2.3 Distribution System Analysis Summary

The existing system model, described earlier in this section, was used to evaluate compliance with City design criteria, provided in Table 2-11, including pipeline velocities and residual pressures. Tank and pump operations were also reviewed during these peak demands.

As shown on Figure 5-1 and Figure 5-2, the existing system performs well and is within design criteria under peak hour demand conditions during the summer months. Pressure fluctuates very little within the transmission system and only experiences larger swings at the extremities of the NSA. Minimum operating pressures of 50 psi are maintained. In the far north, some lower elevations create high service pressures that could be mitigated with installation of a new pressure reducing station. Figure 5-2 shows the system's relative available capacity, with pipeline velocities well below design criteria (8 to 10 fps) during peak hour demand conditions.

Figure 5-1. Existing System Minimum Pressures

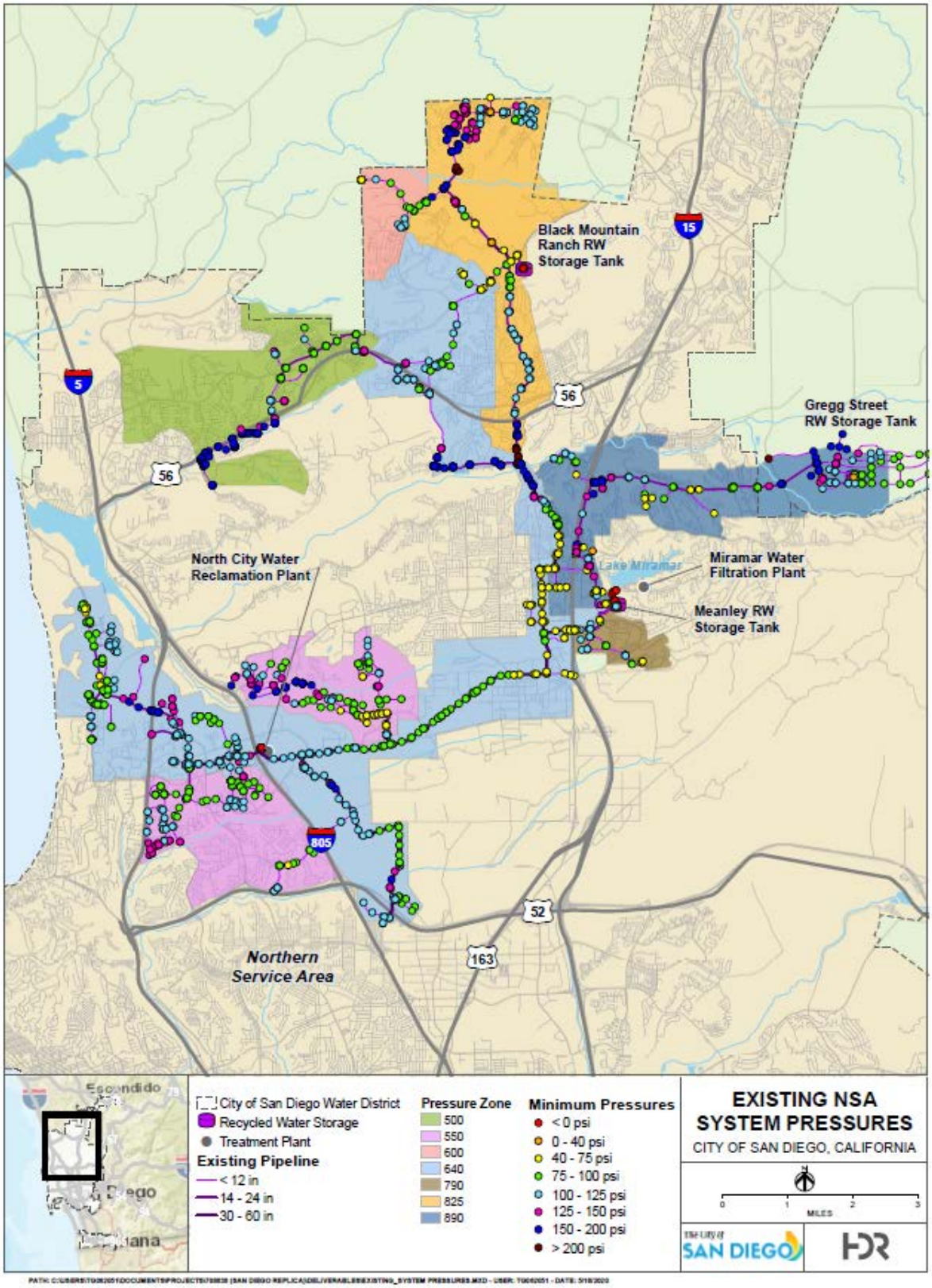
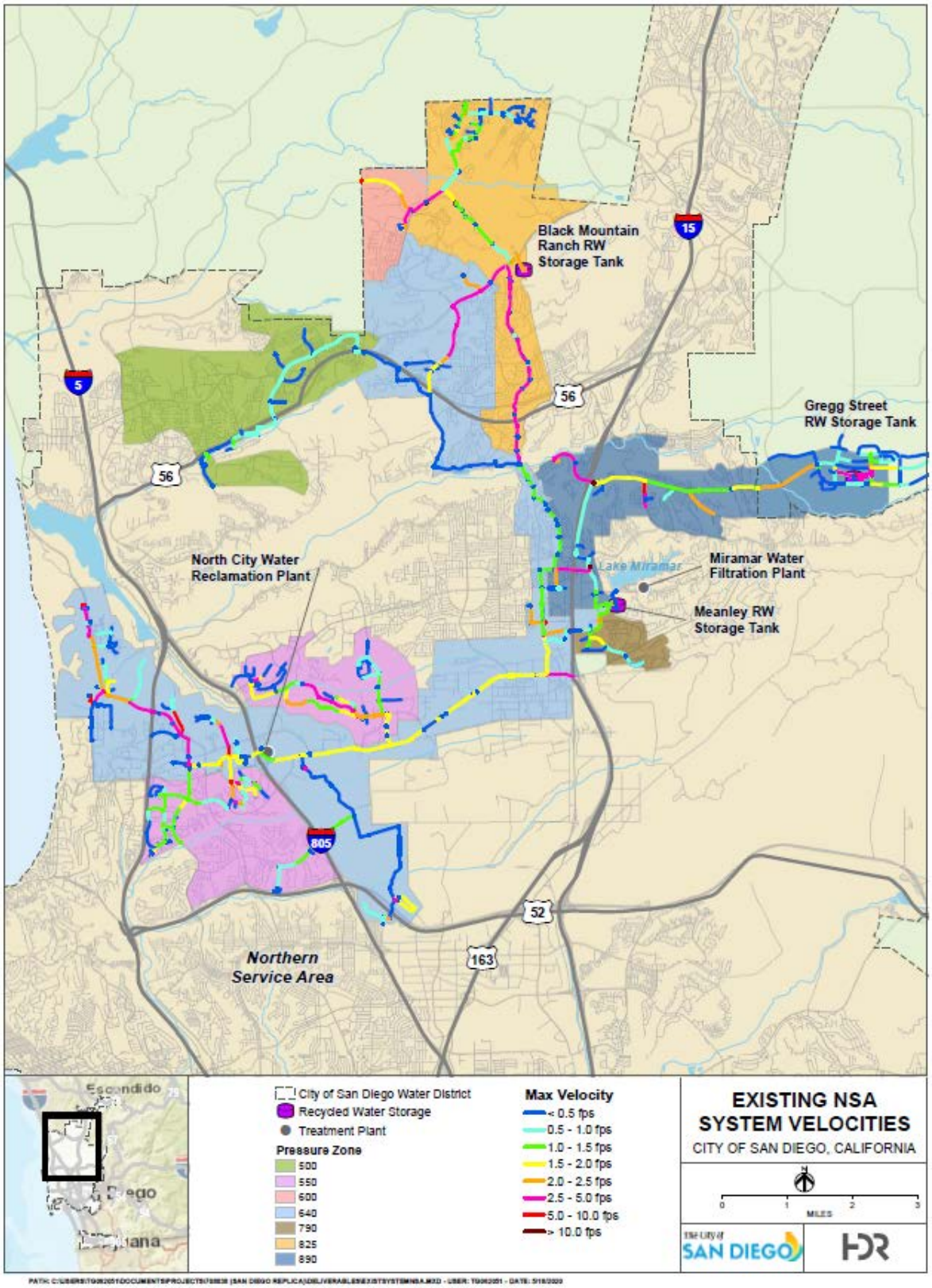


Figure 5-2. Existing System Maximum Pipe Velocity



During summer demands, the City relies on both the NCWRP Pump Station and the Meanley Tank to meet peak hourly demands, which may be as high as 16,000 to 18,000 gpm (25 mgd) for short durations. Shown on Figure 5-3 is the operational storage utilized in the Meanley Tank over 72 hours. Currently, the Meanley Tank fluctuates between 17 and 22 feet, using only 25 percent of its available storage. By allowing the water levels to fluctuate more and increasing utilization of Meanley Tank to approximately 40 percent by allowing the water level to drop to 13 feet, the City could reduce peak hour flows from NCWRP and operate the system more effectively.

Figure 5-3. Existing Tank Peak Hour Turnover

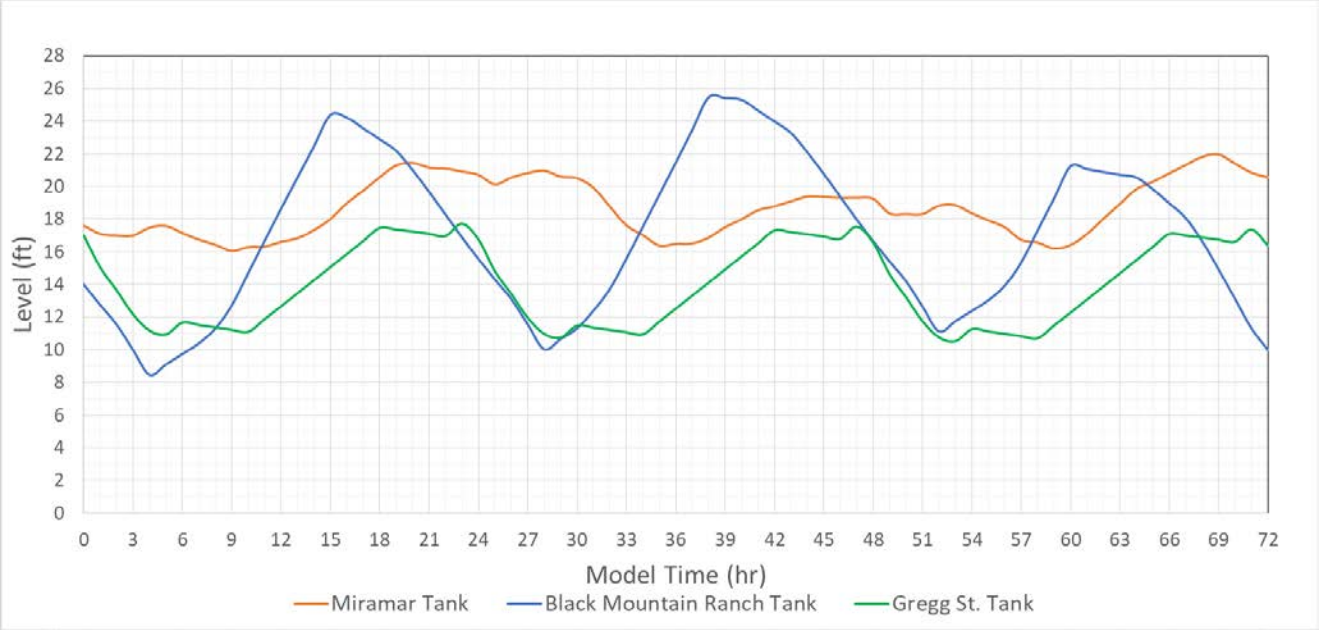
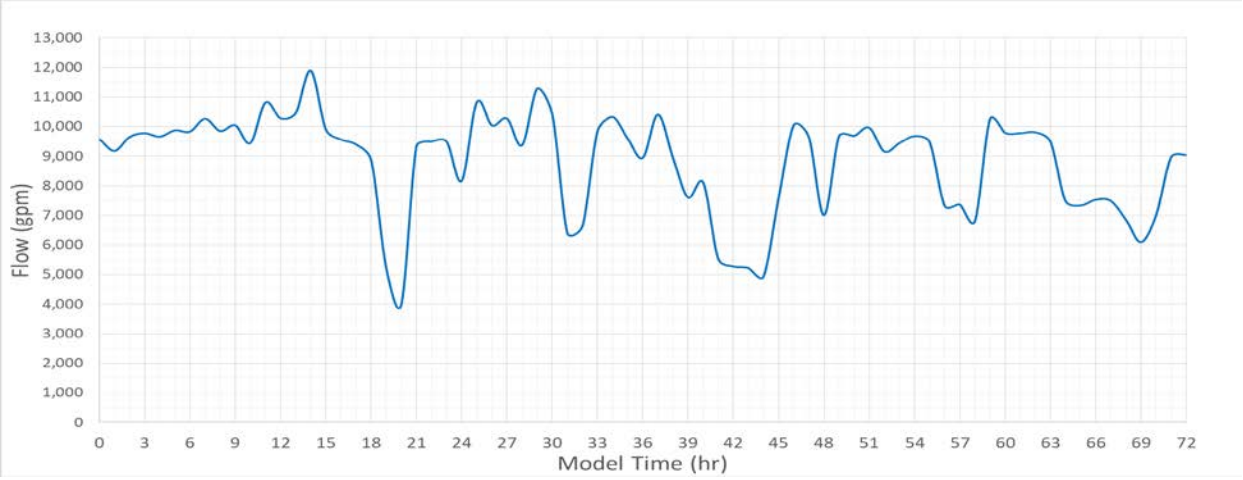


Figure 5-4 shows the flow variability at NCWRP Pump Station during peak summer months. The City utilizes variable frequency drives (VFDs) to ramp flows up and down (between 70 and 100 percent) based on set levels in Meanley Tank and peak hour demands. The City could potentially adjust the operating levels at Meanley Tank to reduce the peaking at NCWRP Pump Station and operate the system more constantly, if desired, for Pure Water.

Figure 5-4. NCWRP Pump Station Existing Modeled Flows



In contrast, during the winter months or low demand, the NCWRP Pump Station operation is based on minimum operating capacity of the tertiary filters at NCWRP and the Meanley Tank levels, which may not experience large fluctuations, causing excess recycled water to be diverted to the PLWWTP. Opportunities to adjust these operating scenarios to improve operations for the NSA are discussed in the next section.

5.1.2.4 Other Existing System Considerations

This section summarizes observations and considerations for improvements to operating the existing recycled water system, prior to the Pure Water system coming on line in the next 3 to 4 years.

Low Demand Operations and Flows to Point Loma

Also, under low demand operations the City does experience aged water and loss of chlorine residual. Section 5.1.2.5 includes a discussion of water quality in the NSA.

Demand Management for Top Users

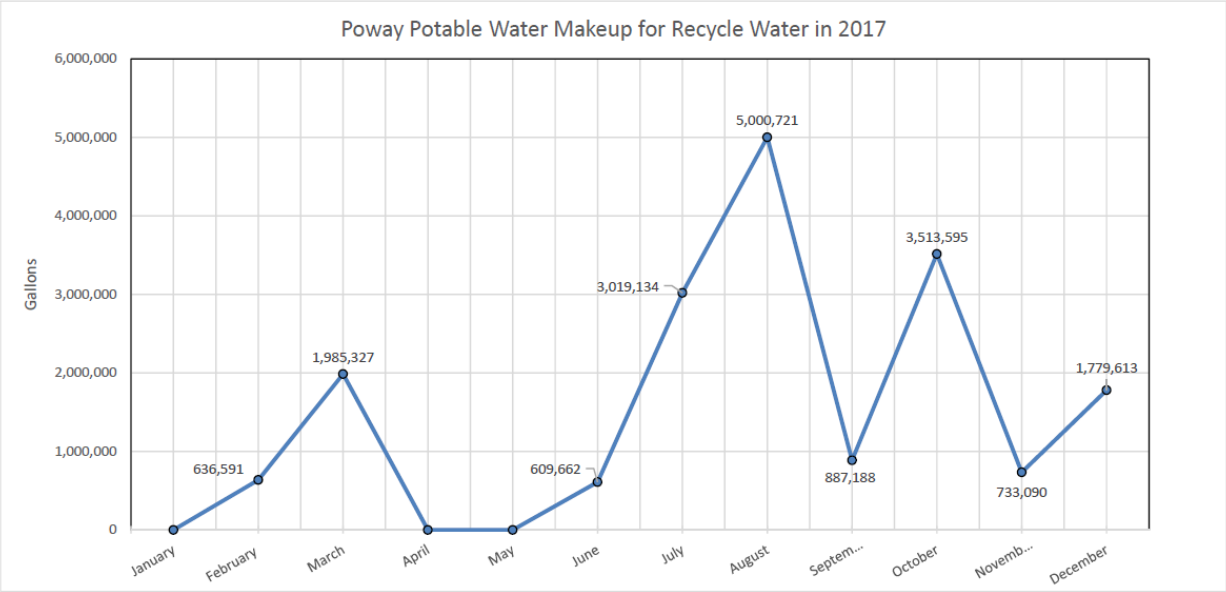
As discussed in Chapter 2, although the City has an established irrigation window from 10 pm to 6 am for recycled water irrigation many of the larger users have compressed their irrigation windows towards the initial 3 to 4 hours resulting in higher peak hour demands compared to the original system design.

