CITY OF OXNARD CALIFORNIA

Programmatic Environmental Impact Report

Public Works Integrated Master Plan

(SCH #: 2016071078)

Public Draft

July 2019

SMB ENVIRONMENTAL

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Acronyms

F	degrees Fahrenheit
µm	micrometer
µN/m^2	micro Newtons per square meter
µPa	micro Pascals
AA	administering agency
AB	Assembly Bill
ABP	Alamitos Barrier Project
ACP	asphalt concrete pavement
ADT	average daily traffic
AFY	acre-feet per year
ANSI	American National Standards Institute
APE	Area of Potential Effect
AQMP	Air Quality Management Plan
ASPIS	Abandoned Site Program Information System
ASR	aquifer storage and recovery
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AVO	average vehicle occupancy
AWP	Annual Work Plan
AWPF	advanced water purification facility
AWTF	advanced water treatment facility
AWTS	advanced water treatment system
B.P.	Before Present
bgs	below ground surface
BMP	best management practice
BSF	base sanitary flow
BWRDF	brackish water reclamation demonstration facility
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CA-FID	California Facility Inventory Database

Cal-ARP	California Accidental Release Prevention
Cal-EPA	California Environmental Protection Agency
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CDMG	California Division of Mines and Geology
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHAS	Comprehensive Housing Affordability Strategies
CHMIR	California Hazardous Material Incident Report CHMIRS California Hazardous Material Incident Report System CHP California Highway Patrol
City	City of Oxnard
CIWMB	California Integrated Waste Management Board
CMWD	Calleguas Municipal Water District
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNG	compressed natural gas
CNPS	California Native Plant Society
CO	carbon monoxide
CO2	carbon dioxide.
CRHR	California Register of Historical Resources
CUPA	Certified Unified Program Agency
CVC	California Vehicle Code
CWA	Clean Water Act
cy	cubic yard
CZMA	Coastal Zone Management Act

dB	decibel
dBA	A-weighted decibel
DC	direct current
DGBP	Dominguez Gap Barrier Project
DHS	California Department of Health Services
DPR	Department of Parks and Recreation
DTSC	Department of Toxic Substances Control
DWFOB	Drinking Water Field Operation Branch
DWR	Department of Water Resources
EA	Environmental Assessment
EDR	electrodialysis reversal
EFH	essential fish habitat
EFZ	earthquake fault zone
EHS	extremely hazardous substance
EIR	Environmental Impact Report
ENSO	El Niño/Southern Oscillation
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act ERNS Emergency Response Notification System
FCGMA	Fox Canyon Groundwater Management Agency
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act
FID	Facility Inventory Database
FIRM	Flood Insurance Rate Map
FMP	Fishery Management Plan
ft/yr	feet per year
g	gravity
gpm	gallons per minute
GREAT	Groundwater Recovery Enhancement and Treatment Program
GRRP	Groundwater Recharge Reuse Project
GWI	groundwater infiltration
HABS	Historic American Building Survey

HCP	Habitat Conservation Plan
HMBP	Hazardous Materials Business Plan
hp	horsepower
HSC	Health and Safety Code
HWCL	Hazardous Waste Control Law
Hz	hertz
I/I	inflow/infiltration
IEC	International Electrotechnical Commission
ISO	International Standards Organization
kg/day	kilogram per day
kHz	kilohertz
kV	kilovolt
LAFCO	Local Agency Formation Commission
LARWQCB	Los Angeles Regional Water Quality Control Board
LAS	Lower Aquifer System
LCP	Local Coastal Plan
LD	Larson Davis
LEPC	local emergency planning committee
Leq	equivalent sound level
Lmax	highest sound pressure level in a specific time period
Lmin	lowest sound pressure level in a specific time period
Ln	sound pressure level exceeded n percent of a specific time period
LNG	liquefied natural gas
LORS	local ordinances, regulations, and standards
LOS	level of service
LQG	large quantity generator
LUST	leaking underground storage tank
M	magnitude
M&I	municipal and industrial
M&RP	Monitoring and Reporting Plan
MCL	maximum contaminant level

Metropolitan	Metropolitan Water District of Southern California
MF	microfiltration
MG	million gallon
mg/L	milligrams per liter
mgd	million gallons per day
mm/yr	millimeter per year
MOA	Memorandum of Agreement
MRZ	Mineral Resource Zone
MSDS	Material Safety Data Sheet
msl	mean sea level
MSW	municipal solid waste
MTBE	methyl tertiary-butyl ether
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NF	nanofiltration
NFRAP	No Further Remedial Action Planned
NMFS	National Marine Fisheries Service
NO2	nitrogen dioxide
NOI	Notice of Intent
NOP	Notice of Preparation
NOx	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historical Places
O3	ozone
OAL	Office of Administrative Law
O-H pipeline	Oxnard-Hueneme pipeline
OVMWD	Ocean View Municipal Water District
Pb	lead
PCH	Pacific Coast Highway

PDO	Pacific Decadal Oscillation
PHWA	Port Hueneme Water Agency
PM10	particulate matter sized 10 microns or less
PM2.5	particulate matter sized 2.5 microns or less
POTW	publicly owned treatment works
PPE	personal protection equipment
ppm	parts per million
PRC	Public Resources Code
PTP	pumping-trough pipeline
PVCWD	Pleasant Valley County Water District
RASA	Regional Aquifer System Analysis
RCPG	Regional Comprehensive Plan and Guide
RCRA	Resource Conservation and Recovery Act
RDI/I	rainfall-dependent inflow/infiltration
RMP	Risk Management Plan
RO	reverse osmosis
ROG	reactive organic gas
ROWD	report of waste discharge
rpm	revolutions per minute
RQ	reportable quantity
RTP	Regional Transportation Plan
RWC	recycled water contribution
RWQCB	Regional Water Quality Control Board
S&HC	Streets and Highways Code
SARA	Superfund Amendments and Reauthorization Act
SCAG	Southern California Association of Governments
SCAT	South Coast Area Transit
SCE	Southern California Edison
SCGC	Southern California Gas Company
SCH	Governor's Office of Planning and Research State Clearinghouse
SCWW	Santa Clara Wastewater Company

SDI	silt density index
SDWA	Safe Drinking Water Act
SERC	state emergency response committee
SFHA	Special Flood Hazard Area
SIP	State Implementation Plan
SO2	sulfur dioxide
SOAR	Save Open-space and Agricultural Resources
SOP	standard operating procedures
SOx	sulfur oxide
SPCC	spill prevention, control, and countermeasure
SQG	small quantity generator
SQMP	Stormwater Quality Management Plan
SQUIMP	Stormwater Quality Urban Impact Mitigation PlanSR State Route
SRRE	Source Reduction and Recycling Element
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TMDL	total maximum daily load
TMP	Traffic Management Plan
TOC	total organic carbon
TPQ	threshold planning quantity
TSDF	transfer, storage and disposal facility
TTF	tertiary treatment facility
UAS	Upper Aquifer System
UBC	Uniform Building Code
UF	ultrafiltration
UHLA	ultra-high lime aluminate
UIC	Underground Injection Control
USA	Underground Service Alert
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation

USC	United States Code
USDW	underground sources of drinking water
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	underground storage tank
UV	ultraviolet
UWCD	United Water Conservation District
UWMP	Urban Water Management Plan
V/C	volume to capacity
VCAPCD	Ventura County Air Pollution Control District
VCRR	Ventura County Railroad
VCTC	Ventura County Transportation Commission
VOC	volatile organic compound
VRSD	Ventura Regional Sanitation District
WCBBR	West Coast Basin Barrier Project
WCMWD	West Coast Municipal Water District
WDR	Waste Discharge Requirement
WMA	Watershed Management Area
WRD	Water Replenishment District
WRR	Water Reclamation Requirements
WWTP	wastewater treatment plant
WWTF	wastewater treatment facility

* Terminology Note: The terms "brine" and "concentrate" are used interchangeably for the purposes of discussion in this document.

Executive Summary

The City of Oxnard (City) has prepared this Programmatic Draft Environmental Impact Report (Program EIR, PEIR, DPEIR, and/or Draft PEIR) to provide the public and responsible agencies with information about the potential environmental effects of the City's proposed Public Works Integrated Master Plan (PWIMP, Project, and/or Proposed Project). Please see Appendix A for the PWIMP and supporting engineering reports. The City will be the lead agency under the California Environmental Quality Act (CEQA).

ES.1 Purpose of the Program Environmental Impact Report

The purpose of this PEIR is to provide the public and responsible and trustee agencies with information about the potential environmental effects of the Proposed Project. This Draft PEIR was prepared in compliance with the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000et seq.) of 1970 (as amended), and the CEQA Guidelines (California Code of Regulations, Title 14). As described in CEQA guidelines Section 15121(a), an EIR is a public information document that assesses potential environmental effects of the Proposed Project, and identifies mitigation measures and alternatives to the Proposed Project that would reduce or avoid adverse environmental impacts. CEQA requires that state and local government agencies consider the environmental consequences of projects over which they have discretionary authority.

