3.0 Development and Supply Availability of Recycled Water

Water Reuse Study

This section provides an overview of the history of water reuse in San Diego that began 25 years ago. In addition, this section provides a discussion on how much recycled water is available to San Diego and issues associated with optimizing its use.

3.1 History of Water Reuse in San Diego

Because the City has long recognized the importance of developing its local water resources, it has been a true pioneer in the field of water recycling. Through grants and alternate funding sources the City has been active in the development of water treatment technologies. 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). The 1984 start of 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 freeway landscape irrigation beginning in 1987.

In 1991, the Aqua III Water Reclamation Facility and Aqua 2000 Research Center were constructed in the San Pasqual Valley, north of Rancho Bernardo, where the Aqua III plant continued to use aquaculture treatment to reclaim wastewater. This facility had the capacity to treat 1 MGD for agricultural use and irrigation. The Research Center continued to study advanced water treatment using a variety of methods until 2001 when the project was discontinued.

The City has been delivering recycled water to customers for non-potable irrigation and industrial uses on a larger scale since the completion of the NCWRP in 1997. NCWRP was a major investment that highlighted the City's commitment to delivering a safe and reliable new water supply to large areas of San Diego. In 2002, the SBWRP was completed to provide the same benefits to the southern portion of the City. Both of these facilities provide a locally controlled, drought-proof supply of recycled water for San Diego.

Chronology of Events Influencing the City's Reclamation Program

The incentive to develop water reuse projects was also driven by wastewater management issues. Since 1963 the City has treated its wastewater at the Point Loma Wastewater Treatment Plant, which provides treatment at the advanced primary level before disposal through an ocean outfall. In 1972, the Federal Clean Water Act (CWA) was adopted, requiring that wastewater plants provide a more advanced form of wastewater treatment known as secondary treatment, but allowing certain ocean dischargers, such as the City, to apply for waivers. Over the course of the 34 years since the passage of the CWA, the City has applied for a waiver, withdrawn the

waiver, found itself sued by the U.S. Environmental Protection Agency (EPA) and other environmental organizations, reapplied for and been approved for a waiver, and settled the lawsuit. These events are summarized below:

1963: The City begins treating wastewater at the new Point Loma Wastewater Treatment Plant.

1972: Congress passes the CWA, requiring wastewater treatment plants to provide secondary treatment, but allowing certain ocean dischargers to apply for waivers.

1987: Following the City's withdrawal of its waiver application, the EPA and environmental organizations sue the City for non-compliance with the CWA.

1994: Congress passes the Ocean Pollution Reduction Act (OPRA), allowing the City to reapply for a waiver. The City reapplies and a waiver is granted. The City settles the lawsuit, and begins work to achieve 45 MGD in water reclamation capacity by 2010, a condition of OPRA.

The City has fulfilled its treatment capacity commitment with the completion of the 30 MGD North City Water Reclamation Plant in 1997, and the 15 MGD South Bay Water Reclamation Plant in 2002.

1995: An EPA grant for construction of the City's NCWRP requires the City to attempt to meet a goal of reusing 25 percent of treated flows by 2003 and 50 percent of the plant's treated flow by 2010. Based on anticipated wastewater flows to the NCWRP, the City established reuse goals consistent with the above commitments of 6 MGD by the end of 2003, and 12 MGD by the end of 2010.

2002: The City fulfills the 45 MGD treatment capacity requirement with the completion of the 30 MGD NCWRP in 1997, and the 15 MGD SBWRP in 2002. After allowances for treatment process losses and other on-site uses, these two reclamation plants have recycled water production capacities of approximately 24 MGD and 13.5 MGD, respectively.

2004: The City enters into a Settlement Agreement with environmental organizations, committing to conduct a comprehensive study of opportunities to make beneficial use of the City's recycled water. 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. This Study is intended to investigate methods to augment the City's use of recycled water.

The Water Reuse Study is intended to fulfill part (c) of the Settlement Agreement with environmental stakeholders to study increased water reuse.

Water Repurification Project

Beginning in 1993, the City, in cooperation with the Water Authority, proposed an IPR project called the Water Repurification Project. The project proceeded through various phases of planning, regulatory reviews, and preliminary design prior to being cancelled by Council in

1999. The history of the project is important to any forward-looking evaluation of water reuse opportunities.

The history of the City's Water Repurification Project is important to any forward-looking evaluation of water reuse opportunities.