Torrey Pines Golf Course and several other larger users peak on the order of 12 to 14 times their average day demand, where the NSA system was designed for 6 to 8 times average. This requires the need for the NCWRP Pump Station to supply those peak flows, rather than storage, to meet demand. It is recommended that the City explore, for the top five users, the possibility of demand management by increasing their irrigation windows to reduce peak hourly demands. The City should develop remote reading of the AMI metering data and begin to reach out to several of the major users and discuss the opportunities for minor adjustments to their irrigation cycles. This would also help to foster a partnership with the end user in delivering recycled water. Although not as critical today, this will help the City in the future in managing the Pure Water system at NCWRP.

Poway Potable Water System Flushing

As part of the existing system analysis and review of demand and supply data, it was noted that during the summer months, the City of Poway needs to flush their South Poway Business Park potable water system to maintain sufficient chlorine residuals. The City flushes the potable water system directly into the Gregg Street Tank using the approved air gap connection for potable water make-up. Interestingly, the result is the addition of new water supply into the City's NSA recycled water system. Over 5 million gallons of potable water was supplied in August of 2017, as shown below on Figure 5-5. This equates to an average of 160,000 gpd during peak month demand that offsets recycled water demand within the City of Poway, and potentially nearby City of San Diego customers. No improvements are called for, in this case, however the City should be aware that this is occurring and may offset recycled water demand within the City of Poway throughout the year.

Figure 5-5. Poway Potable Water Makeup



5.1.2.5 Age of Water Influences on Water Quality

A water age analysis within the hydraulic model quantifies how long water has been residing in the distribution system. This analysis can provide a less expensive approach to assessing water quality than conducting sampling and lab analyses for specific constituents at various points along the distribution system. Although no regulatory requirements exist for water age or chlorine residual in recycled water systems, general industry guidelines indicate water age should not exceed five days in the system to maintain good water quality. The NCWRP master recycling permit (Order No. R9-2015-0091) requires that the chlorine contact time for the disinfection process meets a minimum of 450 milligram-minutes per liter for at least 90 minutes, based on peak dry weather design flows, but does not specify a chlorine concentration for effluent produced. This chlorine contact time occurs within the NCWRP boundaries. Maintaining a chlorine residual throughout the distribution system minimizes the growth of biofilms that can clog recycled water delivery systems and produce unwelcome odors at customer sites.

The hydraulic model simulates water age by calculating the time spent by a “parcel” of water in the pipelines and storage tanks prior to being delivered to the customer. The age of water for the NSA system was simulated in the hydraulic model by assuming the age of water entering the distribution system at the NCWRP source is zero days old.

Water age in the City system varies depending upon water demands, distance from the supply connection (NCWRP), and residence time in storage tanks. As recycled water demands increase, water travels through the system faster, and water age stays low. To determine water age, the City Infowater hydraulic model was run under both summer and winter demand conditions for a period of 10 days. The age of water at the end of the summer simulation is shown on Figure 5-6 and the winter simulation is shown on Figure 5-7.

As expected, the recycled water sits in the system longer during winter demand periods, than in summer. In winter, although the portion of the recycled water system where most of the demand occurs was estimated to have a water age less than five days old, significant sections of the northernmost portion of the NSA have a water age estimated to be greater than 5 days old. This, in

general, is attributed to long distance from the supply connections, dead ends, and relatively lower winter demands in the area. While the Merge 56 connection from Canyonside to SR-56 improves the northern portion of the NSA system with reliability and relieving demands off the Black Mountain Ranch tank, it does not have a significant effect on recycled water age throughout the pipelines due to the overall lower demands along the system, which is shown on Figure 5-8.

The water age model demonstrates that under the modeled conditions, the age of water exceeds the generally accepted ceiling of five days in several areas of the distribution system. The water age model demonstrates areas where operational improvements could be focused to improve water age, such as increased cycling of water in tanks. It is noted that the age of water model can be used to evaluate the effect of different control settings on water turnover rates in tanks. It can also be used to determine the impact of various operational changes or construction projects by indicating if the water age will subsequently decrease or increase.

Figure 5-6. Water Age under Summer Demand Conditions

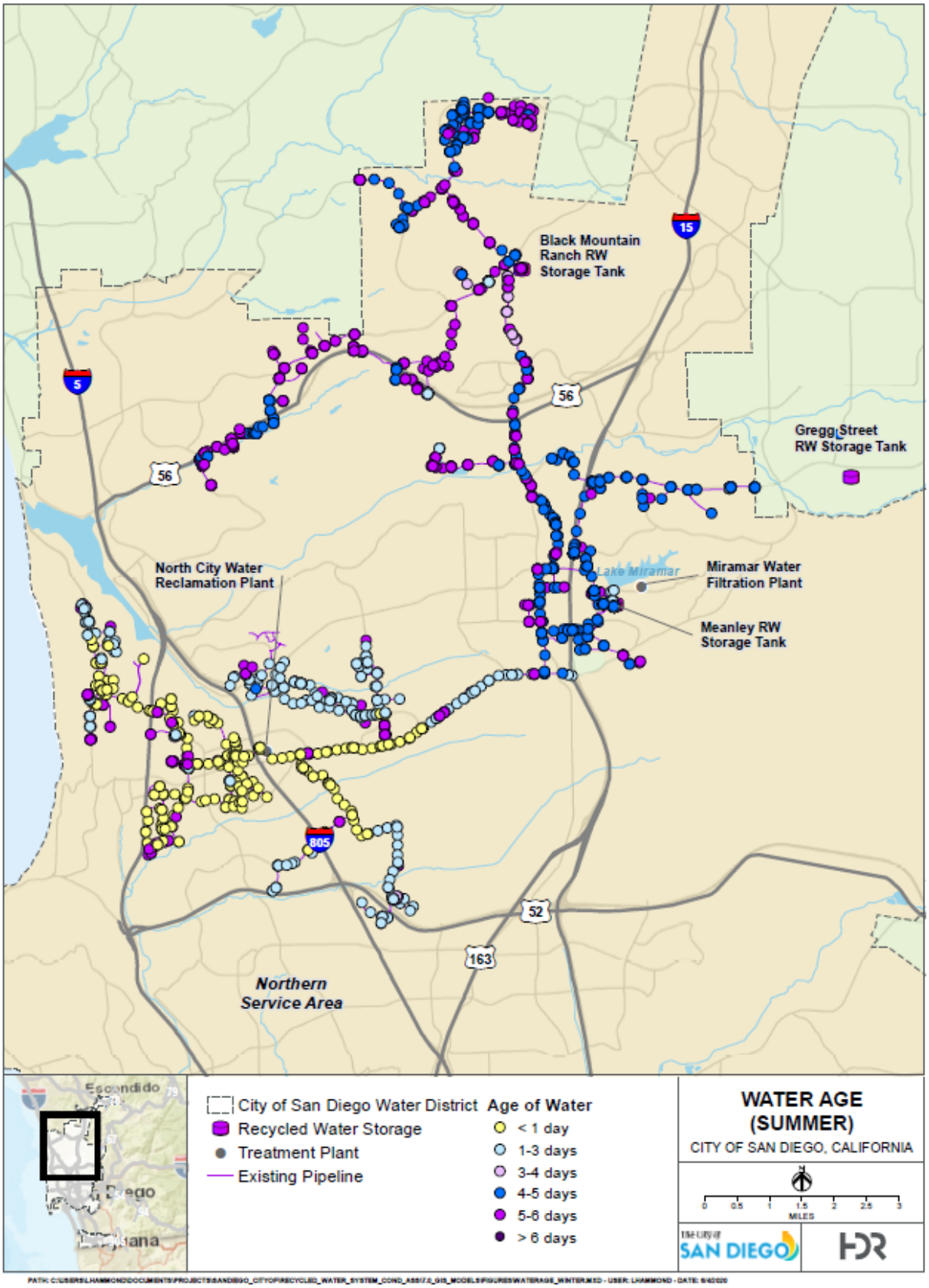


Figure 5-7. Water Age under Winter Demand Conditions

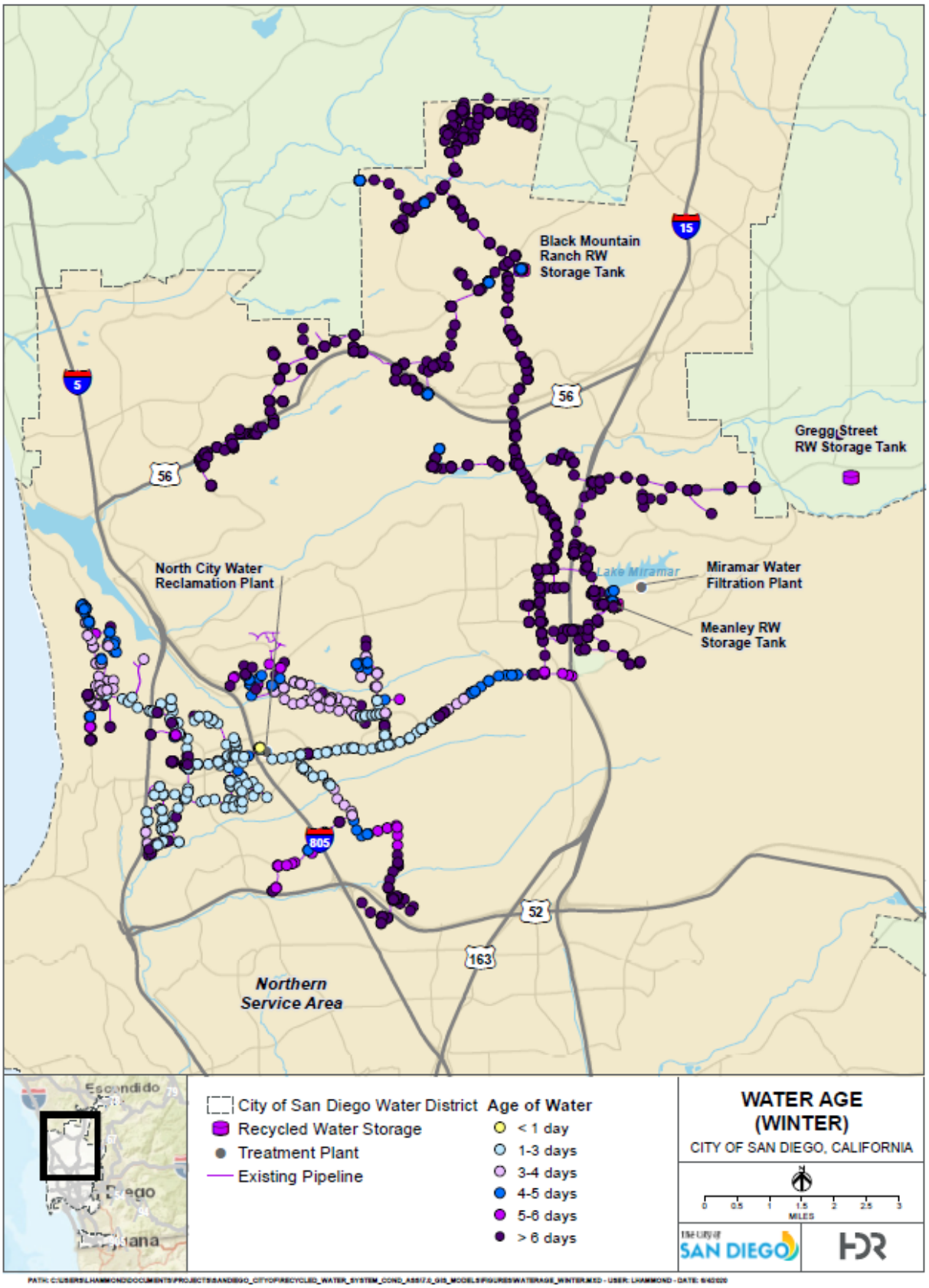
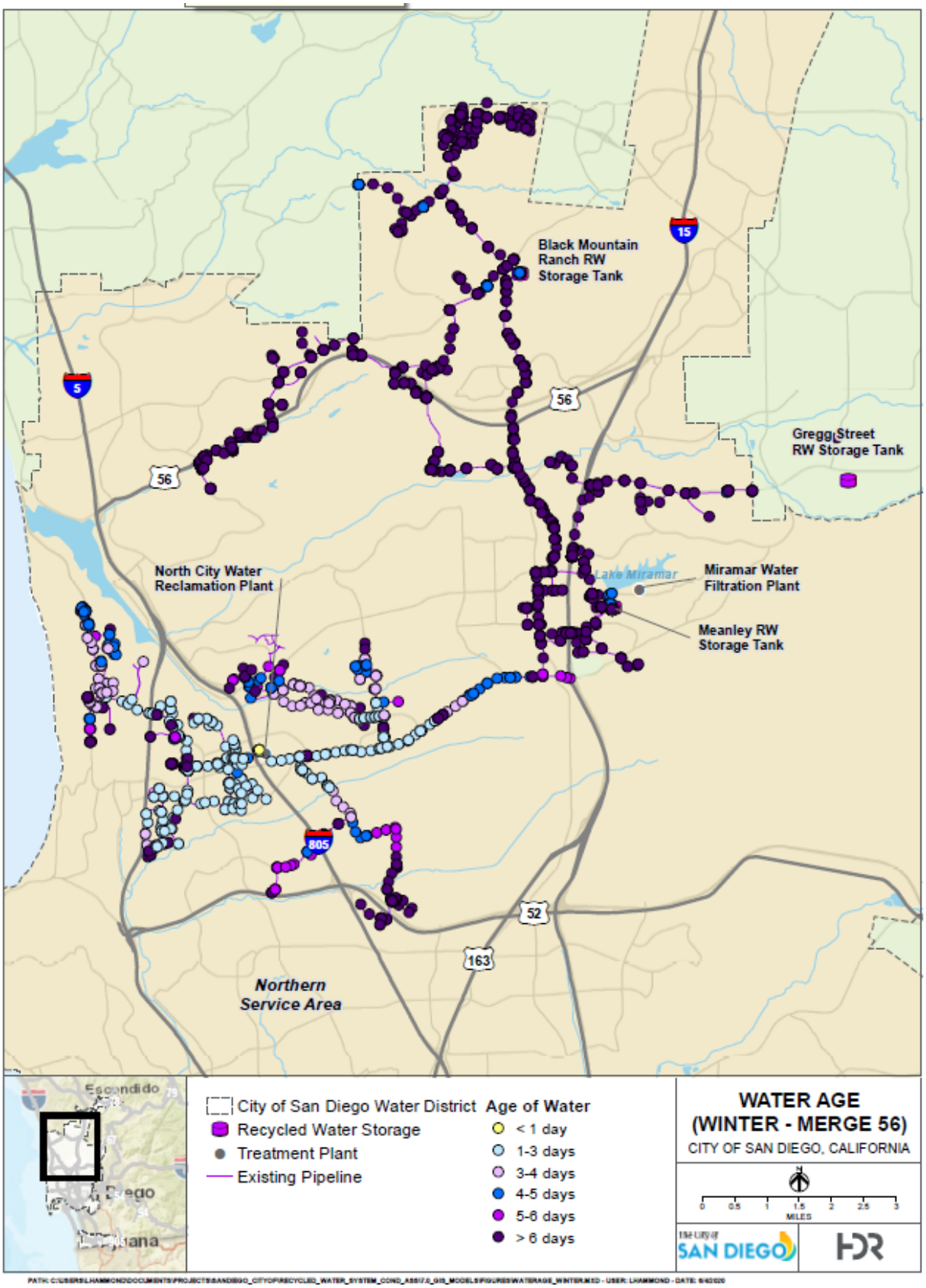


Figure 5-8. Water Age under Winter Conditions with Merge 56 Connection

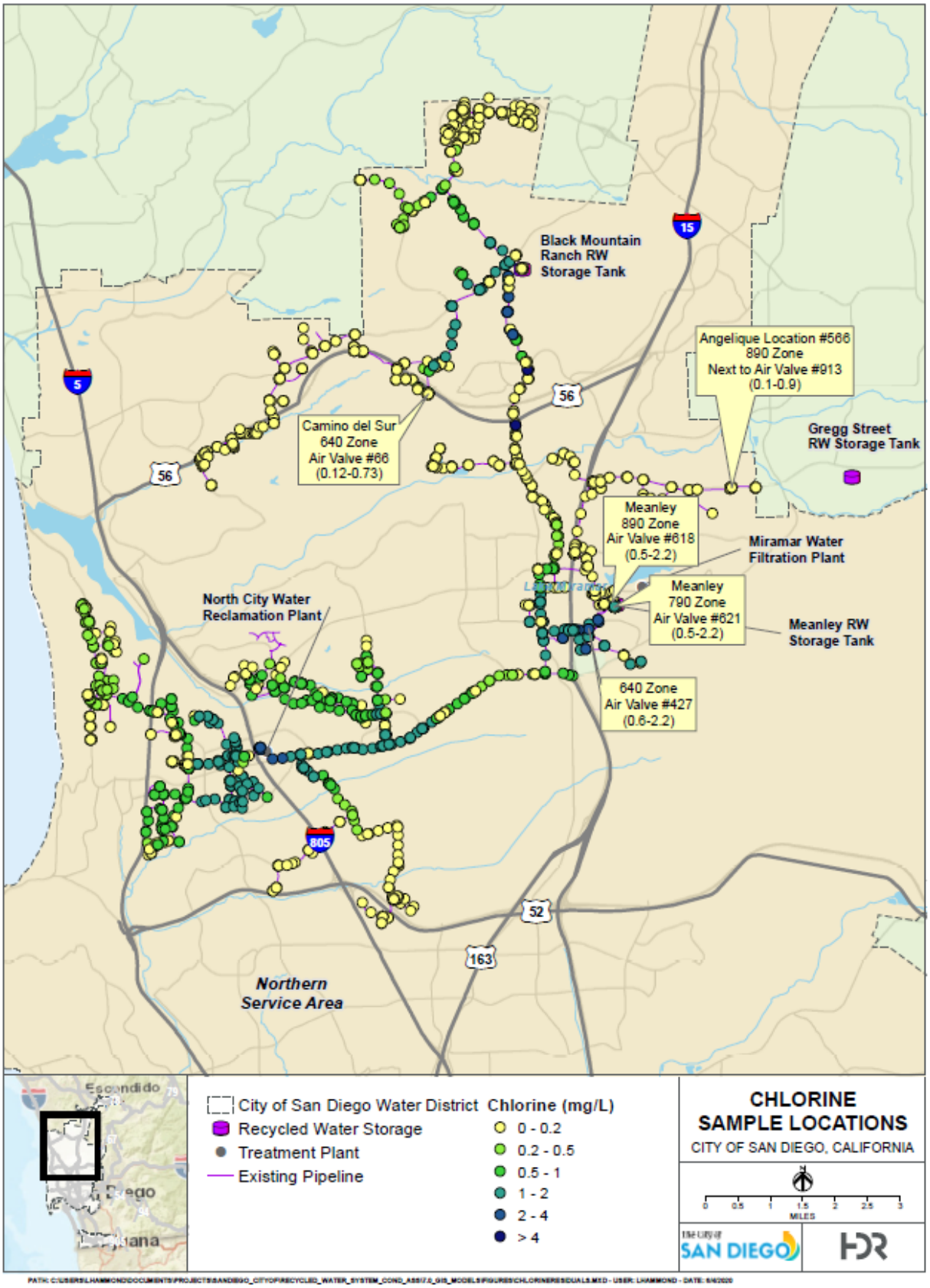


The water model was also used to estimate chlorine residuals throughout the City recycled water system. Ideally, chlorine residuals should be sufficient within the recycled water pipelines to prevent biofilm development, but should be <1 mg/L when delivered for irrigation use to protect plants.