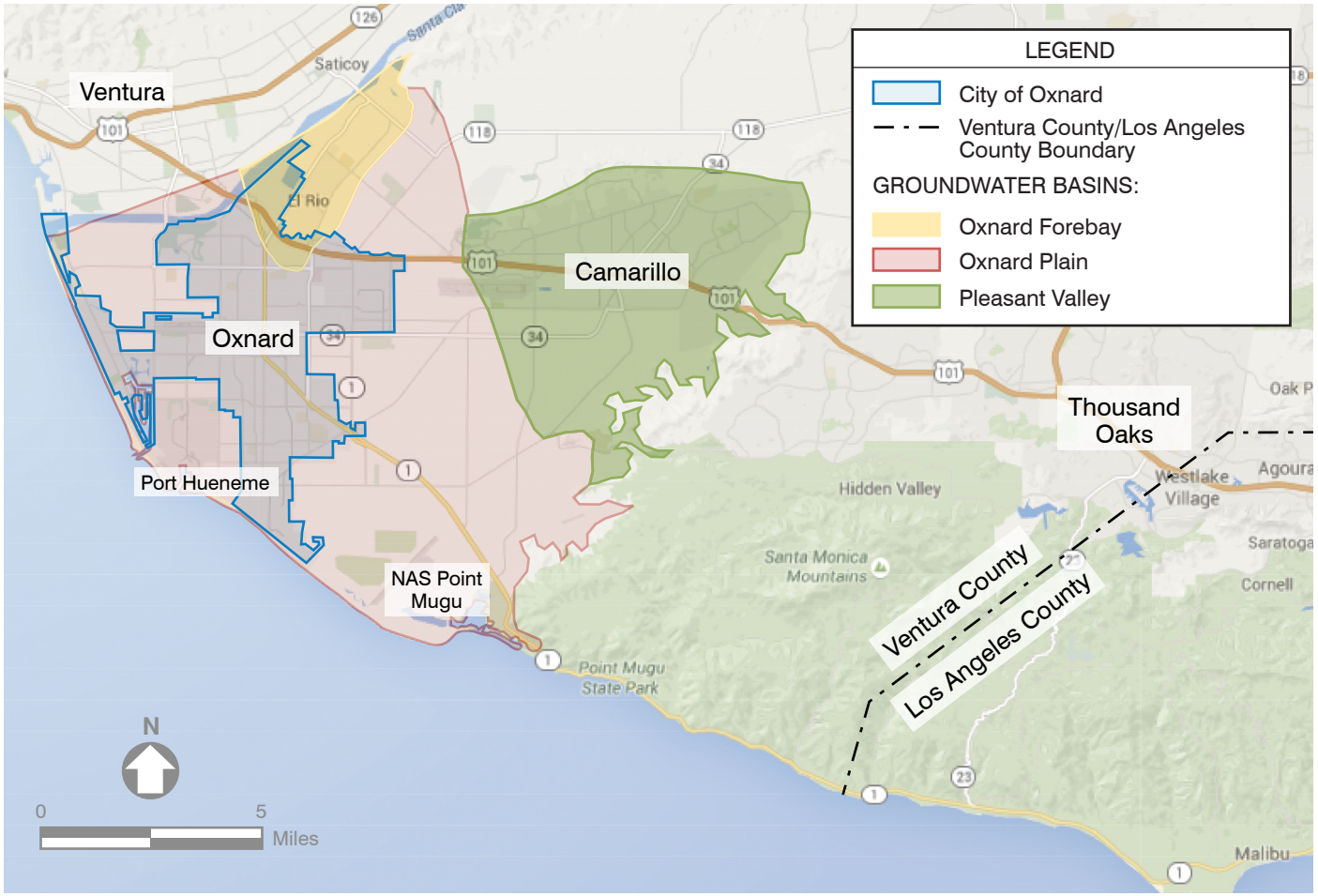
ES.2 Project Location and Background

As shown in Figure ES-1, the City is located along the Pacific Ocean coastline in Southern California, just northwest of Los Angeles. 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 its nearly 200,000 citizens and numerous industrial and commercial users.

The City's Public Works Department oversees the water, wastewater, recycled water, and stormwater utilities[1] throughout the City and faces many challenges in managing these four utilities and its future water resources. These challenges include identifying the best response to immediate drought conditions while planning for long-term water needs, reducing dependence on costly imported water, addressing aging infrastructure and reliability concerns, pursuing aggressive goals for energy efficiency and sustainable solutions, as well as maintaining compliance with changing regulatory requirements.

Given the City's challenges and opportunities to meet them, the PWIMP develops long-term recommendations for policies, programs, and goals that successfully address the challenges and opportunities in a holistic and integrated way. Opportunities to meet these challenges range from institutional and non-structural approaches (policies and programs) to technical and structural approaches (capital projects). The PWIMP will help the City respond to planned population increase, challenges from new regulatory requirements, drought conditions, aging infrastructure, and reliability concerns. In addition, the PWIMP 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 resources management.

[1] The City manages most of the stormwater facilities and the County of Ventura manages the major canals.



PROJECT AREA FOR INTEGRATED MASTER PLAN

FIGURE ES-1

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

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ES.3 Proposed Project Vision, Purpose, Need, Goals, and Objectives

The PWIMP provides a phased program over the next 15-20 years for constructing improvements to the City's infrastructure facilities that will accommodate planned growth while maintaining treatment reliability, meeting future regulatory requirements, and optimizing costs through the City's 2030 planning horizon. Specifically, the PWIMP addresses future planning needs including infrastructure additions and upgrades for City's water, wastewater, recycled water, and stormwater utilities. The PWIMP builds upon previous planning efforts using a coordinated methodology, which will allow the City to take full advantage of potential linkages and synergies between the four water utility systems. In addition, the PWIMP is also coordinated with a streets plan in an attempt to allow timing of future streets upgrades to be tied together with infrastructure upgrades.

This Draft PEIR document is being circulated to local, state, and federal agencies as well as to interested organizations and individuals who may wish to review and comment on the report and Proposed Project. Publication of this Draft PEIR marks the beginning of a 45-day public review period. The City will hold a public hearing on the Draft PEIR during the 45-day public review period.

Date: August 15, 2019
Time: 7:00 pm
Location: City of Oxnard
City Council Chambers
305 West Third Street
Oxnard, CA 93030

During this review period, written comments will be received by the City from July 15, 2019 up until, but no later than, close of business on August 30, 2019 at the following address:

Kathleen Mallory, Planning & Sustainability Manager
City of Oxnard
214 "C" Street
Oxnard, CA 93030
kathleen.mallory@oxnard.org

ES.4 Proposed Project Description

The City's proposed Project is to construct and operate the City's Public Works Integrated Master Plan (PWIMP), which is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System. Each is summarized below.

WATER SYSTEM IMPROVEMENTS

The goal of the proposed improvements to the City's water system is to increase the City's water supply by 12,000 acre-feet per year to offset future groundwater pumping restrictions and planned growth. These improvements include Water Supply and Quality Improvements and Water Supply Distribution Improvements. These are summarized below.

- **Water Supply and Quality Improvements.** The proposed water supply/quality improvements include: 6 new 2,000 gallons per minute (gpm) water supply wells: a new 2.0 million gallon (MG) storage tank: a 7.5 million gallon per day (mgd) expansion of the existing 7.5 mgd Desalter Facility in two 3.75 mgd phases for an overall capacity of 15 mgd (i.e. approximately 16.8 acre-

feet per year); and the construction of a new 32,100 linear foot (LF) Brine Line from BS 1/6 to the City's Ocean Outfall from the OWTP (14- to 24-inches in diameter).

- **Water Supply Distribution Improvements.** The proposed water supply distribution improvements include: replacing 14,198 LF of existing pipelines ranging from 8-30 inches in diameter; repairing and replacing the electrical, mechanical, auxiliary equipment at the existing blending stations (including adding cathodic protection); repairing and replacing 291,450 LF of existing pipelines throughout the City; and pressure zone and operational improvements for fire flow.

RECYCLED WATER SYSTEM IMPROVEMENTS

The proposed improvements to the City's recycled water system includes improvements to the City's recycled water system treatment facilities; recycled water pipeline distribution system; and Indirect Potable Recharge/Direct Potable Recharge facilities. These are summarized below.

- **Recycled Water Treatment System Improvements.** The proposed Recycled Water Treatment System Improvements include three (3) Phases of improvements. Phase 1 includes the conversion of the existing disinfection system to an Ultraviolet/Advanced Oxidation Process Treatment system. Phase 2 will expand the existing 6.25 mgd AWPF by an additional 6.25 mgd to 12.5 mgd. Phase 3 would expand the Phase 2 AWPF by another 6.25 mgd to a final capacity of 18.75 mgd.
- **Recycled Water Distribution System Improvements.** The proposed Recycled Water Distribution System Improvements include the construction of approximately 82,000 LF of new recycled water pipelines ranging in sizes of 20-24-30-, and 36-inches in diameter to deliver recycled water to agricultural users in the east and to the ASR wells; and four (4) 3.1 MG recycled water storage facilities at the AWPF for agricultural users and ASR sites.
- **Indirect Potable Recharge and Direct Potable Recharge Facilities and Improvements.** The IPR/ASR facilities will include the construction of ten (10) new 2,000 gpm ASR wells and standby wells – each with three (3) monitoring wells. Acquisition of property near BS No. 1/6 and BS No. 3 will be required.

WASTEWATER SYSTEM IMPROVEMENTS

The proposed improvements to the City's wastewater system improvements are discussed below.

- **Wastewater Collection System Improvements.** The proposed improvements to the City's wastewater collection system include rehabilitation and/or replacement of manholes and collection conduits to increase overall capacity throughout the City.
- **Wastewater Treatment System Improvements.** The City needs to decide if it will invest in the future of the aging existing OWTP or relocate the OWTP to an entirely new location – with entirely new facilities. Regardless, there are immediate rehabilitation and replacement project that need to be done to the OWTP. These include replacing equipment and making structural repairs. Facilities that are unsafe or are at the end of their useful lives, including the headworks, primary clarifiers, DAFTs, digesters, interstage pump station, effluent pump station, SCADA, and cogeneration facility will also need to be rehabilitated and/or replaced. If the City decides to invest in the existing OWTP, then there would be additional improvements needed to ensure its useful life for another 25-30 years. The relocation of the OWTP would require the acquisition of land suitable for such a facility and would require building all new facilities.

STORMWATER SYSTEM IMPROVEMENTS

The proposed stormwater system improvements include improvements to the City's existing stormwater collection system and the addition of new stormwater projects. These are discussed below.