The Water Repurification Project proposed to take NCWRP recycled water and deliver it to a new, nearby facility for further treatment. The additional treatment steps would include the use of several advanced treatment technologies including membrane filtration, reverse osmosis (RO), ion exchange (IX), advanced oxidation using ozone, and disinfection. The product of this sophisticated treatment regimen was termed "repurified water." About 20,000 acre-feet per year (AFY) or 18 MGD of repurified water was to be pumped approximately 20 miles to the 90,000 acre-foot San Vicente Reservoir, one of the City's potable water sources, where it would be discharged into the reservoir and blended with imported and local water. The repurified water would have been stored in the reservoir for approximately two years, during which time further natural treatment would occur. San Vicente Reservoir water, augmented by repurified water, would then be treated along with other water sources at the City's Alvarado Water Treatment Plant before being distributed to customers.

DHS first granted conditional approval to the project in 1994, and many groups voiced support for the project including the EPA, the Sierra Club, the San Diego Medical Society, the U.S. Bureau of Reclamation, a citizen's advisory panel, and a variety of business and community interests.

Despite this support for the repurification project, public opposition to the project began to emerge. During the 1998 political campaigns, the water repurification project became an issue in several closely contested races. Some members of the public and media began to raise concerns about potable use of recycled water, and project opponents began to characterize the project with slogans eliciting a negative reaction from the public. The project was also inaccurately portrayed as targeting poor and ethnic communities, when in fact the water would have been available to nearly half of the City's residents of a broad socioeconomic range. These factors placed a challenging burden on City policy makers. Subsequently, Council voted to halt the Water Repurification Project.

2000 Updated Water Reclamation Master Plan

Because the City remained committed to beneficially using its recycled water per the goals established as a condition of the EPA grant, an alternate means to proceed was developed. The Water Department initiated the Beneficial Reuse Project that produced the *2000 Updated Water Reclamation Master Plan* (Master Plan) and the numerous planned and implemented system improvements to maximize non-potable use of recycled water.

3.2 North City Water Reclamation Plant Recycled Water Use and Availability

The NCWRP, operated by the City's Metropolitan Wastewater Department, currently treats a wastewater inflow of 22.5 MGD, which is 75 percent of its capacity. Of this amount, approximately 6 MGD of tertiary-treated recycled water is produced and beneficially reused on average each year. The remaining flow is treated to a secondary level and conveyed to the Point

Loma Wastewater Treatment Plant for disposal through an ocean outfall.

North City Water Reclamation Plant Summary Information

• Inflow Design Capacity:	30 MGD
• Maximum Recycled Water Production Capacity (with demineralization and full inflows):	24 MGD
• Existing Beneficial Reuse:	6 MGD
• Total Planned Reuse by 2010 with completion of ongoing reuse projects (distribution system expansion Phases I & II):	9 MGD

The existing distribution facilities in place to serve the northern service area (the recycled water distribution area served by NCWRP) include a 9 million gallon storage tank, two pump stations, and about 66 miles of pipeline, including a large backbone pipeline in Miramar Road. These facilities extend from the coast to the City of Poway (Poway).

As of March 31, 2006, the City provides recycled water to 363 meters connected to the system, including a single connection with Poway that serves an additional 195 customers. Most of the City of San Diego customers (99%) use recycled water for irrigation while a few customers use recycled water for industrial purposes. Large City customers include the NCWRP, the City's Metropolitan Biosolids Center, Caltrans, City Park and Recreation Department, General Atomics, Miramar Landfill, Miramar Nursery, Mitchell International, Motorola, Nissan Design, Pacific Retail Trust, San Diego California Temple, Superior Readymix, Timberland II, University of California at San Diego, the Torrey Pines municipal golf course and the Marine Corps Air Station Miramar golf course. Opportunities exist for perhaps 150 to 200 additional irrigation customers connecting to the existing northern service area system including public parks, freeway medians and private customers, each using between 0.5 to 20 AFY (see Section 5).

Planned NCWRP Distribution System Expansions

The City is continuing to expand the recycled water distribution system and connect additional customers. Divided into three segments known as Phase I, Phase II and Phase III, this expansion is based on the City's Master Plan completed in 2000. Its major facilities are shown in **Figure 3-1**. The City is currently completing construction of Phase I, and Phase II is in various stages of planning, design or construction. Phase III expansion has not yet been funded and therefore provides an opportunity to reassess this expansion along with other non-potable opportunities (see Section 5).

