CITY OF
OXNARD
CALIFORNIA

PUBLIC WORKS

Integrated Master Plan

Executive Summary

FINAL DRAFT • MAY 2016

carollo

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This document is released for the purpose of information exchange review and planning only under the authority of Hugh Steve McDonald, State of California Professional Engineer No. 20740; Tracy Anne Clinton, State of California Professional Engineer No. 48199; and Courtney L. Eaton, State of California Professional Engineer No. 62957.
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1. INTRODUCTION

The City of Oxnard's (City) Public Works Department is facing many challenges in managing its future water resources and utilities. These challenges include responding to immediate drought conditions while also planning for long-term water needs, reducing dependence upon costly imported water, addressing aging infrastructure and reliability concerns, pursuing aggressive goals for energy efficiency and sustainable solutions, maintaining compliance with changing regulatory requirements, and the on-going loss of seasoned staff and personnel. The City's opportunities in meeting these challenges are varied and range from institutional and non-structural approaches (policies and programs) to technical and structural approaches (capital projects). Because of its broad authority, the City is also keenly aware of its unique opportunity to realize the benefits of optimizing both capital and operations and maintenance investments for all water utilities, street improvements and other City infrastructure.

The City is located along the Pacific Ocean coastline in Southern California, just northwest of Los Angeles (see Figure 1). Oxnard is the largest city in Ventura County and is at the center of a regional agricultural industry with a growing business center.

The City has jurisdictional authority to provide potable water, wastewater, recycled water, and stormwater services to nearly 200,000 citizens and numerous commercial, industrial, and agricultural users. For example, the City provides potable water to users by blending groundwater and imported surface water (State Water Project) for its potable water supply.

The Public Works Integrated Master Plan (Integrated Master Plan or Plan) develops long-term recommendations for policies, programs, and projects that successfully address these challenges and opportunities in a holistic and integrated way. In carrying out the

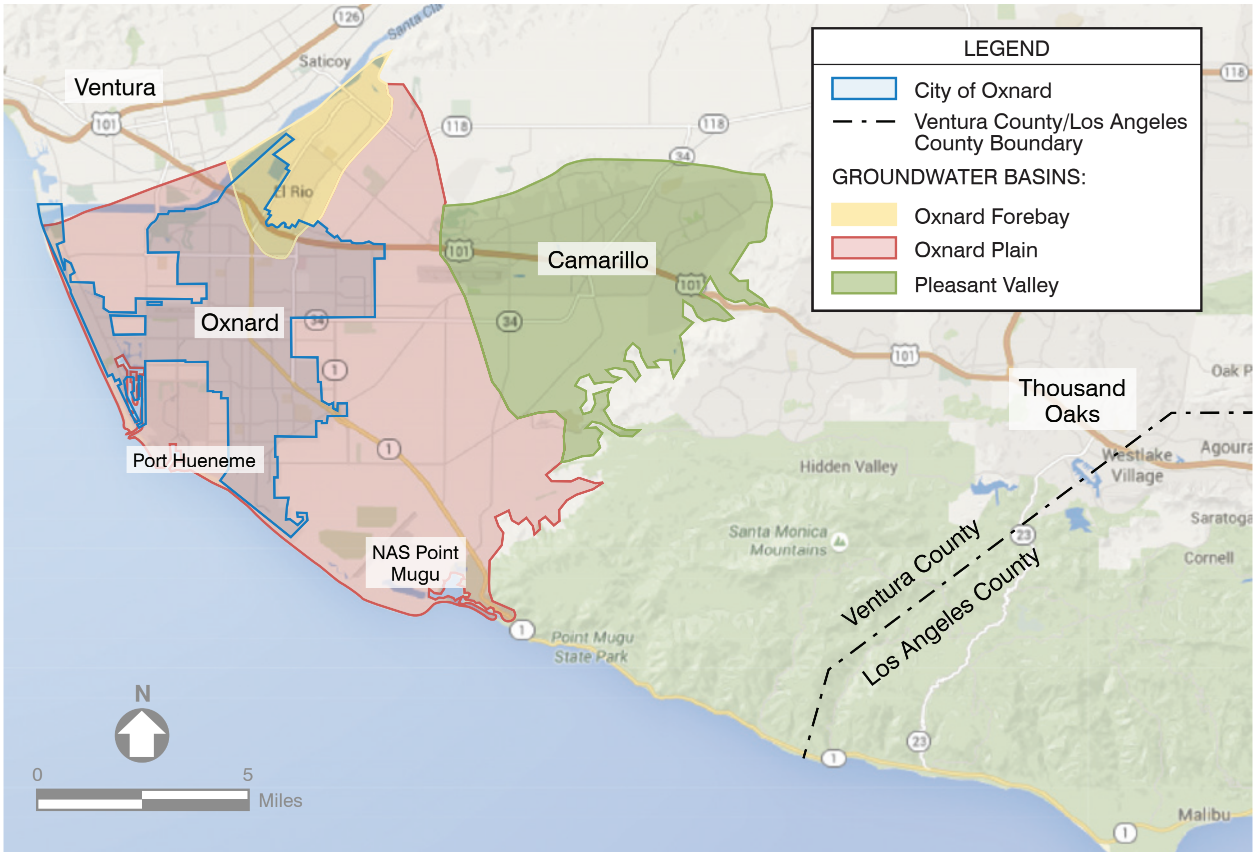

Figure 1. The City of Oxnard in relation to its surrounding communities and groundwater basins.

project goals, the Plan will help the City respond to planned population increases as well as challenges from new regulatory requirements, drought conditions, aging infrastructure, and reliability concerns.

> The Integrated Master Plan documents the policy decisions, goals, and objectives to help protect public health while balancing the environmental, social, and financial impacts of the City's water resource management.

Furthermore, the Integrated Master Plan documents the policy decisions, goals, and objectives to help protect public health while balancing the environmental, social, and financial impacts of the City's water resource management. This Plan also develops cost-effective strategies to address growth, regulatory compliance, environmental protection, and public and worker safety in ways that are consistent with the Plan's polices, goals, and objectives. While not covered in detail herein, the Integrated Master Plan also considered public works staffing, streets linkages to infrastructure, and security of public works facilities.

BRIEF OVERVIEW

The City of Oxnard receives water by drawing it from the local Oxnard Plain groundwater basin and importing groundwater and surface water from the United Water Conservation District and State Water Project via Calleguas Municipal Water District, respectively. Before the water enters the potable water distribution system, the City uses six blending stations throughout city limits for hydraulic blending. One of the six blending station treats local groundwater for high levels of total dissolved solids.

The City also owns and operates its own wastewater collection and treatment system, the Oxnard Wastewater Treatment Plant (OWTP), located on Perkins Road. Since its inception, the plant has grown from a treatment capacity of approximately 5 million gallons per day (mgd) to its current permitted capacity of 31.7 mgd. The current OWTP facility includes raw sewage pumping, influent screening, primary sedimentation, an activated sludge secondary treatment process, effluent disinfection, and solids handling, including digestion. Final effluent is transported to an ocean outfall and discharged offshore to the Pacific Ocean or routed to the City's Advanced Water Purification Facility (AWPF).

In 2009, the City began planning for its Advanced Water Purification Facility, which provides full advanced treatment of secondary treatment wastewater effluent for recycled water use. This facility was dedicated in 2012 as part of the City's Groundwater Recovery Enhancement and Treatment (GREAT) program. Although its origins can be traced to two decades ago, the GREAT program was formally established in 2002 to address increasing concerns over the long-term sustainability of the City's groundwater supply.

GREAT Program Objectives

The objectives of the program as it was first established included the following:

- Increased water supply reliability during drought.
- Reduced water supply costs.
- Water supply security in meeting growing water demand.
- Enhanced local water supply stewardship through the reduction of groundwater pumping and recycling and reusing a substantial portion of the region's wastewater.
- Environmental benefits associated with the development and rehabilitation of local saltwater wetlands.

As the GREAT program evolved, the City shifted from using groundwater recharge as a seawater intrusion barrier to groundwater recharge as an Aquifer Storage and Recovery operation. Because indirect/direct potable reuse provides many benefits and is becoming more commonplace in the current regulatory climate, the City has renewed interest in it.

In addition to these water, wastewater, and recycled water processes, the City operates a network of stormwater facilities with collection piping and channels to convey stormwater to both the Santa Clara River and the ocean. Although Ventura County owns most of these facilities, the City maintains many of them.

INTEGRATED MASTER PLAN APPROACH

The Integrated Master Plan addresses future planning needs for all major water utilities within the City's jurisdiction, including water, wastewater, recycled water, and stormwater. Building on previous planning efforts, this Plan allows the City to take full advantage of potential linkages and efficiencies among the four water utility systems.

The Integrated Master Plan addresses the major water supply issues, including availability, quality, and cost, in a coordinated and integrated fashion across the entire City water utilities. For example, the Plan documents the relationship of the different City water utility policies, programs and projects in terms of physical, institutional, and financial linkages.

A key outcome of the plan was documenting the function of the Advanced Water Purification Facility (AWPF) as to its role in supplementing the community's water supply. It clarifies the AWPF physical linkages to the upstream OWTP, and to the downstream recycled water system. This is especially important in terms of defining the clear link between wastewater utility investments, and water supply and cost decisions, and extending to cost of service policy and water pricing.

Further, the Plan coordinates the need and timing of planned water utility infrastructure facilities as related to the infrastructure elements of the City's 2030 General Plan. This is an important consideration in establishing the priorities and rationale for investment decisions regarding water utility infrastructure to support the overall goals and objectives of the City.

The Plan also serves to integrate the many parallel planning and on-going water utility improvement efforts. This includes the development of industrial wastewater local limits, the permitting process for the indirect potable reuse program, the wastewater utility Report of Waste Discharge submittal, and the Salt and Nutrient Management Plan, among others.

To develop this Integrated Master Plan, six major steps (see Figure 2) were completed. These steps are described below.

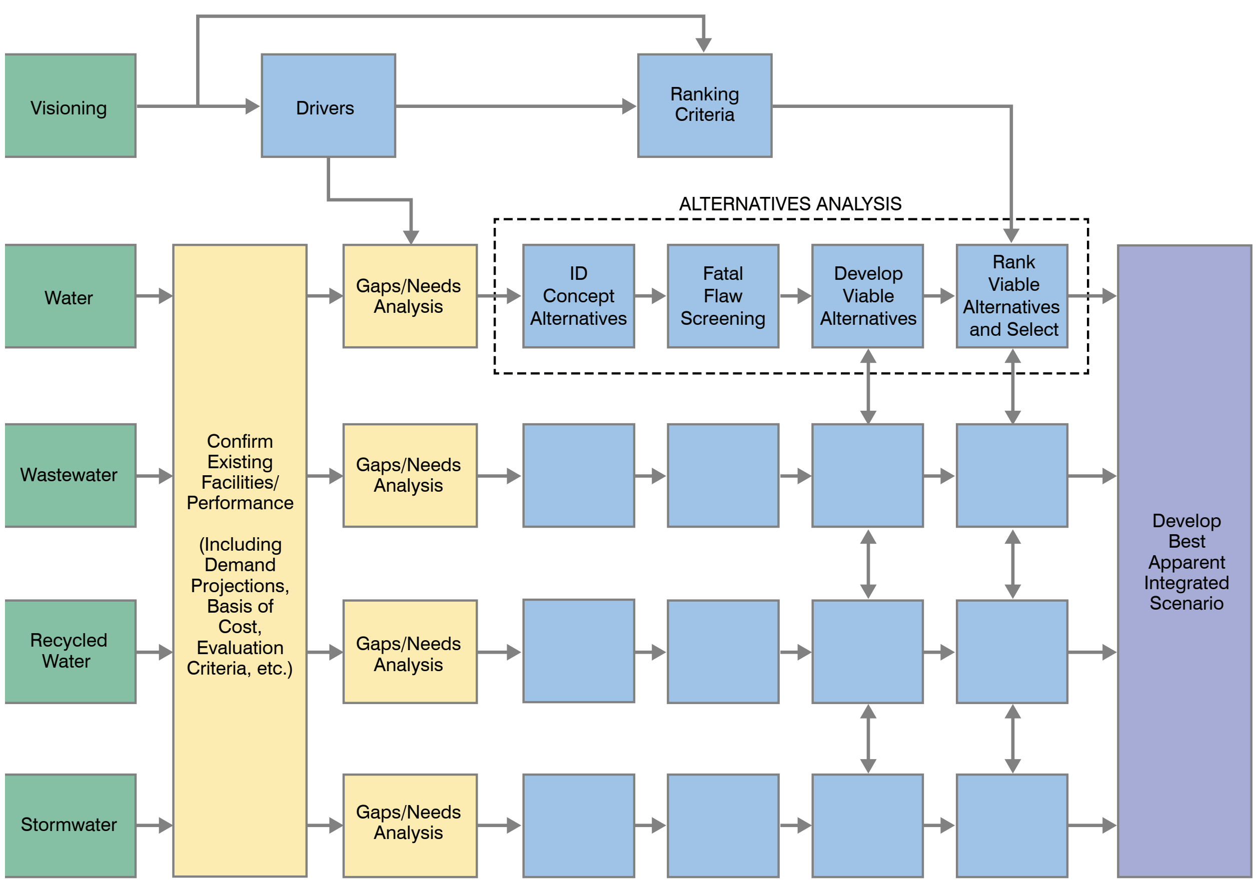

Figure 2. An overview of the Integrated Master Planning Process.

1. **Confirm Existing Facilities/Performance.** Findings and conclusions of past studies and reports were assimilated to confirm existing facilities and their performance. Asset condition assessments were completed to assess condition, criticality, and risk of failure of key assets.
2. **Identify Gaps/Needs Analysis.** Gaps in required performance and utility capacity were identified by comparing the existing facilities' condition, performance, and capacity with the anticipated needs for repair and replacement, capacity, regulatory compliance, and other planning drivers. Future needs were then determined based on anticipated regulatory requirements, planned capacity increases, repair and replacement, risk assessments, cost-effectiveness, and performance improvements that drive the need for future facility improvements.
3. **Analysis of Alternatives.** Viable alternatives were identified, evaluated, and developed to meet anticipated needs or to take advantage of new opportunities in resource recovery and/or technologies. A wide range of solutions were brainstormed, conceptual alternatives were identified, and screenings were conducted to select viable alternatives. The viable alternatives and their abilities were then selected to meet the overall goals and objectives.
4. **Identify Linkages/Evaluate Alternatives.** Various water system plans that support utilities were coordinated to identify key linkages and critical implementation issues, to quantify costs and benefits, and to rank alternatives.
5. **Develop Best Apparent Scenario.** The best combination of policies, projects, and ongoing programs across all water utilities were evaluated and determined, and the best apparent integrated scenario was developed.
6. **Develop Recommended Capital Improvement Plan.** Estimated capital, operations, and maintenance costs were developed to the 25-year planning horizon (through 2040), and a financial evaluation and rate analysis were developed. A phased Implementation Plan was also developed to integrate the recommended improvements for all utilities for greater efficiency and cost-effectiveness.

Viable alternatives were identified, evaluated, and developed to meet anticipated needs or to take advantage of new opportunities in resource recovery and/or technologies.

This Integrated Master Plan is a high level study covering a multitude of areas within each infrastructure system. As such, this Plan will serve as the basis for future documentation and implementation steps, such as the environmental impact review, more detailed facilities planning, design, and implementation of planned projects, and financial planning.

2. MASTER PLAN DRIVERS AND OBJECTIVES

The main purpose of the Integrated Master Plan is to provide a phased program for constructing recommended facilities to accommodate planned growth while simultaneously maintaining treatment reliability, meeting future regulatory requirements, and optimizing costs.

> Key planning drivers were identified that would direct the master planning efforts and be used to evaluate and recommend necessary facilities, policies, and programs within the Integrated Master Plan.

In the first stages of the planning process, key planning drivers were identified that would direct the master planning efforts and be used to evaluate and recommend necessary facilities, policies, and programs within the Integrated Master Plan. These drivers are described below.

- **Repair/Replacement (Condition).** A condition trigger was assigned when the process or facility had reached or was near the end of its economic useful life. This trigger is determined by the need for the facility to operate reliably and meet performance requirements related to the existing permit, worker and public safety, protection of the environment, and all other requirements.
- **Regulatory Requirement**. A regulatory trigger was assigned when local, state, or national regulatory requirements and deadlines established the need for additional treatment facilities. Determining when the new facilities would be put in service depends on the amount of lead-time needed to plan, design, and construct the facilities.
- **Economic Benefit.** An economic benefit trigger was assigned when life-cycle costs could be significantly reduced based on capital and operations and maintenance costs. For example, an economic benefit might be realized for an increase in initial capital investment that achieved an ongoing reduction in labor, energy, or chemical usage.
- **Improved Performance Benefit.** An improved performance benefit trigger was assigned when improved operations and maintenance performance led to more reliability and/or to reduced operational and safety-related risks. For example, an improved performance benefit can be seen in cases of improved process control or automation or to address an operational concern, such as flexibility, reliability, and the need for less complexity.
- **Growth Leading to Increased Demands/Flows/Loads.** A flow or pollutant load trigger was assigned when an increase in existing capacity is needed to accommodate future increases in demand or influent flows or loads to a facility. These increases are determined by population growth, industrial discharges, annexation, regionalization, or changes in wet weather or drought operations.
- **Resource Sustainability.** The resource sustainability trigger was assigned when there was a desire to meet energy initiatives, include resource recovery opportunities, and /or consider sustainable design alternatives.
- **Policy Decision.** The policy trigger was assigned when policy makers made management and/or political decisions.

Taking into account the Master Plan's main goal and key drivers, Carollo developed a set of specific goals and objectives, summarized in Table 1, to provide a framework and boundary conditions for the City's planning process. These goals and objectives guided the development of alternatives and strategies and help select alternatives based on established evaluation criteria.