- **Stormwater Collection System Improvements.** The proposed stormwater collection system improvements include rehabilitating and/or replacing of approximately 19,000 LF of existing pipeline/conduit throughout the City.
- **New Stormwater Projects and Improvements.** The New proposed Stormwater Projects include the construction of a new infiltration basin, a City-wide incentive stormwater reduction program, and a dry weather diversion program. The goal of these projects is to improve stormwater quality so it can be harvested as an additional water source and meet regulatory requirements. Each is described below.
    - *New Infiltration Basin.* The new proposed infiltration basin, recommended for TMDL compliance, is required to meet the Santa Clara River's indicator bacteria TMDL and would be sized to treat the 85th percentile stormwater volume from the local drainage area and would require approximately 85,000 square feet. It would be approximately 2-feet deep and infiltrate at a rate of 0.5-inches per hour.
    - *City-Wide Incentive Stormwater Reduction Program.* The proposed City-wide incentive program that would involve capturing stormwater to offset potable water use. This program would encourage new developers to invest in rainwater harvesting and onsite reuse. It would also give interested residents the opportunity to retrofit their homes with rain barrels or rain cisterns. These measures would lower the risk of flooding and would encourage residents and developers to take a proactive stance on stormwater. The City would encourage rainwater collection in several ways. It would provide discounted rain barrels and cisterns for purchase or offer a discount on water utilities bills. Such incentives could be provided for both existing landowners and developers. The cost for such an incentive program would depend entirely on its size and the amount the City is willing to offset.
    - *Dry Weather Diversion Program.* The proposed Dry Weather Diversion Program would divert dry weather stormwater channel flows to the OWTP to be treated and potentially reused at the AWPF. Dry weather flows include flow from irrigation runoff, pool draining, washdown water, construction work, and other related activities. In Oxnard, shallow groundwater infiltration is likely another component of dry weather 'stormwater' flow. Water could be diverted from the stormwater collection system in a number of ways. Typically, stormwater diversion structures in California are constructed to first screen water for trash and then pumping water from a stormwater pump station to a sanitary collection system. However, water can also be diverted in an open channel by installing an inflatable dam or mechanical gate. Water that builds up behind the dam or gate can then be pumped into the sanitary collection system. The diverted stormwater would be treated downstream at the OWTP and potentially the AWPF. A dry weather diversion could be used only when the OWTP has excess capacity. In Oxnard's case, storage would not be required because dry weather flows in stormwater channels occur year-round. To prevent significant water quality degradation of OWTP influent, however, dry weather diversions should be kept small in proportion to OWTP influent. Before this project could be implemented, the City should consider the effects removing this dry

weather storm channel flow could have on downstream habitat. Additionally, water quality implications should be studied further.

ES.5 Alternatives

As detailed in Chapter 3 – Environmental Analysis, the construction and operation of the PWIMP would have several potentially significant impacts to the environment. However, with the implementation of the identified and corresponding mitigation measures, all of the potentially significant impacts can be reduced to less-than-significant levels. As a result, the only alternative that needs to be evaluated in this Program EIR is the CEQA required No Project Alternative. Among others, alternatives considered, but eliminated from further consideration include the following:

- Relocation of the Oxnard Wastewater Treatment Facility;
- Alternative Locations for New PWIMP Facilities;
- Increased Groundwater Pumping;
- Purchase of Imported Water Supplies; and
- Seawater Desalination.

The No Project Alternative is discussed below.

NO PROJECT ALTERNATIVE

Section 15126.6 (e) of the CEQA Guidelines requires the analysis of a No Project Alternative. The purpose of describing and analyzing a No Project Alternative is to allow decision-makers the opportunity to compare the impacts of approving the proposed project with the impacts of not approving the proposed project. The CEQA Guidelines state that the No Project Alternative is the circumstance under which the project would not proceed. If the No Project Alternative would not result in the preservation of existing conditions, the consequences of not approving a project should also be discussed.

Under the No Project Alternative, the PWIMP would not be implemented. Construction of the expanded AWTP, desalter, and new water and DPR/IPR/ASR wells and other facilites would not occur. As a result, secondary effluent produced from the Oxnard WWTP would not be diverted from the existing ocean outfall for tertiary and advanced water treatment at the AWPF facility. Further rehabilitation of the existing pipelines and conveyance facilities that are at the end of their useful lives would not occur. This would cause the need for emergency repairs rather than a planned, orderly, and cost-effective method for ensuring reliability with the various water, wastewater, recycled water, and stormwater pipeline and conveyance facilities.

Agricultural users would not be provided an alternative source of quality irrigation water and proposed new recycled water conveyance pipelines and storage would not be constructed. As a result, current groundwater pumping practices for irrigation would be continued as allowed by assigned allocations; unused groundwater pumping allocations (credits) would not be available for City use.

Groundwater injections afforded by new IPR/ASR would not occur, and over-drafted aquifer conditions would continue to occur or worsen. Additional potable water supplies potentially provided by treatment of extracted groundwater (allowed by transfer of unused groundwater pumping in lieu of groundwater recharge) would not be available for extraction and treatment by the proposed regional desalter expansion(s).

The No Project Alternative could result in a shortage in the amount of reliable and affordable water supplies available to meet both potable and non-potable demands. A shortage would require the City to consider other alternative solutions to meet the goal of the City to provide current and future residents and businesses with a reliable and affordable source of high-quality water.

The No Project Alternative was included as the Base Case Scenario in the groundwater flow modeling conducted for the PWIMP. The results of the modeling are discussed in the PWIMP, which is located in Appendix A. These results assist in understanding the potential condition of the groundwater aquifer in 2030 under the No Project Alternative (i.e., existing conditions). To summarize, groundwater aquifer conditions under the No Project Alternative in the lower aquifer system (LAS) in the Southern Oxnard Plain will remain significantly above sea level, only occasionally dropping to near sea level during extended drier climatic periods. These conditions would indicate a low potential for coastal landward flow (i.e., seawater intrusion). In contrast, groundwater aquifer conditions in the LAS in the Southern Oxnard Plain and Pleasant Valley areas would continue to experience severe overdraft conditions and water quality degradation in the LAS of the southern Oxnard Plain and Pleasant Valley areas.

The No Project Alternative would avoid the less-than-significant significant with mitigation impacts identified for the PWIMP Program. However, several of the beneficial impacts of the PWIMP related to groundwater recharge in the LAS would not be realized, including increased groundwater elevations, minimization of coastal landward flow of seawater, and reduction of severe overdraft conditions and water quality degradation. In addition, the No Project Alternative fails to meet any of the stated objectives for the Proposed Project.

ES.6 Summary of Environmental Impacts and Mitigation Measures

Table ES-1 provides a summary of the potential environmental impacts of the construction and operation of the Proposed Project as identified in this PEIR and the potential mitigation measures if required. The level of significance of each potential environmental impact is indicated before and after the application of any proposed or recommended mitigation measures.

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
3.1 Aesthetic/Visual Resources			
Impact 3.1-1: Construction associated with PWIMP facilities could temporarily degrade the existing visual character of a site or surroundings.	Less-than-Significant Impact	None Required	Less-than-Significant Impact
Impact 3.1-2: Permanent facilities could have an adverse effect on scenic vistas, damage scenic resources, or degrade the existing visual character or quality of the site and its surroundings.	Potential Significant Impact	Mitigation Measure 3.1-2a: Blend in with the Existing Environment. Mitigation Measure 3.1-2b: Fencing.	Less-than-Significant Impact
Impact 3.1-3: Exterior lighting associated with	Potential Significant Impact	Mitigation Measure 3.1-3a: Shielded Lighting.	Less-than-Significant Impact

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
proposed facilities would create new sources of light and glare in the surrounding areas.		Mitigation Measure 3.1-3b: Security Lighting.	
3.2 Agricultural and Soil Resources			
Impact 3.2-1: Construction and operation of the PWIMP and/or identified components/facilities could result in the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use.	No Impact	None Required	No Impact
Impact 3.2-2: Construction and operation of the PWIMP and/or identified components/facilities could conflict with existing zoning for agricultural use or an existing Williamson Act contract.	No Impact	None Required	No Impact
Impact 3.2-3: Construction and operation of the PWIMP and/or identified facilities could result in conversion of off-site farmland to non-agricultural use.	No Impact	None Required	No Impact
3.3 Air Quality			
Impact 3.3-1: Construction and operation of the PWIMP could conflict with population or other growth forecasts contained in the Ventura County AQMP or otherwise obstruct implementation of the Ventura County AQMP.	Less-than-Significant Impact	None Required	Less-than-Significant Impact
Impact 3.3-2: Construction and operation of the PWIMP and/or identified facilities could violate any federal or state air quality standard or contribute substantially to an existing or projected air quality standard violation.	Potential Significant Impact	Mitigation Measure 3.3-2a: Calculate Air Emissions. Mitigation Measure 3.3-2b: Construction Emissions Control Plan. Mitigation Measure 3.3-2c: Construction Fugitive Dust Control Plan. Mitigation Measure 3.3-2d: San Joaquin Valley Fever Prevention	Less-than-Significant Impact

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		Plan. Mitigation Measure 3.3-2e: ROC and NOx Construction Measures.	
Impact 3.3-3: Construction and operation of the PWIMP and/or identified components/facilities could result in a net increase of any criteria air pollutant in excess of quantitative thresholds recommended by the VCAPCD.	Less-than-Significant Impact	None Required	Less-than-Significant Impact
Impact 3.3-4: Construction and operation of the PWIMP and/or identified components/facilities could expose sensitive receptors to pollutant concentrations exceeding state or federal standards or in excess of applicable health risk criteria for toxic air contaminants.	Less-than-Significant Impact	None Required	Less-than-Significant Impact
Impact 3.3-5: Construction and operation of the PWIMP and/or identified components/facilities could create objectionable odors affecting a substantial number of people.	Less-than-Significant Impact	None Required	Less-than-Significant Impact
3.4 Biological Resources			
Impact 3.4-1: Construction and operation of the PWIMP and/or identified components/facilities could have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.	Potential Significant Impact	Mitigation Measure 3.4-1a: Conduct Pre-construction Biological Survey(s).	Less-than-Significant Impact
Impact 3.4-2: Construction and operation of the PWIMP and/or identified	Potential Significant Impact	Mitigation Measure 3.4-2a: Avoid Construction Impacts on Riparian	Less-than-Significant Impact

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
components/facilities could have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations adopted by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.		Habitat. Mitigation Measure 3.4-2b: Avoid Construction Impacts on Critical Habitats.	
Impact 3.4-3: Construction and operation of the PWIMP and/or identified components/facilities could have a substantial adverse effect on federally protected waters of the U.S. as defined by Section 404 of the federal Clean Water Act or protected waters of the state as defined by Section 1600 et seq. of the California Fish and Game Code (including, but not limited to, marshes, vernal pools, and coastal wetlands) through direct removal, filling, hydrological interruption, or other means.	Potential Significant Impact	Mitigation Measure 3.4-3a: Avoid Federally Protected Wetlands and Waters of the U.S.	Less-than-Significant Impact
Impact 3.4-4: Construction and operation of the PWIMP and/or identified components/facilities could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	Potential Significant Impact	3.4-1a: Conduct Pre-construction Biological Survey(s).	Less-than-Significant Impact
Impact 3.4-5: Construction and operation of the PWIMP and/or identified components/facilities could conflict with any local policies or ordinances protecting biological resources.	No Impact	None Required	No Impact