The City has previously identified three phases of NCWRP distribution system expansion. Phases I and II are ongoing. Phase III remains a future option and is presented for consideration in Section 5 of this report.

New customers will include a golf course, parks, landscape sites, and the Olivenhain Municipal Water District (OMWD).

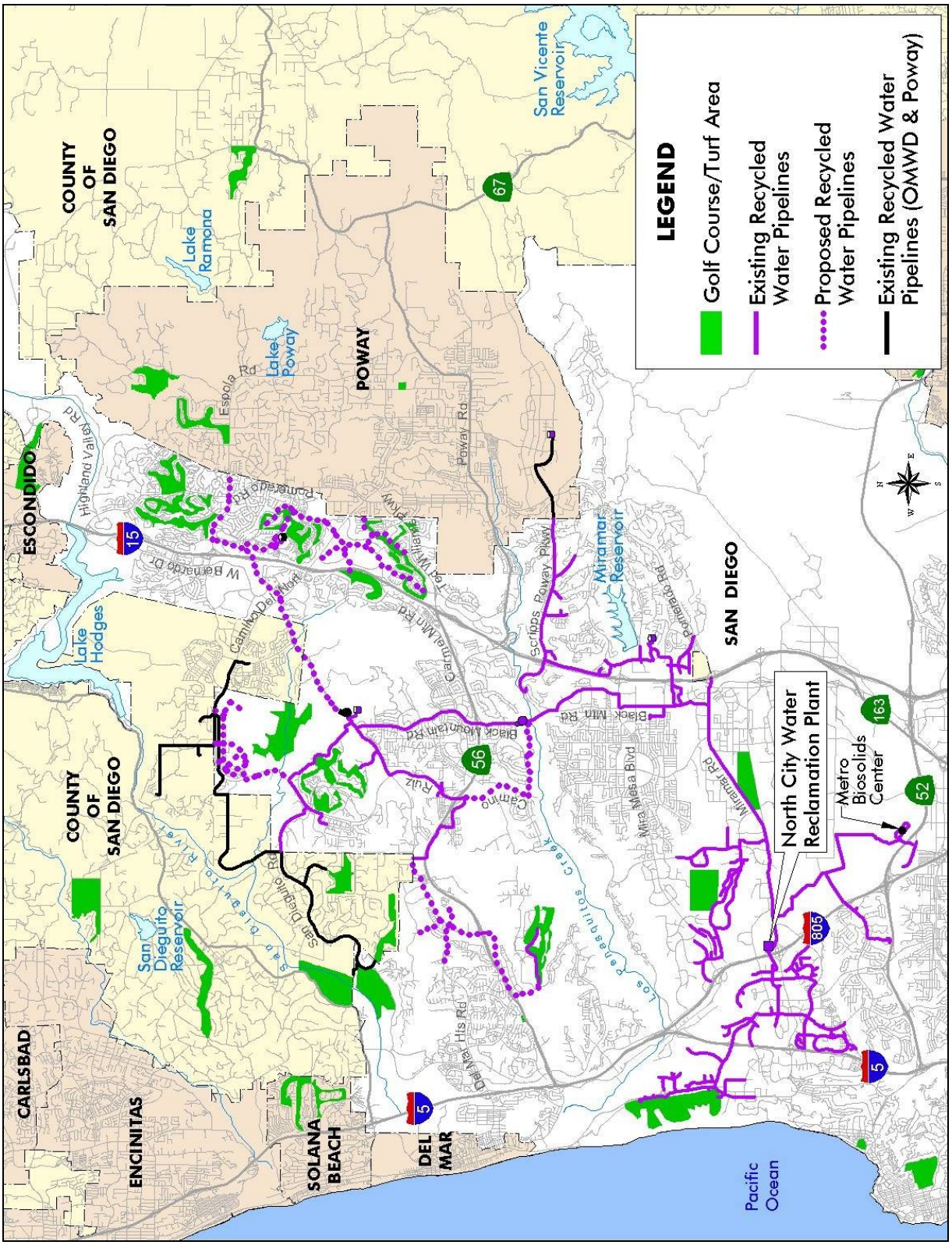

Figure 3-1 – North City Recycled Water Distribution System

Thirteen miles of pipeline have been installed through the Rancho Peñasquitos community to the Black Mountain Ranch area. In addition, a pump station and a three million gallon reservoir have been constructed. Phase I customers are anticipated to generate a recycled water demand of approximately 1.7 MGD by 2007.