Chlorinated recycled water originates at the NCWRP and additional chlorine is added at the Meanley and Black Mountain Ranch Tanks. For this analysis, it was assumed that the dosing of the system at each of these locations was at a rate of 2.4 mg/l. Results from the simulation are illustrated on Figure 5-9. It should be noted that the predicted chlorine residuals under winter demand conditions are based on the reported dosing concentrations at Meanley and Black Mountain Ranch Tanks. Although the hydraulic model has not been calibrated for chlorine residual analysis, the field data shows that the chlorine residual varied from 2.2 mg/L to a low of 0.1 mg/L at the 5 sites sampled in October/November 2019, which aligns with the model results.

The water quality model suggests, as illustrated by the yellow dots, that flows throughout the recycled water system do not carry chlorine residuals through the pipelines beyond areas near the dosed locations, which is primarily due to lower demands and pipeline flows in the upper portions of the NSA and along dead-end reaches towards the western portion of the NSA system.

Figure 5-9. Modeled Chlorine Residual under Minimum Demand Conditions



5.1.3 NSA Existing System Condition Assessment

The capacity analysis was only one part of the overall evaluation of the NSA infrastructure. An overall condition assessment was performed for the NSA pump stations, reservoirs, pressure reducing stations, and select transmission mains. These findings are included in the following technical memorandums submitted separately to the City:

- Pressure Reducing Station Condition Assessment Technical Memorandum
- Pump Station Condition Assessment Technical Memorandum
- Reservoirs Condition Assessment Technical Memorandum
- Pipeline Condition Assessment Technical Memorandum
- Valve Assessment Technical Memorandum
- SCADA System Technical Memorandum

There are a number of improvements and upgrades recommended in the NSA system related to condition assessment, which are summarized in a Condition Assessment Summary Technical Memorandum (included as Appendix C) and pertinent findings are included in Chapter 6 as part of the overall implementation plan.

5.1.4 Ultimate System Analysis

The main focus of the ultimate system recycled water system analysis is the City's planned implementation of Pure Water and how it will interact with the existing recycled water supply, given its seasonal nature and daily fluctuations. The City's ability to increase demand on the recycled water system in the NSA and serve potential customers identified in the CSA may be impacted by the commitments and goals of the Pure Water program. The analysis was intended to assess whether integrating the Pure Water program could present operational limitations and/or expansion constraints and to propose potential mitigation measures.

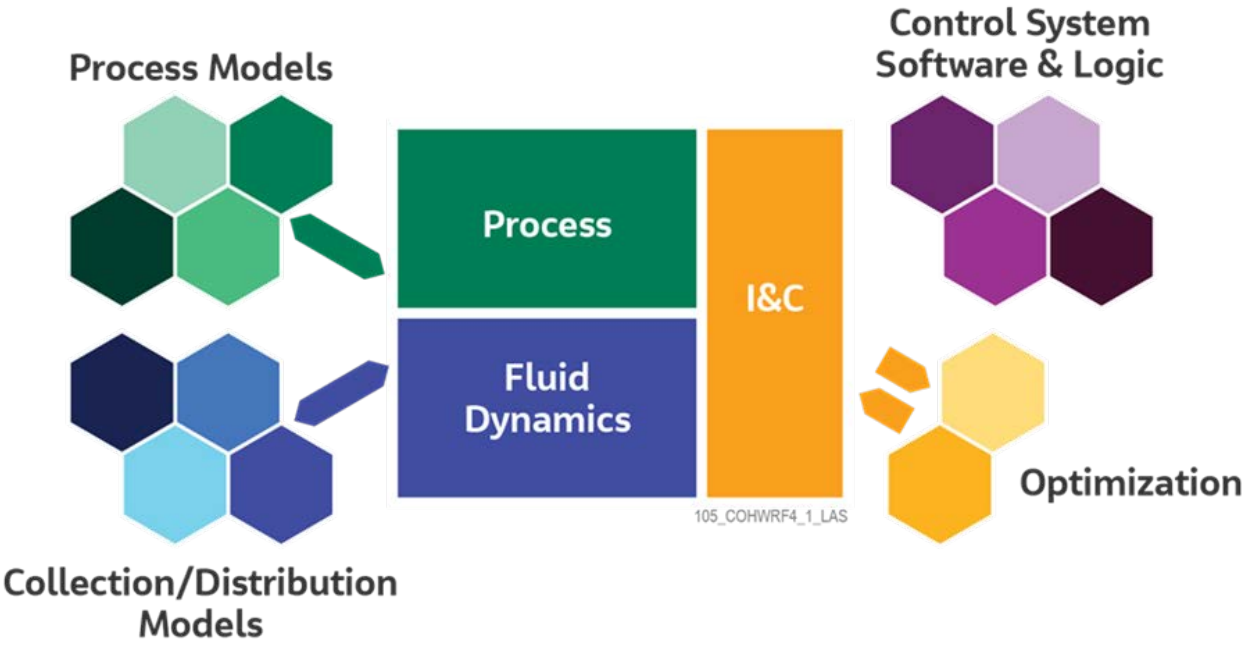
As presented in Chapter 3, the City's planned Pure Water program requires a tertiary expansion at NCWRP to accommodate a new constant supply to the NCPWF year round. The City plans to expand NCWRP from 30 mgd to 52 mgd and convey 30 mgd of tertiary water to the NCPWF. The Pure Water program also includes the Morena Pump Station and Pipelines project, which is necessary to increase wastewater flows to the NCWRP to meet both Pure Water and recycled water demands.

In order to evalaute the future integration with Pure Water and explore expansions of the NSA recycled water system, a modeling tool, previously developed for Pure Water known as "Replica", was leveraged. Replica is a suite of models and object libraries for dynamic simulation and optimization of facilities, created to analyze the wastewater supply and plant operations (tertiary and advanced water) for Pure Water. The Replica model components include:

- Conveyance and diversion structures
- Pump stations and in-plant storage
- Wastewater treatment facilities
- Water and advanced treatment facilities

A schematic of the process modeling is shown on Figure 5-10, below. The Replica model integrates system hydraulics, SCADA, and instrumentation and controls to allow for various scenario management and optimization of the systems, as discussed in Section 5.1.5.

Figure 5-10. Replica Model Schematic



5.1.4.1 Infill Customers and New Demands

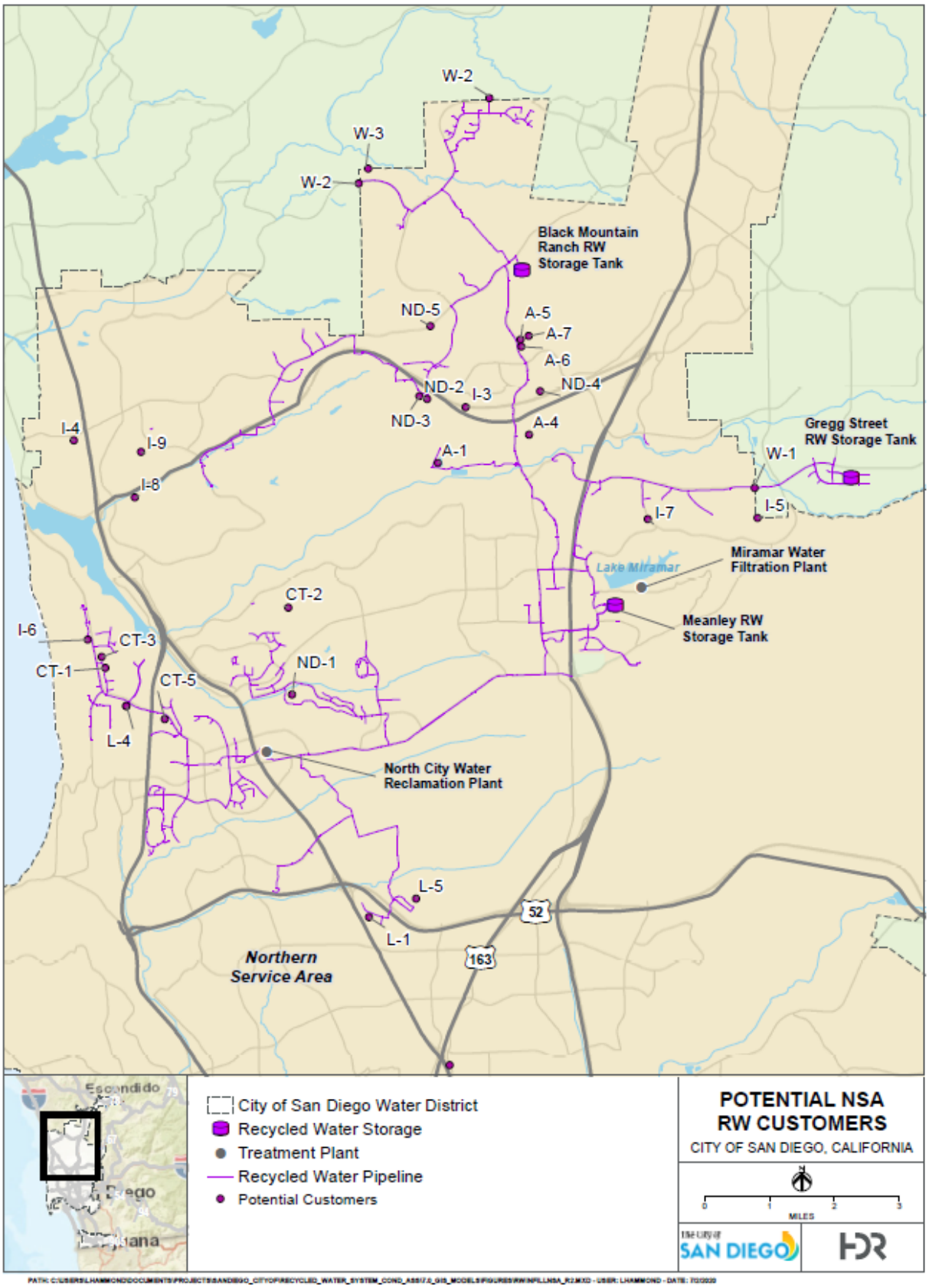
As presented in Chapter 4, the NSA infill customers are estimated to add a potential average demand of approximately 5,400 AFY or 4.8 mgd. The City's Metro Biosolids Center (MBC) expansion accounts for a little over one-third of this demand. The remainder of the identified future customers include converted irrigation and cooling tower use, increased demand from wholesale and large irrigation users, new developments, and additional retrofit opportunities for parks and schools.

This volume of potential new demand represents a conservative assumption to future demands as it would require several wholesale agencies, including SFID, OMWD and the City of Poway to take significantly larger flows. For the hydraulic analysis scenarios, these wholesale customers were assumed to take this flow at a constant rate and provide onsite storage to reduce large peaks on the City side. Future irrigation users were assumed to follow typical pressure zone diurnal demands. MBC future demands were also assumed to have similar demand patterns as existing demands.

5.1.4.2 Distribution System

Distribution system planning performed in previous studies were reviewed to provide a foundation for future alignments to reach infill customers that are not located directly beside the existing distribution system. Where feasible, future development plans were used as references for potential pipeline alignments. Although most of the infill customers along the existing distribution require minimal new distribution piping, several potential users identified would require pipeline expansions of the City system. Figure 5-11 presents potential future pipelines to serve the infill customers and facilities anticipated to be constructed by future developers such as 3 Roots and the Preserve at Torrey Highlands.

Figure 5-11. Ultimate NSA System Expansions



Pump Stations

Table 5-3 provides a summary of the future recycled water pump station capacity needs assuming an increase of annual demands of 4.8 mgd. The future NSA system has excess pumping capacity during the summer at all its pump stations, with the exception of the NCWRP Pump Station which becomes slightly deficient (by 1,328 gpm or 1.9 mgd) under maximum day demand assumptions. No recommendations are included for any updates to the NCWRP Pump Station at this time, given the uncertainties of future recycled water demands and supplies to wholesale customers. Once maximum day recycled water demands consistently exceed 15 mgd, then the City may begin to consider expansion of the 12,000 gpm or 17.2 mgd NCWRP Pump Station capacity.

Table 5-3. Ultimate Recycled Water System Pump Station Analysis

Pump Station[c]	No. of Pumps	Capacity Per Pump (gpm)	Total Capacity (gpm)	Firm Capacity[a] (gpm)	Zones Served	AAD (gpm)	MDD (gpm)	Surplus/ Deficit (gpm)
Canyonside	3	3,000	9,000	6,000	600, 825	1,300	2,210	3,790
Meanley Drive 890	3	1,250	3,750	2,500	890, 1028	900	1,530	970
Meanley Drive 790	4	550	2,200	1,650	790	100	170	1,480
NCWRP	3	6,000	18,000	12,000	ALL	7,840	13,328	-1,328
Gregg Street (Poway)[b]	3	1,500	4,500	3,000	1028	590	1,003	1,997

Notes:

[a] Firm Capacity is the pump station capacity with one pump on standby or out of service.

[b] The Gregg Street Pump Station is owned and operated by the City of Poway and serves the Poway 1028 Zone from the Gregg Street Tank.

[c] The City's Parks and Recreation Department owns booster pump stations downstream of the meters at Torrey Pines South and North Golf Courses to increase pressures and supply. These are not part of the public distribution system.

5.1.4.3 Reservoirs

Table 5-5 provides an assessment of future recycled water storage needs. The future NSA system will continue to have excess storage capacity during the summer time under ultimate demand conditions. No additional storage would be required to serve the potential ultimate maximum day demand assuming that the wholesale agencies could receive their demands on a 24 hour basis.

Table 5-4. Ultimate Recycled Water System Storage Tank Analysis

Storage Tank	Zone Served	Zone ADD (mgd)	MDD (ADD * 1.7)	Tank Capacity (MG)	Storage Required (2/3 * MDD)	Total Required Storage (MG)	Surplus/ Deficit
Black Mountain Ranch[a]	600	1.41	2.40	3.0	1.60	2.11	0.89
	825	0.45	0.76		0.51		
Meanley[b]	500	0.24	0.41	9.0	0.27	9.22	-0.22
	550	1.44	2.45		1.63		
	640	6.32	10.74		7.16		
	790	0.14	0.23		0.16		
Gregg Street (Poway)[c]	890	0.44	0.74	2.0	0.50	1.46	0.54
	1028	0.85	1.44		0.96		

Notes:

[a] Zones 500 and 640 are no longer served by Black Mountain Ranch Tank when the Merge 56 connection pipeline is constructed.

[b] Although Meanley shows a minor deficit this includes a significant new demand at the Metro Biosolids Center, which may not require as much operational storage as projected under ultimate conditions.

[c] The Gregg Street Tank is owned by the City of Poway and includes operational storage for both the City and Poway.

5.1.4.4 Ultimate System Analysis Summary

The ultimate system modeling analysis, which included the infill demands and assumed diurnal curves, indicates that the existing system is sufficient to supply the additional customers identified. The results demonstrate the capacity and robustness of the City's recycled water system to add future customers. A summary of findings is noted below:

- The Meanley Tank and NCWRP Pump Station can be controlled to provide increased operational storage to meet future demands and demonstrate adequate tank refilling (Figure 5-12).
- The Canyonside PS will operate longer when compared to the existing system but has sufficient capacity to deliver the larger wholesale demands to the north (Figure 5-13).
- Minimum pressures are still within design criteria (Figure 5-14).
- Pipeline velocities marginally increase under ultimate demands but remain well within design criteria (Figure 5-15).

The ultimate recycled water demand modeled also allows for a continuous supply of 30 mgd to the NCPWF during maximum day demand conditions. This is further discussed in Section 5.1.5 with the Replica model discussion.