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
Impact 3.4-6: Construction and operation of the PWIMP and/or identified components/facilities could conflict with an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.	No Impact	None Required	No Impact
3.5 Climate Change and Greenhouse Gases			
Impact 3.5-1: Construction and operation of the PWIMP and/or identified components/facilities could generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.	Potential Significant Impact	Mitigation Measure 3.5-1a: Calculate Air Emissions. Mitigation Measure 3.5-1b: Construction Emissions Control Plan. Mitigation Measure 3.5-1c: ROC and NOx Construction Measures. Mitigation Measure 3.5-1d: Purchase of GHG Offset Credits.	Less-than-Significant Impact
Impact 3.5-2: Construction and operation of the PWIMP and/or identified components/facilities could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases or otherwise conflict with state goals for reducing GHG emissions in California.	Potential Significant Impact	Mitigation Measures 3.5-1a through 3.5-1d above.	Less-than-Significant Impact
Impact 3.5-3: Construction and operation of the PWIMP and/or identified components/facilities could contribute or be subject to potential secondary effects of climate change (e.g., sea level rise, increase fire hazard).	Potential Significant Impact	Mitigation Measures 3.5-1a through 3.5-1d above.	Less-than-Significant Impact
3.6 Cultural, Paleontological, and Tribal Resources			
Impact 3.6-1: Construction and operation of the PWIMP and/or identified components/facilities could cause a substantial adverse change in the significance of an historical	Potential Significant Impact	Mitigation Measure 3.6-1a: Pre-Construction Cultural Resources Survey(s). Mitigation Measure 3.6-1b: Avoidance. Mitigation Measure 3.6-1c:	Less-than-Significant Impact

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
resource as defined in State CEQA Guidelines Section 15064.5.		Evaluation for CRHR. Mitigation Measure 3.6-1d: Develop a Cultural Resources Treatment Plan (CRTP). Mitigation Measure 3.6-1e: Halt work if Cultural Resources are Discovered.	
Impact 3.6-2: Construction and operation of the PWIMP and/or identified components/facilities could cause a substantial adverse change in the significance of a unique archaeological resource pursuant to State CEQA Guidelines Section 15064.5.	Potential Significant Impact	Mitigation Measures 3.6-1a through 3.6-1e, above.	Less-than-Significant Impact
Impact 3.6-3: Construction and operation of the PWIMP and/or identified components/facilities could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	Potential Significant Impact	Mitigation Measure 3.6-3a: Stop Work if Paleontological Remains are Discovered.	Less-than-Significant Impact
Impact 3.6-4: Construction and operation of the PWIMP and/or identified components/facilities could disturb any human remains, including those interred outside of formal cemeteries.	Potential Significant Impact	Mitigation Measure 3.6-4a: Halt Work if Human Remains are Discovered.	Less-than-Significant Impact
Impact 3.6-5: Construction and operation of the PWIMP and/or identified components/facilities could cause a substantial adverse change in the significance of a tribal cultural resource.	Potential Significant Impact	Mitigation Measure 3.6-5: Halt Work if Tribal Cultural Resources are Discovered.	Less-than-Significant Impact
3.7 Geologic, Seismic, and Soil Hazards			
Impact 3.7-1: Implementation of the PWIMP and/or identified components/facilities could expose people or structures to potential substantial adverse effects, including the risk of loss,	Potential Significant Impact	Mitigation Measure 3.7-1a: Conduct Appropriate Geotechnical Engineering Studies.	Less-than-Significant Impact

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
injury, or death involving earthquakes, landslides, liquefaction, and/or subsidence.			
3.8 Hazards and Hazardous Wastes			
Impact 3.8-1: Excavation and grading for the project could expose construction workers, the public, or the environment to hazardous materials that may be present in excavated soil or groundwater.	Potential Significant Impact	Mitigation Measure 3.8-1a: Conduct Phase I Environmental Site Assessment(s). Mitigation Measure 3.8-1b: Prepare Project-Specific Health and Safety Plan(s). Mitigation Measure 3.8-1c: Environmental Construction Monitor(s). Mitigation Measure 3.8-1d: Develop a Materials Disposal Plan(s).	Less-than-Significant Impact
Impact 3.8-2: Potential for accidental release of hazardous materials from construction activity es.	Potential Significant Impact	Mitigation Measure 3.8-2a: Store, Handle, Use Hazardous Materials in Accordance with Applicable Laws. Mitigation Measure 3.8-2b: Properly Dispose of Contaminated Soil and/or Groundwater. Mitigation Measure 3.8-2c: Properly Dispose of Hydrostatic Test Water.	Less-than-Significant Impact
Impact 3.8-3: Handling and Use of Hazardous Materials within ¼-mile of a school during construction.	Potential Significant Impact	Mitigation Measures 3.8-1a through 3.8-1d and 3.8-2a through 3.8-2c, above.	Less-than-Significant Impact
Impact 3.8-4: Increased risk of wildland fires during construction in high fire hazard areas.	Potential Significant Impact	Mitigation Measure 3.8-4a: Fire Prevention and Control.	Less-than-Significant Impact
3.9 Hydrology, Water Quality, and Water Utilities			
Impact 3.9-1: Construction and operation of the PWIMP could cause a violation of any adopted water quality standards or waste discharge or treatment requirements.	Potential Significant Impact	Mitigation Measure 3.9-1a: Implement Construction Best Management Practices.	Less-than-Significant Impact
Impact 3.9-2: Construction and operation of the PWIMP could substantially deplete groundwater supplies or interfere with groundwater	Potential Significant Impact	Mitigation Measure 3.9-2a: Prepare Groundwater and Hydrogeological Plan and Modeling.	Less-than-Significant Impact

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted).			
Impact 3.9-3: Construction and operation of the PWIMP could substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in on- or off-site flooding or exceed the capacity of existing or planned stormwater drainage systems.	Less-than-Significant Impact to Beneficial Impact	None Required.	Less-than-Significant Impact to Beneficial Impact
Impact 3.9-4: Construction and/or Operation of the PWIMP could: 1) Place new structures within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map; 2) Impede or redirect flood flows such that it would increase on- or off-site flood potential; 3) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; and/or 4) Be exposed to a substantial risk related to inundation by seiche, tsunami, or mudflow.	Less-than-Significant Impact	None Required.	Less-than-Significant Impact
3.10 Land Use Planning			
Impact 3.10-1: Construction and operation of the PWIMP could conflict with an applicable land use plan, policy or regulation of the City or other agency with	Potential Significant Impact	Mitigation Measure 3.10-1a: Land Use Compatibility Review. Mitigation Measure 3.10-1b: New Pipeline Locations. Mitigation Measure 3.10-1c-:	Less-than-Significant Impact

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
jurisdiction over the project adopted for the purpose of avoiding or mitigating a significant environmental effect.		Return to Existing Conditions.	
Impact 3.10-2: Construction and operation of the PWIMP could involve land uses that are not allowed under an applicable airport land use compatibility plan.	Less-than-Significant Impact	None Required.	Less-than-Significant Impact
Impact 3.10-3: Construction and operation of the PWIMP could conflict with an applicable habitat conservation plan or natural community conservation plan.	No Impact	None Required.	No Impact
Impact 3.10-4: Construction and/or Operation of the PWIMP could physically divide an established community.	No Impact	None Required.	No Impact
3.11 Mineral Resources			
Impact 3.11-1: Construction and operation of the PWIMP could result in the loss of availability of a known mineral resource of value to the region or state.	No Impact	None Required.	No Impact
Impact 3.11-2: Construction and operation of the PWIMP could result in the loss of availability of a locally important mineral resource recovery site delineated in the 2030 General Plan or other adopted land use plan.	No Impact	None Required.	No Impact
3.12 Noise			
Impact 3.12-1: Construction and operation of the PWIMP could generate or expose persons to noise levels exceeding standards established in the Oxnard 2030 General Plan or Noise Ordinance, or applicable standards of other agencies.	Potential Significant Impact	Mitigation Measure 3.12-1a: Limit Construction Hours. Mitigation Measure 3.12-1b: Locate Staging Areas away from Sensitive Receptors. Mitigation Measure 3.12-1c: Maintain Mufflers on Equipment. Mitigation Measure 3.12-1d: Idling Prohibition and Enforcement.	Less-than-Significant Impact

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		Mitigation Measure 3.12-1e: Equipment Location and Shielding. Mitigation Measure 3.12-1f: Notify Residents and Sensitive Receptors. Mitigation Measure 3.12-1g: Enclosed Noise Structures.	
Impact 3.12-2: Construction of the PWIMP could generate or expose persons to excessive groundborne vibration or groundborne noise levels.	Potential Significant Impact	Mitigation Measures 3.12-2a: Vibration Monitoring.	Less-than-Significant Impact
3.13 Traffic and Transportation			
Impact 3.13-1: Construction and operation of the PWIMP could cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections) based on adopted City of Oxnard level of service (LOS) standards.	Potential Significant Impact	Mitigation Measure 13.1-1a: Prepare and Implement Traffic Control Plan(s). Mitigation Measure 13.1b: Return Roads to Pre-construction Condition.	Less-than-Significant Impact
Impact 3.13-2: Construction of the PWIMP could exceed, either individually or cumulatively, an LOS standard established by the Ventura County Congestion Management Program (CMP) for designated roads or highways.	Potential Significant Impact	Mitigation Measure 13.1a, above.	Less-than-Significant Impact
Impact 3.13-3: Construction and operation of the PWIMP could result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.	No Impact	None Required.	No Impact
Impact13.3-4: Construction and operation of the PWIMP could substantially	Less-than-Significant Impact	None Required.	Less-than-Significant Impact