Phase II of the distribution system expansion will provide recycled water service to Carmel Valley and the State Route 56 corridor. The 16 miles of pipeline needed to implement this phase are under various stages of design or construction. Major customers to be served by the Phase II expansion include the Del Mar National Golf Club (formerly Meadows Del Mar), Caltrans, Pacific Highlands Ranch Parks, and the Palacio Del Mar Golf Course. Recycled water use along this corridor is anticipated to generate a recycled water demand of approximately 0.9 MGD when the entire length of pipeline is completed in 2010.

Recycled Water Availability at the NCWRP

The NCWRP is referred to as a 30 MGD facility, based on its ability to treat 30 MGD of incoming wastewater flow. The actual amount of recycled water produced is less than the plant's rated capacity due to internal treatment process uses such as filter backwashing and demineralization. Accounting for these uses, the ultimate recycled water production capacity of the NCWRP is approximately 24 MGD of recycled water.

Of the 24 MGD NCWRP available supply, 7.2 MGD is available for new opportunities in the summer months, and 16.8 MGD is needed to meet existing demands combined with the Phase I and Phase II expansions. This 16.8 MGD total is approximately twice the average annual uses summarized above, as non-potable uses peak during the warm summer months. Additional recycled water produced during off-peak months could be utilized if seasonal storage was available, or included as part of an IPR project. These considerations were taken into account in developing the reuse implementation strategies to maximize recycled water use from NCWRP.

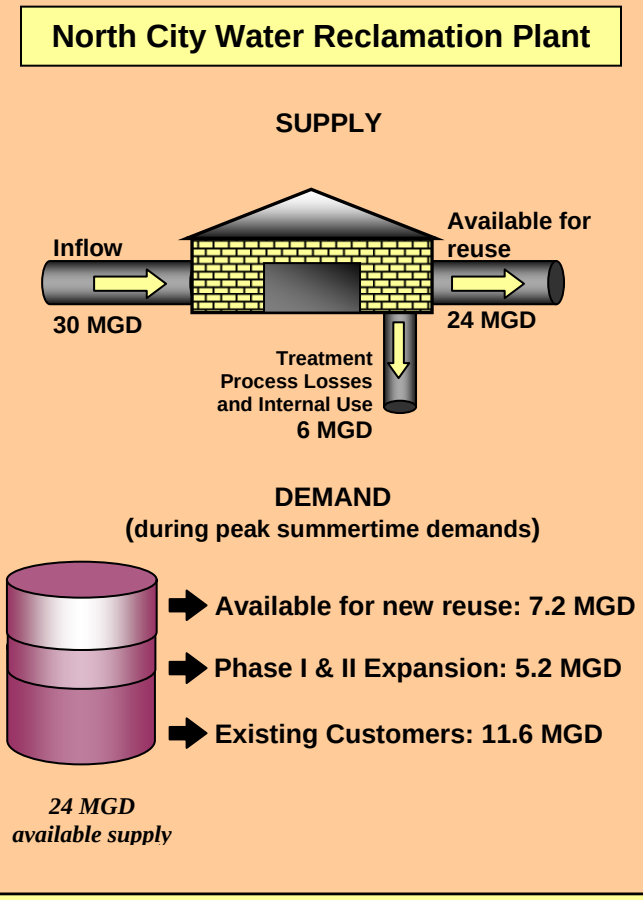

Figure 3-2 - The 30 MGD NCWRP could provide 24 MGD of recycled water (top figure). Of the 24 MGD of recycled water produced, 7.2 MGD is available for new opportunities (bottom figure).

3.3 South Bay Water Reclamation Plant Recycled Water Use and Availability

The 15 MGD SBWRP became operational in the summer of 2002. It currently produces 5 to 6 MGD of secondary treated wastewater that is disposed via the South Bay Ocean Outfall. Certification of the tertiary treatment facilities by the RWQCB was granted in 2004.