Table 1. Integrated Master Planning Objectives

Specific Goals	Integrated Master Plan Objectives
Provide compliant, reliable resilient and flexible systems	• Improve system reliability consistent with industry standards. • Implement redundancy/backup systems for routine maintenance and repairs and to address security threats.
Integrate grey and green infrastructure with an emphasis on energy efficiency	• Optimize energy efficiency of systems. • Investigate green and grey infrastructure options such as low impact development techniques for stormwater and alternative energy sources.
Manage assets effectively (economic sustainability)	• Maximize cost/benefit ratio. • Spend public money wisely.
Integrate community interests and maximize public acceptance (social sustainability) and develop sustainable ongoing communication processes	• Minimize impacts to system due to potential climate change related events (i.e., sea level rise, changing rainfall patterns, etc.). • Minimize impacts to the public.
Mitigate and adapt to potential impacts of climate change	• Minimize impacts to systems due to potential climate change related events (i.e., sea level rise, changing rainfall patterns, etc.).
Protect environmental resources	• Maintain permit/regulatory compliance. • Position City for future regulatory changes.
Enhance environmental sustainability	• Maximize water conservation. • Maximize wastewater reclamation and reuse. • Maintain/minimize groundwater extraction levels. • Maximize beneficial reuse of biosolids.

3. MASTER PLANNING ASSUMPTIONS AND CONSIDERATIONS

A common set of planning considerations and assumptions was used to develop and evaluate the overall Integrated Master Plan and its many contributing elements. These planning considerations and assumptions support the City's positions and most current thinking, direction, and needs related to master planning drivers. However, as with any planning effort, changes in these assumptions and considerations could occur. This master planning process, however, includes flexibility to accommodate some variation in assumed planning forecasts.

POPULATION AND LAND USE

Population and land use projections help to determine the City's planned growth. With these projections, future water demands and wastewater flows can be calculated and used to determine additional water and wastewater infrastructure capacity required. For this Plan, the population and land use projections developed were based on the City's 2030 General Plan and on conversations with the City's Planning Department. The projections shown in Figure 3 were used for all water system planning. The future mix of residential, commercial, and industrial users is assumed to remain largely the same as the current mix, with the largest population increase anticipated to be from residential infill and mixed-use development.

The Integrated Master Plan is flexible and sensitive to changes in the timing of future water utility infrastructure capacity. This results in the "just-in-time" construction of additional capacity, as needed, which allows the Integrated Master Plan to establish the least-cost future Capital Improvement Plan.

CLIMATE CHANGE

Scientists predict that sea levels will rise and more frequent and intense storms will occur. Thus, this Integrated Master Plan focuses on how rising sea levels

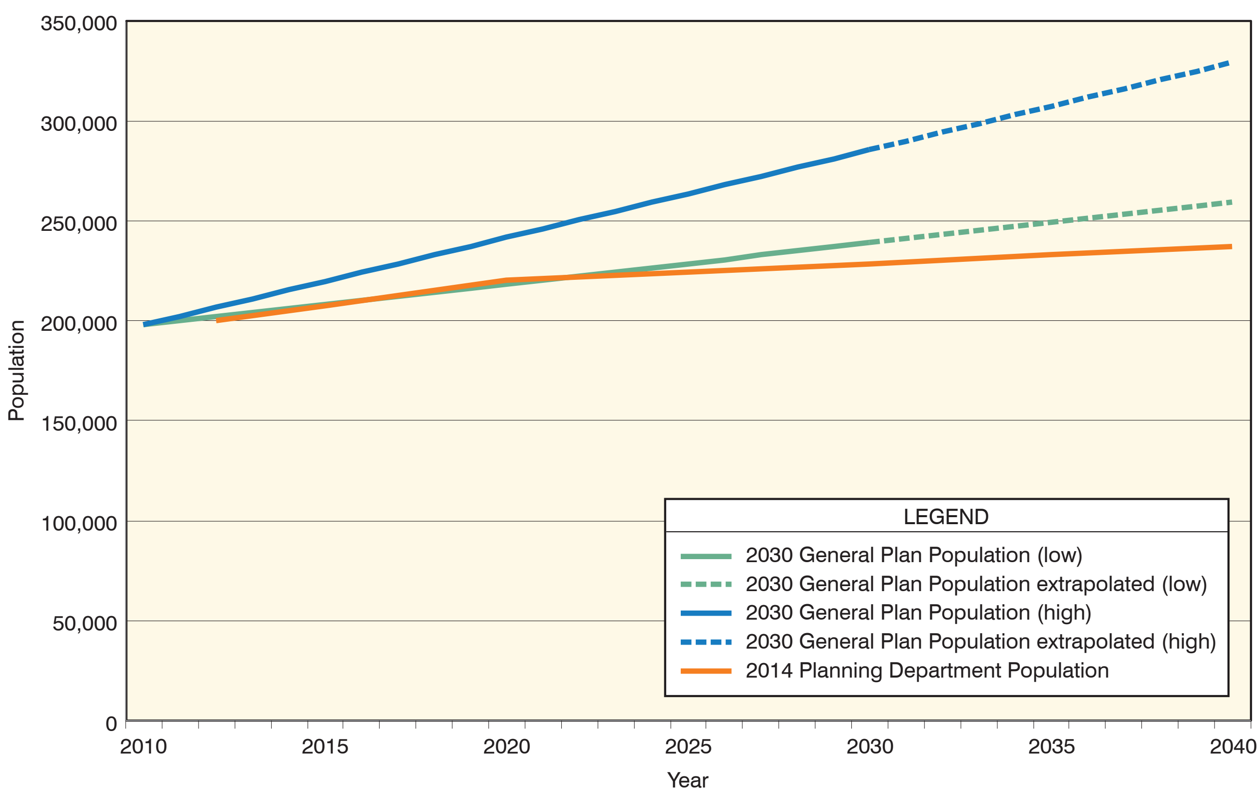

Figure 3. The City's historical and projected population through 2040, assuming population increase due to residential infill and mixed use development.

might affect the wastewater system, and how changes in precipitation patterns and the potential for drought might affect water supply and stormwater collection system capacity. For example, the Federal Emergency Management Agency (FEMA) predicts that portions of the wastewater treatment plant could experience significant flooding because of its low elevation.

REGULATORY

Regulations are constantly evolving. To determine the ability of the City's water systems to adapt to regulatory changes, a regulatory review was conducted for each system. This review analyzed the system's current regulatory performance and its ability to respond to pending shifts in regulations. In addition to this individual utility assessment, an integrated review was performed to understand how changes in one system might affect the regulatory compliance or performance of other systems and what mitigating requirements might be needed.

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Water System

The water treatment and supply facilities currently meet all state and federal water quality guidelines for both groundwater and surface water. The City is tracking several pending regulations, but none are expected to significantly affect the water system. In addition to following these regulations, the City is monitoring for several constituents (compounds found in water) that relate to public health and water quality. Specifically, the City seeks to limit total dissolved solids to less than 500 mg/L, hardness to less than 100 mg/L, and meet the permit limit of nitrates (as Nitrogen) to less than 10 mg/L. These goals apply to the quality of blended water and were included in the overall assessment of the water system's future needs.

Wastewater System

Regulations for the wastewater system can be divided into three major categories: water quality, air quality, and biosolids.

Water Quality. The City's ocean outfall wastewater discharge is governed by both federal and state requirements through the issuance of the National Pollutant Discharge Elimination Systems (NPDES) permit (CA0054097), which limits the amount of conventional constituents, nutrients, metals, and organic pollutants that can be discharged into US waters. The City's current permit was adopted by the Los Angeles Regional Water Quality Control Board (Regional Board) on July 26, 2013. For this permit, the City is consistently in compliance, but is rapidly approaching the limit of treatment reliability and redundancy.

Air Quality. At the local level, the Ventura County Air Pollution Control District is primarily responsible for controlling air pollution from the Oxnard Wastewater Treatment Plant, which holds operating permits for its gas and diesel engines and odor reduction and control systems. Improvements and changes to the wastewater process and discharge location are likely to require revised air quality permits.

Biosolids. Currently, the City disposes of its screenings, grit, and dewatered anaerobically digested solids (or biosolids) by hauling them to a nearby landfill. This complies with the EPA's 40 CFR 503 regulations, the main federal regulation for handling biosolids, as well as other regulatory requirements. However, using or disposing of biosolids is becoming increasingly difficult and costly in California, with fewer landfills accepting biosolids and many counties restricting the application of biosolids. Thus, several adopted and proposed regulations are expected to affect the City's ability to dispose of biosolids in landfills in the future.

Recycled Water

The City has served urban irrigation uses as of mid-2015 and agricultural uses as of early 2016. The City's long-term plan includes indirect potable reuse through aquifer storage and recovery as well as groundwater recharge. For these specific uses, the following regulations and policies apply:

- **Urban/Agricultural Reuse**. California Code of Regulations, Title 22, Division 4, Chapter 3, Section 60301 et seq. & the Recycled Water Policy (adopted by the State Board and administered through the Regional Board and Division of Drinking Water).

- **IPR/Groundwater Recharge**. Division of Drinking Water Groundwater Recharge Regulations and State Board Recycled Water Policy and Anti-Degradation Policy.

The recycled water regulations noted above are summarized in the following sections. In addition to these regulations, the City's GREAT program is currently permitted under Waste Discharge Permit, Order No. R4-2011-0079-A01, recently amended in July 2015. This permit covers non-potable reuse within the GREAT program.

Because the City will be starting to use recycled water for groundwater recharge through its Aquifer Storage and Recovery Demonstration Project, it has submitted a Title 22 Engineer's Report and Report of Waste Discharge to the Regional Board and Department of Drinking Water for approval. The City is also in the process of developing a Salt and Nutrient Management Plan for the Oxnard Plain Groundwater Basin in accordance with requirements in the Recycled Water Policy and Anti-Degradation Policy.

Stormwater

The City's stormwater system is governed by a stormwater permit (termed a Municipal Separate Stormwater System Stormwater permit [MS4]) held by Ventura County Watershed Protection District and nine other surrounding communities. The Regional Board issued the current MS4 permit on July 8, 2010 (Permit CAS004002, Order No. R4-2010-0108). In addition, the City is a participating party in the Santa Clara River Bacteria TMDL and independently implements the Harbor Beaches TMDL.

GROUNDWATER MANAGEMENT CONDITIONS

One major constraint placed on the City's system is the safe yield of the Oxnard Plain Groundwater Basin, from which Oxnard draws its groundwater. The Fox Canyon Groundwater Management Agency protects the quantity and quality of the local groundwater by overseeing and managing all contractual withdrawals within the Oxnard Plain Groundwater Basin. For future groundwater allocation, this Plan made the following key assumptions:

- Groundwater pumping will be restricted to between 50 and 75 percent of historical allocation.
- Future additional and banked (i.e.: on the books) groundwater credits are not reliable and are therefore not included.
- Pump-back allocation for any recycled water supplied to agricultural users will be at a 1:1 ratio, with a maximum of 5,200 AFY available.

One major constraint placed on the City's system is the safe yield of the Oxnard Plain Groundwater Basin, from which Oxnard draws its groundwater.

SUSTAINABILITY

The City seeks to develop sustainable water solutions and infrastructure. As such, the Integrated Master Plan used the Envision® Sustainability Rating System to develop evaluation criteria and metrics for the strategies and alternatives. Each of the planning goals shown in Table 1 was assessed with the Envision® tool to produce measurable metrics for comparing alternatives.

Although the City has a broad interest in applying sustainable solutions, it specifically aims to reduce energy use and increase energy efficiency throughout the system. In April 2013, the City completed an Energy Action Plan (EAP). As part of this plan, the City committed to pursuing the "Gold Level" distinction in Southern California Edison's Energy Leadership Partnership Program, targeting a 10 percent reduction in energy use for its government facilities. Furthermore, Oxnard's Energy Action Plan expands this 10 percent reduction to the community at large, requiring a 10 percent citywide reduction in electricity and natural gas use.

AGREEMENTS/CONTRACTS

As part of the Integrated Master Plan, current agreements and contracts were organized into a database software program to provide the information for efficient City use. The database table structure was set up to be fully scalable for future buildout and also provide security preferences for different users. Some of the key information included in the database is start and expiration dates, dollar amount of original contract and description of contract scope.

4. KEY OPPORTUNITIES TO INTEGRATE BETWEEN SYSTEMS

The four water utility systems: water, wastewater, recycled water and stormwater, are integrally linked because of their positions in the water cycle. For this integrated planning effort, other potential integration opportunities and linkages were identified during the planning process through integration workshops. These workshops brought together key members from various consultant teams and city departments to provide input, coordination, and feedback on many planning elements. From these efforts, key integration linkages were identified, which are described below.

> Planning parameters and tools, such as population and land use projections, the City GIS database, the planning cost basis, and levels of service, were coordinated among plans.

- **Basis of Planning.** Early on in the project, a common basis of design was identified to improve consistency among system plans. Planning parameters and tools, such as population and land use projections, the City GIS database, the planning cost basis, and levels of service, were coordinated among plans.
- **Water Supply Sustainability.** The City sought to secure a sustainable water supply for its community through the GREAT program. As such, the City proposed a relationship between recycled water and potable water. By planning the potable and recycled water systems together, the City was able to create combinations of alternatives that would have been more challenging to generate had the plans been evaluated separately.
- **AWPF and Outfall/Discharge.** The AWPF facility is an advanced treatment facility consisting of microfiltration (MF), reverse osmosis (RO), and advanced UV disinfection. This treatment process treats a portion of the final effluent from the OWTP secondary treatment process, and produces an excellent finished recycled water quality suitable for the widest range of end uses. It results in a concentrated waste "brine" waste stream, however, that is blended back into the remaining secondary effluent for discharge through the ocean outfall. As the percentage of secondary effluent that is diverted to the AWPF plant for treatment increases, so does the amount of the brine that is returned for blending and ocean discharge. There are several constituents that are concentrated in the brine that must be addressed to meet existing ocean outfall discharge requirements. There are two categories of concentration effects: 1) conventional NPDES permit limitations for secondary effluent (i.e. biochemical oxygen demand (BOD), and total suspended solids (TSS), and 2) ammonia limits with the Ocean Plan that need to be addressed as future AWPF capacity is increased. The two approaches to address these concentration effects are on-going, and include: 1) regulatory change involving the point of compliance, and 2) treatment of ammonia to reduce effluent concentrations.
- **Source Control.** It is critical to control the quality of wastewater entering the system and ultimately becoming the water source for advanced treatment systems. As part of this Integrated Master Plan, the City updated its local discharge limits from industrial dischargers through a Local Limits Study (Carollo, 2016). The City also developed best management practices for Centralized Waste Treatment facilities, which treat and discharge hazardous and nonhazardous materials. Plus the City began identifying and analyzing the possible users of a concentrate collection line to remove salts from the wastewater collection system.
- **Staffing.** Staff needs throughout the Public Works Department were reviewed and assessed to determine how staff could best facilitate all water-utility-related systems.
- **Streets.** A key point of integration with the Integrated Master Plan is the City's Streets Master Plan. To minimize overall disruption to the entire community, the planned improvements recommended (e.g., pipeline replacement/addition) must be coordinated with any street upgrades (e.g., repaving, curb, and gutter addition).

5. EXISTING SYSTEM CAPACITY/CONDITION AND FUTURE NEEDS

A thorough assessment of the facilities associated with the City's four water systems was conducted, which included reviewing operation and monitoring data, conducting condition assessments, reviewing drawings, and completing collaborative discussions with staff. From this effort, Carollo drew several conclusions about the existing systems conditions and capacities, which are noted in the following sections.

Water System — At-a-Glance:

- 3 sources of supply:
  - Imported surface water (Calleguas Municipal Water District)
  - Imported groundwater (United Water Conservation District)
  - Locally controlled groundwater
- 6 blending stations throughout the City where supplies are blended to meet required water quantity/quality
- 9 local potable water wells
- 1 desalter that removes dissolved particles to acceptable levels
- Approximately 613 miles of distribution piping

WATER SYSTEM

The City's water system is a combination of water conveyance and treatment, drawing from the three main sources of water, which are all of unique quality. In general, groundwater sources are high in total dissolved salts and hardness, whereas surface water is softer and less salty.

The average annual water demand is approximately 25,000 acre-feet per year and comes from predominantly residential uses. Projecting out to 2040, the water demand is expected to rise to approximately 38,000 acre-feet per year due to in-fill and projected development.

The City's existing system, shown in Figure 4, is a combination of blending stations, potable drinking water wells, and desalter treatment. Depending on the asset, the overall condition of the existing system is fair to good. Currently, no facilities are in immediate risk of failure; however, a fair amount of facilities must be repaired and replaced to ensure that the City's potable infrastructure lasts well into the future. Regarding system maintenance, two of the highest priorities are to provide cathodic protection and to replace the Supervisory Control and Data Acquisition (SCADA). Regular maintenance needs to also be conducted routinely such as flushing the system, exercising the valves, and conducting an active leak detection program.

The system operates as a single pressure zone, which makes meeting pressure targets a challenge. As demands increase, these challenges are expected to worsen. To assess whether the City would benefit from splitting into two or more pressure zones, a pressure zone analysis was conducted using an updated and calibrated system hydraulic model.

The water system's biggest overall challenge will be to maintain a source of sustainable, high-quality supply.