Table ES-1
Summary of Environmental Impacts and Mitigation Measures

Potential Environmental Impact	Level of Significance Before Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).			
Impact 13.3-5:Construction and operation of the PWIMP could result in inadequate emergency access.	Potential Significant Impact	Mitigation Measure 13.1a, above.	Less-than-Significant Impact
Impact13.3-6: Construction and operation of the PWIMP could conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks).	Potential Significant Impact	Mitigation Measure 13.1a, above.	Less-than-Significant Impact
Growth Inducement Effects			
Implementation of the PWIMP could be considered to have indirect growth inducing effects as it would remove a barrier to growth by providing improved water supplies and utilities to support the current, planned, and 2030 growth. In as such, it would then be reasonable conclude that the implementation of the PWIMP would contribute to the same indirect significant and unavoidable growth inducing impacts as identified in the 2030 General Plan EIR.	Indirectly contributes to the Significant and Unavoidable impacts identified in the 2030 General Plan Directly only contributes to less-than-significant impacts	None Available. None Required.	Indirectly Significant and Unavoidable Directly Less-than-Significant Impacts
Cumulative Effects			
Temporary construction of the PWIMP and facility(s) in conjunction with other undetermined projects over the next 15-to-20 years has the potential to have direct and/or indirect cumulative environmental impacts. These could result in potentially significant temporary impacts, perhaps even significant and	Potentially Significant Impact	Mitigation Measure: Prepare Project-level environmental documentation for each individual PWIMP Project and Implement mitigation measures identified in each resource chapter	Less-than-Significant Impact

Table ES-1 Summary of Environmental Impacts and Mitigation Measures			
Potential Environmental Impact	**Level of Significance Before Mitigation**	**Mitigation Measure(s)**	**Level of Significance After Mitigation**
unavoidable impacts on air quality, noise, and traffic and transportation - depending upon the other projects being constructed nearby at the same time.			

ES.7 Environmentally Superior Alternative

Section 15126.6(e)(2) of the CEQA Guidelines requires an EIR to identify an environmentally superior alternative. Of the two alternatives considered in this section (Proposed Project and the No Project Alternative), the Proposed PWIMP Project appears to be environmentally superior to the No Project Alternative. The No Project Alternative would not meet any of the goals and objectives of the PWIMP and would not allow the city to have reliable water, wastewater, recycled water and stormwater facilities to accommodate the planned and approved growth through the City's 2030 General Plan and planning process. Further, the Proposed PWIMP Project would meet all of the objectives, would have many beneficial long-term impacts to the City's water supplies and utilities/infrastructure, and would not result in any direct significant environmental impacts that could not reasonably be reduced to less-than-significant levels. The PWIMP would help contribute to indirect significant unavoidable impacts identified in City's 2030 General Plan as water would remove an obstacle for growth. However, the City has already approved this plan growth and commissioned the PWIMP and this environmental document to accommodate this planned and approved growth. As a result, the Proposed PWIMP Project is considered to be the environmentally superior alternative.

Chapter 1 Introduction

The City of Oxnard (City) has prepared this Programmatic Draft Environmental Impact Report (Program EIR, PEIR, DPEIR, and/or Draft PEIR) to provide the public and responsible agencies with information about the potential environmental effects of the City's proposed Public Works Integrated Master Plan (PWIMP, Project, and/or Proposed Project). For more information on the PWIMP, please see Appendix A. The City will be the lead agency under the California Environmental Quality Act (CEQA).

1.1 Purpose of the Program Environmental Impact Report

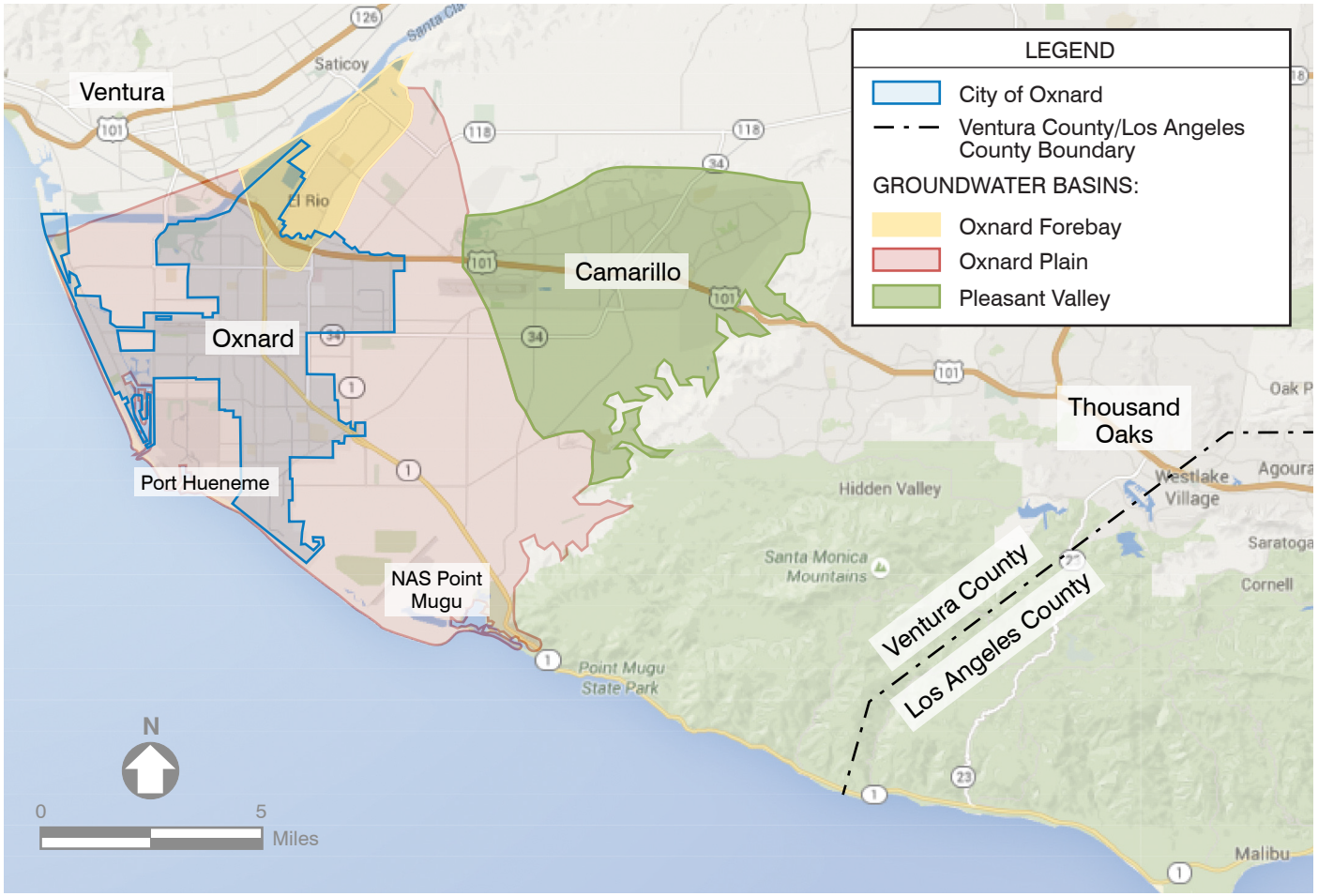
The purpose of this PEIR is to provide the public and responsible and trustee agencies with information about the potential environmental effects of the Proposed Project. This Draft PEIR was prepared in compliance with the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000et seq.) of 1970 (as amended), and the CEQA Guidelines (California Code of Regulations, Title 14). As described in CEQA guidelines Section 15121(a), an EIR is a public information document that assesses potential environmental effects of the Proposed Project, and identifies mitigation measures and alternatives to the Proposed Project that would reduce or avoid adverse environmental impacts. CEQA requires that state and local government agencies consider the environmental consequences of projects over which they have discretionary authority.

CEQA requires that a lead agency neither approve nor carry out a project as proposed unless the significant environmental effects of the project have been reduced to an acceptable level, or unless specific findings are made attesting to the infeasibility of altering the project to reduce or avoid environmental impacts (CEQA Guidelines Sections 15091 and 15092). An acceptable level is defined as eliminating, avoiding, or substantially lessening the significant effects. CEQA also requires that the decision makers balance the benefits of a proposed project against its unavoidable environmental risks. If environmental impacts are identified as significant and unavoidable, the project may still be approved if it is demonstrated that social, economic, or other benefits outweigh the unavoidable environmental impacts. As the CEQA lead agency, the City would then be required to state in writing the specific reasons for approving the project based on information presented in the EIR, as well as other information in the record. This process is defined as a "Statement of Overriding Considerations" by Section 15093 of the CEQA guidelines.

As stated above, the City will be the lead agency for CEQA compliance and will use this document to evaluate the Proposed Project's potential environmental impacts and to aid in the decision-making process.

1.2 Project Location and Background

As shown in Figure 1-1, the City is located along the Pacific Ocean coastline in Southern California, just northwest of Los Angeles. 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 its nearly 200,000 citizens and numerous industrial and commercial users.



PROJECT AREA FOR INTEGRATED MASTER PLAN

FIGURE 1-1

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

ox0917rf1-9587-CEQA(EIR-Fig1-1).ai

The City's Public Works Department oversees the water, wastewater, recycled water, and stormwater utilities[1] throughout the City and faces many challenges in managing these four utilities and its future water resources. These challenges include identifying the best response to immediate drought conditions while planning for long-term water needs, reducing dependence on costly imported water, addressing aging infrastructure and reliability concerns, pursuing aggressive goals for energy efficiency and sustainable solutions, as well as maintaining compliance with changing regulatory requirements.

Given the City's challenges and opportunities to meet them, the PWIMP develops long-term recommendations for policies, programs, and goals that successfully address the challenges and opportunities in a holistic and integrated way. Opportunities to meet these challenges range from institutional and non-structural approaches (policies and programs) to technical and structural approaches (capital projects). The PWIMP will help the City respond to planned population increase, challenges from new regulatory requirements, drought conditions, aging infrastructure, and reliability concerns. In addition, the PWIMP 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 resources management.

1.3 Proposed Project Vision, Purpose, Need, Goals, and Objectives

The PWIMP provides a phased program for constructing improvements to the City's infrastructure facilities that will accommodate planned growth while maintaining treatment reliability, meeting future regulatory requirements, and optimizing costs through the City's 2030 planning horizon. Specifically, the PWIMP addresses future planning needs including infrastructure additions and upgrades for City's water, wastewater, recycled water, and stormwater utilities. The PWIMP builds upon previous planning efforts using a coordinated methodology, which will allow the City to take full advantage of potential linkages and synergies between the four water utility systems. In addition, the PWIMP is also coordinated with a streets plan in an attempt to allow timing of future streets upgrades to be tied together with infrastructure upgrades.