South Bay Water Reclamation Plant Summary Information

• Inflow Design Capacity:	15 MGD
• Maximum Recycled Water Production Capacity (with full inflows):	13.5 MGD
• Existing Beneficial Reuse:	1.25 MGD
• Total Planned Reuse with completion of ongoing reuse projects (distribution system expansion to Otay Water District):	7.25 MGD

The distribution system consists of a 30-inch pipeline in Dairy Mart Road that will eventually connect to facilities currently being constructed by Otay Water District (OWD). Construction of facilities was recently completed to deliver 0.7 MGD of recycled water to the adjacent International Boundary and Water Commission (IBWC) Wastewater Treatment Plant.

Planned SBWRP Distribution System Expansions

On October 16, 2003, Council approved an agreement to sell up to 6 MGD of recycled water to the OWD, which will have infrastructure in place to take this water by January 1, 2007. In addition, Caltrans has expressed interest in using recycled water for freeway landscape irrigation at the southern ends of Interstates 5 and 805, and the 905 interchange. The facilities that comprise the distribution system for the South Bay area are illustrated in **Figure 3-3**. Additional potential recycled water customers have been identified and are presented in Section 5 of this report.

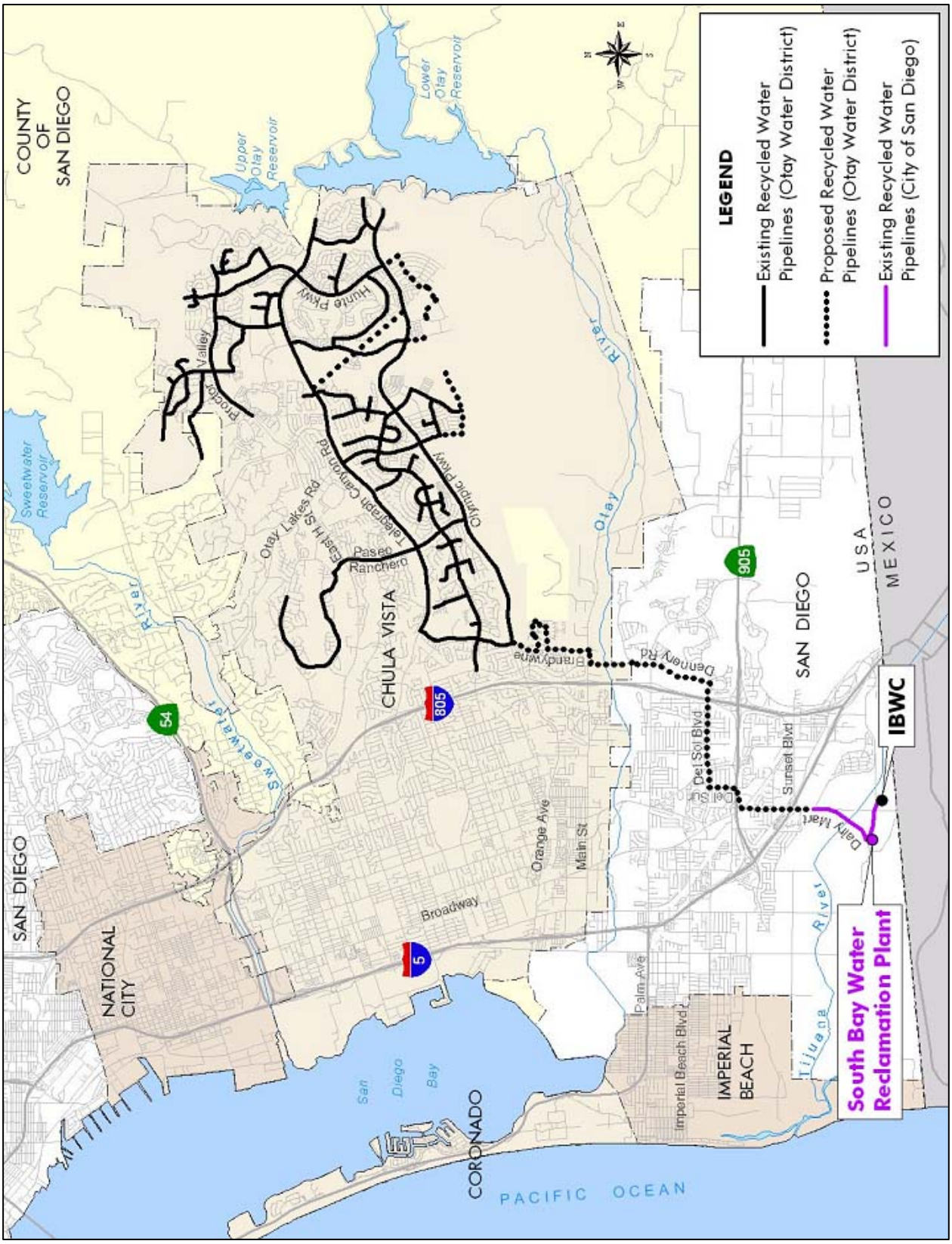

Figure 3-3 – South Bay Recycled Water Distribution System

Recycled Water Availability at the SBWRP

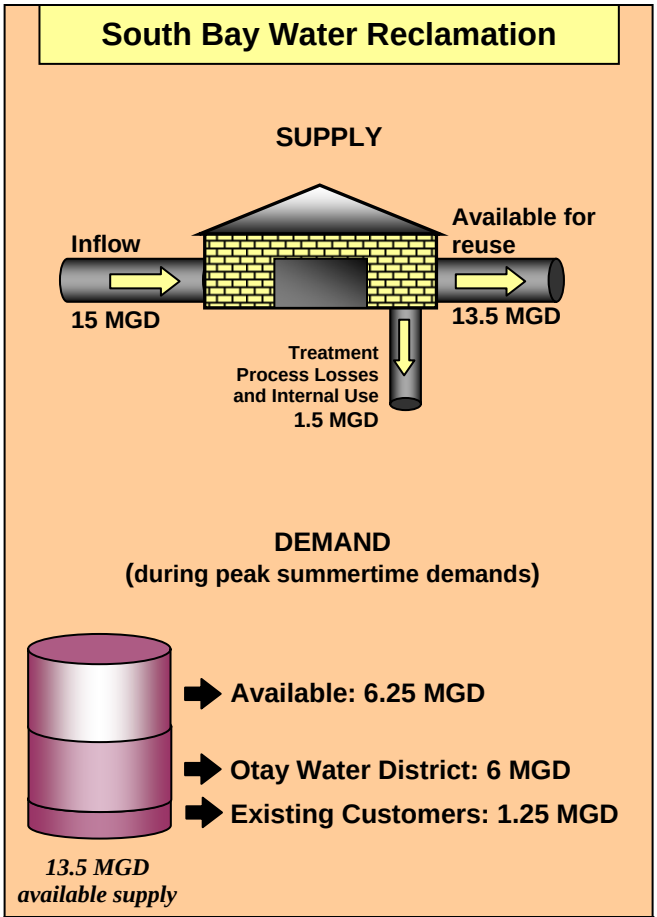

Figure 3-4
The 15 MGD SBWRP provides 13.5 MGD of recycled water (top figure). Of the 13.5 MGD of recycled water produced, 6.25 MGD is available for new opportunities (bottom figure). Note: if demineralization is used there will be less water available to market.