Figure 5-12. Ultimate Tank Peak Hour Turnover

Figure 5-13. NSA PS Ultimate Modeled Flows

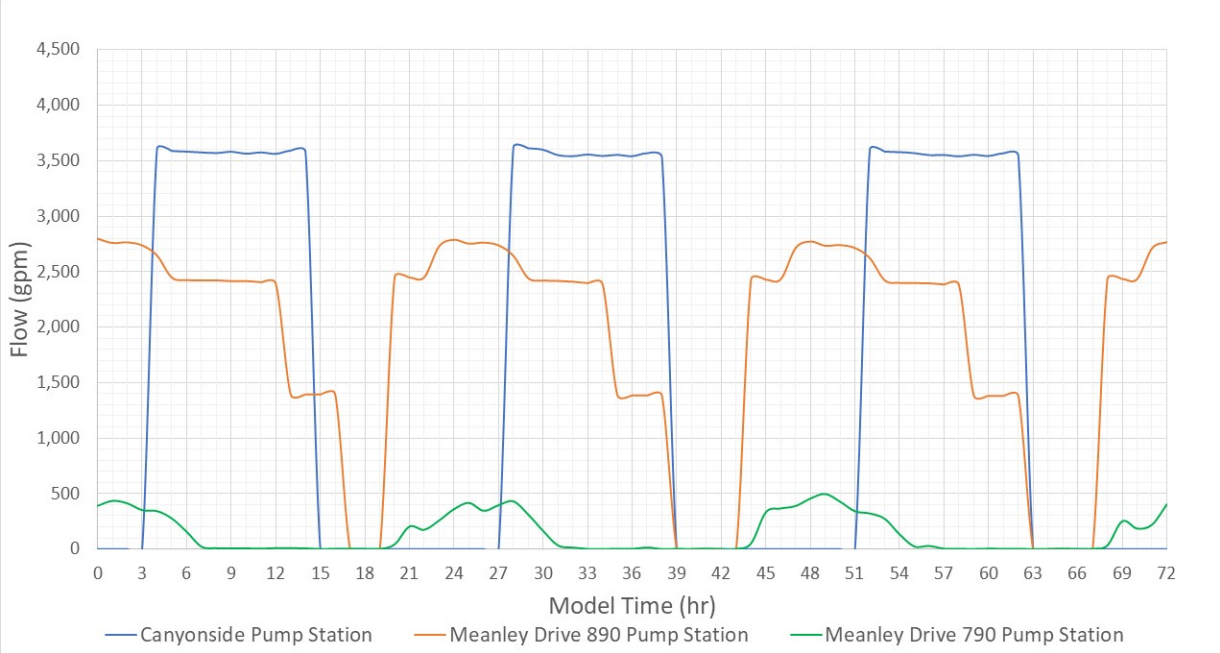


Figure 5-14. Ultimate System Minimum Pressures

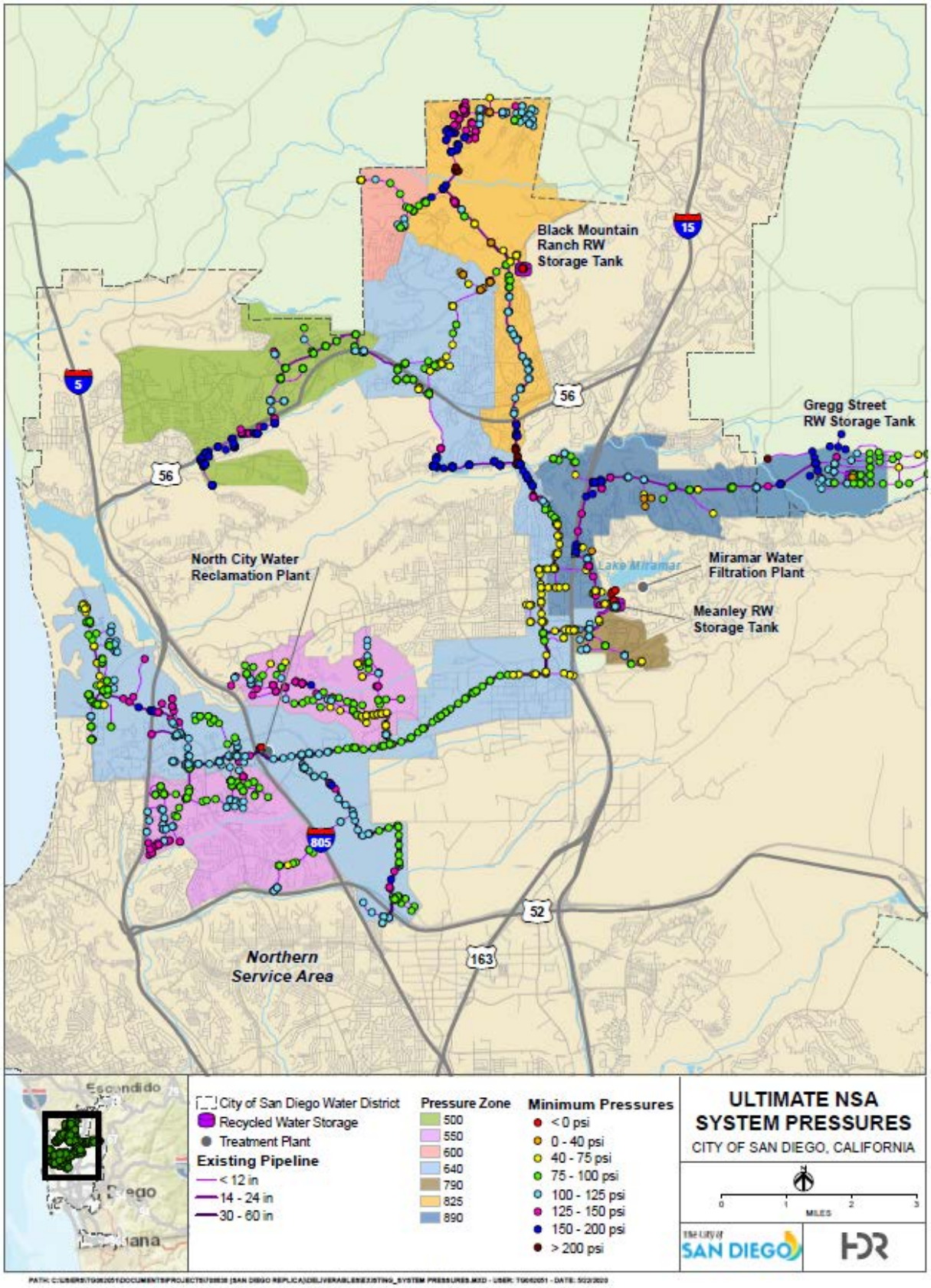
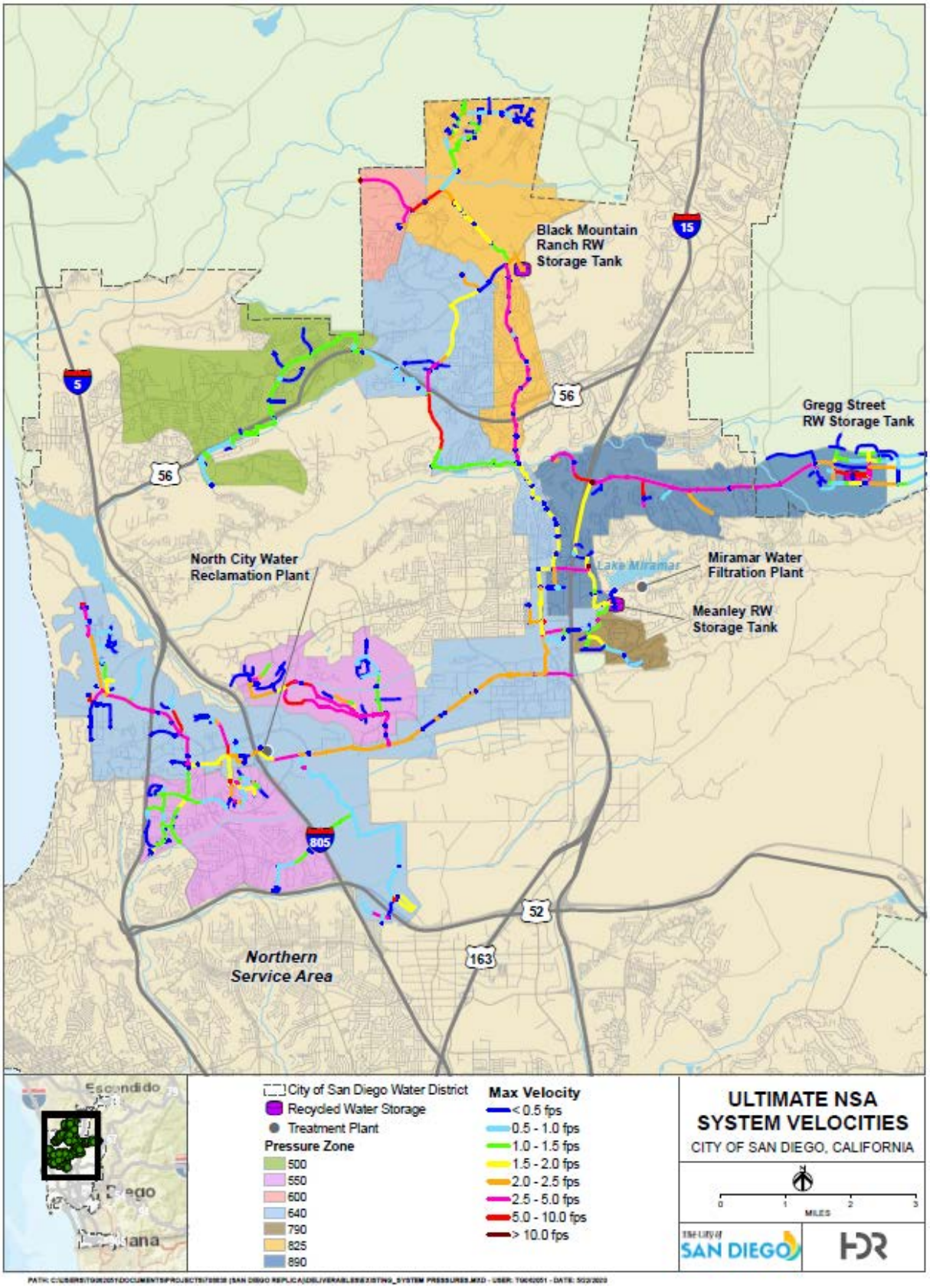


Figure 5-15. Ultimate System Maximum Pipe Velocity



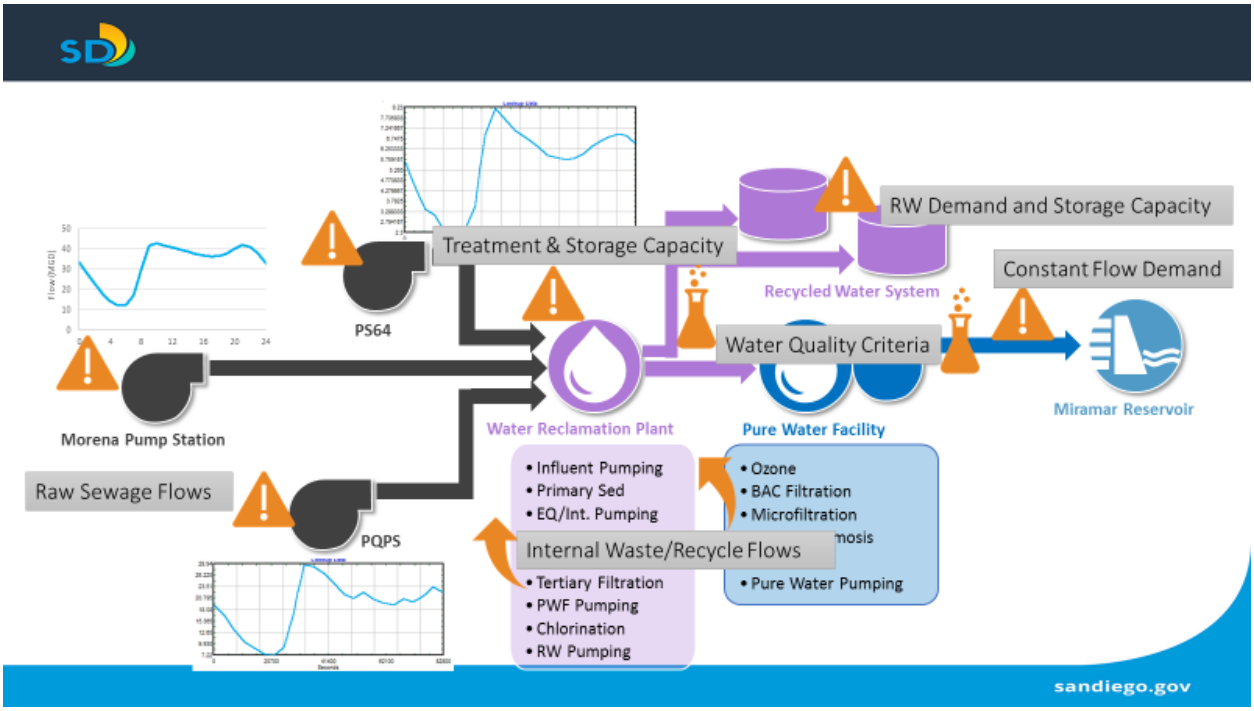
5.1.5 Replica Modeling: Opportunities and Constraints

A critical component of the future recycled water system is to operate seamlessly with the City's Pure Water program. This section provides an overview of how the Replica model is being used to identify opportunities and constraints associated with simultaneously operating the recycled water system and the Pure Water program using the same source of wastewater.

Shown on Figure 5-16 is a schematic of the City's Pure Water system and the components included in the Replica model. Key benefits of the Replica model include:

- Digital representation of physical assets
- Improved dual system understanding and operation
- Ability to optimize system performance
- Effectively evaluates complex issued and reduces risk

Figure 5-16. Replica Model Schematic



The City's NCWRP expansion design is based on a maximum day recycled water supply of 20 mgd. Currently, the maximum day demand within the NSA is approximately 12.5 mgd, leaving potential expansion within the NSA for 7.5 mgd of maximum day demand. In order to fully simulate the NSA system, the NSA InfoWater model was linked to the Replica model and run as one overall integrated model. This allowed for a simultaneous evaluation of both the NCWRP and NCPWF operations as well as the recycled water distribution system, including pump station and tank operations.

One of the challenges with Pure Water is maintaining a constant flow from NCWRP to the NCPWF at all times. This puts the constraint on wastewater inflows rather than NCWRP treatment capacity. Currently, NCWRP is operated as a scalping plant, and does not receive more wastewater than it needs to meet its permit requirements. In order to boost flow to NCWRP under the Pure Water program, the Morena Pump Station will send up to 30 mgd of wastewater flows to NCWRP. Critical to overall operations is the operational set up at Morena Pump Station to allow wastewater to bypass

the pump station when recycled water demands are low in winter months, to go to Point Loma WWTP, if needed. This new flow dynamic will become an integral part of the Pure Water and recycled water operations. Shown on Figure 5-17 is a screenshot from Replica illustrating a peak day operation and the importance of the Morena Pump Station acting as a critical flow control for both high and low flows for the recycled water system.

The schematic below is a close-up showing the pumping operations of the tertiary system, including the utility pumps, backwash pumps, and two large pumps on at NCWRP Pump Station (noted running two pumps by the green light). As noted in Section 5.1.2.4, one consideration to reduce the start and stop of the large pumping units at NCWRP Pump Station during low flow (winter demand) conditions is to potentially use the onsite utility pumps to supply the recycled water distribution system, instead of the large pumps.

Figure 5-9 illustrates the Replica model output displaying various pump and tank level status within the recycled water distribution system. By interconnecting the entire Pure Water system, including wastewater influent, with the recycled water system, the Replica model and predict how an operational change in either system may impact the entire system.