Drivers. In the first stages of the planning process, key planning drivers were identified that would direct the master planning efforts and evaluate and recommend necessary facilities, policies, and programs within the PWIMP. These drivers are described below.

- Rehabilitation/Replacement (Condition) – A condition trigger was assigned when the process or facility had reached the end of its economic useful life. This trigger is determined by the need to maintain a facility so it can operate reliably and meet performance requirements related to existing regulatory permits, worker and public safety, and protection of the environment.
- Regulatory Requirement – A regulatory trigger was assigned when local, state, or national regulatory requirements necessitated new facilities. Determining when the new facilities would be built depended on the amount of lead-time needed to plan, design, and construct the facilities according to the new requirements.
- Economic Benefit – An economic benefit trigger was assigned when life-cycle costs, consisting of capital costs and operations and maintenance costs, could be significantly reduced. For example, an economic benefit might be realized when an increase in initial capital investment achieves 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 reduced

[1] The City manages most of the storm water facilities and the County of Ventura manages the major canals.

operational and safety-related risks. For example, this type of trigger would be applied when improving process control and automation or addressing an operational concern, such as adding flexibility / reliability or decreasing complexity.

Goals and Objectives. For the PWIMP, specific goals and objectives were developed considering the broad drivers established above. These goals and objectives provide a framework and boundaries for the City's planning process and can guide the development of alternatives and strategies as projects progress. Table 1-1 summarizes the PWIMP goals and corresponding objectives.

Table 1-1
Integrated Master Plan Goals and Objectives
Public Works Integrated Master Plan
City of Oxnard

Goal Number	Planning Goals	PWIMP Objectives
1	Provide compliant, reliable resilient and flexible systems	• Improve system reliability consistent with industry standards. • Implement redundancy/ backup systems for routine maintenance and repairs and for addressing security threats. • Implement innovative technology
2	Integrate gray and green infrastructure with an emphasis on energy efficiency	• Optimize the systems' energy efficiency.(1) • Investigate green and gray infrastructure options, such as low impact development techniques for stormwater, or alternative energy sources
3	Effectively manage assets (economic sustainability) Integrate community interests and maximize public acceptance (social sustainability)	• Maximize the cost/benefit ratio. • Spend public money wisely. • Develop sustainable ongoing communication processes. • Minimize impacts to the public
4	Mitigate and adapt to potential impacts of climate change	• Minimize potential climate change-related impacts to the system (e.g., sea level rise or changing rainfall patterns).
5	Protect environmental resources	• Maintain permit/regulatory compliance. • Position City for future regulatory changes. • Enhance environmental sustainability • Maximize water conservation. • Maximize wastewater reclamation and reuse. • Manage groundwater extraction. • Maximize the beneficial reuse of biosolids.

Water and Recycled Water Goals. In addition to the goals and objectives included in Table 1-1, specific water supply goals that provide a framework for alternatives development and comparison were identified. These water supply goals include:

- Provide reliable/resilient supply to meet future conditions (i.e., changes to demand, regulations, and water quality).
- Meet City's water quality objectives.
- Protect existing water rights by maximizing use of groundwater allocation.
- Minimize future reliance on imported water by maximizing use of AWPF Facility.
- Attract industry and jobs.
- Keep rates affordable.

The Oxnard Plain Groundwater Basin's safe yield is a major constraint placed on the City's water system. The Fox Canyon Groundwater Management Agency (FCGMA) protects the quantity and quality of the local groundwater by overseeing and managing all contractual withdrawals within the Oxnard Plain

Groundwater Basin.

Wastewater Goals. While no goals specific to wastewater were identified, all projects proposed in this PWIMP are centered on the goals presented in Table 1-1. Key considerations for wastewater planning in Oxnard revolved around repairing and replacing (R&R) the existing system to maintain its reliability and safety as well as meeting or surpassing all regulatory requirements for wastewater effluent discharge.

Stormwater Goals. In addition to the goals presented in Table 1-1, two stormwater specific objectives include maintaining the existing infrastructure and ensuring compliance with the Total Maximum Daily Load (TMDL). The PWIMP focuses on stormwater projects that will improve stormwater quality entering the environment and that can potentially harvest stormwater as an additional water supply. By including stormwater in the PWIMP, the integrated water utility system can become more robust, adaptable, and cost efficient.

1.4 Key Planning Considerations and Assumptions

Although each utility (water, wastewater, recycled water, and stormwater) has its own set of specific design criteria based on each system's unique features, a common set of planning considerations and assumptions formed the basis for developing and evaluating each project. These key planning considerations are discussed in the following sections.

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. The PWIMP is flexible and sensitive to changes in the timing of future water utility infrastructure capacity. With this flexibility and sensitivity, constructing additional capacity can occur quickly when needed, providing for the least-cost future Capital Improvement Plan.

Land Use Projections. Land use projections were based on the City's 2030 General Plan and on conversations with the City's Planning Division. The future division between residential, commercial, and industrial users is assumed to remain largely the same as the current mix. As such, residential infill and mixed-use development are expected to form the largest population increase. Specific developments that will trigger significant growth include RiverPark, The Village, and potentially the South Shore and Teal Club Specific Plans.

Population Projections. A wide range of population projections were considered conceptually and three were evaluated in more detail. These three population projections are described below. Two of the three projections were based on the City's 2030 General Plan, which was adopted in 2011 and extends through the year 2030. Using a variety of assumptions, this plan forecasted the 2030 population to be between 238,996 and 285,521. These two population forecasts are referred to as the low and high forecasts of the 2030 General Plan.

Because the 2030 General Plan population projections used data before the 2008 recession, the effects of the recession on population growth were not taken into account in these low and high forecasts. In response to this discrepancy, the City's Planning Division updated the 2030 General Plan population forecast in 2014 based on the 2010 Census and housing projections developed by Traffic Analysis Zone. The updated information formed the basis for the third projection, which projected a population below the low forecast of the 2030 General Plan.

The City's population forecasts vary significantly. The lowest population forecast (2014 Update) reflects

an average growth rate of 0.5 percent per year, whereas the highest projection (2030 General Plan – High Forecast) reflects an average annual growth rate of 1.5 percent for the next 25 years. The City's population is currently trending toward the 2030 General Plan's low forecast. Because of this, the PWIMP used the 2030 General Plan's low forecast to establish the planned needs and phasing of future capacity. These lower population projections were modified somewhat when combined with higher, more conservative per capita flows used to project water and wastewater flows.

Climate Change. In addition to population, climate change can affect all utilities considered in the PWIMP. The chemistry and dynamics of atmospheric greenhouse gases, including water vapor and carbon dioxide, hold heat in the atmosphere and create a natural greenhouse effect for the planet. Since the onset of the Industrial Revolution, data show that human-generated emissions of greenhouse gases, such as carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons, have been accumulating in the atmosphere and are intensifying Earth's natural greenhouse effect more rapidly than expected (Rahmstorf, et al., 2007). Although the scientific community is not in total agreement about the causes of climate change, scientists predict that sea levels will rise and that more frequent and intense storms will occur. Thus, this Plan focuses on how rising sea levels 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.

Sea Level Rise. Sea level is the ocean's elevation relative to a reference elevation. Data has shown that sea levels have increased over the last 100 years and are expected to accelerate at a faster rate in the future. Depending on the projection used, sea levels could rise anywhere from 7 to 18 feet by the year 2100. Since rising sea levels will affect the City's facilities, planning efforts incorporated these projections into the wastewater planning.

Rainfall. The City has experienced an increase in extreme precipitation events consistent with scientists' projections of a changing, warming climate. Although the amount of annual rainfall has increased only slightly, rainfall events are likely occurring more frequently and becoming more intense, with distribution patterns changing as well. Until regional climate models can provide more accurate projections for the Oxnard area, long-term planning should assume that more frequent and intense precipitation events and changing weather patterns will continue.

Drought. The number of dry days during summer months is also expected to increase, extending California's already long dry season. As such, longer, drier, and more frequent periods of drought are anticipated, with up to 2.5 times the number of critically dry years by the end of the century. Until more accurate scientific information and regional model results indicate otherwise, the California Department of Water Resources recommends that local agencies assume a 20 percent increase in the frequency and duration of future dry conditions to prepare for future droughts (DWR 2008h).

Sustainability. The City seeks to develop sustainable water solutions and infrastructure. As such, the PWIMP used the Envision® Sustainability Rating System as a framework for developing the evaluation criteria and metrics for strategies and alternatives. Each of the five PWIMP goals (shown in Table 1-1) were assessed through the lens of the Envision® tool to help further define these goals in a way that produces measureable metrics for comparing alternatives.

Envision®. The Envision® Rating System was developed through a joint collaboration between the Zofnass Program for Sustainable Infrastructure at the Harvard University Graduate School of Design and

the Institute for Sustainable Infrastructure[2]. It provides a holistic framework for evaluating and rating the community, environmental, and economic benefits of all types and sizes of infrastructure projects. The Envision® Rating System evaluates, grades, and recognizes infrastructure projects that use transformational and collaborative approaches to assess the sustainability indicators throughout a project's life cycle. The PWIMP used Envision® to make an initial assessment of sustainability at the "big picture" level. This assessment was informed by the City's overarching values and goals for sustainability as much as it was by the goals and objectives of the PWIMP. With the assessment, a minimum performance level for reducing greenhouse gas emissions was identified and stretch goals were established to show the range of sustainable principles that could be implemented. This assessment also helped to develop criteria used to evaluate and compare alternatives.

From the initial assessment, two types of evaluation tests emerged. The first type was termed an overarching principle (OP), which is the minimum threshold every alternative must meet to be considered viable. The second type was termed a measurable criterion (MC), which is a result that can be measured, quantified, and assigned (a "metric") to determine the relative performance of alternatives.

Table 1-2 summarizes the OP, and MC, associated with each of the five major goals of the PWIMP.