The SBWRP is referred to as a 15 MGD facility, based on its ability to treat 15 MGD of incoming flow. The actual amount of recycled water available is less than this due to internal treatment process uses such as filter backwashing. Accounting for these uses, the ultimate recycled water production capacity of the SBWRP is approximately 13.5 MGD. Because the SBWRP does not require an additional treatment step to reduce the salt content of the recycled water, process loss is less than at NCWRP.

Of the 13.5 MGD SBWRP available supply, 6.25 MGD is available for new opportunities in the summer months. A portion of the SBWRP recycled water supply is committed to existing customers – the SBWRP on-site uses and the IBWC treatment plant. These non-potable uses are constant throughout the year. The City has an agreement to supply OWD with up to 6 MGD. However, recycled water produced during off-peak months could be utilized if seasonal storage was provided or if it were part of an IPR project. These considerations were taken into account in developing the reuse implementation strategies available to maximize recycled water use from the SBWRP.

3.4 New Recycled Water Supply Sources

Mission Valley Plant
A new 5 MGD Mission Valley Plant could be constructed to serve the Central Service Area.

New water reclamation plants are major investments; therefore, it is prudent for the City to maximize existing treatment facilities before considering the construction of new facilities. However, if the City were to consider siting a new treatment facility in an area that is in need of wastewater treatment facilities, or in an area with significant potential demand for recycled water, a satellite reclamation plant could be feasible.