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Figure 5-17. NCWRP Expansion Schematic

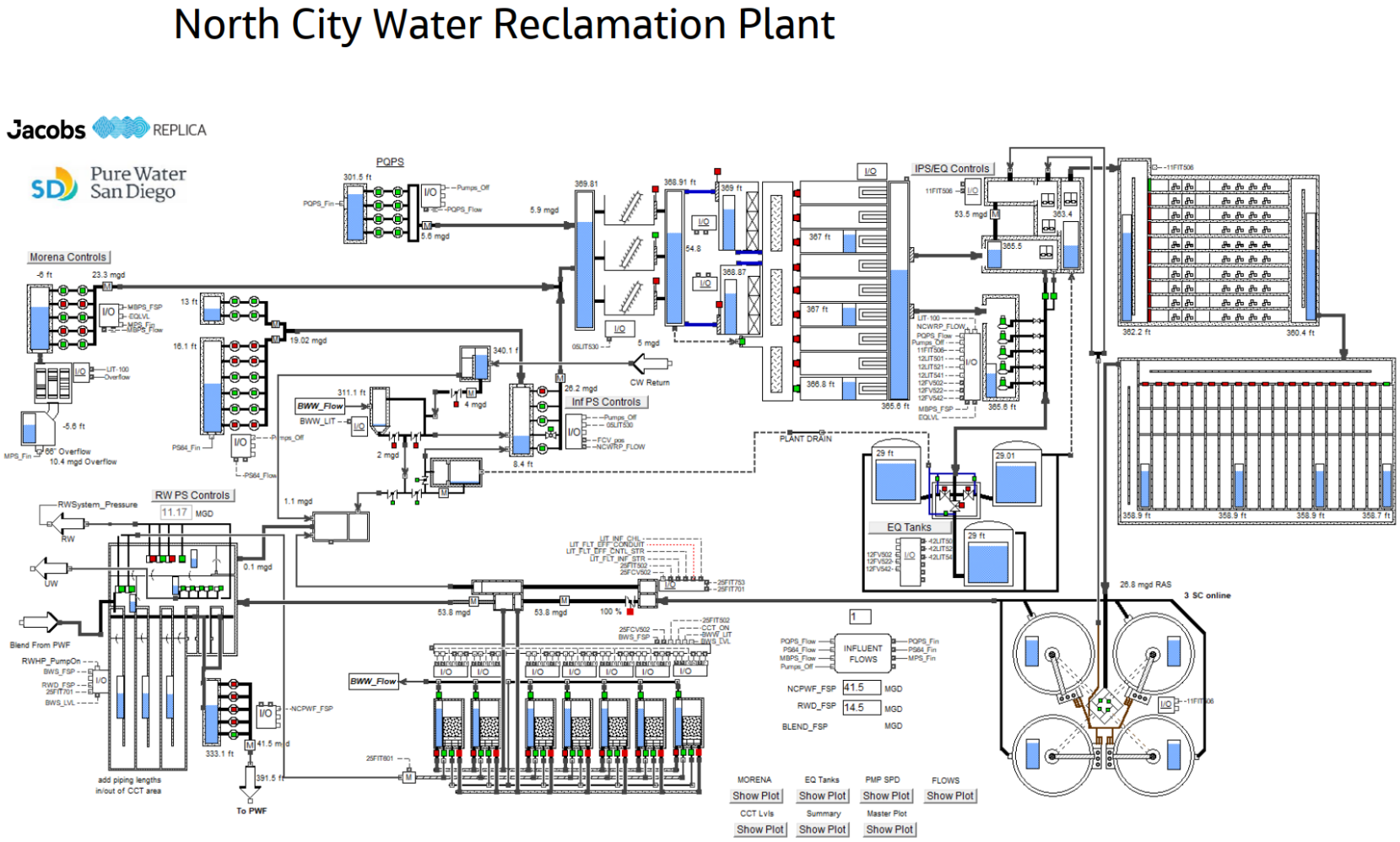


Figure 5-18. NCWRP Expansion Tertiary Pump Schematic

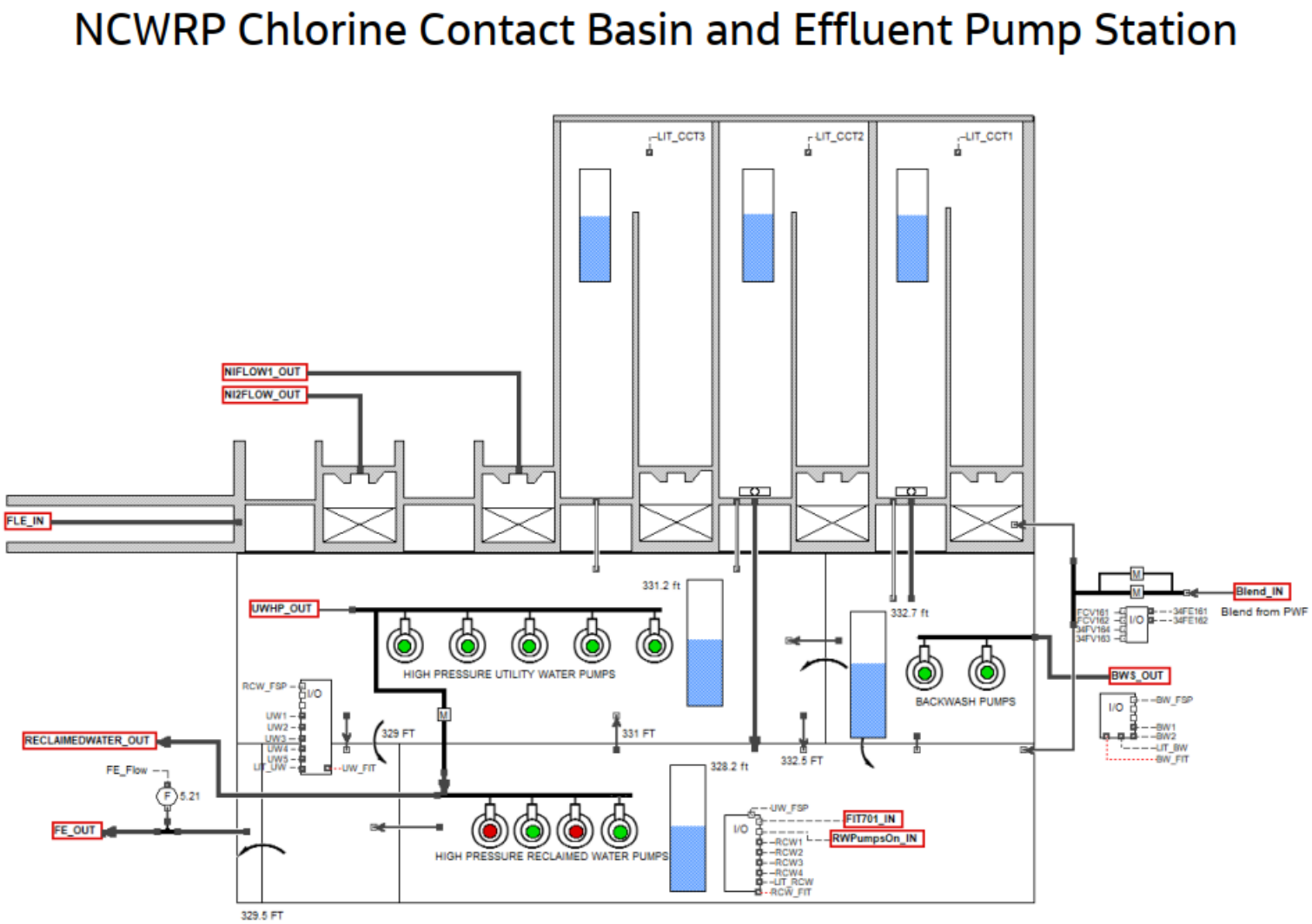
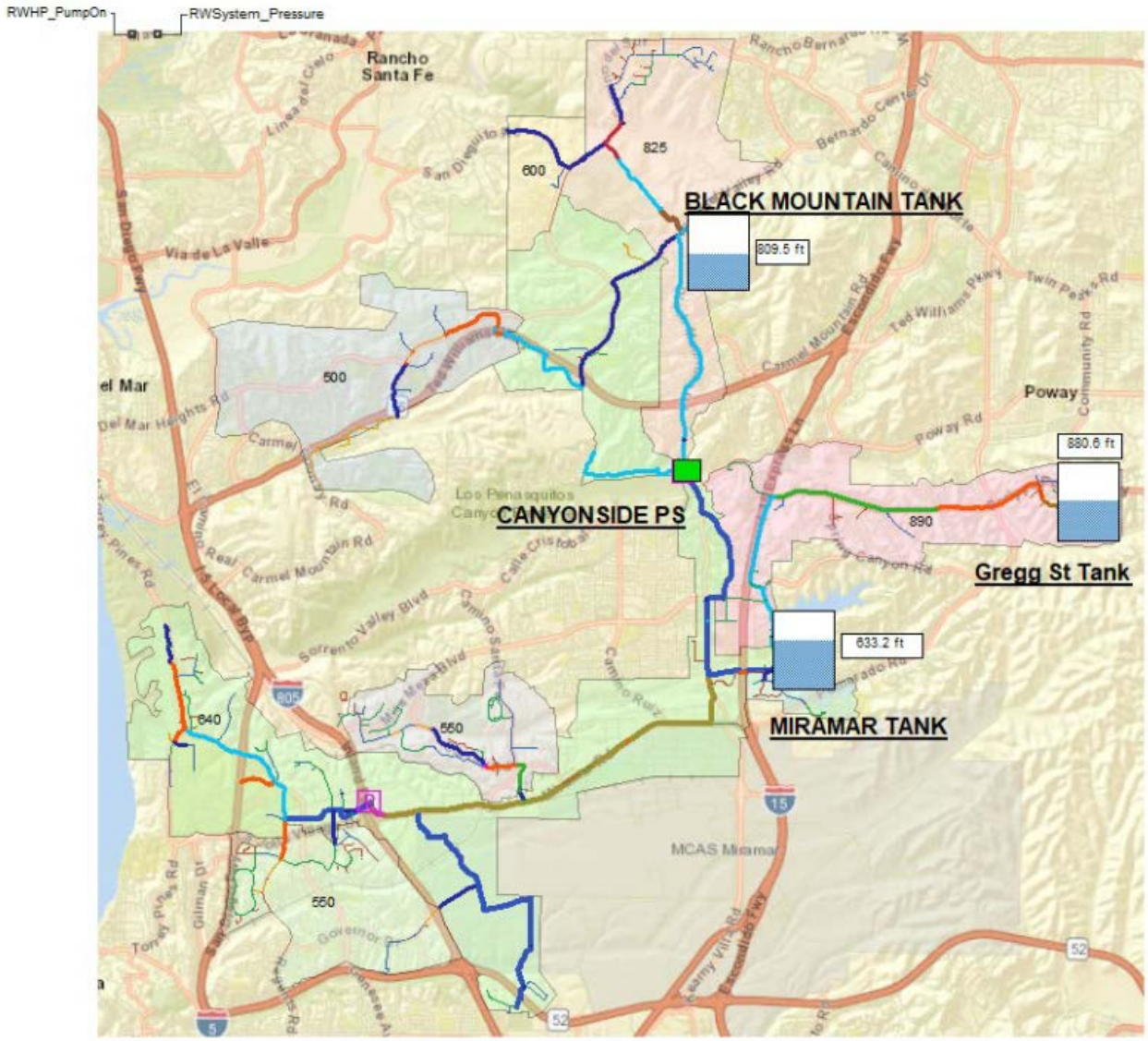


Figure 5-19. Replica Model Output Example for Recycled Water Tank Levels



The Pure Water system has been designed to maintain the City's recycled water quality target of 1,000 mg/L TDS. This will require, at varying flows, the need to blend recycled water with Pure Water to improve water quality. The maximum design amount of blended flow from the NCPWF to get TDS below 1,000 mg/L is approximately 9 to 10 mgd. The blending water pipeline between the NCPWF and NCWRP has a capacity of about 16 to 17 mgd to allow for short term increases in blending water to NCWRP, if needed. This high flow rate, however, would drastically cut the flow delivered for reservoir augmentation. The Replica tool should provide the City a valuable operations model to dial-in potential blending scenarios accounting for the seasonal variability of recycled water demands.

The City plans to utilize the proposed on-site equalization basins in managing influent flows for the Pure Water program. Should the City need to look at storage management or optimization, the Replica model can be used to analyze any benefits of recycled water equalization.

5.1.6 Planning Level Costs for NSA Infill Expansion

The cost estimates developed for this study are intended to be planning level estimates that provide an order of magnitude opinion of cost. Allowances for project contingencies consistent with an "Order of Magnitude" estimate are also included in the project costs.

Approximately 60,000 feet of small diameter pipelines would be required to extend the recycled water system and further expand the infill demand for the NSA. Table 5-5 summarizes proposed pipeline sizes and costs to serve the potential new customers. As the City Recycled Water Program no longer uses pipelines less than 8-inch in diameter for expansion in the right-of-way, costs include the linear feet of 8-inch pipe (at an estimated cost of $200 per liner foot) needed to reach that customer from the existing system and a fixed cost of $100,000 to retrofit the site. The retrofit costs may vary depending on the size of the site, however this represents a reasonable assumption of cost to convert existing irrigation systems or cooling towers for recycled water use. Note that some customers are existing and will require no additional infrastructure to increase recycled water demand to their site.

The return on investment (ROI) measures the annual cost savings associated with converting from potable water to recycled water divided by the total cost of improvements. The payback period, or ROI, is how many years it takes for that infill site to see a positive return on the investment. Ideally, the return on investment would occur within a 5 to 10 year timeframe. Those with longer ROI payback periods may not be ideal candidates for conversion to recycled water.

Another way to look at the value of conversion is to evaluate the relative cost per AF of the conversion. This is calculated by amortizing the total cost over 30 years at 2.5% interest and dividing that by the annual volume of recycled water the site will use, in AFY. The cost per AF would ideally be below $1,000 per AF, which coincides with a ROI of less than 10 years.

Table 5-5. Summary of Potential NSA Infill Customers Costs

Customer Type/ ID	Customer Name	Recycled Water Demand Net increase (AFY)	New Pipelines to Future Users				
			Length (ft)	Price per Linear Foot (8-inch pipe)	Total Cost[a]	ROI[b] (years)	Annualized Cost per AF[c]
Previously Identified Infill Customers that have not connected							
CT-1	General Atomics (existing)[d]	37.40	0	$200	$100,000	1.3	$128
CT-2	Gen Probe Inc	29.10	4,500	$200	$1,000,000	16.1	$1,642
CT-3	Novartis Institute[d]	55.70	136	$200	$127,200	1.1	$109
CT-5	Scripps Memorial Hospital[d]	110.70	330	$200	$166,000	0.7	$72
I-3	CALTRANS (8321 Carmel Mtn Rd)	6.70	3,000	$200	$700,000	48.9	$4,992
I-4	CALTRANS (2502 Del Mar Heights Rd)	9.30	14,400	$200	$2,980,000	150.1	$15,309
I-5	PARK & REC/COMM PARK (11470 Cypress Canyon Rd)	22.40	2,750	$200	$650,000	13.6	$1,386
I-6	PARK & REC/GC (11580 N Torrey Pines Rd)	12.00	300	$200	$160,000	6.2	$637
I-7	PARK & REC/OPEN SPACE (11554 Scripps Ranch Bl)	16.30	1,050	$200	$310,000	8.9	$909
I-8	SAN DIEGO JEWISH ACADEMY	27.00	6,700	$200	$1,440,000	25.0	$2,548
I-9	SAN DIEGUITO UNION HIGH – Carmel Valley Middle School	16.90	5,500	$200	$1,200,000	33.3	$3,392
	Subtotal - Previously Identified Infill Customers	**343.50**	**38,666**	**—**	**$9,133,200**	**—**	**—**
Large and Wholesale Customers							
W-1	City of Poway Wholesale Meter (existing)	570.00	—	—	—	—	—
W-2	Olivenhain MWD Wholesale Meter (existing)	200.00	—	—	—	—	—
W-3	SFID Wholesale Meter (new)[e]	850.00	—	—	—	—	—
	CalTrans (35 meters) (near completion)	135.00	—	—	—	—	—
L-1	Caltrans – Copley Drive	66.00	—	—	—	—	—
L-2	Caltrans (I-8)	105.00	13,600	$200	$2,720,000	12.1	$1,238
L-3	MCAS Miramar Master Meter (existing)	188.00	—	—	—	—	—
L-4	UCSD (4 Master) (existing)	291.00	—	—	—	—	—
L-5	Metro Biosolids Center (existing)	2,000.00	—	—	—	—	—

Table 5-5. Summary of Potential NSA Infill Customers Costs

Customer Type/ ID	Customer Name	Recycled Water Demand Net increase (AFY)	New Pipelines to Future Users				
			Length (ft)	Price per Linear Foot (8-inch pipe)	Total Cost[a]	ROI[b] (years)	Annualized Cost per AF[c]
	Subtotal - Large and Wholesale Customers	**4,405.00**	**14,000**	**—**	**$2,720,000**	**—**	**—**
New Developments							
ND-1	3Roots	342.00	600	$200	$220,000	0.3	$31
ND-2	Merge 56	32.00	150	$200	$130,000	1.9	$194
ND-3	Preserve at Torrey Highlands	8.00	350	$200	$170,000	10.0	$1,015
ND-4	Penasquitos Casa Blanca HOA	33.00	1,700	$200	$440,000	6.2	$637
ND-5	Fairbanks Highlands HOA	33.00	3,600	$200	$820,000	11.6	$1,187
	Subtotal - New Developments	**448.00**	**6,400**	**—**	**$1,780,000**	**—**	**—**
Additional Opportunities							
A-1	PUSD Park Village Elementary School	7.00	350	$200	$170,000	11.4	$1,160
A-2	PUSD Mesa Verde Middle School	7.00	0	$200	$100,000	6.7	$683
A-3	PUSD Adobe Bluffs Elementary School	12.00	1,000	$200	$300,000	11.7	$1,194
A-4	PUSD Canyon View Elementary School	7.00	800	$200	$260,000	17.4	$1,775
A-5	PUSD Black Mountain Middle School and soccer fields	28.00	310	$200	$162,000	2.7	$276
A-6	PUSD Sunset Hills Elementary School	16.00	330	$200	$166,000	4.9	$496
A-7	PUSD Mount Carmel HS and Baseball Fields	28.00	1,100	$200	$320,000	5.4	$546
A-8	PUSD Sundance Elementary	9.00	2,100	$200	$520,000	27.1	$2,760
A-11	Del Mar Mesa HOA (no irrigation meters identified in this area)	—	—	—	—	—	—

Table 5-5. Summary of Potential NSA Infill Customers Costs

Customer Type/ ID	Customer Name	Recycled Water Demand Net increase (AFY)	New Pipelines to Future Users				
			Length (ft)	Price per Linear Foot (8-inch pipe)	Total Cost[a]	ROI[b] (years)	Annualized Cost per AF[c]
Subtotal - Additional Opportunities		**114.00**	**5,990**	**—**	**$1,998,000**	**—**	**—**
Grand Total - Potential NSA Infill Customers		**5,371.00**	**59,756**	**—**	**$15,631,200**	**—**	**—**

Notes:

[a] Unit price includes contingencies and Total Price includes $100k onsite retrofit cost

[b] ROI calculation assumes:
Recycled Water cost is at $1.734 per hundred cubic feet (HCF = 748 gallons) as of 11/21/2018
Potable Water cost is at $6.032 per HCF for irrigation customers

[c] Annualized cost assumes 2.5% interest rate and 30 year loan

[d] Customer has been connected to the recycled water system following this master plan baseline demand year of 2017.