Table 1-2
Evaluation Criteria Established for Public Works Integrated Master Plan
City of Oxnard

Goal	Objective	Type of Criteria	Metric	Unit of Measure	Associated Envision® Credit
#2	**Investigate Gray and Green Infrastructure with an Emphasis on Energy Efficiency**				
	Investigate gray and green infrastructure	OP			NW2.1 Manage Stormwater (through LID).
	Maximize energy efficiency/sustainable energy use.	MC	Net nonrenewable Energy Use (Energy use – Energy production Renewable energy use/ purchase	kWh/year	RA2.1 Reduce Energy consumption. RA2.2 Use renewable energy
#3	**Manage Assets Effectively (Economic Sustainability)**				
	Maximize cost/benefit ratio.	MC	Capital Costs O&M Cost ($/year) Life-cycle Costs	Total Project Cost ($) Total O&M Cost ($/year) Annual Costs ($/year)	LD3.3 Extend O&M Costs Useful Life.
#4	**Mitigate and Adapt to Potential Impacts of Climate Change**				
	Minimize impacts to system due to events related to climate change.	OP			CR2.1 Assess climate threat. CR2.2 Avoid traps and vulnerabilities. CR2.3 Prepare for long-term adaptability.

[2] The Institute for Sustainable Infrastructure (ISI) is a 501 (c) (3) not for profit organization, structured to develop and maintain a sustainability rating system for civil infrastructure in the United States. ISI was founded by the American Council of Engineering Companies (ACEC), the American Public Works Association (APWA), and the American Society of Civil Engineers (ASCE) and is governed by a nine-member Board of Directors appointed by the founding organizations.

Table 1-2
Evaluation Criteria Established for Public Works Integrated Master Plan
City of Oxnard

Goal	Objective	Type of Criteria	Metric	Unit of Measure	Associated Envision® Credit
	Minimize contribution to climate change factors through reducing/minimizing GHG emissions.	MC	Greenhouse Gas Emissions	Metric tons of CO2 equivalent Emissions per year	RA1.1 Reduce net embodied energy. CR1.1 Reduce greenhouse gas emissions.
#5	**Protect/Enhance Environmental/Resource Sustainability**				
	Maintain regulatory/permit compliance.	OP			QL2.1 Protect public health.
	Maximize sustainable water use.	MC MC	Potable Water Offset Groundwater Replenishment	MG per year MG per year	RA3.1 Protect fresh water availability. RA3.2 Reduce potable water consumption. RA3.1 Protect fresh water availability
	Maximize beneficial reuse of solids.	MC	Solids Reused	Tons per year	RA1.5 Divert waste from landfills

Notes:
OP = Overarching Principle
MC = Measured Criteria
QL = Quality of Life
RA = Resource Allocation
LD = Leadership
NW = Natural World
CR = Climate & Risk

Energy. 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. As part of this effort, the City completed an Energy Action Plan in April 2013 and committed to pursuing the "Gold Level" as defined in Southern California Edison's Energy Leadership Partnership Program.

This goal targets a 10 percent reduction in energy use for City Government facilities. Oxnard's Energy Plan expands this 10 percent reduction to the community at large, calling for a 10 percent city-wide reduction in electricity and natural gas use. By implementing all recommended Energy Plan programs, State programs, and programs implemented since 2005, Oxnard is expected to decrease its greenhouse emissions by 114,000 million tons (MT) of CO_2 equivalent, which is an 8 percent reduction.

As part of the planning efforts for the PWIMP, the Energy Plan's recommendations were incorporated into the recommended CIP. The following three main recommendations were applicable:

- Incorporate Greening Guidelines: Incorporate green strategies by constructing new facilities that reduce energy consumption.
- Increase Onsite Electricity Generation at City Wastewater Treatment and Materials Recovery Facility: Investigate increasing the fats, oil, and grease collected for bio-gas electricity generation at the wastewater treatment plant.
- Recycled Water Outreach and Education Program: Expand use of the advance water purification facility (AWPF) and educate the public on the energy savings associated with it.

Basis of Costs. Cost estimates were also coordinated across each utility to ensure comparable and consistent estimates. These estimates are described below.

The Association for the Advancement of Cost Engineering International (AACE International, formerly

known as the American Association of Cost Engineers) has suggested levels of accuracy for five estimate classes. These five estimate classes are presented in the AACE International Recommended Practice No. 17R-97 (Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries). For projects in the PWIMP, cost estimates were developed following the AACE International Recommended Practice No. 17R-97 estimate Classes 4 and 5. Class 4 and 5 estimates are appropriate for master planning purposes and are derived from previous project costs and factored estimates where the former were not available.

Additionally, due to the differing nature of projects that occur within a treatment plant and for a collection or distribution system, two approaches were taken to estimate costs. The first approach, outlined in Table 1-3, is the method used for all projects recommended within the fence line of the OWTP and AWPF. The second approach, also outlined in Table 1-3, is the method used for all other capital improvement projects recommended for the PWIMP, including the water blending stations.

Table 1-3
Basis for Estimating Project Costs for the Public Works Integrated Master Plan
City of Oxnard

Item	Estimated Cost at OWTP and AWPF(1)	Estimated Cost for All Other Projects(2)
Base Construction Cost from Carollo Cost Curves and past projects (Bid Tabs)(3):	"A"	"A"
• Adjust base construction cost for field piping(4)	15% of "A"	--
• Adjust base construction cost for electrical/instrumentation(4)	20% of "A"	--
• Adjust base construction cost for sheeting/shoring/piles and painting(4)	10% of "A"	--
Subtotal ("B")	**145%**	**100%**
Construction Contingency	15% of "B"	30% of "B"
Subtotal Construction Cost ("C")	**167%**	**130%**
Project Cost Factor[5]	24% of "C"	24% of "C"
Total Estimated Project Cost ("D")	**207%**	**161%**

Notes:
(1) Used to estimate all costs considered within the fence line of the treatment facilities.
(2) Used to estimate all costs considered outside the fence line (i.e., pipelines, well pumps, booster pumping, and storage).
(3) Adjust this cost to 20-City Index ENR CCI of 9962 (February 2015) and needed city location adjustment factors.
(4) Costs are adjusted based on site-specific conditions.
(5) Includes all "soft" costs: engineering, administration, legal, and construction management.

The main difference in these approaches is that the OWTP and AWPF projects use a construction contingency of 15 percent, whereas all other projects use a construction contingency of 30 percent. The different contingencies reflect the type of work being done and the more detailed nature of the OWTP and AWPF projects.

Table 1-4 presents the economic criteria used to estimate annual costs for all projects. When developing annual costs, these criteria are applied to capital and Operations and Maintenance (O&M) costs.

Table 1-4 Economic Criteria
Public Works Integrated Master Plan
City of Oxnard

Item	Assumption
Costs in Time and Place(1)	Costs are based on Oxnard costs in February 2015
Inflation Rate(2)	Annual inflation rate is assumed to be 3 percent
Interest Rate(2)	5 percent for amortization purpose
Amortization Period	20 years

Note:
(1) 20-City Average Index ENR CCI of 9,962 was used for February 2015. A R.S. Means Location Factor of 106.6 for Oxnard was used (ENR,

Table 1-4 Economic Criteria Public Works Integrated Master Plan City of Oxnard	
Item	**Assumption**
2015) (RSMeans, 2015). (2) The inflation and interest rate are based on past experience with and an understanding of the economic climate of this industry.	

1.5 Regulatory Requirements

Detailed below are the current and projected regulatory requirements.

Water. Water treatment and supply facilities must meet all state and federal water quality guidelines. The United States Environmental Protection Agency (USEPA) establishes federal regulations in the form of the Safe Drinking Water Act, and the California Division of Drinking Water (DDW) administers state guidelines. Because the City's drinking water supply is a blend of surface water and groundwater, regulations apply to both.

- **Current.** Local groundwater wells are a major source of the City's water, making groundwater regulations the most relevant. Since wholesalers providing surface water to the City must meet treatment regulations before the water enters the system, surface water regulations related to treatment are not summarized in this chapter. In this case, the Calleguas Municipal Water District (CMWD) is responsible for meeting all applicable surface water treatment regulations. The City, however, must meet any distribution-related regulation related to water quality. Table 1-5 summarizes current regulations focused on water quality within groundwater and distribution systems.

Table 1-5
Overview of Relevant Drinking Water Regulations
Public Works Integrated Master Plan
City of Oxnard

Regulation	Compliance Date	Requirements and Maximum Contaminant Level (MCL)
Safe Drinking Water Act and National Primary Drinking Water Regulations	Ongoing	Maximum contaminant levels (MCLs), maximum contaminant level goals (MCLGs), and/or treatment techniques set for 83 contaminants, including turbidity, seven microorganisms (two of which are indictors), four radionuclides, 16 inorganic contaminants, and 57 organic contaminants.
Stage 1 Disinfectants and Disinfection Byproducts Rule	1/1/01 – monitoring 1/1/02 – MCL compliance	Reduced total trihalomethanes (TTHM) limit from 0.1 to 0.080 milligrams per liter (mg/L); reduced haloacetic acids (HAA5) limit from 0.08 to 0.060 mg/L. Established an MCL for bromate of 0.010 mg/L; Established an MCL for chlorite of 1.0 mg/L Compliance for TTHMs & HAA5 based on a running annual average
Stage 2 Disinfectants and Disinfection Byproducts Rule	10/1/06 – first provision 1/1/13 – all provisions	Perform Initial Distribution System Evaluation to identify new DBP compliance locations. Change compliance calculations from RAA to Locational Running Annual Averages.
Radionuclides Rule	12/31/07	Updated standards: Combined radium 226/228: 5 pCi/L. Total beta particles and photon emitters: 4 mrem/yr. Gross alpha particles (excluding U and Rn): 15 pCi/L. Uranium MCL: 30 µg/L.
Arsenic Rule	1/23/06	Arsenic MCL: 0.010 mg/L.
Secondary Drinking Water Regulations	Ongoing	Non-enforceable standards for aesthetic parameters.
Partnership for Safe Water	Ongoing	Voluntary standards and practices to minimize risk of microbial contamination of treated water.
Inorganic Chemicals	Various	Existing National Primary Drinking Water Regulations (NPDWRs) set standards for a number of different metals and other inorganic chemicals, including aluminum and nitrate.
Synthetic and volatile organic chemicals	Various	Existing NPDWRs for a number of different herbicides, pesticides, solvents, and other organic chemicals. Monitoring and reporting requirements.