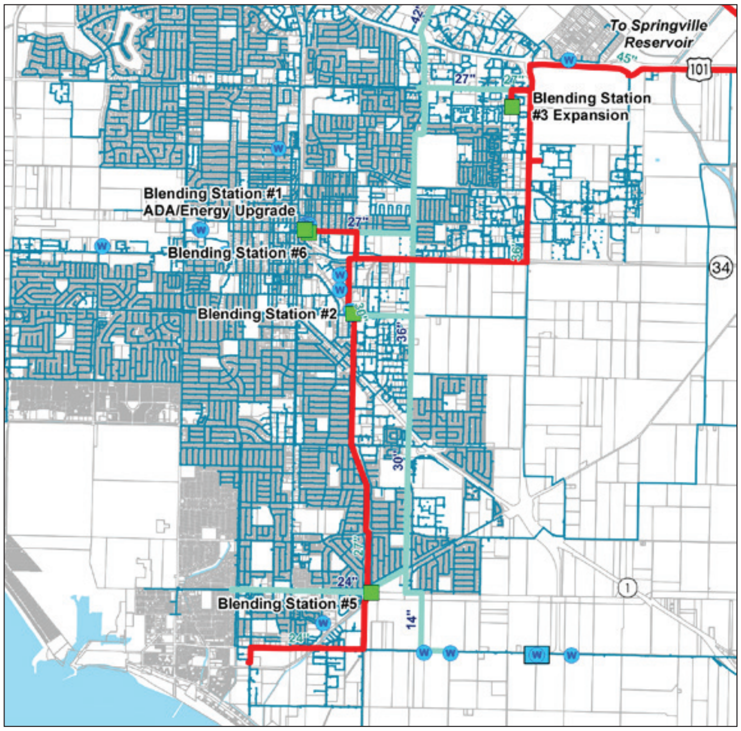


Figure 4. The City's water system is a combination of hydraulic blending stations, treatment, and distribution pipelines.

Though the City currently meets water demand requirements, projections made in the Integrated Master Plan indicate a potential supply gap throughout the planning period. This supply gap, which is based solely on quantity, is projected to be between 3,800 and 10,700 acre-feet per year (illustrated in Figure 5). These numbers depend on the groundwater pumping restrictions, which are expected to be between 50 and 75 percent less than current rates in the long-term.

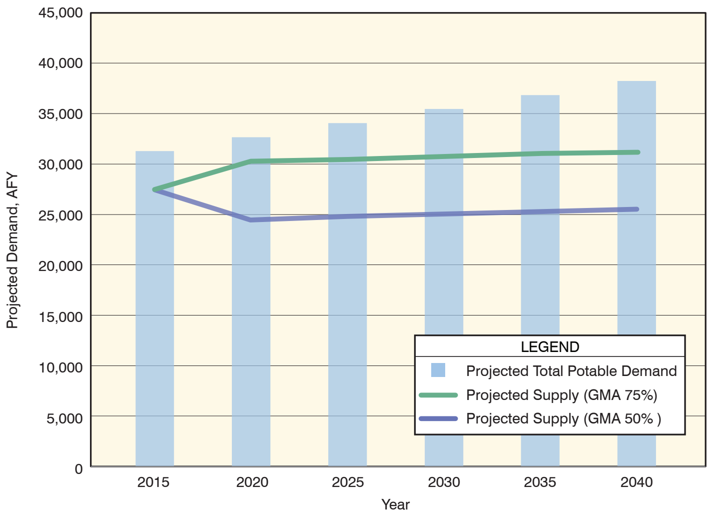


Figure 5. Due to an expected shortfall in supply, the Integrated Master Plan evaluated options for securing a sustainable water supply for the future.

From a water quality and regulatory standpoint, the system meets current regulations for drinking water quality. However, the City wishes to improve upon some taste and odor parameters. The hardness in the blended water is higher than acceptable for some customers, resulting in widespread use of point-of-use softeners throughout the City, which return salt to the wastewater system. Therefore, one of the City's goals is to reach a more acceptable level of hardness in the blended drinking water quality, which would reduce or even eliminate the need for point-of-use softeners. Because of the relatively high hardness of groundwater sources (both local and United Water), reducing the hardness will directly affect the water supply analysis. However, low hardness water could be supplied from the Advanced Water Purification Facility through indirect potable reuse.

WASTEWATER

The Oxnard Wastewater Treatment Plant has a permitted capacity of 31.7 million gallons per day and treats wastewater for discharge to the existing ocean outfall. The Wastewater Treatment Plant includes preliminary, primary, secondary, and disinfection treatment as well as solids handling (shown in Figures 6 and 7). Recent historic average dry weather flows are approximately 20 million gallons per day. If the same flow were projected out to 2040, it would be expected to increase to 27.5 million gallons per day. By 2040, the loading rates of total suspended solids and organics, which are measured by biological oxygen demand (BOD), are expected to increase at a minimum to moderate level.

Though the City consistently meets its discharge permit requirements, much of the wastewater treatment plant is in poor condition and reaching the end of its useful life. Because of this, major investment in repair and replacement is needed in the near future to improve the reliability and safety of plant operations.

Replacement is recommended for a number of process facilities, namely the primary clarifiers, dissolved air flotation thickeners, gravity thickeners, digesters, interstage pump station, effluent pump station, and cogeneration facility. Additionally, due to safety concerns, the biotowers should be demolished as soon as possible. Cathodic protection, SCADA, and electrical upgrades are also needed on key processes and buried facilities.

Wastewater System — At-A-Glance:

- Wastewater collection - Approximately 384 miles of gravity collection pipe, 5 miles of force main collection and 15 lift stations
- Preliminary Treatment - bar screens, screenings conveyance, grit removal, and grit conveyance
- Primary Treatment - 4 primary sedimentation basins with chemical addition
- Secondary Treatment - 2 biotowers, 2 activated sludge tanks, and 18 secondary sedimentation basins
- Equalization - 2 basins
- Disinfection - 2 chlorine contact tanks
- Solids Treatment - 2 gravity thickeners for primary sludge thickening, 2 dissolved air flotation thickeners for waste activated sludge thickening, 3 anaerobic digesters, and 4 belt filter presses for dewatering

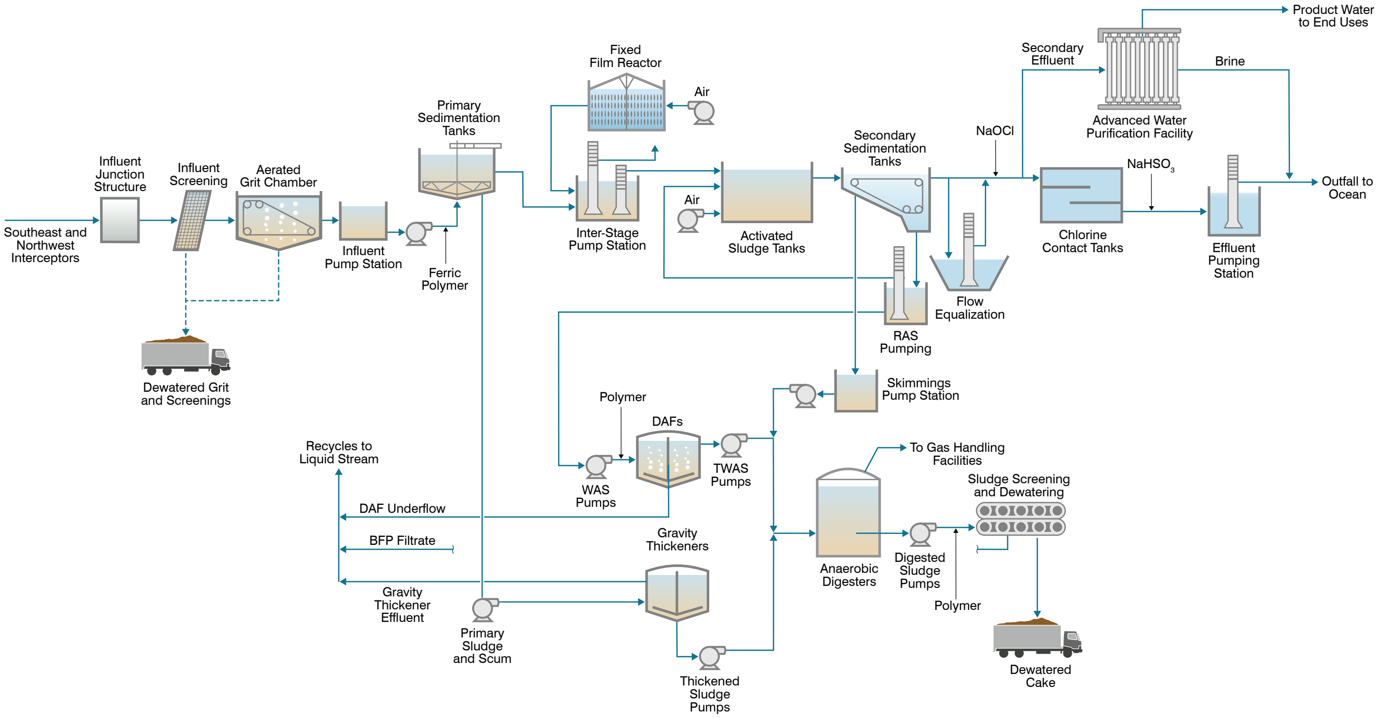


Figure 6. A schematic of the treatment processes currently in use at the Oxnard Wastewater Treatment Plant.

In general, the wastewater unit processes have operated at loading rates well within their original design values or typical operating ranges. In addition, performance has been adequate, and some of the unit processes do not operate with all units in service.

Though the liquid treatment process appears to have sufficient capacity for projected future flows, the solid process does not. In addition, the secondary process does not have the ability to nitrify or denitrify, both of which may be needed as more of the City's treated wastewater effluent is treated to become recycled water.

For the wastewater collection system, some sewers will need to be replaced to meet level-of-service criteria during peak dry weather flow conditions based on current and future growth estimates. In addition, the City will need to consider routine repair and replacement due to age, based on the City's understanding of project needs. The Central Trunk Sewer is also experiencing collapsing manholes that will need to be repaired and replaced.

RECYCLED WATER

The City's recycled water system is a product of the GREAT program, with most parts of the system only recently coming online for full-time operation in 2016. Currently, the recycled water system is used to provide unrestricted reuse water for urban irrigation to the River Ridge Golf Club as well as for agricultural irrigation to growers on the Oxnard Plain through Pleasant Valley County Water District's irrigation network and the Oxnard Recycled Water Pipeline in Hueneme Road. Figure 8 illustrates the location of existing recycled water lines.

Under the GREAT Program, the Advanced Water Purification Facility is planned to be constructed in four phases, resulting in capacities of 7,000, 14,000, 21,000, and 28,000 acre-feet per year. The first phase is complete (7,000 acre-feet per year or 6.25 million gallons per day of recycled water capacity) and is in

Recycled Water System — At-a-Glance:

- Source of Supply - City's secondary wastewater effluent
- Advanced Water Purification Facility (membrane treatment, advanced oxidation, and disinfection) capable of producing 6.25 mgd of recycled water effluent (Phase 1)
- Finished water pump station that pumps to the Recycled Water Backbone Pipeline for urban irrigation uses
- Ocean View pump station that is delivering recycled water to farmers through temporary use of the Salinity Management Pipeline until the Hueneme Pipeline is completed

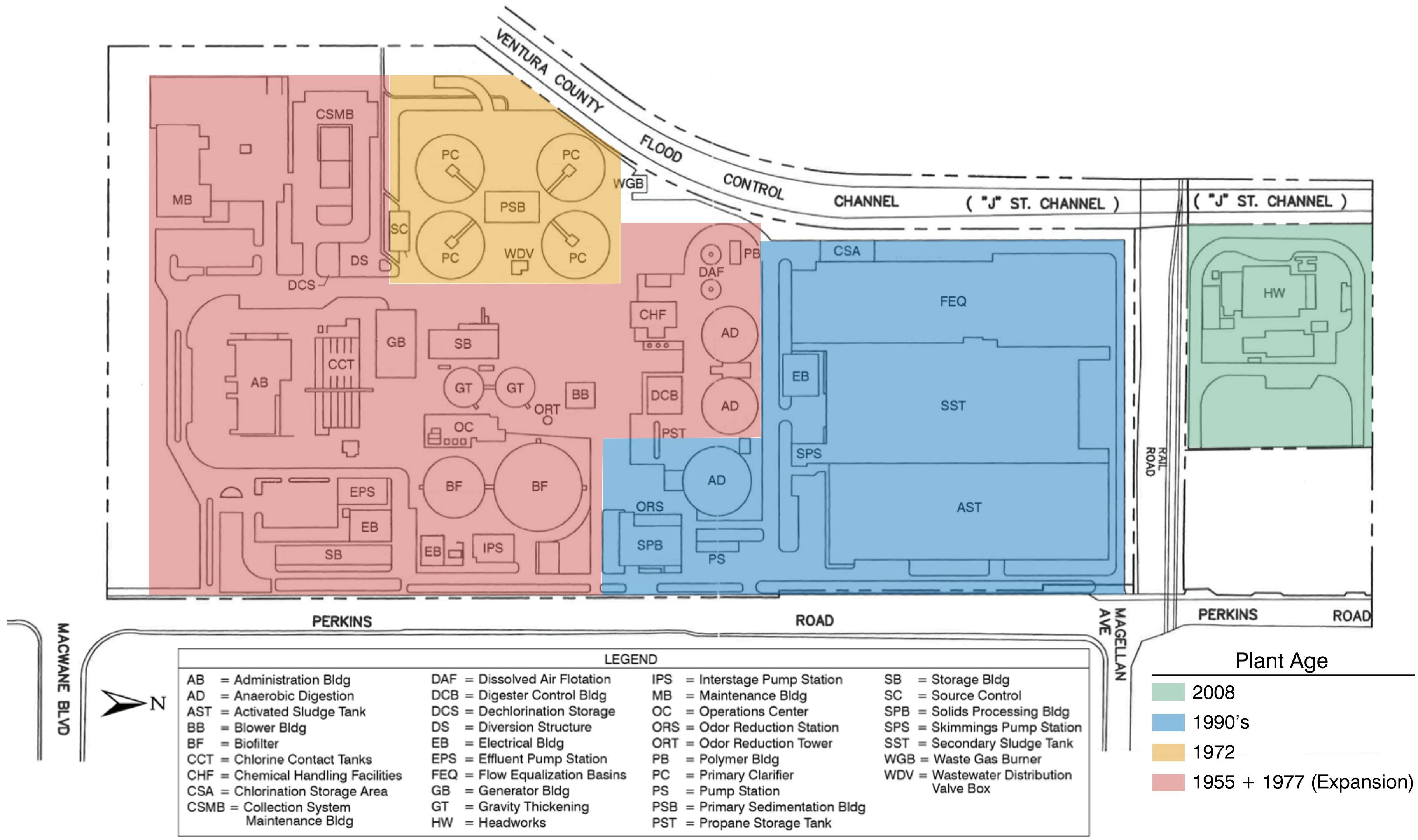


Figure 7. The Oxnard Wastewater Treatment Plant consists of preliminary, primary, and secondary treatment, effluent disinfection and solids handling facilities.

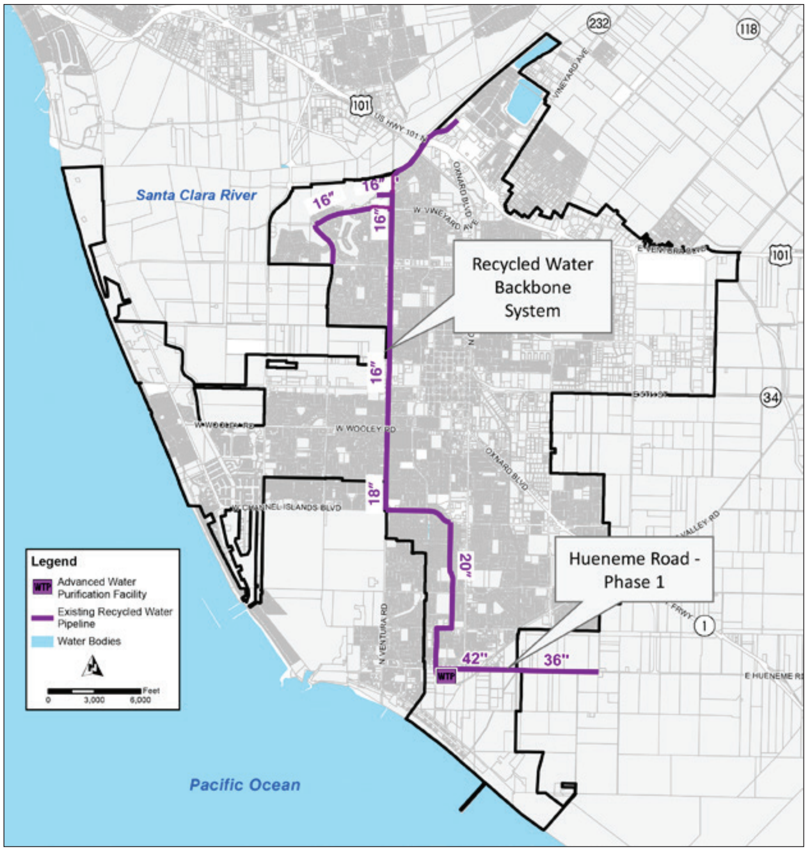


Figure 8. The City serves both urban and agricultural reuse customers with recycled water.

operation. Figure 9 provides a schematic of the treatment facility. For this phase, the current capacity is allocated to urban irrigation, industrial reuse, agricultural irrigation, and indirect potable reuse. As subsequent phases of the Advanced Water Purification Facility finish, the preferred schedule will be to first deliver recycled water to recycled water users currently under contract, second to indirect/direct potable reuse, and third to additional agricultural users, which could benefit the City groundwater due to pump-back credits.