[e] Assumes cost would be borne by SFID

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5.2 Southern Service Area

As noted in previous sections of this report, opportunities for expansion of the City's recycled water system in the SSA is limited to two major customers, OWD and Caltrans. Opportunities to expand recycled water use in the SSA are limited, due to the challenge in diverting additional wastewater from the Grove Avenue Pump Station to supply the SBWRP, and an increasing level of total dissolved solids in the wastewater influent. The City does not have plans to expand the City-owned portion of the distribution system.

5.2.1 Opportunities and Constraints

As noted in Section 4.2.1.2, OWD's agreement to purchase recycled water from the City expires in December 2026. OWD will need to amend the agreement to allow 6,000 AFY or more of recycled water to be delivered to meet OWD's 2050 demands, if source water to the SBWRP is available to expand recycled water production, and extend the term beyond December 2026. While additional supply to OWD is technically feasible with future diversion of wastewater flows to SBWRP, the City and OWD are in the process of resolving an issue related to wholesale pricing of recycled water that is putting on hold any additional purchase of recycled water from the City.

Assuming that OWD and the City come to agreement on the recycled water purchase agreement, the 2015 OWD Water Facilities Master Plan identifies future expansions of the City of Chula Vista's Otay Ranch development area. OWD has abandoned any future plans to use recycled water in the Otay Mesa area, a large area of undeveloped industrial lands, due to the high cost to extend the transmission system. In 2015, OWD's Board issued a moratorium on requiring recycled water expansion in Otay Mesa to serve future development. A majority of the planned industrial development in Otay Mesa continues to be warehouse and distribution type uses with minimal water demand.

Another opportunity for demand growth in the SSA includes Caltrans' expansion of service to landscaped areas along SR 905, SR 125, and the new SR 11 to the Port of Entry. The 2017 South Bay Recycled Water Project Initiation report, developed by CalTrans, noted that approximately 320 acres of freeway landscaping within the SSA is served with potable water due to the distance of existing CalTrans meter locations from recycled water pipelines. This study proposed three additional connections to the SSA recycled water system. The first two connections could be served from the OWD transmission main, and the third connection at Palomar Street would have to be served from OWD's recycled water distribution system. Further extension of the recycled water system along SR-905, east of the City boundary within the OWD service area, would require an agreement with OWD. Should the westerly portion of Otay Mesa, which lies within the City boundary, begin to see new residential development as part of the Otay Mesa Community Plan, there may be an opportunity to utilize the Caltrans corridor to "wheel" recycled water to serve irrigation water for streetscapes, parks and schools.

No improvements to the City's recycled water infrastructure system in the SSA are required for these opportunities to come to fruition. The feasibility of expansion of the SSA system relies heavily on the City's ability to negotiate a new recycled water purchase agreement with OWD.

5.3 New Central San Diego Service Area

As part of the Pure Water Program, there are plans to locate a WRP (tertiary treatment) at Harbor Drive and pump tertiary-treated recycled water along the I-8 corridor to a PWF in Mission Valley. The recycled water would be conveyed, from the proposed CAWRP near Harbor Drive to the proposed CAPWF near SDCCU Stadium, via a large, low pressure transmission main through Mission Valley. Branching off of that conveyance system, recycled water could feasibly be delivered within the CSA, extending the recycled water system to serve customers along the I-8/Friars Road corridor in Mission Valley. However, booster pump stations may be required to serve customers. The proposed alignment of the conveyance pipeline and potential facilities are shown on Figure 5-20.

5.3.1 Opportunities and Constraints

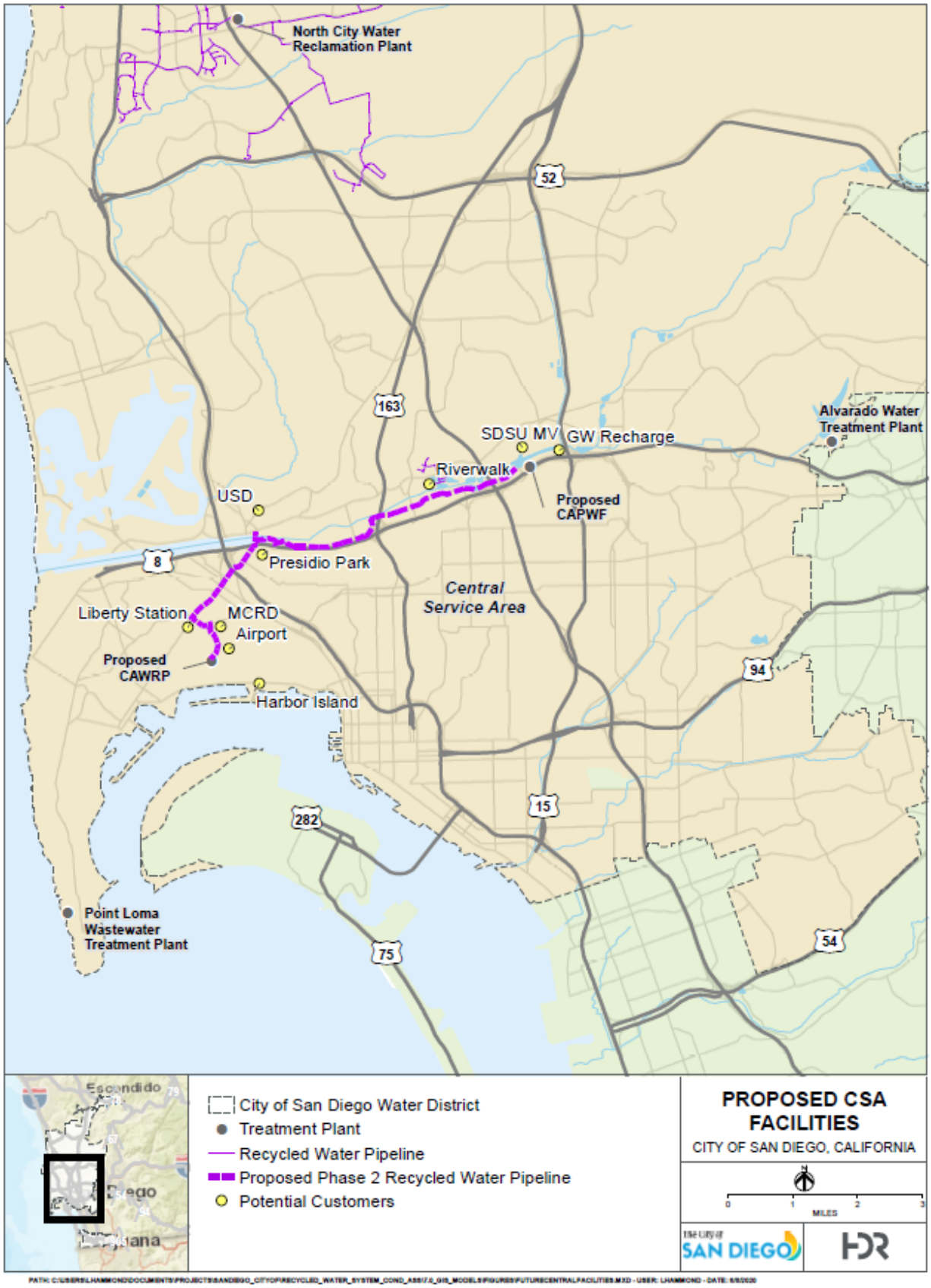
Phase 2 of the City's Pure Water Program may offer new opportunities to tap several major recycled water customers in the CSA. Although the City first commitment is to meet the goal of 83 mgd Pure Water by 2035, a marginal increase in tertiary supply may be efficient and economical to achieve new recycled water supplies for the CSA. The City is currently studying alternative siting locations for these facilities. Opportunities to serve customers off of the proposed transmission main, which will convey tertiary treated water to the pure water facility, will depend on the location of tertiary treatment facility.

The greatest potential for developing recycled water demand in the CSA is based on the City's selection of a new CAWRP at the Harbor Drive site adjacent to the San Diego Airport. The City is currently studying the alignment and hydraulics of the transmission system, which would convey tertiary water to the CAPWF. The transmission main is anticipated to operate at relative low pressures to deliver tertiary water approximately 10 miles through Mission Valley, to the headworks of the CAPWF.

The potential for recycled water use in the CSA was detailed in Table 4-14, identifying over 650 AFY (0.59 mgd) of average annual demands in proximity to the proposed transmission main. The feasibility of tapping into this main and delivering recycled water to neighboring sites will take coordination with the Pure Water Program to develop 5 to 10 connection points along the transmission main. Given the lower pressure of the transmission system, irrigation booster pumps would likely be required. In most cases, these booster pumps would be private and downstream of the meter, except for USD and Presidio, where possibly a small City booster pump and up to a mile of pipe would be needed.

Outreach to the potential recycled water customers identified is highly recommended to gauge interest in and ability to fund onsite retrofits in order to accommodate recycled water service. As the alignment of the proposed transmission main becomes more definitive, then planning level costs for constructing recycled water facilities to serve the interested customers can be developed. This new CSA system could offset over 600 AFY and up to 1 mgd of potable water use during summer months.

Figure 5-20. Proposed CSA Facilities



5.4 San Pasqual Conceptual Service Area

The San Pasqual Service Area is not a feasible expansion for the City at this time, primarily due to its distance from an existing recycled water supply source in the City of San Diego or the City of Escondido. As noted in Section 4.4, the City's former San Pasqual Recycling Plant and distribution to irrigation customers in Rancho Bernardo has been abandoned. The City continues to utilize the recycled pipeline, charged with potable water, to serve irrigation meters. In order to supply recycled water from Escondido, approximately 10,000 linear feet of 8-inch pipe would be needed connect Escondido's existing recycled water system, near Kit Carson Park in Escondido, across the San Pasqual Basin to the City's existing pipeline to serve a limited number of irrigation meters.

The City, in association with the County of San Diego, is currently preparing the San Pasqual Valley Groundwater Sustainability Plan, as required by the 2014 SGMA legislation. The Plan will look at long term sustainability of the basin and the potential for recharge and extraction opportunities using recycled water from Escondido. If a recharge program comes to fruition, it may be feasible for the City to develop a small non potable supply source for local irrigation customers at that time.

6 Implementation

This chapter provides an implementation plan for operation optimization and infill development, as well as repair and rehabilitation of the existing recycled water system for efficient integrated operations with the future Pure Water Program. This Master Plan has focused primarily on the recycled water operation optimization and infill development nominally increasing annual reuse demand. As part of the same project, on a parallel track, the condition assessment of the existing system was performed, and improvement recommendations developed. Individual technical memoranda and a summary Condition Assessment Technical Memorandum, included in Appendix C, was prepared detailing the approach, findings and recommendations associated with the assessment of the system pipelines, valves, reservoirs and pump stations. The repair and replacement recommendations are included in this master plan's implementation plan. These improvements are an essential element to enhance existing system operations and prepare for future operations with Pure Water.

This implementation plan is intended to be adaptable, as the City moves forward with the integration of its Pure Water Program with the operation of the recycled water program. An updated Recycled Water System Operations and Maintenance Manual, included in Appendix A, provides recommendations for on-going preventive maintenance activities.

6.1 Optimization Recommendations

Currently the recycled water system operates relatively efficiently, with sufficient pipeline, pump station and storage capacity to meet average and peak day demands, as much of the backbone system was originally designed to accommodate higher anticipated demands. However, during peak hourly demands, some customers are irrigating for a short time at the beginning of the allowable 8-hour irrigation window, causing a strain on portions of the system. With focused demand management, these peaks can be mitigated by distributing them across longer irrigation periods within the 8 hour window.

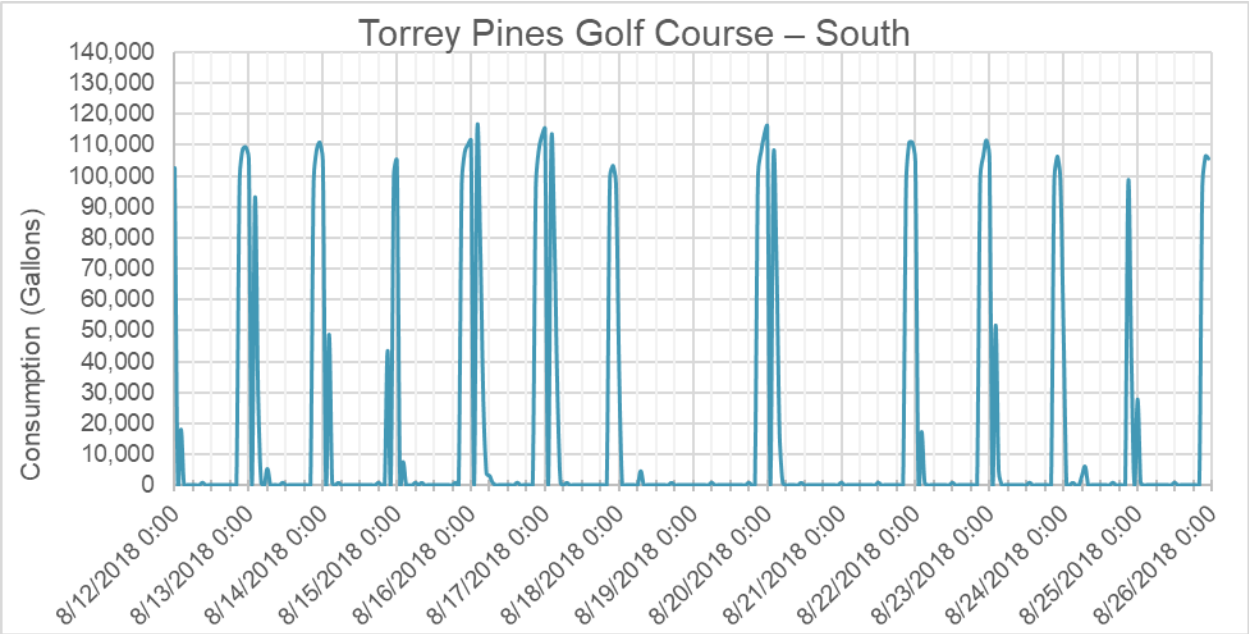
High pressures are evident in the very northern part of the NSA recycled Water system, due to topography variations, which could be mitigated with a new pressure reducing station. During low demand conditions, typically in winter months, recycled water may remain in the system for longer periods of time, allowing water age to increase. Satellite chlorination use at storage tanks may improve water quality in the system. Use of daily operational storage, especially during summer months, can be maximized to promote more constant pumping, which will be more desirable when Pure Water comes on-line.

These issues and recommendations are discussed in detail in the following paragraphs.

6.1.1 Demand Management

There are a number of irrigation users, including Torrey Pines Golf Course, that peak over a short irrigation window starting at 10 pm and continued for only 3 to 4 hours, as shown on Figure 6-1. Ideally some of these customers could extend their irrigation over a longer period (6 to 8 hours) to reduce overlapping peak hour demands within the NSA.

Figure 6-1. Peak Hourly Recycled Water Use at Torrey Pines South Golf Course



Recommendation: It is recommended that the City explore, for the top five recycled water customers, the possibility of demand management by increasing their irrigation windows to reduce peak hourly demands. The City should develop remote reading of the AMI metering data and begin to reach out to several of the major users to discuss opportunities for minor adjustments to their irrigation cycles. This would also help to foster a partnership with the end user in delivering recycled water. Although not as critical today, this will help the City in the future in managing the Pure Water system at NCWRP, which will desire a more constant supply operations of the recycled water system.

Infill customers identified within this Master Plan could potentially add 5,400 AFY or 4.8 mgd; a major portion includes expanded wholesale customers and the City's MBC expansion. Some of these potential customers have already reached out to the City for support. Others, such as local school districts with multiple sites, or potential wholesale customers would benefit from direct outreach from City staff.

Recommendation: Develop a prioritized, targeted outreach program for infill customers identified in the Master Plan to initiate discussions regarding recycled water service and potential return on investments for those customers.

Recommendation: Contact and meet with OMWD, Poway, and SFID to initiate discussions regarding future increases in supply.

In the winter months when demand is low, in order for the City to supply recycled water, the NCWRP tertiary filters still must be operated at minimum flow rates. During these periods the NCWRP Pump Station will periodically fill the Meanley Tank based on level control. However, when the pump station is off, tertiary flows cannot be pumped into the NSA and these flows are diverted to the PLWWTP. Until these tertiary flows can all be conveyed to the NCPWF as part of Pure Water operations, the City will need to continue to operate in this mode.

Recommendation: To reduce the start and stop of the large pumping units at NCWRP Pump Station during these low flows, the City may consider using the onsite utility pumps, which includes five pumps each rated for approximately 1,250 gpm and 300 feet of head. In reviewing the pump curves, it appears this pump station may offer the City an efficient alternative to supplying low flows during the winter months while minimizing the use of the high capacity pumps, potentially reducing energy costs. This would require some control and piping upgrades. Ultimately, with Pure Water, the City's goal at NCWRP is to only use the overflow weir to PLWWTP in case of emergency.

Due to the limited city-owned infrastructure, nearly all new future expansion in demand in the SSA is within the OWD service area. Therefore, future expansion in the City's SSA is primarily limited to serving Caltrans and additional Otay demands. OWD's agreement to purchase recycled water from the City expires in December 2026. OWD will need to amend the agreement to allow 6,000 AFY or more of recycled water to be delivered to meet OWD's 2050 demands, if source water to the SBWRP is available to expand recycled water production, and extend the term beyond December 2026. While additional supply to OWD is technically feasible with future diversion of wastewater flows to SBWRP, the City and OWD are in the process of resolving an issue related to wholesale pricing of recycled water that is putting on hold any additional purchase of recycled water from the City.

Recommendation: Proceed with negotiations with OWD to continue serving recycled water in the SSA. Failure to come to an agreement with OWD may result in a significant increase in ocean discharges from the SBWRP.