Satellite treatment plants must be in close proximity to large supplies of wastewater to treat and have access to disposal facilities. A location near or adjacent to a large

trunk sewer is ideal. For this study, it was assumed that a satellite treatment plant could be constructed in the Mission Valley area. The new plant is conceptualized as a 5 MGD facility that would use membrane bioreactor (MBR) treatment. MBRs are systems that integrate biological degradation of waste with membrane filtration. MBRs require less space and are more automated than conventional treatment facilities, ideal for decentralized treatment. This concept is discussed further in Section 5. The Water Authority completed a regional study on MBR recycled water satellite treatment plants in November 2005. Additional emphasis on such facilities is planned during future recycled water master plan updates.

3.5 Seasonal Storage

Seasonal storage is used to increase the amount of recycled water available for non-potable uses during the hotter, higher-demand months due to warmer weather by storing surplus recycled water in the colder, lower-demand months. Because recycled water supply availability is consistent year-round (due to steady year-round wastewater inflows) plants are maximized in the summer, while excess capacity is created in the winter resulting from cooler temperatures and rainfall, as shown in **Figure 3-5**. Seasonal storage allows excess off-peak supplies to be stored for later use during peak demands, effectively increasing the total amount of non-potable water reuse possible. This situation is relatively common for non-potable recycled water systems. An alternative to seasonal storage is supplementing the recycled water distribution system with raw water or potable water to meet peak demands.

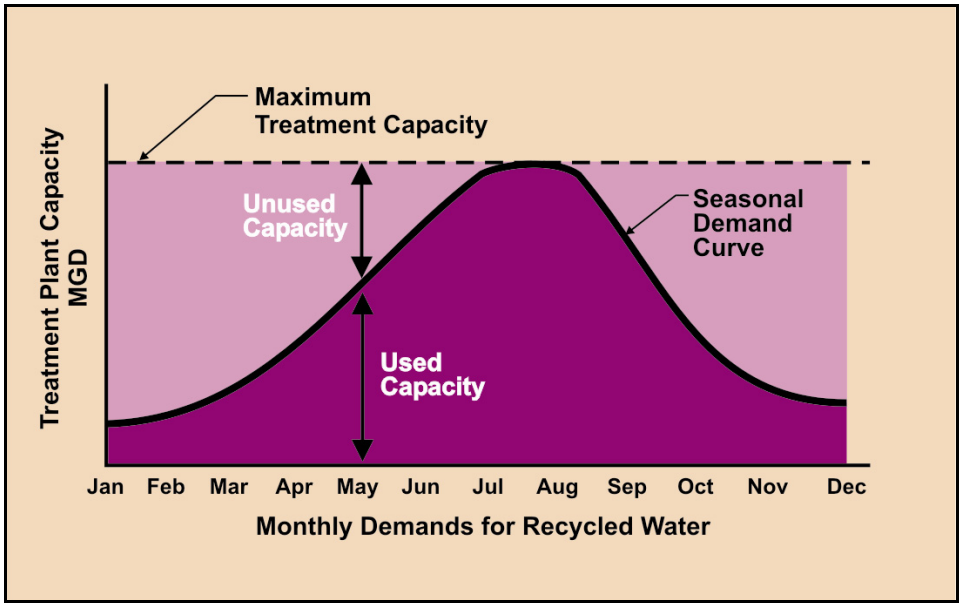

Figure 3-5 – Seasonal Storage of Recycled Water

Seasonal storage is not a use in itself, and the volume of seasonal storage required is dependent on the additional demands put on the system. For seasonal storage to be effective, a significant volume of water must be stored. Because land availability is a critical element of most seasonal storage projects, the addition of a seasonal storage facility is relatively expensive. For this study, potential sites for the construction of earthen basins were estimated to be:

- 40 acres in size for storage of approximately 1,000 AF of recycled water, located on relatively level terrain.
- In relative proximity to the existing or planned recycled water distribution systems.

Groundwater storage of recycled water was also investigated. However, the groundwater basins in San Diego are all designated for potable use by the RWQCB. An amendment to the region's Basin Plan would be required before storage of non-potable recycled water could be permitted to occur in a groundwater basin. According to State regulators, no groundwater basins in California have been permitted for the seasonal storage of non-potable recycled water, therefore, only earthen basins were considered in this study.

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