The City will be constructing an Aquifer Storage and Recovery Demonstration well (ASR Demo Well), which is expected to finish in 2016. The construction of this well is grant funded and will serve as a test well for understanding how indirect potable reuse will work moving forward. Initially, the ASR Demo Well will be used as an aquifer storage and recovery well for the recycled water system. In this case, recycled water from the Advanced Water Purification Facility will be injected into the ground and then extracted and returned to the City's recycled water system for irrigation use. Ultimately, once all of the required start-up testing and monitoring is complete, the well will switch

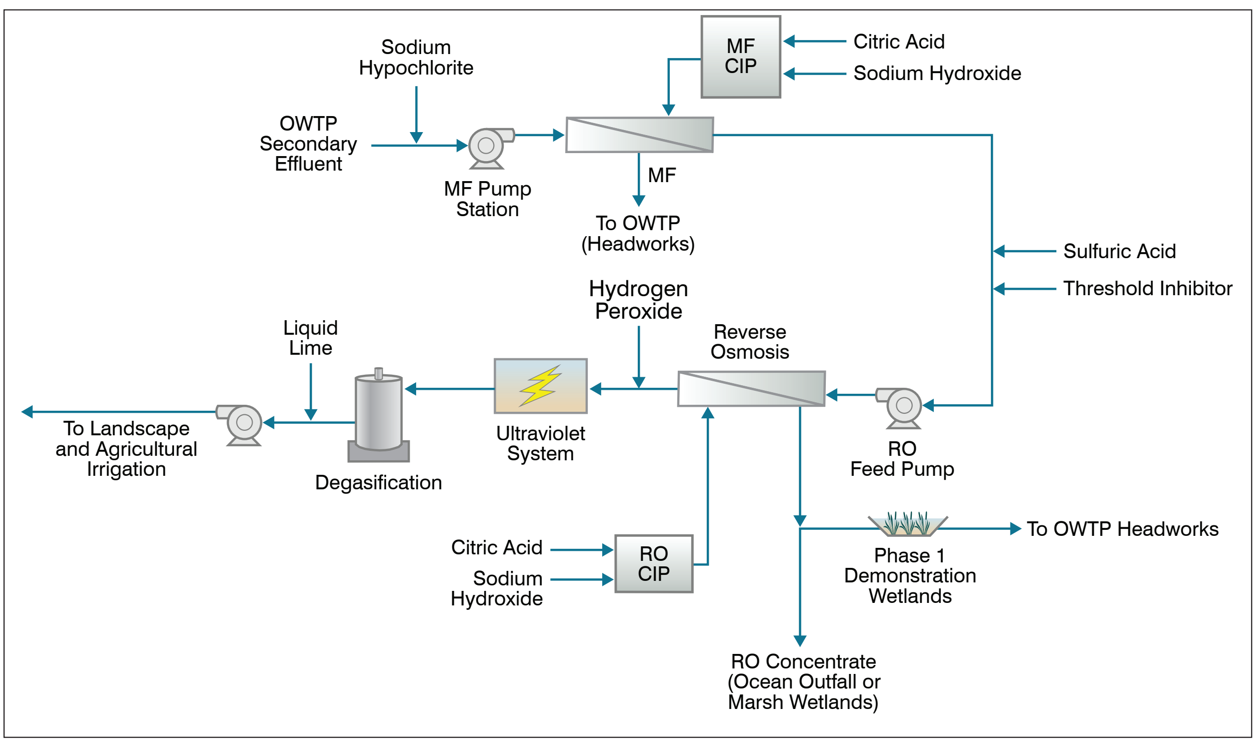


Figure 9. The Advanced Water Purification Facility includes microfiltration, reverse osmosis, and advanced disinfection.

to indirect potable reuse operation, and the extracted water will be conveyed to the nearby Water Campus (Blending Station No. 1) for disinfection and injection into the potable system.

STORMWATER

The City's stormwater system serves the City and surrounding lands that drain into Oxnard, an area that covers approximately 35 square miles. Drainage channels for this area are either partly or completely under the jurisdiction of the Ventura County Watershed Protection District and discharge directly into the ocean or into the Ventura County facilities before discharging to the ocean. The City's existing storm drainage system collects and conveys stormwater runoff from developed and undeveloped areas throughout the City.

During the condition assessment, the City's stormwater system was found to be in relatively good condition, with only 12 percent in poor or very poor condition. During the level-of-service analysis, significant surcharging was found for a 10-year, 24-hour storm event in the City's storm pipes located in the downtown core of the City. However, this surcharging is likely not related to the drainage pipe's capacity as much as it is to the Ventura County Channels' conveyance capacity. In similar locations, the existing storm drain system lacks sufficient capacity to convey the 100-year design runoff while meeting the flooding criteria.

Although major upgrades to the City's existing stormwater system are not needed, the City might benefit from adding a dry weather diversion into its system. Dry weather flows, including flow from irrigation runoff, pool draining, washdown water, construction work, and likely shallow groundwater infiltration, could be diverted to the wastewater plant for treatment and potential reuse at the Advanced Water Purification Facility.

Additionally, the City recently completed a Green Alleys Plan, the goal of which was to identify City alleys that are good candidates for green alley projects and to provide a framework to guide the future design and implementation of these projects. In reviewing the Green Alley program results, some of the high priority public alleys were noted to overlap with the observed areas of flooding. Figure 10 shows the areas of high priority for Green Alleys projects, along with the existing flooding areas.

Stormwater System — At-A-Glance:
- City owned - Approximately 162 miles of storm drains and open channels and 5 stormwater pump stations
- Ventura County owned - Approximately 28 miles of open channels

In addition to the structural needs addressed above, the City faces a total maximum daily load restriction for indicator bacteria in the Santa Clara River Estuary. This load limit will require participating agencies, including Oxnard, to prepare an implementation plan that outlines proposed activities to reduce the bacteria and trash loads to the Estuary.

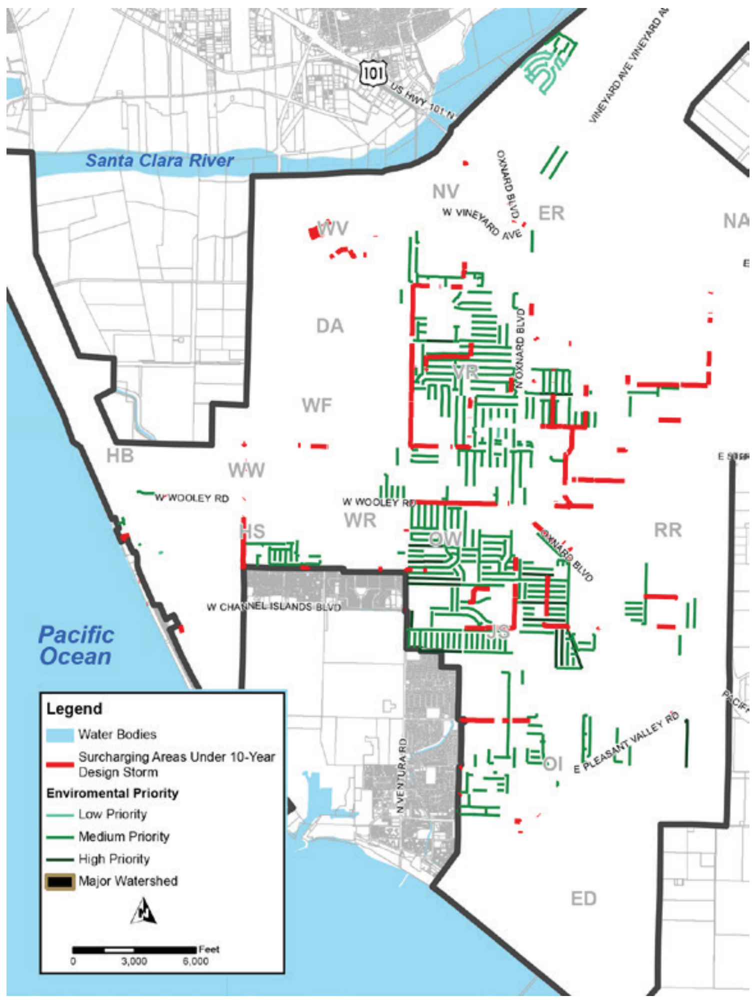


Figure 10. High Priority Green Alleys Environmental Improvements and Flooding Areas.

SUMMARY OF FUTURE NEEDS

When considering the future needs of each water system, categorizing them by their corresponding planning driver is helpful. Table 2 matches each future need with its planning driver.

Table 2. Summary of Future Needs Categorized by Planning Driver

Driver	Water	Wastewater	Recycled Water	Storm Water
Repair and Replacement (R&R)	• Cathodic protection • Select water main replacement due to age and fire flow needs • Routine maintenance on blend stations • Automatic Meter Reader Devices • Security needs	• Repair and/or replacement needed on almost every treatment plant process • Seismic/structural upgrades needed on several facilities • Cathodic protection of buried plant piping, clarifiers and digesters • Select sewer replacement due to age	• Minor improvements to the advanced water purification facility	• Select storm water pipeline/culvert replacement due to age and condition
Regulatory		• Potential addition of nitrification/ denitrification		• Infiltration basin to meet total maximum daily load allocation for indicator bacteria
Operational Optimization	• Electrical rehabilitation • Generator and ATS service • Turnout service	• Biotower removal • Interstage pumping reconfiguration(1)	• Addition of diurnal storage and booster pumping	
Growth/ Capacity/ Water Supply	• New potable wells • Upgraded pipelines to meet projected demand • Pressure zone separation	• Solids process expansion • Expansion of select sewer pipelines	• Expansion of advanced water purification facility • Addition of aquifer storage and recovery wells • Addition of recycled water distribution forcemains	
Resource Sustainability		• Blower and cogeneration replacement • Fats, oils and grease receiving station		• Dry weather stormwater diversion • Incentive program to encourage using stormwater as an offset to potable use
Improved LOS	• Additional desalting capacity to improve water quality • Pressure zone separation			

(1) Project satisfies driver for Resource Sustainability as well.

6. KEY FEATURES OF THE RECOMMENDED 25-YEAR PLAN

With future needs identified, recommended projects can be developed to meet those needs. This section presents the rationale for the City's 25-year Capital Improvement Plan (CIP). The complete CIP is presented at the end of the Executive Summary. For each system, the set of recommended projects uses the existing system's condition assessment, capacity, and performance needs in meeting projected future demands and the water quality objectives summarized below. These projects cover the needs of the entire planning period for this Integrated Master Plan (2015-2040). Though the overall Capital Improvement Plan was combined and integrated to account for potential linkage opportunities, each system plan is presented individually for added clarity and simplicity.

> The complete CIP is presented at the end of the Executive Summary. These projects cover the needs of the entire planning period for this Integrated Master Plan (2015-2040).

The lists presented in the CIP should be considered "draft" until the environmental review and assessment for the Integrated Master Plan are complete. Once the environmental review process is complete, the recommended project list will be reviewed and revised as necessary and made final.

The recommended projects are based on evaluations of conventional and advanced treatment requirements, the analysis of master plan alternatives and scenarios from the previous sections, and numerous integration workshops and meetings with the City.

CAPITAL COSTS

The estimated capital (or project) costs presented are based on preliminary layouts and suggested unit process sizes. Construction costs have been estimated using information from estimating guides, equipment manufacturers, previous City construction projects, and construction costs of similar facilities designed by Carollo Engineers.

While the estimated construction costs represent the average bidding conditions for many projects, variation in bidding climate at the time the facilities are constructed could affect actual costs. The facilities' size may also be refined during preliminary and final design based on the most current operational information available. As a result, the actual construction costs may be lower or higher than estimated.

Although costs have been adjusted to cover special conditions known at this time, planning estimates are not as accurate as estimates prepared in conjunction with final design. The overall expected level of accuracy of the project cost estimates prepared for this Integrated Master Plan is +30 percent to -20 percent, which is consistent with the guidelines established by the American Association of Cost Engineers for planning studies.

Capital (or project) costs for the Capital Improvement Plan are based on a February 2015 20-City Engineering News Record Construction Cost Index of 9962 and were adjusted for City location as necessary. This date is used as the base level to which construction costs are adjusted. Therefore, all costs presented will reflect February 2015 cost levels. This means that actual costs may be higher than presented, depending on when the facilities are finally constructed. For the financial analysis, the estimated costs are escalated to the projected time of construction.

PROJECT PHASING

The projects presented in the Capital Improvement Plan were split into phases, which loosely follows the following project timing: 1) Phase 1 – Immediate Needs (First 2 years); 2) Phase 2 – Near-Term Needs (Years 2 to 10); and 3) Phases 3/4 – Long-Term Needs (beyond 10 years).

> While the estimated project costs and phasing presented are consistent with those developed for the Cost of Service Study (Carollo, 2015), the timing implemented for those phases may differ.

While the estimated project costs and phasing presented are consistent with those developed for the Cost of Service Study (Carollo, 2015), the timing implemented for those phases may differ. Some of this is because the timing and implementation of certain projects use assumptions with a range of uncertainty. These uncertainties include the rate of population growth, timing and performance standards for future regulatory requirements, the outstanding planning considerations mentioned above, and the development of new technologies and associated reliabilities. Thus, while the overall investment and total Capital Improvement Plan budget over the 25-year planning horizon is consistent with the Integrated Master Plan and the Cost of Service Study, the implementation timing of some projects may differ with the variability in the underlying assumptions of Integrated Master Plan drivers.

WATER SYSTEM

Figure 11 illustrates the location of the recommended water system improvements for securing and sustaining the City's water supply. Since the recommended projects work in concert with the recycled water improvements, both are shown together.

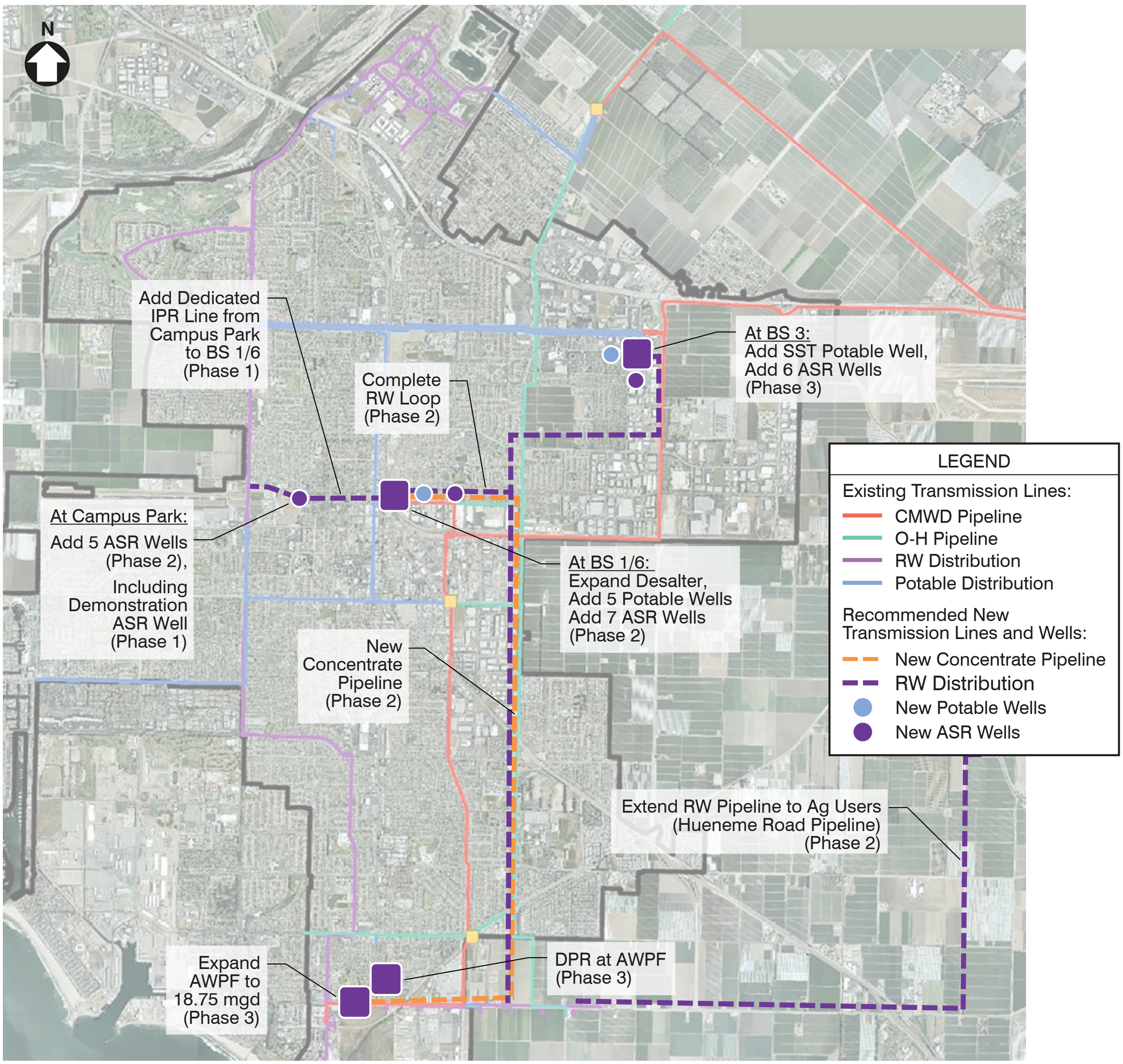


Figure 11. Recommended water/recycled water projects for water supply.

Water Supply

Securing a sustainable water supply for the City will come through a combination of additional potable water pumping and recycled water aquifer storage and recovery. As such, new potable water supply wells are needed to maintain the reliability of the City's local groundwater pumping operation and to add system reliability. These new wells will replace and bolster the City's current local groundwater pumping capacity. Because Blending Station No. 1/6 and Blending Station No. 3 are the most favorable locations for potable groundwater pumping due to the significant existing infrastructure in both locations, these sites were selected for the location of the new potable wells.

In general, most of the City's distribution system is capable of handling current and future demand flows, with the exception of some pipes in the immediate vicinity of the blending stations. As demands rise, the velocities in these pipes will likely exceed level-of-service criteria. Although the list of recommended projects includes replacing these pipes, the exact year for replacement needs to be determined after coordination with the Project Memorandums contained in this Integrated Master Plan.

Also of note is a separate project indirectly related to water supply, which involves constructing a dedicated concentrate pipeline from Blending Station No. 1/6 to the Wastewater Treatment Plant's ocean outfall. This pipeline is especially needed since increasing the desalting capacity as local groundwater pumping increases is recommended. Furthermore, the City discharges brine from the existing desalter back to the Wastewater Treatment Plant, which could adversely affect the Advanced Water Purification Facility. Adding a dedicated concentrate pipeline could prevent this from occurring.