As the City proceeds with the second phase of the Pure Water Program, there may be opportunities to connect irrigation customers to the pipeline that is proposed to deliver tertiary treated water from a new WRF near Harbor Drive to an advanced treatment facility in Mission Valley.

Recommendation: As preliminary design of the Pure Water Phase 2 tertiary pipeline proceeds, and the alignment is identified, the City should investigate the potential for new recycled water customers along the proposed alignment. The design of the pipeline might include turnout locations for future connections to San Diego Airport, MCRD, Liberty Station, and Mission Bay.

6.1.2 Pressure Management

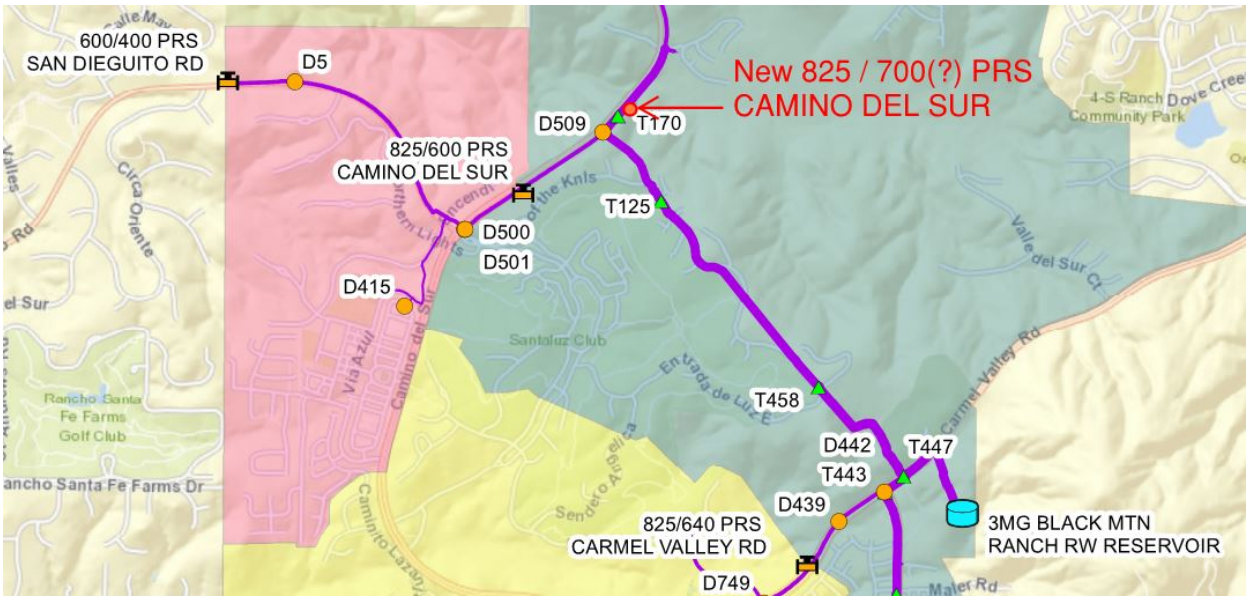
In several cases the hydraulic model pressure settings differ from the pressures observed in the field, indicating that the reduced zone may be operating at a slightly lower or higher pressure than planned. These differences are normal especially when multiple PRS's feed a single pressure zone, to ensure PRS supplies have primary, and then secondary feeds to a zone and avoid the stations from fighting each other.

Recommendation: Review the field settings relative to the nominal pressure zone and confirm this is most desirable based on customer pressures in the system.

Pressures in the northernmost portion of the NSA, along Camino Del Sur, were observed to be well over 150 psi. Design criteria sets a typical service pressure range at 60 to 100 psi.

Recommendation: Install a PRS in the vicinity of Camino Del Sur, north of Black Mountain Road in the vicinity of Del Sur Court, to keep pressures within desired service ranges. This new PRS would reduce pressures from the 825 zone and develop a new 700 zone, as shown on Figure 6-2. The City should adjust PRS setting based on maintaining minimum services pressure in the northeast and reducing high operating pressure in the lower canyon areas.

Figure 6-2.Proposed Location for New Camino Del Sur PRS



6.1.3 Water Quality Management

Maintaining a chlorine residual throughout the distribution system minimizes the growth of biofilms that can clog recycled water delivery systems and produce unwelcome odors at customer sites. The recycled water system hydraulic model was used to estimate chlorine residuals throughout the City recycled water system. Ideally, chlorine residuals should be sufficient within the recycled water pipelines to prevent biofilm development, but should be <1 mg/L when delivered for irrigation use to protect plants. Additional dosing at the Meanley Tank and Black Mountain Ranch Tank is currently accomplished by introducing chlorine tablets to achieve a concentration of 2.4 mg/L. The water quality analysis suggests that flows throughout the recycled water system do not carry chlorine residuals through the pipelines beyond areas near the dosed locations, which is primarily due to lower demands and pipeline flows in the upper portions of the NSA and along dead-end reaches towards the western portion of the NSA system. Recycled water sits in the system longer during winter demand periods, than in summer. In winter, although the portion of the recycled water system where most of the demand occurs was estimated to have a water age less than five days old, significant sections of the northernmost portion of the NSA have a water age estimated to be greater than 5 days old.

Recommendation: The City is in the process of improving chlorine dosing facilities at both the Meanley Tank and Black Mountain Ranch Tank. With these automated systems, the dosing should be more consistent. As part of this Master Plan project, a standard operating procedure for chlorine sampling has also been provided. It is recommended that the City develop a monitoring program and adjust dosing to sufficiently prevent biofilm growth in the pipelines and still protect irrigated plants. Customer outreach to assess impact on irrigated areas and monitoring of any customer complaints due to water quality should be taken into consideration when making dosing adjustments.

6.1.4 Storage Tank Operations

A chlorinator system using calcium chloride tablets was originally designed to dose chlorine and boost residual levels in the Meanley Tank. The system failed, but has been replaced and started up

in September, 2019. The tablet chlorinator is set to operate from 8:00 am to 2:30 pm Monday through Friday to maintain residuals and is turned off over the weekends.

Recommendation: To improve water quality with a more consistent chlorine residual and improve tank mixing, bulk liquid sodium hypochlorite storage tanks and reservoir mixing pump(s) are proposed. Fill piping to the tanks will be proposed to eliminate the need to fill the chlorinator with 50 pound tablet buckets to improve Operator safety. Installation of storage tanks and piping connections with new chemical dosing pumps in the existing below grade chlorination building for bulk liquid sodium hypochlorite deliveries is proposed. Installation of a new recirculation pump and repair of the chlorine analyzer are also recommended.

The Meanley Tank currently includes a backup raw water supply pipeline which is plumbed from Miramar Lake. Due to state regulations, the use of raw water supply is no longer permitted for the City's Title 22 Recycled Water system. During those times that the NCWRP recycled water supply is interrupted or limited, a reliable potable water make-up system is needed.

Recommendation: A plan is being developed as part of the City's Pure Water Program to utilize the existing 24-inch Raw Water Supply Pipeline and connections to the existing 12-inch potable water mains in Meanley Drive to provide 12 million gallons per day backup supply. It is anticipated that the costs to provide additional supply during the period the NCWRP production is limited due to Pure Water upgrades will be funded by the Pure Water Program.

The existing local control panel (LCP) at the Meanley Tank and the communications data acquisition router from the Gregg Street Reservoir is outdated and does not meet current City standards. At the Black Mountain Ranch Tank (Figure 6-3), the local control panel has been updated, but the existing instrumentation needs to be connected and programmed.

Recommendation: The LCP should be replaced including new programmable logic controller, communications equipment, and operator interface terminal (OIT). The equipment should be capable with the planned future connection to the fiber optic cable being installed to the facility with the construction of the North City Pure Water Pipeline. In addition, the existing communications data acquisition leased line from the City of Poway's Gregg Street Reservoir will need to be replaced as the router is outdated, no longer supported, and not compatible with current City standard equipment. At the Black Mountain Ranch Tank, the existing human machine interface (HMI) screen at the panel no longer functions and a new HMI screen to City standards is needed. The old PLC and radio equipment should be removed and the existing instrumentation connected to the new PLC and programmed.

Black Mountain Ranch Tank originally included a functioning sodium hypochlorite generation and dosing system to maintain chlorine residual levels in the tank. The system has been out of service for seven years. To maintain water quality within the recycled water system, the chlorination system needs to be repaired or replaced.

Recommendation: It has been determined that the sodium hypochlorite generation system equipment will be removed and not be replaced. The chlorination system will be converted for bulk liquid sodium hypochlorite deliveries to fill the existing 1,000 gallon capacity chemical storage tank including new piping connections, variable frequency drives for dosing pumps, tank recirculation pump, and repairs to the existing chlorine analyzers.

Figure 6-3. Black Mountain Reservoir

In the event that there is an interruption in the recycled water supply to northern parts of the system served by Black Mountain Ranch Tank, a potable water make-up system is needed to maintain levels of service to existing customers. City staff previously used a temporary 2-inch highline extended from the Black Mountain potable water 950 Zone Pump Station for this purpose.

Recommendation: A permanent 4-inch pipeline connection to the existing 2-inch potable water service pipeline from the Black Mountain Ranch Tank Inlet / Outlet Control Valve Building and booster pump system is recommended. The 4-inch pipeline would be extended up the wall and along the roof and connected at the 2-foot square access hatch near the center vent.

Interior cleaning and inspections of the Meanley Tank and the Black Mountain Ranch Tank were conducted in March 2019. Debris collected along the bottom of each tank was significant, however interior coatings appeared to be in good shape.

Recommendation: Perform follow-up dive cleaning and inspection of both the Meanley Tank and the Black Mountain Ranch Tank within the next three years and continue to monitor status of coating. In addition, recoating of the Black Mountain Ranch Tank roof exterior within the next 3 years was recommended.

6.1.5 Pump Station Operations

A comparison of the original pump performance efficiency, the 2015 pump efficiency test results, and the current pump efficiency test results indicate that all pump stations are operating in an acceptable range and no pumps need to be taken out of service for repair at this time.

Recommendation: It is recommended that the City conduct testing of all pumps every 3 years to confirm performance and efficiency.

The 790PS (Figure 6-4) pumps into a small closed zone and utilizes variable frequency drives (VFDs) to adjust pump speeds to maintain system pressures. Currently, the VFDs are not being utilized, which is causing the pumps to “short” cycle (come on and off in a few seconds). The VFDs are set to operate at a constant 50 Hz (83 percent speed) and turn on when the discharge pressure

reaches 59 psi and off when the discharge pressure reaches 65 psi. Pumps were observed to start between every 3 to 5 minutes and run for a maximum of 30 seconds. Pumps alternate between pump starts. This type of operation is inefficient and damaging to the pumps and motors. The constant startup torque is damaging to pump components and the in-rush of electrical current is damaging to the motor windings.

Recommendation: It is recommended that the 790PS VFDs be reprogrammed to vary speed based on downstream demand. It is further recommended that in the future, when a pump needs replacement, the City consider replacing with a smaller capacity “jockey” pump to allow longer run times during minimum demand periods to improve efficiency, service life, and reduce capital and maintenance costs.

The 890PS (Figure 6-4) system hydraulics were originally designed for operation of two duty pumps with one standby pump. Currently, the City staff is operating only one pump to fill the Gregg Street Reservoir and have indicated that during peak demand periods, it is difficult to fill the tank. Performance testing showed a slight increase of pump efficiency when operating two 890PS pumps at the same time.

Recommendation: It is recommended that the City revise the operation of the 890PS to run two pumps at the same time to improve the pump efficiency and filling capabilities of the Gregg Street Reservoir. Also, a review of the pump drive hour meters show that the pumps are not alternating between starts as Pump 2 has approximately twice the amount of run hours as Pump 4. It is further recommended that the City reprogram the 890PS to alternate the pump starts.

Figure 6-4. 890/790 Zone Pump Stations

The existing local control panels at the 790 and 890 PSs are outdated and do not meet current City standards.

Recommendation: The local control panel should be replaced, including new programmable logic controller, communications equipment, and operator interface terminal. The equipment should be coordinated with the planned future connection to the fiber optic cable being installed to the facility with the construction of the North City Pure Water Pipeline.

The Canyonside PS (Figure 6-5) system hydraulics were designed for operation of two duty pumps with one standby pump. Performance testing showed an efficiency increase of 1 to 2 percent when operating two pumps at the same time. Currently, City staff operates only one pump to fill the Black Mountain Ranch Tank.

Recommendation: To improve pumping efficiency and Black Mountain Ranch Tank filling, it is recommended that the City reprogram the Canyonside PS to operate two pumps when filling the Black Mountain Ranch Tank. Based on observed pressure fluctuations during normal pump shutdown, it is recommended that the City perform a pressure transient (surge) analysis to confirm if mitigation equipment is recommended.

Figure 6-5. Canyonside 825 Zone PS

The flow meter at the Canyonside PS does not appear to be measuring discharge flow accurately.

Recommendation: Replace Canyonside PS discharge flow meter.

In the event that the Canyonside PS fails, there is no emergency bypass connection. Also, the City Park and Recreation Department requires a larger connection than is currently available to provide sufficient flow and pressure to irrigate Canyonside Park.

Recommendation: Modify the 6-inch suction and discharge blow off assembly piping to 12-inch minimum to provide emergency bypass pumping connection. This bypass connection may also incorporate a 4-inch turnout for irrigation demands to the park.

An electrical rate analysis was performed for each of the pump stations based on current San Diego Gas & Electric rates for the City. Energy use data was compiled using monthly energy bills from January 2018 through December 2018. An energy rate analysis was performed to estimate the annual charges associated with each suitable rate schedule.

Recommendation: The Pump Station Energy Rate Analysis report recommended changing the SDGE rate schedule for the CSPS from AL-TOU to PAT-1, saving $136,000 annually. Additional demand savings could be realized if the pump station operations can be shifted to operate outside the On-Peak period during the summer months (June through October). There are a number of months where the On-Peak consumption is very low, which indicates there may be a possibility of achieving this goal. Potential savings could be up to $10,000 per year. Operating the Canyonside PS with two pumps running, instead of just one, may also mitigate on-peak consumption.

The NCWRP Recycled Water Pump Station (RWPS) is an integral part of the North City Water Reclamation Plant. The majority of the energy for the RWPS is provided by the City Cogeneration Facility (four 3.8 MW, 950kW units), located adjacent to the NCWRP. The facility has two interconnections with SDGE (one service account) and imports power from FortiStar. In 2014, the City of San Diego added a 1.55 MW cogeneration facility adjacent to the facility to augment the power production and decrease the dependency on the cogeneration facility. One emergency back-up generator is also provided to provide critical power requirements for the biological processes in the event all available power is lost. Power from all sources is distributed through seven different substations located on site. Each substation has dual metering capabilities and interconnection to the DCS (Ovation) system. In the event the onsite power is inadequate, supplemental power is provided by SDGE. The cost of the standby SDGE power source is very expensive and includes a $60,000 per month standby fee, or about $700,000 per year. If SDGE power is provided, the standard fees are charged on a monthly basis.

Recommendation: A potential cost savings measure to minimize the occasional purchase of SDGE power, would be to incorporate the RWPS into the plant demand, load shedding program to automatically turn off or reduce energy use during times SDGE is needed. The potential for savings if the RWPS could load shed the entire annual amount in 2018 would be approximately $10,000. This would include consumption, on-peak demand and some of the TOU demand; however, standby costs cannot be minimized.

The future NSA system has excess pumping capacity during the summer at all its pump stations, with the exception of the NCWRP Pump Station which becomes slightly deficient (by 1,328 gpm or 1.9 mgd) under maximum day demand conditions if all infill customers are connected.

Recommendation: No recommendations are included for any updates to the NCWRP Pump Station at this time, given the uncertainties of future recycled water demands and assumed conservative future supplies to wholesale customers. Once maximum day recycled water demands consistently exceed 15 mgd, then the City may begin to consider expansion of the 12,000 gpm or 17.2 mgd NCWRP Pump Station capacity.

6.1.6 Pressure Reducing Stations

During inspections of the City's thirteen PRSs (Figure 6-6), five recurring maintenance concerns/preferences were identified including: addition of sump pits, replacement of existing wheel valves, install heavy duty pipe supports, installation of Cal OSHA compliant ladders, and replacement/installation of pressure relief valves. The Condition Assessment TM, included in Appendix C, provides a summary of recommended improvements for each PRS sorted by PRS

prioritization rank. PRS improvements were prioritized using the overall rating, demand, and number of customers served.

Recommendation: Make recommended improvements to the PRS within the next 3 years, and develop an annual PRS inspection program.

The Governor Drive PRS is located at the northeast corner of the intersection of Governor Drive and Interstate 805 and directly east of the north-bound on-ramp within Caltrans Right-of- Way. The Governor Drive PRS regulates pressure from the 640 Zone to the 550 Zone through 6-inch and 2-inch pressure reducing valves and includes a 4-inch pressure relief valve. In the event the pressure reducing valves fail, the 4-inch pressure relief valve opens and discharges water to atmosphere to prevent over pressurizing the downstream 550 Zone. Based on the differential pressure, valve size and type expected discharge is 950 gallons per minute. Currently, the 4-inch pressure relief valve discharges to a storm drain inlet installed along the Interstate 805 northbound on ramp which outlets to an unlined ditch south of Governor Drive. This storm drain connection is not permissible. As part of the Master Plan project, alternative solutions were evaluated.

Recommendation: The recommended alternative includes the installation of a gate valve with motorized operator on the downstream piping of the PRS and the removal of the pressure relief valve and associated piping. The new motorized operator will close the gate valve when the downstream pressure indicating transducer indicates a high pressure set point. The gate valve with motorized operator will be located in a manhole at the PRS site. It is anticipated that construction of the new facilities will be within the area allowed by the existing Caltrans encroachment permit.
Additional flow monitoring at the City's 13 PRSs would provide valuable operational information, monitored from the MCC, which would enhance the efficiency of the system.