Repair and Replacement

A number of projects related to repair and replacement for the water system were identified through the efforts of this Integrated Master Plan and City staff. These improvements are broken down into two broad categories: above-ground assets (blending station/treatment) and below-ground assets (distribution system piping). These two categories are described below.

Blending Station/Treatment. Replacing the cathodic protection systems is needed for the desalter and steel permeate storage tank. The water Supervisory Control and Data Acquisition (SCADA) system is also slated for complete replacement and upgrade.

Distribution. Distribution system piping improvements are needed for the replacement of aging pipes to meet reliability and redundancy requirements, and to protect public health. New piping is recommended to provide adequate fire flow water. Cathodic protection projects were identified for several key water force-mains throughout the City. Replacing the automatic meter reader devices is also imperative for accurate billings and water use data.

Operations Optimization

The City is also working on several optimization projects for the City's water system operation. These projects were identified and included as recommended projects in the CIP.

Improved Level of Service

For potable water customers, water quality and pressure are the two most readily perceived issues with water service. If the City is to maintain and improve its high level of service to its customers, two main projects are recommended. These projects are described below.

Water Quality. Because of the groundwater supply's high level of hardness, the City operates a desalter to reduce the hardness level of blended water to approximately 350 mg/L. However, many customers still find the water dissatisfying and run their own softeners. These softeners increase the salt concentration, which adversely affects the Wastewater Treatment Plant and Advanced Water Purification Facility.

> For potable water customers, water quality and pressure are the two most readily perceived issues with water service.

To improve the quality of the water supply, increasing the current and future supply's desalting capacity so it can meet a target hardness level of 100 mg/L is the most cost-effective option. To facilitate this project, the existing 7.5 million gallon per day desalter located at Blending Station No. 1/6 will be expanded to a total treated water capacity of 15 million gallons per day.

Water Pressure. Based on the pressure zone analysis, it is recommended to reduce service pressures outside of the established delivery pressure criteria by breaking its single pressure zone distribution system into four pressure zones: North, Coast, Central, and South. Figure 12 illustrates these pressure zone areas.

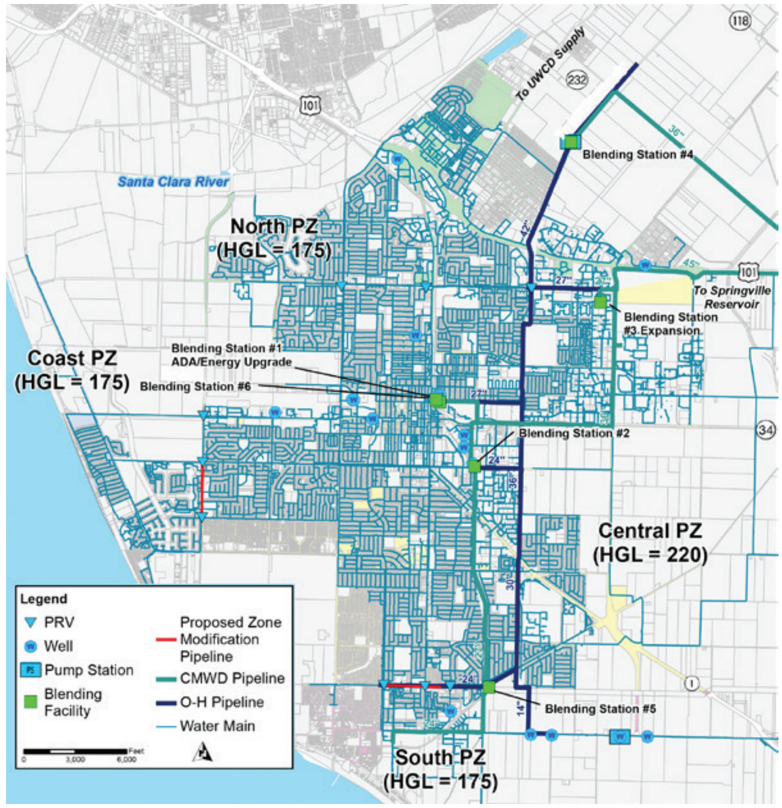


Figure 12. Proposed Pressure Zone Separation within the City's Water System.

WASTEWATER

Figure 13 shows the recommended projects for the wastewater treatment facility, which are categorized by implementation phase. Two overarching wastewater treatment locations were considered, namely, repair in place and relocate the plant. Both are described in this section.

COLLECTION SYSTEM

Capacity

Projects related to increasing the wastewater system's capacity involve the collection system, and these projects are relatively few. Specifically, there are three main capacity projects, all of which are identified in the CIP.

Repair and Replacement/Improved Performance

Collection System. There are 14 identified repair and replacement and performance-based projects which are summarized in the CIP. These projects are located in various places throughout the City's collection system.

TREATMENT SYSTEM

Repair and Replacement

Headworks. The proposed headworks improvement projects are to improve reliability and to help maintain a fully functioning and permit-compliant facility. As part of these projects, the following improvements will be made:

- Adding odor containment and ventilation facilities
- Repairing the cover coating of interior influent structures
- Adding a new seal water system for the influent pumps
- Adding fiberglass covers for the headworks structures for odor control
- Making minor modifications at the grit screenings building for seismic reliability
- Repairing concrete that is spalling
- Replacing small equipment with more energy-efficient models as the small equipment reaches the end of it's useful life
- Building a new non-hazardous liquid (septage) receiving station and screen wall

Primary Treatment. All four clarifiers and the associated primary clarifier building need to be replaced to increase the treatment plant's reliability and safety for plant operators due to seismic criteria and deteriorated condition. The primary clarifiers will be replaced. The existing primary clarifier equipment will be replaced as well so reliable service can be maintained during construction. An influent new splitter box is recommended to improve flow control. As the new primary clarifiers are being constructed, the City should continue to incorporate chemically enhanced primary treatment for better nutrient removal and cathodic protection.

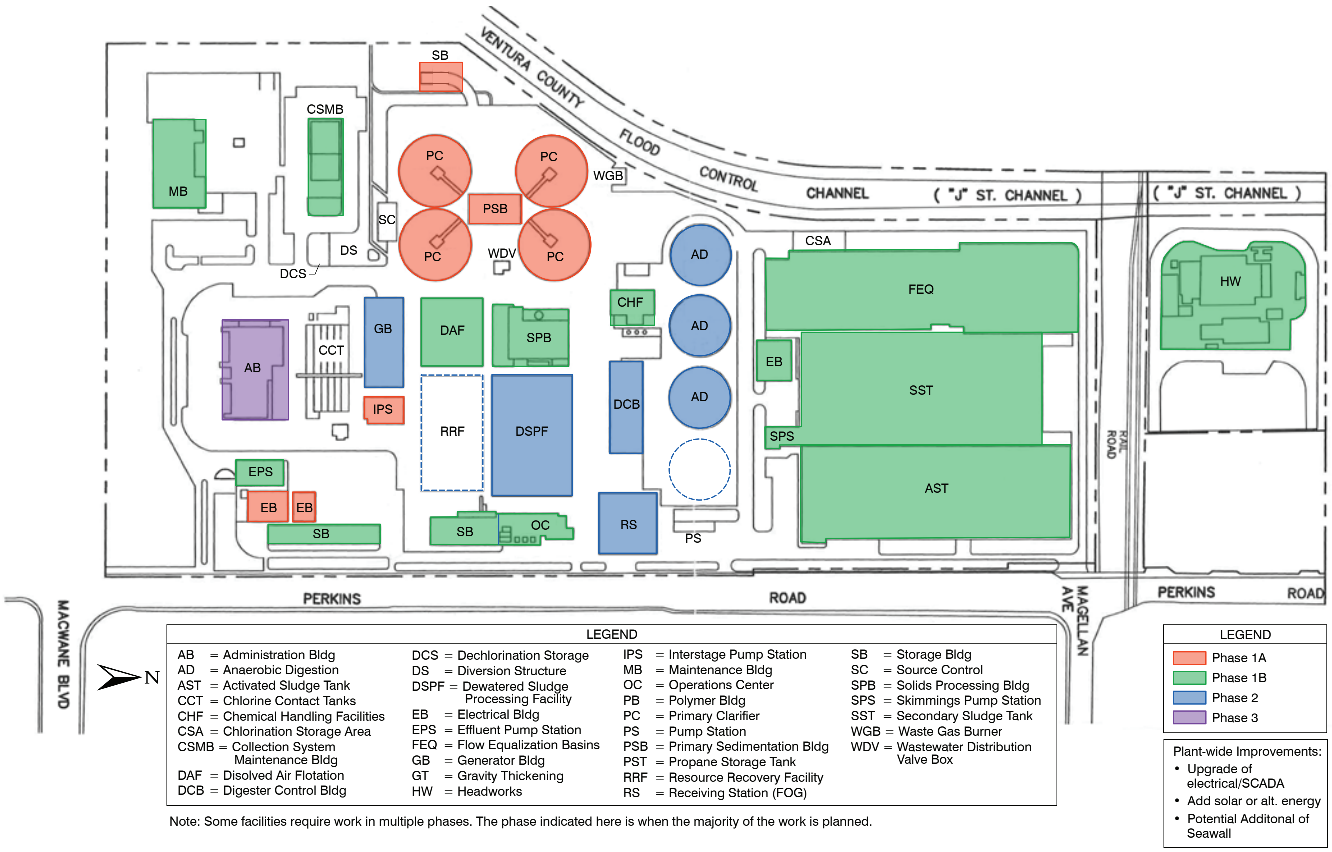


Figure 13. Recommended Wastewater Treatment Plant Projects by Implementation Phase.

Secondary Treatment. Based on the plant condition assessment and seismic evaluation, several improvements were identified in the secondary treatment process. Because the secondary process has sufficient capacity to meet future needs, the recommended projects are intended to address aging facilities and to improve operability and performance rather than increasing capacity. The recommended projects are as follows:

- Demolish **biotowers** since they have reached the ends of their useful lives an are a safety hazard.
- Reconfigure and relocate **interstage pumping** for more energy-efficient pumps.
- Repair concrete and make seismic/structural repairs to **activated sludge tanks** and replace associated diffusers and blowers with high-efficiency models.
- Add baffle walls in **activated sludge tanks** and convert them to a step-feed configuration with an anaerobic selector so the process can handle higher organics loading without expanding its footprint.
- Repair and repaint concrete in the **secondary sedimentation tanks** and replace the small equipment associated with the tanks, such as return and waste activated sludge pumps, collectors, skimmers and drives, variable frequency drives, and magnetic flow meters.
- Modify the **secondary sedimentation tank** inlet to more equally partition flow between each tank.
- Add a **mixed liquor wasting station** to automatically control the solids residence time in the secondary system.
- Make concrete and seismic repairs to the **flow equalization basins** and replace the associated gates, drives, and equalization and utility water pumps; make recommended upgrades to the utility water control system for potential energy savings.

Disinfection. For continued reliability of the disinfection system, concrete repairs and a new interior coating are recommended on the disinfection contact tank. Replacing the associated gates and operators as well as the

All four clarifiers and the associated primary clarifier building need to be replaced to increase the treatment plant's reliability and safety for plant operators due to seismic criteria and deteriorated condition.

sodium hypochlorite storage tanks and pumps is also recommended.

Effluent Pumping. The effluent pump station building and the associated effluent pump station equipment, all nearing the ends of their useful lives, should be replaced. These improvements will provide reliability for downstream users and will enhance safety for plant operators.

Solids Treatment. Based on the plant condition assessment and seismic evaluation, several improvements were identified in the solids treatment processes. Furthermore, the solids handling facilities do not have sufficient capacity for the expected increase in sludge production from removing the biotowers and adding an anaerobic selector in the activated sludge tanks. Because of these anticipated changes, additional solids handling units are needed. Improvements to the solids treatment processes are as follows:

- Abandon and demolish the existing **gravity thickeners** and associated blower building and odor reduction tower, which are at the ends of their useful lives, and switch to co-thickening in dissolved air flotation thickeners or thickening in the new primary clarifiers.
- Demolish the existing **dissolved air flotation thickeners (DAFT)** and relocate the two new units of similar size near the existing generation building; add two units and a larger thickened waste activated sludge pump station to accommodate additional co-thickened primary sludge.
- Replace all **anaerobic digesters**, which are nearing the ends of their useful lives, with digesters slightly larger than the existing digesters and of equal size to one another; relocate the old digesters to the location of the existing dissolved air flotation thickeners. Relocating the digesters would provide enough space for an additional digester in the future. To facilitate the transition, Digester 2's cover should be replaced so the Digester can be temporarily put back in service while concrete testing is conducted and Digester 1 is being demolished and rebuilt. In addition to replacing and relocating the digesters, the digester building is also recommended for replacement.

The solids handling facilities do not have sufficient capacity for the expected increase in sludge production from removing the biotowers and adding an anaerobic selector in the activated sludge tanks.

- Relocate the **solids processing building** to the central portion of the plant to concentrate unsightly and odorous operations away from property boundaries.
- Replace the existing **belt filter presses** housed in the solids processing building, which are past the ends of their useful lives, with centrifuges or screw presses. As solids loads increase, an additional dewatering unit is recommended to provide more operator flexibility so the dewatering units do not need to run continuously.
- Add **digested sludge silos** to decouple dewatered sludge hauling from sludge dewatering. This will allow operators to run the dewatering units without having to haul sludge simultaneously.

Cogeneration. Because a seismic review found the cogeneration building to be nonconforming for the Immediate Occupancy performance level, replacing the building and the associated cogeneration equipment is recommended. However, because this project is not as critical as some of the others listed, it is slated for a later phase of the plan. An interim replacement for the building roof will be needed in the immediate future.

Electrical Systems. The majority of the existing electrical equipment at the treatment plant is in poor condition and needs to be replaced. All of the motor control centers (MCCs) throughout the plant are past or nearing the ends of their useful lives. In addition, the existing generators cannot be brought online quickly enough to meet new standards for emergency standby. Thus, new generators are recommended to supply the plant with emergency power. Furthermore, a new supervisory control and data acquisition (SCADA) system is needed for adequate plant process operation and control. Table 5 provides a list of all of the major electrical projects included in this plan.

Various assessments for this Plan also identified several non-process facilities improvements.

Non-Process Facilities. Various assessments for this Plan also identified several non-process facilities improvements. The major improvements are as follows:

- Cathodic protection of major treatment plant assets and annual cathodic protection maintenance
- Repaving the plant site once major improvements have been completed
- Adding a new Computerized Maintenance Management System (CMMS) for more uniformity and the ability to share data between divisions and departments
- Replacing various heat pumps and air conditioning condensing units with more efficient models

Resource Sustainability

Several projects focusing on resource sustainability were also identified. These projects were aimed at recovering resources onsite and decreasing waste sent offsite. Some of the projects also address issues with resiliency and reliability from potential climate change effects. These projects are described below.

Some of the projects also address issues with resiliency and reliability from potential climate change effects.

- Add a **fats, oil, and grease receiving station** to provide flexibility in timing the addition of fats, oil, and grease to prevent slug loading, which can lead to digester upsets. Adding a receiving station will also allow fats, oil, and grease to be added when energy costs are high.
- Add **solar cells** to the rooftops and carports throughout the facility. Adding solar cells would increase the amount of energy produced onsite, thus helping the OWTP become energy self-sufficient.
- Add a **membrane bioreactor** (MBR) to address potential nutrient requirements placed on the outfall from increased levels of water reuse that concentrate ocean discharge. Adding membrane bioreactors is recommended as a "placeholder" technology to replace the secondary sludge tank. The bioreactors would treat all wastewater flow.
- Add **ultraviolet/advanced oxidation process** as a recommended additional step after installing the membrane bioreactors. This process would allow flows to be sent to the Advanced Water Purification Facility. One concern with a high reuse percentage is that the concentrate will not properly disinfect water. If this occurs, an additional disinfection process is recommended to address potential pathogen and toxics concerns.
- Allocate funds for the future **seawall** to protect the low-lying plant site from the potential effects of sea level rise. Predictions show that by 2040, the 100-year storm sea level could rise as much as seven feet, which would flood every major process unit.

Alternative Treatment Plant Location

Improvements to the treatment facilities on the existing plant site as previously described is considered the most viable short-term option. In the long-term, however, relocating all or many of the treatment processes to a different location near the Advanced Water Purification Facility is more attractive because of the extent of repair and replacement needed at the current site, and due to the potential flooding risk from rising sea levels.

To evaluate both sites, a preliminary master planning-level cost estimate was developed (shown in Table 3), which revealed little difference in the comparative cost of building wastewater treatment plant facilities in either location. It should be noted that for this high-level comparison, conventional secondary treatment was assumed for both options. However, further assessment is needed to confirm the selection of conventional secondary treatment and/or nutrient reduction, especially in light of the various regulatory and integration aspects of the water reuse program.

If the City chooses to relocate the processes to a new site, it would need to further consider the regulatory, timing, and financial feasibility. Specifically, planning work could take approximately five to ten years to complete. Because these efforts take time to finish and much of the Wastewater Treatment Facilities are in poor condition, a number of critical improvement projects must be completed before moving forward. These projects are estimated to cost approximately $30 million. Table 5 highlights these projects in bold.

Table 3. High-Level Cost Comparison Between Upgrading the Existing Plant and Constructing a New Plant in a New Location

Components	Existing Plant Location(1)	New Plant Location(2)(3)
Total Construction Cost	$331,000,000	$258,000,000
Total Project Cost	**$410,000,000**	**$411,000,000**
Constructability and Protection of electrical and major equipment from SLR	$50,000,000	--
Additional O&M for existing Plant (15% of Construction Cost)	$77,000,000	--
Immediate Needs	--	$30,000,000
Additional civil/site work/inter-process piping needed with new plant (15% of Construction Cost)	--	$39,000,000(4)
Demolish and Reclaim existing OWTP site	--	$10,000,000
Land Acquisition	--	$22,000,000
CEQA/Permitting (2% of Construction Cost)	--	$5,000,000
Total Estimated Costs(5)	**$540,000,000**	**$520,000,000**

(1) Engineering, legal, administration, and construction management is 24% of construction cost, consistent with other recommended projects in this Integrated Master Plan.