Recommendation: Install flow meters and displays at each of the PRSs.

Figure 6-6. Pressure Reducing Station

6.1.7 Valves and Appurtenances

The City owns and operates approximately 2,120 in-line valves and 545 air valves within their recycled water system. For the purpose of this condition assessment, in-line valves were organized into three (3) categories: transmission, distribution, and service. Transmission valves included valves in sizes greater than or equal to 16-inch, distribution valves ranged between 8- inch and 14-inch in size, and service valves are less than 8-inch in size. Field inspection of 64 of 211 Transmission Valves, 60 of 444 Distribution Valves and 59 of 545 Air Valves was conducted during the spring of 2019. Overall, the City's recycled water valves are in good operational condition, with over 70% of valves being inspected receiving an overall rating of 1 – Operable, No Maintenance. A risk model was developed to prioritize inspection of the remaining valves.

Recommendations: Replacement of 13 Transmission Valves, ranging in size from 16 to 36 inch, was recommended; 7 valves were inoperable and 6 valves were not operating properly. Replacement of 9 Distribution Valves, ranging in size from 8 to 12 inch, was recommended. Replacement of 9 Air Valves, ranging in size from 1 to 2 inch, was recommended. Additional repairs to other inspected valves were also noted. The locations of these valves and specific recommendations are provided in the Condition Assessment Summary TM, in Appendix C.

The City should continue to inspect valves in accordance with the list recommended in the Valve Risk Model and continue to update the risk model with new information annually. A valve replacement program would provide an annual budget for prioritized valve replacement. It is recommended that the City establish sufficient budget to replace 7 Transmission Valves and 15

Distribution Valves per year. Air valves are much smaller and replacements are typically held in inventory. These can be replaced as needed by City staff.

Recommendation: There is no means of isolating the Dairy Mart Road pipeline prior to it transitioning to OWD. It is recommended that a new 24-inch butterfly valve be installed on the City side of the transition in order for City to have control over emergency or maintenance shutdowns of the pipeline. This could be done in coordination with cathodic protection improvements noted in Section 6.2.8.

6.1.8 Pipelines

A portion of the Dairy Mart Road Recycled Water Line consists of approximately 3,800 feet of 30-inch Class 150 ductile iron pipe. The pipeline was constructed in 1997 and runs along Dairy Mart Road from De La Plaza Road to Clearwater Way in San Ysidro. With discontinuous pipe materials and no cathodic protection, this pipeline is at risk for corrosion. An investigation of the soil corrosivity was conducted. Pipe-to-soil potential measured were more electropositive than typical for ductile iron pipe material (typical range -400 to -700 mV) at all but two cathodic protection test stations (CPTS). This typically means that there could be active corrosion occurring on the line, however, in this case the cause may be stray current from the cathodic protection system on a parallel gas line.

Figure 6-7.

Recommendations: When the 5 year paving moratorium along Dairy Mart Road ends in 2022, locate and repair the electrical discontinuities. After the discontinuous areas are repaired, verify electrical continuity along the alignment. Investigate potential stray current from gas line. Design and install an impressed current cathodic protection system – approximately 3,800 linear feet of 30-inch ductile iron pipe (Dairy Mart Road Pipeline). Impressed current cathodic protection system will protect the 30-inch ductile iron pipe as well as the existing 30-inch wastewater force main and 8-inch sludge line. Perform annual pipe-to-soil potential survey.

Additional locations that require addition cathodic protection were identified along the pipeline from the NCWRP to the MBC, and the pipeline along Production Avenue.

Recommendations: Repair electrical discontinuities along the MBC pipeline and repair the flange isolation kit along the Production Avenue pipeline.

6.2 Costs

A summary of recommended improvement CIP costs is provided in Table 6-1. These costs are planning level costs for budgeting purposes. Business case evaluations were performed for some of these recommended improvements, as noted.

Table 6-1. Recycled Water System Recommended Improvements

Recycled Water System Capital Improvement Projects	Planning Level Costs		
	2020-2025	2025-2030	Beyond 2030
Reservoirs			
Miramar (Meanley) Recycled Water Storage Tank			
Upgrade Local Control Panel / SCADA	250,000		
Chlorination System Upgrades*	80,000		
Site Security Upgrades - Intrusion Switches, Cameras, Site Lighting	36,000		
Interior Coating Replacement	1,700,000		
Black Mtn Ranch Recycled Water Storage Tank			
PLC Programming	10,000		
Chlorination System Upgrades*	43,000		
Potable Water Back Up System (To be completed by Pure Water Program)	NA		
Site Security Upgrades - Intrusion Switches, Cameras, Site Lighting	8,000		
Exterior and Interior Coatings Replacement / Metal Repairs	1,200,000		
Pump Stations			
790 Zone (Meanley) Pump Station			
Replace 2 Pumps with smaller jockey pumps	20,000		
Reprogram Variable Frequency Drives	10,000		
Replace Motors with TEFC Enclosures	16,000		
Replace Hydro Tank Control Panel and Control Valves	15,000		

Table 6-1. Recycled Water System Recommended Improvements

Recycled Water System Capital Improvement Projects	Planning Level Costs		
	2020-2025	2025-2030	Beyond 2030
Site Security Upgrades - Intrusion Switches, Cameras, Site Lighting	36,000		
Replace Local Control Panel / MCC / Breaker / SCADA	84,000		
890 Zone (Meanley) Pump Station			
Replace Pump Motors w/ TEFC - Pump 2	8,000		
Replace Pump Motors w/ TEFC - Pumps 3 and 4	20,000		
Reprogram PLC to Operate 2 Pumps and Verify Alternation	5,000		
Replace Hydro Tank Control Panel and Control Valves	15,000		
Site Security Upgrades - Intrusion Switches, Cameras, Site Lighting	36,000		
Replace Local Control Panel / MCC / Breaker / SCADA	84,000		
825 Zone (Canyonside) Pump Station			
Replace Discharge Flow Meter	10,000		
Replace Electrical Breaker	4000		
Perform Surge Analysis	12,000		
Security Upgrades - Cameras and Site Lighting	95,000		
Emergency Bypass Pumping Connection/ Irrigation Line Replacement	24,000		
Pressure Reducing Stations			
Camino Del Sur PRS - New			
Install New PRS	450,000		
Governor Drive PRS			
Pressure Relief Valve Reconstruction*	99,000		
PRS Flow Monitoring			
Add ClaVal Mdl X144D e-FlowMeter w/ Display	130,000		
Valves			
30" Dairy Mart Road Pipeline Isolation Valve			
Install new Butterfly Valve	35,000		
Transmission Replacements			
7 Per Year	280,000	280,000	280,000
Distribution Replacements			
15 Per Year	75,000	75,000	75,000
Pipelines			
Dairy Mart Road Pipeline Improvements			
Cathodic Protection Improvements - Electrical Discontinuities and Impressed Current Sys	338,000		

Table 6-1. Recycled Water System Recommended Improvements

Recycled Water System Capital Improvement Projects	Planning Level Costs		
	2020-2025	2025-2030	Beyond 2030
Production Avenue Pipeline			
Repair flange isolation kit	50,000		
MBC Pipeline			
Repair Electrical Discontinuities	100,000		
Subtotal	$5,378,000	$ 355,000	$ 355,000
Total	$ 6,088,000		

Notes:

[a] CIP planning level costs based on 2020 dollars

[b] Schedule subject to available funding

[c] For details on recommended improvements, see Appendix C, Condition Assessment Summary TM

[d] Business Case Evaluations have been performed for projects indicated with an asterisk *

6.3 CIP Schedule

The proposed CIP schedule associated with recommended improvements listed in Table 6-1, is included in the project schedule (Figure 6-8). Actual scheduling of these improvements will be based on available funding.

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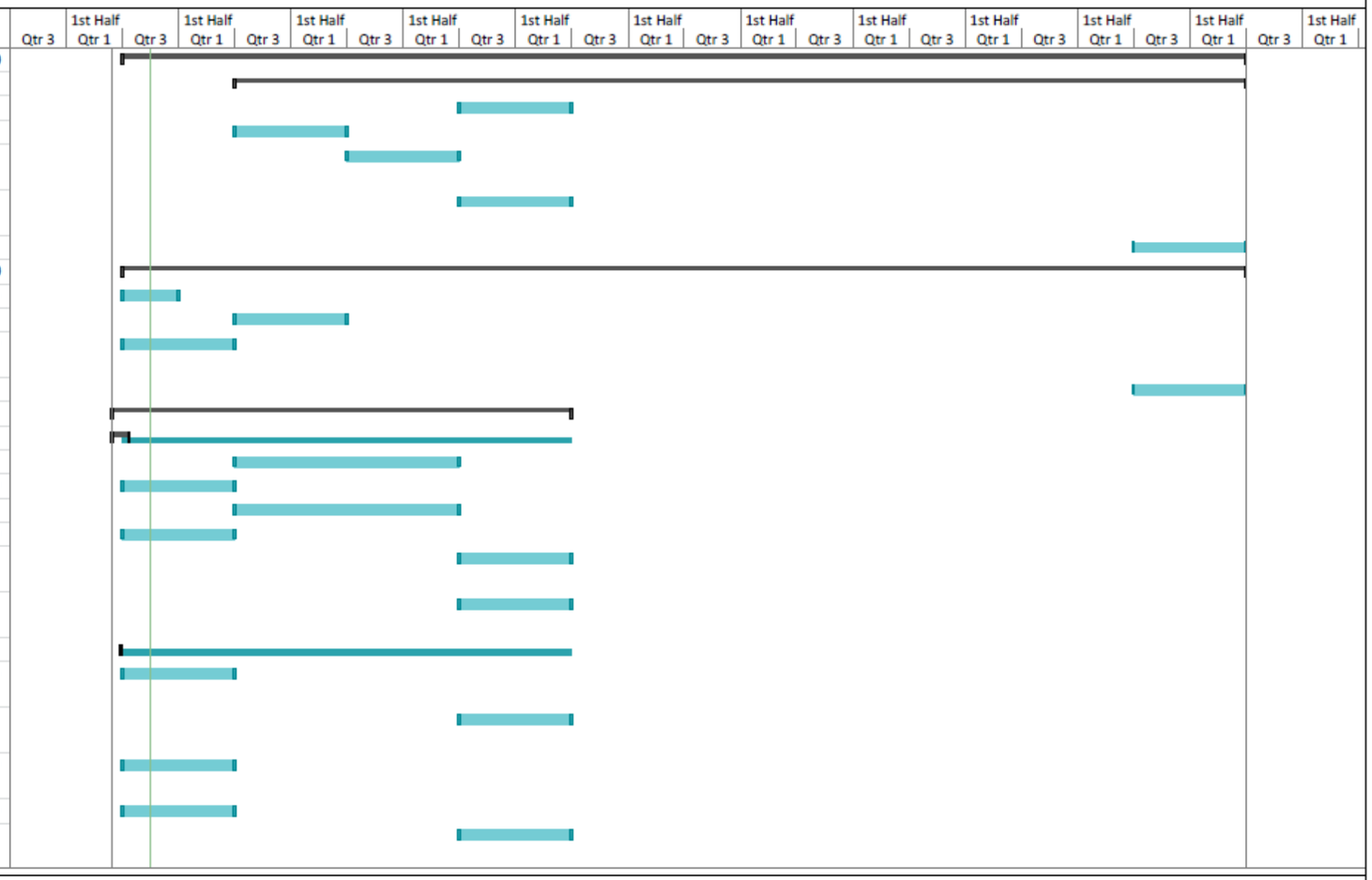
Figure 6-8. Proposed CIP Schedule

CITY OF SAN DIEGO PUBLIC UTILITIES DEPARTMENT
RECYCLED WATER DIVISION -
CIP IMPLEMENTATION SCHEDULE

ID	Task Name	Duration	Start
1	**Reservoirs**	**2608 days**	**Wed 7/1/20**
2	**Miramar (Meanley) Recycled Water Storage Tank**	**2347 days**	**Thu 7/1/21**
3	Replace Local Control Panel / SCADA Upgrades	261 days	Sat 7/1/23
4	Chlorination System Upgrades	261 days	Thu 7/1/21
5	Potable Water Back Up System - Pure Water Program	261 days	Fri 7/1/22
6	Site Security Upgrades - Intrusion Switches, Cameras, Site Lighting	261 days	Sat 7/1/23
7	Interior Coating Replacement	261 days	Sun 7/1/29
8	**Black Mtn Ranch Recycled Water Storage Tank**	**2608 days**	**Wed 7/1/20**
9	PLC Programming	131 days	Wed 7/1/20
10	Potable Water Back Up System	261 days	Thu 7/1/21
11	Site Security Upgrades - Repair Intrusion Switches, Cameras, Site Lighting	261 days	Wed 7/1/20
12	Coatings Replacement / Metal Repairs	261 days	Sun 7/1/29
13	**Pump Stations**	**1066 days**	**Fri 5/29/20**
14	**790 Zone (Meanley) Pump Station**	**40 days**	**Fri 5/29/20**
15	Replace 2 Pumps with smaller jockey pumps	522 days	Thu 7/1/21
16	Reprogram Variable Frequency Drives	261 days	Wed 7/1/20
17	Replace Motors with TEFC Enclosures	522 days	Thu 7/1/21
18	Replace Hydro Tank Control Panel	261 days	Wed 7/1/20
19	Site Security Upgrades - Intrusion Switches, Cameras, Site Lighting	261 days	Sat 7/1/23
20	Replace Local Control Panel / MCC / Breaker / SCADA Upgrades	261 days	Sat 7/1/23
21	**890 Zone (Meanley) Pump Station**	**1 day**	**Fri 6/26/20**
22	Replace Pump Motors w/ TEFC - Pump 2	261 days	Wed 7/1/20
23	Replace Pump Motors w/ TEFC - Pumps 3 and 4	261 days	Sat 7/1/23
24	Reprogram PLC to Operate 2 Pumps and Verify Alternation	261 days	Wed 7/1/20
25	Replace Hydro Tank Control Panel	261 days	Wed 7/1/20
26	Site Security Upgrades - Intrusion Switches, Cameras, Site Lighting	261 days	Sat 7/1/23



Project: SD RW CIP Implementatio
Date: Mon 9/28/20

Task | Project Summary | Inactive Milestone | Manual Summary Rollup | Deadline
Split | External Tasks | Inactive Summary | Manual Summary | Progress
Milestone | External Milestone | Manual Task | Start-only | Manual Progress
Summary | Inactive Task | Duration-only | Finish-only

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The City of SAN DIEGO

CITY OF SAN DIEGO PUBLIC UTILITIES DEPARTMENT
RECYCLED WATER DIVISION -
CIP IMPLEMENTATION SCHEDULE

FDR

ID	Task Name	Duration	Start
27	Replace Local Control Panel / MCC / Breaker / SCADA Upgrades	261 days	Sat 7/1/23
28	**825 Zone (Canyonside) Pump Station**	**1043 days**	**Wed 7/1/20**
29	Replace Discharge Flow Meter	261 days	Thu 7/1/21
30	Replace Electrical Breaker	261 days	Wed 7/1/20
31	Perform Surge Analysis	261 days	Wed 7/1/20
32	Security Upgrades - Cameras and Site Lighting	261 days	Sat 7/1/23
33	Emergency Bypass Pumping Connection/Irrigation Line Upsize Replacement	261 days	Thu 7/1/21
34	**Pipelines**	**783 days**	Wed 7/1/20
35	**Dairy Mart Road Pipeline Improvements**	**261 days**	**Fri 7/1/22**
36	Cathodic Protection Improvements - Electrical Discontinuties and Impressed Current System	261 days	Fri 7/1/22
37	**Production Avenue Pipeline**	**783 days**	**Wed 7/1/20**
38	Repair flange isolation kit.	783 days	Wed 7/1/20
39	**MBC Pipeline**	**783 days**	**Wed 7/1/20**
40	Repair Electrical Discontinuties	783 days	Wed 7/1/20
41	**Merge 56 Pipeline**	**783 days**	**Wed 7/1/20**
42	Install 16-inch Pipeline	783 days	Wed 7/1/20
43	**Pressure Reducing Stations**	**783 days**	**Wed 7/1/20**
44	**Camino Del Sur PRS - New**	**783 days**	**Wed 7/1/20**
45	Install New PRS	783 days	Wed 7/1/20
46	**Governor Drive PRS**	**261 days**	**Wed 7/1/20**
47	Pressure Relief Valve Reconstruction	261 days	Wed 7/1/20
48	**PRS Flow Monitoring**	**522 days**	**Wed 7/1/20**
49	Add ClaVal Mdl X144D e-FlowMeter w Display	522 days	Wed 7/1/20
50	**Valves**	**2609 days**	**Wed 7/1/20**
51	**30" Dairy Mart Road Pipeline Isolation Valve**	**261 days**	**Thu 7/1/21**
52	Install new Butterfly Valve	261 days	Thu 7/1/21
53	**Transmission Replacements**	**2609 days**	**Wed 7/1/20**
54	7 Per Year	2609 days	Wed 7/1/20
55	**Distribution Replacements**	**2609 days**	**Wed 7/1/20**
56	15 Per Year	2609 days	Wed 7/1/20

Project: SD RW CIP Implementatio
Date: Mon 9/28/20

Task | Split | Milestone | Summary
Project Summary | External Tasks | External Milestone | Inactive Task
Inactive Milestone | Inactive Summary | Manual Task | Duration-only
Manual Summary Rollup | Manual Summary | Start-only | Finish-only
Deadline | Progress | Manual Progress

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