(2) Engineering, legal, administration, and construction management percentages were higher (35%) due to uncertainties associated with the new site.

(3) Engineering, legal, administration, and construction management is 75% of construction costs for those projects based on cost curves.

(4) Spread over all the projects implemented at the new site.

(5) Totals are rounded up to the nearest 5 million.

RECYCLED WATER

The location of the recommended recycled water system improvements was shown previously in Figure 11. These improvements are shown together because the water and recycled water improvements work in concert with one another to offer a new sustainable water supply.

Repair and Replacement

The Advanced Water Purification Facility was completed in 2012 and is now operating at full capacity. For this facility, only minor improvements are considered. The City is planning to retrofit the connection to approximately 40 urban irrigation customers for recycled water delivery.

Water Supply

A key component of providing a sustainable water supply is the use of indirect potable reuse with recycled water from the City's Advanced Water Purification Facility. For this reason, the recommended water supply projects for the recycled water system will involve expanding the system to operate as an indirect potable reuse system. These expansions are described below.

Treatment. Phase 2 will involve expanding the existing 6.25-million gallons per day Phase 1 Advanced Water Purification Facility. This facility of membrane and disinfection treatment trains can be modularly expanded without requiring additional ancillary equipment, such as cleaning and support systems. A Phase 3 expansion of the Advanced Water Purification Facility would require more treatment and ancillary equipment be added to meet the additional capacity, along with influent flow equalization.

Recycled Water Distribution. Current efforts to expand the recycled water distribution system have focused on delivering recycled water to urban and agricultural users east of the City, which will be accomplished with Phase 2 of the Hueneme Road Pipeline. The alignment of this pipeline will start at the terminus of the Hueneme Road Phase 1 Pipeline and terminate just before Lewis Road. The pipeline will also supply farmers with an agricultural demand of up to 5,200 acre-feet per year depending on the recycled water supply available.

Phase 2 includes construction of the recycled water loop, which will feed the various proposed aquifer storage and recovery locations at Campus Park and Blending Station No. 1/6. The recycled water loop starts at the existing Recycled Water Backbone pipeline and completes the remaining three sides of the loop with a combination of 20-, 24-, and 30-inch pipelines (see Figure 11). For Phase 3, a 24-inch pipeline will be installed that connects Blending Station No. 3 to the recycled water loop.

Indirect Potable Reuse. Implementing indirect potable reuse as a supplemental water supply within the City will occur in phases, which are described below.

Phase 1 involves constructing the ASR Demo Well, as previously discussed. In adding this well, the City can assess the feasibility of the indirect potable reuse process in real-time and refine the assumptions for the aquifer capacity and the quality of extracted water.

For Phase 2, the majority of the aquifer storage and recovery wells will be installed for supplemental water supply use, which will also occur in phases. First, the Campus Park site will be "built out," adding four additional aquifer storage and recovery wells, each with its own set of monitoring wells (i.e., three monitoring wells per recovery well). Currently, a "built-out" aquifer storage and recovery site will also have operational storage sized to offset peak hour flows, booster pumping, and add conditioning facilities, such as disinfection and fluoride. However, because the Campus Park site is close to Blending Station No. 1/6, housing the ancillary equipment at Blending Station No. 1/6 makes more sense. Thus, extracted indirect potable reuse water will be conveyed from Campus Park to Blending Station No. 1/6 for storage and conditioning.

After the Campus Park aquifer storage and recovery wells are built out, four wells will be added near Blending Station No. 1/6 site and additional property near Blending Station No. 1/6 will need to be acquired, which the City previously discussed with property owners. Adding these wells will correspond to the Phase 2 expansion of the Advanced Water Purification Facility and should help to meet potable water demands through approximately 2030.

> Adding these wells will correspond to the Phase 2 expansion of the Advanced Water Purification Facility and should help to meet potable water demands through approximately 2030.

To provide direct potable reuse, Phase 3 will involve adding more aquifer storage and recovery wells, located at Blending Station No. 3, and/or additional facilities. Direct potable reuse circumvents injecting recycled water into the groundwater basin or extracting it, allowing the water to be discharged into above-ground storage tanks instead. After a period of monitoring and verification, the water can then be combined with the potable water system. These storage tanks would be located near the Advanced Water Purification Facility.

STORMWATER

Figure 14 shows the relative recommended project locations for the Stormwater System's necessary capacity upgrades.

Repair and Replacement

Approximately 12 percent of the stormwater collection assets evaluated need immediate attention or attention within the next five years. This percentage equates to a total of 22 projects related to repair and replacement, which need to be addressed in Phase 1.

Capacity

Stormwater collection system improvements focused on the capacity needs determined from collection system modeling. The modeling identified a total of 13 main capacity projects, which are summarized in the CIP to address the stormwater systems' capacity needs over the next 25 years. These projects include upgrading sections of culvert and/or piping to reduce surcharging and flooding in specific areas throughout the City.

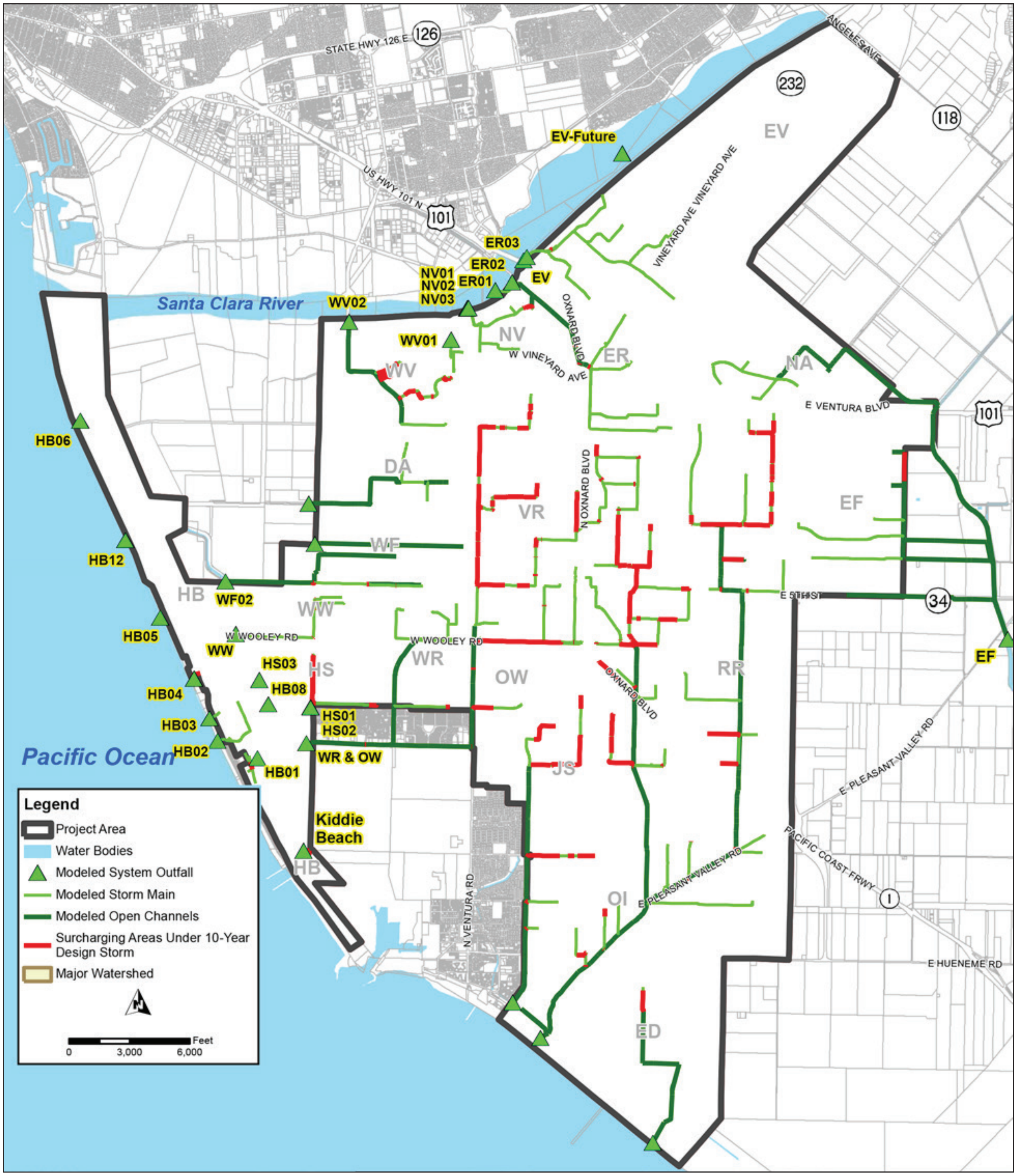


Figure 14. Capacity upgrades needed for 10-year design storm under 2040 conditions.

Regulatory

In response to the total maximum daily load for indicator bacteria placed on the Santa Clara River Estuary, a draft Implementation Plan was developed in March 2015. Within the Implementation Plan, potential infiltration basins and subsurface infiltration basins for both dry and wet weather stormwater are recommended throughout the watershed, including one located at South Bank Park in Oxnard. The City will be expected to cover the cost of this infiltration basin, which helps mitigate the regulatory requirements.

Resource Sustainability

Two opportunities exist for making the City's stormwater system more sustainable for creating and conserving water for potable use. These opportunities are described below.

Two opportunities exist for making the City's stormwater system more sustainable for creating and conserving water for potable use.

The first opportunity would be to divert dry weather stormwater channel flows to the Wastewater Treatment Plant for treatment and potential reuse at the Advanced Water Purification Facility. Typically, dry weather flows include flow from irrigation runoff, pool draining, washdown water, construction work, and other related activities. In Oxnard, dry weather flow is likely shallow groundwater infiltration. Diverting this dry weather flow could potentially create another water source, albeit a small one, for the City's reuse program.

The second opportunity is to create a citywide incentive program that targets capture stormwater to offset potable water use. This program would let interested residents retrofit their homes with rain barrels or rain cisterns to help decrease flooding and encourage residents and developers to be proactive in using stormwater. The cost for such an incentive program depends entirely on its size and the amount the City is willing to offset. It should be noted, however, that since the City of Oxnard is located on a shallow perched aquifer, this Integrated Master Plan recommends that any incentive program focus on onsite capture and irrigation use instead of infiltration to decrease customers' potable water use.

Integrated Overarching Systems

For this Integrated Master Planning effort, several overarching systems were reviewed and evaluated for upgrades. For instance, the planning effort included upgrades to the **Supervisory Control and Data Acquisition** (SCADA) systems for the water and wastewater systems to match the state-of-the art system currently installed in the Advanced Water Purification Facility. The City's **security systems** were reviewed and guidelines/recommendations were made to enhance security for the City's facilities.

Several overarching systems were reviewed and evaluated for upgrades.

In addition, the planning effort made several recommendations for updating the City's **data managements systems**. These recommendations included upgrades to the City's Geographical Information System database and Computerized Maintenance and Management System for accurate and timely tracking and managing of the City's water assets.

In combining the water system utility plans to produce the Integrated Master Plan, the City developed a teracts with Carollo Te

7. SUMMARY OF RECOMMENDED CAPITAL IMPROVEMENT PLAN COSTS AND IMPLEMENTATION SCHEDULE

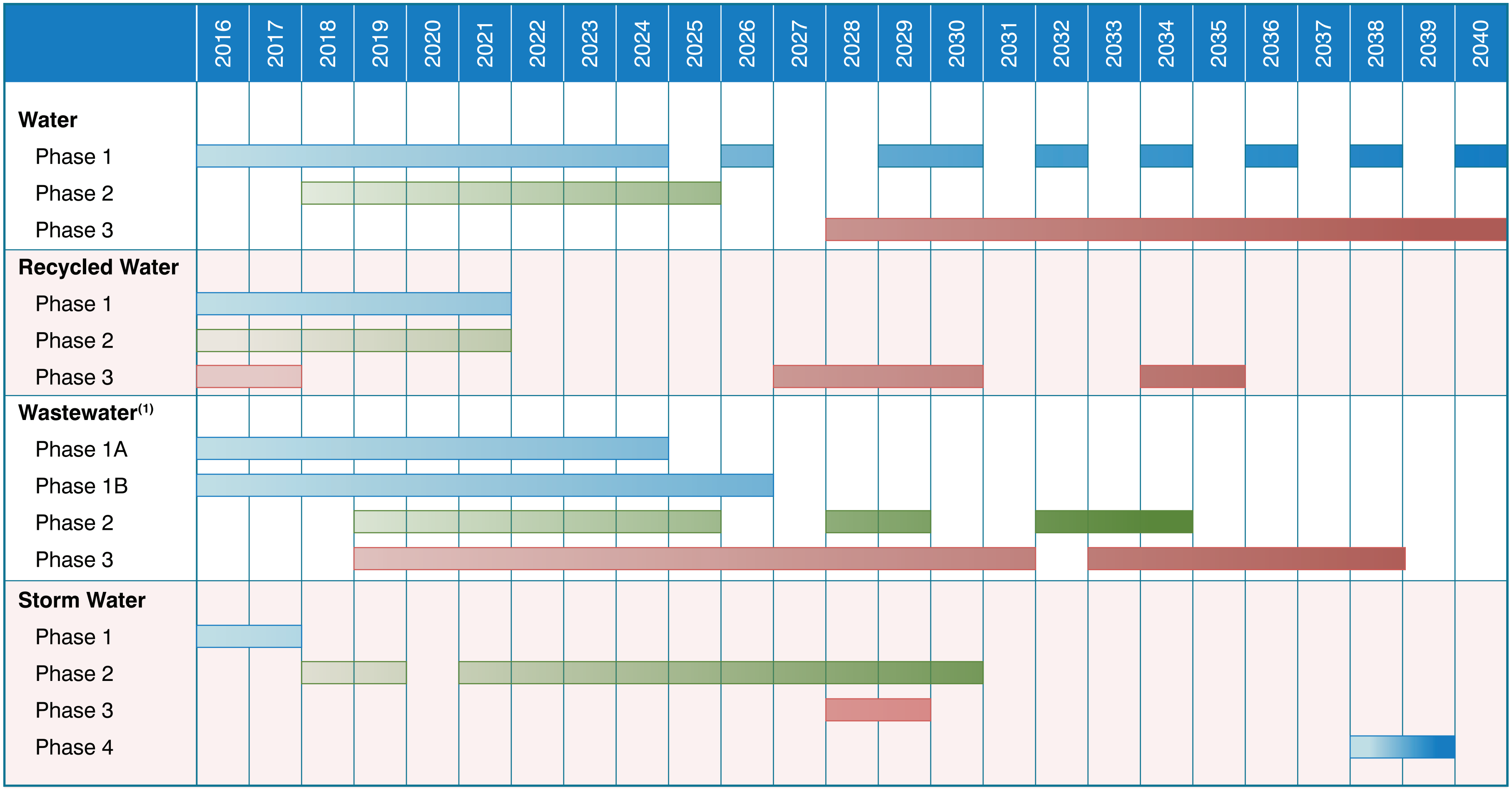
Capital Improvement Plan that provides a cost-effective, reliable, resilient, and highly functioning water infrastructure for the next 25 years. The exact timing of the CIP's phases depends on many factors, including the rate of population growth, the timing and performance standards of future regulatory requirements, the outstanding planning considerations mentioned previously, and the development of new technologies and associated reliabilities. This Integrated Master Plan has built-in flexibility to accommodate these anticipated changes.

Table 4 summarizes the Capital Improvement Plan project costs by implementation phase, and Figure 15 presents an implementation schedule for the recommended projects. Figure 15 also shows the required timing for designing and constructing the Integrated Master Plan facilities.

Table 4. Recommended Overall Capital Improvement Plan for the City's Integrated Master Plan

	Phase 1	Phase 2	Phase 3	Phase 4	Total
PLAN PHASE 1					
Water	$48,500,000	$82,245,000	$90,925,000		$221,670,000
Wastewater[(1)]	$264,451,000	$171,522,000	$123,000,000		$558,973,000
Recycled Water	$29,900,000	$121,900,000	$100,100,000		$251,900,000
Stormwater	$10,060,000	$8,075,000	$2,621,000	$1,930,000	$22,686,000
Total by Phase	**$352,911,000**	**$383,742,000**	**$316,646,000**	**$1,930,000**	**$1,055,229,000**

(1) Assumes rehabilitation at the existing wastewater treatment plant site, and not plant relocation.



(1) Assumes rehabilitation of the existing OWTP, not plant relocation.

Figure 15. Capital Improvement Plan Implementation Schedule by Phase.

8. SUMMARY

The projects/programs/policies recommended in this Integrated Master Plan support the City's positions and most current thinking, direction, and needs related to the master planning drivers. However, these factors could change depending on the outcome of several key outstanding planning considerations. Carollo has noted four key outstanding planning considerations that could particularly affect the outcome, timing, and phasing of the policies, projects, and programs noted in this Integrated Master Plan. These key considerations are listed and described below.

> Carollo has noted four key outstanding planning considerations that could particularly affect the outcome, timing, and phasing of the policies, projects, and programs noted in this Integrated Master Plan.

- **Eventual location of the Wastewater Treatment Plant.** Two major options are being considered: 1) continue treatment in the same location by repairing and replacing most of the facilities, or 2) relocate treatment, all or parts of it, to a completely new site. Not only would continuing in the same location require most of the major processes to be repaired and replaced, but potential seawater intrusion from rising sea levels is also a concern. Conversely, relocating all or parts of the plant to a new site reduces site issues, but it also presents a challenge in implementation. Many of the existing Wastewater Treatment Plant facilities need to be upgraded immediately due to age and condition. Constructing new facilities at a new site would require a longer lead-time to acquire the land and plan, design, and implement the facilities.
- **Regulatory considerations for the existing Wastewater Treatment Plant/Advanced Water Purification Facility outfall based on overall water infrastructure operation.** As more water is proposed for reuse throughout the City and regional area instead of being discharged to the ocean, unintended consequences may arise from trying to meet the end-of-pipe requirements in the City's outfall. Impacts could include limits on the Advanced Water Purification Facility's ultimate capacity, the need to nitrify and denitrify the secondary effluent before discharge, and changes in local limits for industrial users. Although preliminary potential mitigation measures have been explored through this Integrated Master Plan, conversations with regulators must continue until an approach providing the most cost-effective and reliable benefit is determined.
- **The Fox Canyon Groundwater Management Agency and future groundwater allocations.** Developing a sustainable water supply for the City's future depends on the long-term yield of the existing groundwater basin and the allocation apportioned to the City, which are closely tied to the drought conditions and the availability of the natural supply. Thus, this Integrated Master Plan used certain assumptions about future allocations to consider the best- and worst-case conditions and to provide flexibility for working with these parameters. However, the future of groundwater is highly uncertain and must be monitored frequently to ensure the City's ability to plan for changes as they occur. It must also be noted that because of the 2015 Groundwater Management Act, changes are imminent but are not fully defined at this time.
- **Future of imported Calleguas and Metropolitan Water District (MWD) of Southern California water.** As the drought continues, regional water authorities have discussed the best ways to address the region's future water supply. For example, MWD is considering adding both indirect potable reuse and seawater desalination plants in its area. Therefore, the City continues to stay up-to-date on the possibilities of regional desalting and/or desalination facilities, which could provide an alternative supply of drinking water to the City. This would allow for some of the Advanced Water Purification Facility's capacity to be used for more potable offset or for groundwater replenishment.

Capital Improvement Plan

Project ID	PM	Project Description	Driver	Phase	Start Year	Years to Complete	Un-escalated Project Cost ($)
Water CIP Projects							
W-P-1	2.5	Electrical Rehabilitation - Well Nos. 30, 32, 33 & 34	Operations Optimization	1	2016	1.5	$1,000,000
W-P-2	2.5	Sodium Hypochlorite Piping Replacement	Operations Optimization	1	2016	1.5	$30,000
W-P-3	2.5	Emergency Turn-Outs Service	Operations Optimization	1	2016	1.5	$30,000
W-P-4	2.5	Generator and ATS Service	Operations Optimization	1	2016	1.5	$20,000
W-P-5	2.3	Oxnard Conduit - Replace 2 rectifiers, 2 anodes, and 20 test stations	R&R	1	2015	2	$300,000
W-P-6	2.3	Oxnard Conduit - Replace 3rd rectifier and anode; resurvey	R&R	1	2015	2	$100,000
W-P-7	2.3	3rd Street Lateral - Replace rectifier, anode, and all test stations; resurvey	R&R	1	2015	2	$200,000
W-P-8	2.3	Industrial Lateral - Replace all test stations; resurvey	R&R	1	2015	2	$100,000
W-P-9	2.3	Replacement of Automatic Meter Reader Devices (AMR)	R&R	1	2016	6	$14,000,000
W-P-10	2.3	Oxnard Conduit - Replace deep anode beds and rectifiers #1, #2, and #3	R&R	1	2016	1	$330,000
W-P-11	2.3	3rd Street Oxnard Extension - Replace deep anode bed and rectifier; bond UWCD pipeline to Oxnard extension at rectifier	R&R	1	2016	1	$110,000
W-P-12	2.3	Freemont North Neighborhood CIP Replacement	R&R	1	2016	0.5	$1,700,000
W-P-13	2.3	Bryce Canyon South Neighborhood CIP Replacement	R&R	1	2016	0.5	$1,100,000
W-P-14	2.3	Redwood Neighborhood CIP Replacement	R&R	1	2016	0.5	$2,100,000
W-P-15	2.3	La Colonia Neighborhood CIP Replacement	R&R	1	2016	0.5	$1,500,000
W-P-16	2.3	Fire Flow Improvements - 18,500 feet of 8" pipe	R&R	1	2016	2	$4,600,000
W-P-17	2.3	Fire Flow Improvements - Install/replace 13,500 feet of 12" pipe	R&R	1	2016	2	$4,400,000
W-P-18	2.3	Fire Flow Improvements - Install 250 feet of 14" pipe	R&R	1	2016	1	$100,000
W-P-19	2.5	Blending Station 2 – Mechanical, Electrical and AUX Equipment Replacement	R&R	1	2016	1.5	$100,000
W-P-20	2.5	Blending Station 1/6 – Mechanical, Electrical and AUX Equipment Replacement	R&R	1	2016	2	$3,400,000
W-P-21	2.5	Water System Computerized Maintenance Management System (CMMS)	R&R	1	2016	1	$250,000
W-P-22	2.5	Water System SCADA Improvements	R&R	1	2016	2	$5,000,000
W-P-23	2.3	Del Norte Force Main - 48" & 36" CMCL PL - Locate and Repair discontinuity near the ease end of Del Norte Place	R&R	2	2018	1	$30,000
W-P-24	2.3	3rd Street Oxnard Extension - Locate and repair discontinuity near Chem Building at Blending Station 1/6	R&R	2	2018	1	$50,000
W-P-25	2.3	Industrial Lateral - Install new test stations at 6 locations	R&R	2	2018	1	$30,000
W-P-26	2.3	Gonzales 36" Pipeline - Replace test station lids and test CP	R&R	2	2018	1	$5,000
W-P-27	2.3	Oxnard Conduit - Install new test stations, conduct CIS, locate/excavate/bond across approx. 3 points of electrical isolation	R&R	2	2018	1	$160,000
W-P-28	2.5	Blending Station 1/6 - Install electrical isolation at all steel and cast iron water risers	R&R	2	2018	2	$30,000
W-P-29	2.5	Blending Station 1/6 – Cathodic Protection System for Steel Storage Tank	R&R	2	2018	2	$40,000

CAPITAL IMPROVEMENT PLAN

Project ID	PM	Project Description	Driver	Phase	Start Year	Years to Complete	Un-escalated Project Cost ($)
W-P-30	2.5	Well 23 & 31 Rehab	R&R	2	2018	1.5	$210,000
W-P-31	2.5	Wells Electrical & Variable Frequency Drive Replacement	R&R	2	2018	1.5	$770,000
W-P-32	2.5	Blending Station #3	R&R	2	2019	2	$2,500,000
W-P-33	2.5	Blending Station #4	R&R	2	2019	1.5	$370,000
W-P-34	2.5	Blending Station #5	R&R	2	2019	1.5	$190,000
W-P-35	2.5	Ongoing Repair and Replacement of Existing Desalter	R&R	2	2020	--	$21,000,000
W-P-36	2.3	Del Norte Force Main - Install new test stations and leads	R&R	3	2021	1	$30,000
W-P-37	2.3	Del Norte Force Main - Replace rectifiers and anodes; resurvey	R&R	3	2021	1	$390,000
W-P-38	2.3	Wooley Road/United - Replace test stations and install 2 additional stations	R&R	3	2021	1	$30,000
W-P-39	2.3	Wooley Road/United - Replace rectifier and anode; resurvey	R&R	3	2021	1	$130,000
W-P-40	2.5	Blending Station 1/6 - Design and install Cathodic Protection on buried water piping	R&R	3	2021	2	$45,000
W-P-41	2.3	Age Replacement 109,100 feet of 6" pipe	R&R	3	2033	2	$25,500,000
W-P-42	2.3	Age Replacement 47,000 feet of 8" pipe	R&R	3	2034	2	$11,700,000
W-P-43	2.3	Age Replacement 55,000 feet of 10" pipe	R&R	3	2035	2	$17,100,000
W-P-44	2.3	Age Replacement 24,000 feet of 12" pipe	R&R	3	2036	2	$7,900,000
W-P-45	2.3	Age Replacement 2,300 feet of 14" pipe	R&R	3	2037	1	$900,000
W-P-46	2.3	Age Replacement 4,000 feet of 16" pipe	R&R	3	2037	1	$1,700,000
W-P-47	2.3	Age Replacement 3,700 feet of 24" pipe	R&R	3	2037	2	$2,300,000
W-P-48	2.3	Age Replacement 5,000 feet of 36" pipe	R&R	3	2038	2	$3,900,000
W-P-49	2.3	Age Replacement 5,300 feet of 42" pipe	R&R	3	2039	2	$5,500,000
W-P-50	2.3	Age Replacement 3,800 feet of 48" pipe	R&R	3	2040	2	$4,100,000
W-P-51	2.3	Capacity Improvements - 322 feet of 8" pipe	Water Supply	1	2016	1	$80,000
W-P-52	2.3	Capacity Improvements - 238 feet of 12" pipe	Water Supply	1	2016	1	$80,000
W-P-53	2.3	Capacity Improvements - 164 feet of 14" pipe	Water Supply	1	2016	1	$60,000
W-P-54	2.3	Capacity Improvements - 3,804 feet of 30" pipe	Water Supply	1	2016	1	$2,500,000
W-P-55	2.5	Connection to OH/United pipeline	Water Supply	1	2016	1.5	$310,000
W-P-56	2.3	Capacity Improvements - 69 feet of 6" pipe	Water Supply	2	2018	1	$20,000
W-P-57	2.3	Capacity Improvements - 391 feet of 8" pipe	Water Supply	2	2018	1	$100,000
W-P-58	2.3	Capacity Improvements - 1,011 feet of 10" pipe	Water Supply	2	2018	1	$300,000
W-P-59	2.3	Capacity Improvements - 2,447 feet of 12" pipe	Water Supply	2	2018	1	$800,000
W-P-60	2.5	Construct new concentrate line from OWTP to Blending Station 1/6	Water Supply	2	2018	3	$18,800,000
W-P-61	2.5	Construct 3 new potable wells (Blending Station 1/6)	Water Supply	2	2021	2	$10,100,000

CAPITAL IMPROVEMENT PLAN

Project ID	PM	Project Description	Driver	Phase	Start Year	Years to Complete	Un-escalated Project Cost ($)
W-P-62	2.5	Construct booster pump station (Blending Station 1/6)	Water Supply	2	2021	2	$3,600,000
W-P-63	2.5	Expand desalter at Blending Station 1/6 to 11.25 mgd (3.75 mgd expansion)	Water Supply	2	2022	3	$10,900,000
W-P-64	2.5	Blending Station Tie-In (@ Blending Station 1/6)	Water Supply	2	2022	1	$250,000
W-P-65	2.5	Disinfection System Upgrade (@ Blending Station 1/6)	Water Supply	2	2022	2.5	$190,000
W-P-66	2.5	Construct 2 new potable wells (Blending Station 1/6) and 1 new stainless steel well at Blending Station 3	Water Supply	2	2023	2	$11,800,000
W-P-67	2.3	Capacity Improvements - 32 feet of 6" pipe	Water Supply	3	2028	2	$10,000
W-P-68	2.3	Capacity Improvements - 233 feet of 8" pipe	Water Supply	3	2028	2	$60,000
W-P-69	2.3	Capacity Improvements - 1,243 feet of 10" pipe	Water Supply	3	2028	2	$400,000
W-P-70	2.3	Capacity Improvements - 997 feet of 12" pipe	Water Supply	3	2028	2	$330,000
W-P-71	2.3	Capacity Improvements - 2,453 feet of 14" pipe	Water Supply	3	2028	2	$1,000,000
W-P-72	2.3	Capacity Improvements - 937 feet of 24" pipe	Water Supply	3	2028	2	$600,000
W-P-73	2.5	Expand desalter at Blending Station 1/6 to 15 mgd (3.75 mgd expansion)	Water Supply	3	2028	3	$7,300,000
W-P-74	2.3	North Zone Modifications					
W-P-75	2.3	Blending Station #3 Reconfigure Pipeline to feed Coast Zone	Pressure Zone Separation	1	2016	2	$600,000
W-P-76	2.3	Rehab 3 Pressure Reducing Station (PRS)	Pressure Zone Separation	1	2016	2	$400,000
W-P-77	2.3	Minor Piping Modification	Pressure Zone Separation	1	2016	2	$100,000
W-P-78	2.3	Coast Zone Modifications					
W-P-79	2.3	3 new Pressure Reducing Station (PRS)	Pressure Zone Separation	1	2016	2	$700,000
W-P-80	2.3	3,000 ft of 8" Parallel Pipeline	Pressure Zone Separation	1	2016	2	$800,000
W-P-81	2.3	Minor Piping Modification	Pressure Zone Separation	1	2016	2	$100,000
W-P-82	2.3	South Zone Modifications					
W-P-83	2.3	3 new Pressure Reducing Station (PRS)	Pressure Zone Separation	1	2016	2	$700,000
W-P-84	2.3	6,000 ft of 8" Parallel Pipeline	Pressure Zone Separation	1	2016	2	$1,500,000
W-P-85	2.3	Minor Piping Modifications	Pressure Zone Separation	1	2016	2	$100,000
			Phase 1 Subtotal				**$48,500,000**
			Phase 2 Subtotal				**$82,245,000**
			Phase 3 Subtotal				**$90,925,000**
			Water CIP Projects Total				**$221,670,000**
Recycled Water CIP Projects							
RW-P-1	2.5	Recycled Water Retrofits	R&R	1	2016	--	$4,000,000
RW-P-2	2.5	Phase 1 Improvements (Disinfection conversion, security, A/V upgrade)	R&R	1	2015	2	$1,000,000
RW-P-3	2.5	UV/AOP Brine Treatment	Water Supply	1	2018	3	$5,700,000

Project ID	PM	Project Description	Driver	Phase	Start Year	Years to Complete	Un-escalated Project Cost ($)
RW-P-4	2.5	Construct ASR Demonstration Well @ Campus Park Site (and associated monitoring wells)	Water Supply	1	2015	1	$4,400,000
RW-P-5	2.5	Land Acquisition and Improvements - Near Blending Station 1/6 & 3	Water Supply	1	2016	2	$10,000,000
RW-P-6	2.5	Recycled Water Pond for Off-Spec Water at Campus Park	Water Supply	1	2016	1.5	$1,600,000
RW-P-7	2.5	Phase 2 - Expansion to 12.5 mgd (including backup power)	Water Supply	2	2016	2.5	$27,500,000
RW-P-8	2.5	Recycled Water Storage	Water Supply	2	2017	2	$8,000,000
RW-P-9	2.5	Construct 1 duty + 1 standby ASR Wells @ Campus Park	Water Supply	2	2016	2	$7,800,000
RW-P-10	2.5	Construct 1 duty + 1 standby ASR Wells @ Campus Park	Water Supply	2	2017	1.5	$7,800,000
RW-P-11	2.5	Construct 1 duty + 1 standby ASR Wells @ Blending Station 1/6	Water Supply	2	2018	2	$7,800,000
RW-P-12	2.5	Chemical Feed Expansion @ Blending Station 1/6	Water Supply	2	2018	2	$300,000
RW-P-13	2.5	Operational Storage for ASR Wells @ Blending Station 1/6	Water Supply	2	2018	2	$2,100,000
RW-P-14	2.5	Booster Pumping for ASR @ Blending Station 1/6	Water Supply	2	2018	2	$7,200,000
RW-P-15	2.5	Construct 1 duty + 1 standby ASR Wells @ Blending Station 1/6	Water Supply	2	2019	1.5	$7,800,000
RW-P-16	2.5	Rehab Well 18 @ River Ridge Golf Course to Groundwater Recharge Well	Water Supply	2	2020	2	$2,500,000
RW-P-17	2.5	Phase 3 - Expansion to 18.75 mgd	Water Supply	3	2027	2.5	$28,100,000
RW-P-18	2.5	Construct 2 duty + 1 standby ASR Wells @ Blending Station 1/6	Water Supply	3	2027	2	$11,500,000
RW-P-19	2.5	Construct 2 duty + 1 standby ASR Wells @ Blending Station 3	Water Supply	3	2027	2.5	$11,500,000
RW-P-20	2.5	Chemical Feed Expansion @ Blending Station 3	Water Supply	3	2027	2.5	$500,000
RW-P-21	2.5	Operational Storage for ASR Wells @ Blending Station 3	Water Supply	3	2027	2.5	$2,100,000
RW-P-22	2.5	Booster Pumping for ASR @ Blending Station 3	Water Supply	3	2027	2.5	$7,200,000
RW-P-23	2.5	Construct 2 duty + 1 standby ASR Wells @ Blending Station 3	Water Supply	3	2029	1.5	$11,500,000
RW-P-24	4.2	Connect Initial ASR Well at Campus Park to Recycled Water Backbone Line in Ventura Road - 2,000 feet of 20" pipe(2)	Water Supply	1	2015	2	$700,000
RW-P-25	4.2	Construct Dedicated IPR Pipeline from Campus Park to BS 1/6 - 4,000 feet of 24" pipe(2)	Water Supply	1	2015	2	$2,500,000
	4.2	Hueneme - Phase 2 (to Ag Users)					
RW-P-26	4.2	20,700 feet of 24" pipe	Water Supply	2	2016	2	$12,900,000
RW-P-27	4.2	16,000 feet of 36" pipe	Water Supply	2	2016	2	$12,500,000
	4.2	Recycled Water Loop (to ASR Sites)					
RW-P-28	4.2	9,000 feet of 24" pipe	Water Supply	2	2018	2	$7,500,000
RW-P-29	4.2	19,700 feet of 30" pipe	Water Supply	2	2018	2	$10,200,000
RW-P-30	4.2	Direct Potable Reuse (DPR) - 3, 3.1 MG Storage Tanks	Water Supply	3	2034	3	$22,200,000
RW-P-31	4.2	Recycled Water Loop to Blending Station 3 Connection – 10,600 feet of 24" pipe	Water Supply	3	2027	1	$5,500,000

Project ID	PM	Project Description	Driver	Phase	Start Year	Years to Complete	Un-escalated Project Cost ($)
			Phase 1 Subtotal				$29,900,000
			Phase 2 Subtotal				$121,900,000
			Phase 3 Subtotal				$100,100,000
			Recycled Water CIP Projects Total				$251,900,000
Wastewater CIP Projects							
WW-P-1	3.3	Project 1: N Ventura Rd and S Ventura Rd - Ventura Road Trunk Sewer					
	3.3	Conduit 4943	Capacity	1	2016	2	$61,000
	3.3	Conduit 4956	Capacity	1	2016	2	$121,000
	3.3	Conduit 1429	Capacity	1	2016	2	$225,000
	3.3	Conduit 1431	Capacity	1	2016	2	$224,000
	3.3	Conduit 1432	Capacity	1	2016	2	$13,000
	3.3	Conduit 1443	Capacity	1	2016	2	$267,000
	3.3	Conduit 4276	Capacity	1	2016	2	$187,000
	3.3	Conduit 1460	Capacity	1	2016	2	$84,000
	3.3	Conduit 1461	Capacity	1	2016	2	$268,000
	3.3	Conduit 1462	Capacity	1	2016	2	$270,000
	3.3	Conduit 1463	Capacity	1	2016	2	$36,000
WW-P-2	3.3	Project 2: Navarro St and E First St - Sewers in the La Colonia Neighborhood		2			
	3.3	Conduit 2888	Capacity	2	2018	2	$183,000
	3.3	Conduit 2889	Capacity	2	2018	2	$182,000
WW-P-3	3.3	Project 3: S Victoria Ave and W Hemlock St - Sewers in the Channel Islands Neighborhood		2			
	3.3	Conduit 501	Capacity	2	2018	2	$204,000
	3.3	Conduit {74B96752-98B2-4F5D-AF2A-21B06EE4909C}	Capacity	2	2018	2	$114,000
	3.3	Conduit P-2471	Capacity	2	2018	2	$795,000
WW-P-4	3.3	Central Trunk Condition Assessment	R&R	1	2016	2	$200,000
WW-P-5	3.3	Headworks meter vaults/vortex structures coating	R&R	1	2016	2	$1,000,000
WW-P-6	3.3	Phase 1 Central Trunk manholes reconstruction	R&R	1	2016	2	$1,500,000
WW-P-7	3.3	Existing asbestos concrete pipe (ACP) replacement	R&R	1	2016	2	$5,000,000
WW-P-8	3.3	Harbor Blvd manhole rehabilitation	R&R	1	2016	2	$100,000
WW-P-9	3.3	Redwood tributary manholes rehabilitation	R&R	1	2016	2	$200,000
WW-P-10	3.3	Lift Station 23 - Wagon Wheel Replacement	R&R	1	2016	2	$1,000,000

CAPITAL IMPROVEMENT PLAN

Project ID	PM	Project Description	Driver	Phase	Start Year	Years to Complete	Un-escalated Project Cost ($)
WW-P-11	3.3	Lift Station 6 - Canal Rehabilitation	R&R	1	2016	2	$500,000
WW-P-12	3.3	Lift Station 4 - Mandalay & Wooley Rehabilitation	R&R	1	2016	2	$500,000
WW-P-13	3.3	Phase 2 Central Trunk manholes reconstruction	R&R	2	2018	2	$200,000
WW-P-14	3.3	Phase 1 Central Trunk replacement	R&R	1	2016	2	$36,500,000
WW-P-15	3.3	Phase 2 Central Trunk replacement	R&R	2	2018	2	$30,000,000
WW-P-16	3.3	Rice Ave (Rice & 5th) sewer replacement	R&R	1	2016	2	$1,300,000
WW-P-17	3.3	Other Collection System Improvements	R&R	2	2018	2	$66,600,000
WW-P-18	3.3	Casden Village Lift Station	Performance	1	2016	2	$1,000,000
WW-P-19	3.7.1	Biotower Removal					
WW-P-20	3.7.1	Demolish Biotowers	R&R	1A	2016	1	$770,000
WW-P-21	3.7.1	Add Baffle Walls in Activated Sludge Tanks (AST)	R&R	1A	2016	1	$380,000
WW-P-22	3.7.1	Reconfigure Interstage Pumping (and replace pumps)	R&R	1A	2016	2	$15,020,000
	3.7.1	Primary Clarifier Replacement					
WW-P-23	3.7.1	Demolish and Rebuild Primary Clarifiers	R&R	1A	2016	6	$18,600,000
WW-P-24	3.7.1	Rebuild Primary Clarifier Building/ Pump Sludge Pump Station	R&R	1A	2016	6	$2,893,000
WW-P-25	3.7.1	Add CEPT including Mixing Facilities	Performance	1A	2016	2	$1,470,000
WW-P-26	3.7.1	Add Influent Splitter Box	Performance	1A	2016	2	$1,450,000
WW-P-27	3.7.1	Demolish Butler Storage Building - West	R&R	1A	2016	1	$49,000
WW-P-28	3.7.1	New Butler Storage Building - West	R&R	1A	2021	1	$954,000
WW-P-29	3.7.1	Small Equipment Replacement - Primary Clarifier	R&R	1A	2016	1	$469,000
	3.7.1	Electrical Upgrade: Motor Control Center (MCC), Electrical Buildings, CMMS, and Emergency Generator Replacement					
WW-P-30	3.7.1	New Main Switchgear Building	R&R	1A	2017	3	$926,000
WW-P-31	3.7.1	New Effluent Electrical Building	R&R	1A	2017	3	$1,158,000
WW-P-32	3.7.1	Electrical Vault Repair Pre-Design Study	R&R	1A	2016	2	$27,000
WW-P-33	3.7.1	Replace Standby Generators	R&R	1A	2016	3	$2,543,000
WW-P-34	3.7.1	Replace Plant MCCs	R&R	1A	2016	5	$5,430,000
WW-P-35	3.7.1	Plant-wide SCADA System Upgrade	R&R	1A	2016	5	$10,816,000
WW-P-36	3.7.1	Small Equipment Replacement - Electrical 1	Small Equipment Replacement	1A	2016	2	$275,000
WW-P-37	3.7.1	Small Equipment Replacement - Electrical 2	Small Equipment Replacement	1A	2020	2	$626,000
WW-P-38	3.7.1	Small Equipment Replacement - Electrical 3	Small Equipment Replacement	1A	2023	2	$653,000

Project ID	PM	Project Description	Driver	Phase	Start Year	Years to Complete	Un-escalated Project Cost ($)
WW-P-39	3.7.1	CMMS	R&R	1A	2016	3	$250,000
	3.7.1	Belt Filter Press (BFP) Rehab and Non Hazardous Liquid Receiving Station					
WW-P-40	3.7.1	Belt Filter Press (BFP) Rehab	R&R	1A	2016	1	$2,280,000
WW-P-41	3.7.1	Construct a Non Hazardous Liquid Receiving Station	Performance	1A	2016	2	$2,564,000
WW-P-42	3.7.1	Plant-wide Cathodic Protection	R&R	1B	2016	2	$1,430,000
	3.7.1	Solids Campus Upgrade: Gravity Thickener Demo, Dewatering Move and Upgrade, and DAFT Move and Expansion					
WW-P-43	3.7.1	Install Cover on Digester 2	R&R	1B	2016	1	$2,260,000
WW-P-44	3.7.1	Demolish Gravity Thickeners and Blower Building	R&R	1B	2017	1	$583,000
WW-P-45	3.7.1	Demolish Odor Reduction Tower	R&R	1B	2017	1	$100,000
WW-P-46	3.7.1	Demolish Operations Center and Vacuum Filter Bld	R&R	1B	2017	1	$448,000
WW-P-47	3.7.1	Move Dewatering Facility and add New Centrifuges	Performance	1B	2016	3	$23,370,000
WW-P-48	3.7.1	Add Dewatering Capacity	Performance	1B	2016	3	$2,160,000
WW-P-49	3.7.1	New Operations Center Building co-located with new Administration Building	R&R	1B	2016	4	$20,940,000
WW-P-50	3.7.1	Add Sludge Silos	Performance	1B	2018	3	$6,370,000
WW-P-51	3.7.1	Demolish Dissolved Air Flotation Thickeners (DAFTs) and Rebuild (2) at New Solids Campus	Performance	1B	2018	3	$8,590,000
WW-P-52	3.7.1	Build additional 2 DAFTs at New Solids Campus	Performance	1B	2018	3	$7,350,000
WW-P-53	3.7.1	Add Thickened Waste Activated Sludge (TWAS) Sludge Pumping Capacity	Performance	1B	2018	3	$40,000
	3.7.1	Building Upgrades for Seismic Safety and Plant Paving Resurfacing					
WW-P-54	3.7.1	Rehab Cogeneration Building Roof	R&R	1B	2017	2	$120,000
WW-P-55	3.7.1	New Storage Building ("Vacuum Filter Building")	R&R	1B	2017	3	$4,406,000
WW-P-56	3.7.1	Rehab Collection System Maintenance Building	R&R	1B	2019	2	$1,399,000
WW-P-57	3.7.1	Rehab Chemical Handling Facilities Building	R&R	1B	2019	2	$746,000
WW-P-58	3.7.1	Rehab Maintenance Building	R&R	1B	2019	2	$279,000
WW-P-59	3.7.1	Rehab North Area Electrical Building	R&R	1B	2019	2	$448,000
WW-P-60	3.7.1	Rehab Grit Screening Building - Seismic Retrofit	R&R	1B	2019	2	$1,866,000
WW-P-61	3.7.1	New Eastern Trunk Pump Station	R&R	1B	2019	2	$1,003,000
WW-P-62	3.7.1	New Butler Storage Buildings - east	R&R	1B	2022	2	$1,158,000
WW-P-63	3.7.1	Small Equipment Replacement - General Building 1	Small Equipment Replacement	1B	2016	2	$190,000
WW-P-64	3.7.1	Small Equipment Replacement - General Building 2	Small Equipment Replacement	1B	2023	2	$89,000
WW-P-65	3.7.1	Plant Paving Resurfacing	Small Equipment Replacement	1B	2022	3	$410,000

Project ID	PM	Project Description	Driver	Phase	Start Year	Years to Complete	Un-escalated Project Cost ($)
	3.7.1	Headworks Odor Control, Concrete and Coating Repair, and Fiberglass Reinforced Plastic (FRP) Cover Replacement					
WW-P-66	3.7.1	Headworks Odor Control with Screen Walls, Concrete Repair, and Fiberglass Reinforced Plastic (FRP) Cover Replacement	R&R	1B	2016	3	$4,640,000
WW-P-67	3.7.1	Below Cover Coating Repairs	R&R	1B	2016	4	$1,310,000
	3.7.1	Secondary Treatment Concrete Rehab, Equipment Replacement, and Process Optimization					
WW-P-68	3.7.1	Concrete Repair and Seismic Retrofit - Equalization Basin	R&R	1B	2016	3	$2,596,000
WW-P-69	3.7.1	Concrete Repair and Seismic Retrofit - Activated Sludge Tank (AST)	R&R	1B	2016	11	$8,121,000
WW-P-70	3.7.1	Concrete Repair and Re-painting - Secondary Sedimentation Tank (SST)	R&R	1B	2016	11	$5,719,000
WW-P-71	3.7.1	Modify Secondary Sedimentation Tank (SST) Inlet	Performance	1B	2016	3	$160,000
WW-P-72	3.7.1	New Mixed Liquor Wasting Station	Performance	1B	2016	3	$2,640,000
WW-P-73	3.7.1	Replace Collectors, Skimmers, and Drives (Secondary Sedimentation Tanks)	R&R	1B	2016	3	$9,925,000
WW-P-74	3.7.1	Return Activated Sludge (RAS) Pump Modifications	Performance	1B	2016	3	$1,120,000
WW-P-75	3.7.1	Replace Blowers	R&R	1B	2016	3	$2,585,000
WW-P-76	3.7.1	Diffuser Replacement	R&R	1B	2016	3	$3,120,000
WW-P-77	3.7.1	Small Equipment Replacement - secondary 1	Small Equipment Replacement	1B	2016	3	$610,000
WW-P-78	3.7.1	Small Equipment Replacement - secondary 2	Small Equipment Replacement	1B	2020	3	$62,000
WW-P-79	3.7.1	Small Equipment Replacement - wet weather storage 2	Small Equipment Replacement	1B	2020	3	$527,000
	3.7.1	Disinfection and Effluent Pumping Equipment Replacement					
WW-P-80	3.7.1	New Effluent Pumping Station Building	R&R	1B	2017	4	$1,234,000
WW-P-81	3.7.1	New Effluent Pump Station	R&R	1B	2017	4	$13,838,000
WW-P-82	3.7.1	Water Quality Early Warning System	Performance	1B	2017	4	$330,000
	3.7.1	Headworks Equipment Replacement and Building Rehab					
WW-P-83	3.7.1	Small Equipment Replacement - Headworks 1	Small Equipment Replacement	2	2019	2	$383,000
WW-P-84	3.7.1	Small Equipment Replacement - Headworks 2	Small Equipment Replacement	2	2023	3	$6,306,000
WW-P-85	3.7.1	Small Equipment Replacement - Headworks 3	Small Equipment Replacement	2	2028	2	$149,000
WW-P-86	3.7.1	Rehab Headworks Building	R&R	2	2032	3	$3,858,000
	3.7.1	Digester Campus Rebuild of Digesters and Digester Control Building					
WW-P-87	3.7.1	New Digester 1	R&R	2	2019	3	$12,950,000
WW-P-88	3.7.1	New Digester 2	R&R	2	2020	3	$12,950,000

Project ID	PM	Project Description	Driver	Phase	Start Year	Years to Complete	Un-escalated Project Cost ($)
WW-P-89	3.7.1	New Digester 3	R&R	2	2021	3	$12,950,000
WW-P-90	3.7.1	New Digester Control Building	R&R	2	2019	5	$1,543,000
	3.7.1	Cogeneration Building and Equipment Replacement, New FOG Receiving Station					
WW-P-91	3.7.1	New Cogeneration Building	R&R	2	2022	3	$4,630,000
WW-P-92	3.7.1	Small Equipment Replacement - Cogeneration	Small Equipment Replacement	2	2022	3	$2,233,000
WW-P-93	3.7.1	Replace Cogeneration Engines	R&R	2	2022	3	$10,140,000
WW-P-94	3.7.1	Add a Fats/Oils/Grease (FOG) Receiving Station	Resource Sustainability	2	2019	2	$3,390,000
	3.7.1	Disinfection Equipment Replacement					
WW-P-95	3.7.1	Coating Replacement on Chlorine Contact Tanks	R&R	2	2026	2	$1,359,000
WW-P-96	3.7.1	Small Equipment Replacement 1	Small Equipment Replacement	2	2024	3	$403,000
WW-P-97	3.7.1	Membrane Bioreactor (MBR)	Resource Sustainability	3	2019	2	$71,000,000
WW-P-98	3.7.1	Add UV/AOP after Membrane Bioreactor (MBR)	Resource Sustainability	3	2019	2	$13,200,000
WW-P-99	3.7.1	Solar or Alternative Energy Facility	Resource Sustainability	3	2021	10	$1,540,000
WW-P-100	3.7.1	Seawall	Resource Sustainability	3	2033	5	$37,260,000
			Phase 1A Subtotal				**$120,159,000**
			Phase 1B Subtotal				**$144,292,000**
			Phase 2 Subtotal				**$171,522,000**
			Phase 3 Subtotal				**$123,000,000**
			Wastewater CIP Projects Total				**$558,973,000**
Stormwater CIP Projects							
SW-P-1	5.2	Drainage Basin: WV - Length 444 ft	Capacity	2	2018	2	$173,000
SW-P-2	5.2	Drainage Basin: WV - Length 748 ft	Capacity	4	2038	2	$439,000
SW-P-3	5.2	Drainage Basin: OI - Length 607 ft	Capacity	2	2018	2	$237,000
SW-P-4	5.2	Drainage Basin: RR - Length 2,436 ft	Capacity	3	2028	2	$2,621,000
SW-P-5	5.2	Drainage Basin: OI - Length 2,388 ft	Capacity	4	2038	2	$1,491,000
SW-P-6	5.2	Drainage Basin: VR - Length 5,872 ft	Capacity	1	2016	2	$5,768,000
SW-P-7	5.2	Drainage Basin: JS - Length 1,421 ft	Capacity	1	2016	2	$968,000
SW-P-8	5.2	Drainage Basin: JS - Length 1,292 ft	Capacity	2	2018	2	$885,000
SW-P-9	5.2	Drainage Basin: JS - Length 426 ft	Capacity	2	2018	2	$292,000
SW-P-10	5.2	Drainage Basin: JS - Length 457 ft	Capacity	2	2018	2	$313,000

Project ID	PM	Project Description	Driver	Phase	Start Year	Years to Complete	Un-escalated Project Cost ($)
SW-P-11	5.2	Drainage Basin: JS - Length 655 ft	Capacity	2	2018	2	$449,000
SW-P-12	5.2	Drainage Basin: JS - Length 701 ft	Capacity	2	2018	2	$480,000
SW-P-13	5.2	Drainage Basin: HS - Length 1,552 ft	Capacity	2	2018	2	$606,000
SW-P-14	5.2	22 assets identified in the condition assessment	R&R	1	2016	2	$3,324,000
SW-P-15	5.4	Dry Weather Diversion Structure	Resource Sustainability	2	2021	3	$370,000
SW-P-16	5.4	City-Wide Incentive Program	Resource Sustainability	2	2021	10	$2,420,000
SW-P-17	5.4	Santa Clara River Total Maximum Daily Load (TMDL) Infiltration Basin	Resource Sustainability	2	2023	5	$1,850,000
			Phase 1 Subtotal				**$10,060,000**
			Phase 2 Subtotal				**$8,075,000**
			Phase 3 Subtotal				**$2,621,000**
			Phase 4 Subtotal				**$1,930,000**
			Stormwater CIP Projects Total				**$22,686,000**
			Total PWIMP CIP				**$1,055,229,000**