Table 1-5
Overview of Relevant Drinking Water Regulations
Public Works Integrated Master Plan
City of Oxnard

Regulation	Compliance Date	Requirements and Maximum Contaminant Level (MCL)
Lead and Copper Rule and 2007 Revisions	1993 - 4/10/2008	Requires water suppliers to optimize their treatment system to control corrosion in a customer's plumbing. If lead action levels are exceeded, the suppliers are required to educate their customers about lead and suggest actions to reduce their exposure through public notices and public education programs.
Revisions Cr(VI)	CA MCL - 4/2014	DDW established MCL of 10 µ g/L.
New "lead free" standard under the SDWA	1/4/14	Amends SDWA Section 1417 – Prohibition on Use and Introduction into Commerce of Lead Pipes, Solder, and Flux: Changes the definition of "lead-free" by reducing lead content from 8 percent to a weighted average of no more than 0.25 percent in the wetted surface material. This change primarily affects brass/bronze.
Combined Volatile Organic Compounds	Projected 10/14 proposal, 6/15 final	Efforts to define a VOC Rule are ongoing. The novel "group risk" approach focuses on total public health as opposed to each chemical. This may be combined using a common analytical method, treatment, or MCLG.
Revised trichloroethylene and tetrachloroethylene MALss	Unknown	These may be regulated separately from other VOCs.
Revised Lead and Copper Rule	Projected 2017	The EPA is evaluating all aspects of the current rule
Nitrosamines	April 2016	The EPA is collecting data for possible future group MCL for nitrosamines (byproduct of chloramines). California Notification Level of 0.01 µg/L for NDMA.
Revised Total Coliform Rule	April 2016	Requires that MCL for Total Coliforms (including fecal coliform and E. coli) are no more than 5 percent of samples total coliform-positive.

In addition to regulations related to groundwater quality, the quantity of groundwater use is managed by the Fox Canyon Groundwater Management Agency (FCGMA), an organization created by the California Legislature in 1982 to oversee Ventura County's vital groundwater resources. As an independent, special district separate from the County of Ventura or any city government, the FCGMA manages and protects both confined and unconfined aquifers within several groundwater basins beneath the southern portion of Ventura County. The FCGMA is preparing Groundwater Sustainability Plans (GSPs) for the Las Posas Valley Basin, Oxnard Subbasin, and Pleasant Valley Basin. The FCGMA establishes a set of ordinances directed at groundwater extraction. The most recent ordinance, Emergency Ordinance E, limits extractions from groundwater extraction facilities, including the City, due to the drought's impacts on underlying aquifers. For further discussion, please refer to Chapter 3.9 Hydrology, Water Quality, and Water Utilities.

- **Future (Potential Regulations).** Future regulations that could potentially affect the City's water Supply system are also summarized in Table 1-5.

Wastewater – Quality. Detailed below are the current and projected future wastewater quality requirements.

- **Current.** Wastewater discharges are governed by both federal and state requirements. The primary laws regulating water quality are the Clean Water Act (CWA) and the California Water Code. Under the CWA, the EPA or a delegated State agency regulates discharging pollutants into waterways through the issuance of National Pollutant Discharge Elimination Systems (NPDES) permits. NPDES permits set limits on the amount of pollutants that can be discharged into the waters of the United States. Since the Oxnard Wastewater treatment Plant (OWTP) is located in the Los Angeles Region, the Los Angeles Regional Water Quality Control Board (LARWQCB) has authority to issue permits for wastewater discharge and waste discharge requirements for recycled water use.

  Currently, the OWTP discharges to the Pacific Ocean under existing NPDES permit

(CA0054097), which was adopted by the LARWQCB on July 26, 2013. This permit establishes discharge limits for conventional constituents, nutrients, metals, and organics.

The aim of these limits is to protect aquatic life and other beneficial uses of the receiving water. Table 1-6 lists conventional constituents and metals with their permit limits.

Table 1-6
OWTP NPDES Permit Limits
Public Works Integrated Master Plan
City of Oxnard

		Effluent Limitations(1)				
Constituent	**Units**	**Average Monthly**	**Average Weekly**	**Maximum Daily**	**Instantaneous Minimum**	**Instantaneous Maximum**
Biochemical Oxygen Demand (BOD_5)	mg/L	30	45	--	--	--
	lbs/day	7,960	11,900	--	--	--
Total Suspended Solids (TSS)	mg/L	30	45	--	--	--
	lbs/day	7,960	11,900	--	--	--
pH	standard units	--	--	--	6.0	9.0
Oil and Grease	mg/L	25	40	--	--	75
	lbs/day	6,630	10,600	--	--	19,900
Settleable Solids	ml/L	1.0	1.5	--	--	3.0
Turbidity	NTU	75	100	--	--	225
Chronic Toxicity	TUc	--	--	99	--	--
Gross alpha	PCi/L	--	--	15	--	--
Gross beta	PCi/L	--	--	50	--	--
Combined Radium-226 & Radium-228	PCi/L	--	--	5.0	--	--
Tritium	PCi/L	--	--	20,000	--	--
Strontium-90	PCi/L	--	--	8.0	--	--
Uranium	PCi/L	--	--	20	--	--
Benzidine(2)	ug/L	0.0068	--	--	--	--
	lbs/day	0.0018	--	--	--	--
Heptachlor epoxide(2)	ug/L	0.002	--	--	--	--
	lbs/day	0.00053	--	--	--	--
Polychlorinated biphenyls (PCBs)(2)	ug/L	0.0019	--	--	--	--
	lbs/day	0.0005	--	--	--	--
Tetrachlorodibenzo-p-dioxin (TCDD) Equivalents(2)	ug/L	0.00000039	--	--	--	--
	lbs/day	0.0000001	--	--	--	--

Notes:
(1) From the 2013 NPDES Permit No. CA0054097.
(2) The reasonable potential analysis' result is inconclusive. Therefore, limitations are carried over from Order No. R4-2007-0029, as amended by Order No. R4-2010-0048, to avoid backsliding.

- **Future (Potential).** As analytical techniques for detecting toxic compounds improve and detection limits drop, additional parameters might exceed California ocean plan objectives. As such, effluent limits might be added to the OWTP NPDES permit.

Air Quality. The current and future potenetial air quality reguloations are discussed below.

- **Current.** At a local level, the Ventura County Air Pollution Control District (APCD) is primarily responsible for controlling air pollution from the OWTP. Beyond the local level, air quality permits are required by State and Federal laws as part of doing business in Ventura County. The OWTP currently holds permits from the District for the following sources:
    - Two effluent pump natural gas engines.

- Three electrical generator waste gas engines.
- Two waste gas burners.
- One odor reduction tower.
- One odor control system (headworks).
- One odor reduction station (solids processing building).
- Six standby diesel engines for electricity generators.
- One emergency standby diesel engine for air compressor.

The APCD also regulates the emission of certain odorous substances, such as sulfur dioxide and hydrogen sulfide. Improvements and changes to the wastewater process and discharge location are likely to require revised air quality permits. Table 1-7 summarizes these concentration levels.

Table 1-7
Hydrogen Sulfide and Sulfur Dioxide Ground Level Concentrations - Emission Limits
Public Works Integrated Master Plan
City of Oxnard

Substance	Limit Ground Level Concentration (ppm)	Duration
Hydrogen Sulfide(1)	0.06 or 0.03	Averaged over 3 consecutive minutes Averaged over 60 consecutive minutes
Sulfur Dioxide(1)	0.25 or 0.04	Averaged over 60 consecutive minutes Averaged over 24 hour period

Notes:
(1) Source: Ventura County Air Pollution Control District Regulation 4, Rule 54, (July 1994).
(2) http://www.vcapcd.org/Rulebook/Reg4/RULE%2054.pdf .

- **Future (Potential).** A recent amendment to the APCD's air quality regulations may affect the OWTP in the near future. This amendment, called Rule 54, was amended in January 2014 to limit sulfur dioxide emissions to 75 parts per billion (ppb) at or beyond the property line. Although existing sources do not need to demonstrate compliance, all sources must meet the combustion emission limit on a dry basis using a revised calculation to account for percent oxygen content.

  In addition to this amendment, a draft amendment to Rule 74.15.1 regarding boilers, steam generators, and process heaters might also affect regulations. This rule would limit nitrogen oxide emissions for new or replacement units rated greater than 2 million BTU/hr and less than 5 million BTU/hr. These new limits would be based on similar standards adopted by the San Joaquin Valley in Rule 4307.

Biosolids. Currently, the OWTP disposes of its screenings, grit, and dewatered anaerobically digested solids (biosolids) by hauling it to a nearby landfill. To best use the energy and nutrient content, alternatives to landfilling biosolids were considered in the PWIMP. The following current and future potential regulations are as follows.

- **Current.** The EPA's 40 CFR 503 regulations are the main federal regulations of biosolids. The 40 CFR 503 regulations establish metal concentration limitations, pathogen density reduction requirements, vector attraction reduction requirements, and site management practices for the land application of biosolids. The 40 CFR 503 regulations also establish requirements for the surface disposal and incineration of biosolids.

  In California, State regulations of biosolids land application are more stringent than federal regulations. The State Water Resources Control Board (SWRCB) has adopted General Waste

Discharge Requirements for the Discharge of Biosolids to land for use as a Soil Amendment in Agricultural, Silvicultural, Horticultural, and Land Reclamation Activities (Biosolids General Order).

The Biosolids General Order goes beyond the requirements of 40 CFR 503 by requiring additional biosolids testing, soil testing, groundwater sampling, and wind and dryness limitations. Regulations for biosolids reuse and disposal in landfills in California are also more stringent and fall under the jurisdiction of the California Department of Resources Recycling and Recovery (CalRecycle). In addition to regulating the co-disposal of biosolids in landfills and the use of biosolids for alternative daily cover, CalRecycle also regulates facilities that compost biosolids.

- **Future (Potential).** Using or disposing of biosolids is becoming increasingly difficult in California. Many California utilities are restricting the land application of biosolids, and fewer landfills are accepting them. Furthermore, the State of California has passed several bills that directly affect the ability to send biosolids to landfills in the future.

  Two bills in particular affect the land application of biosolids: Assembly Bill 341 and Assembly Bill 1594. In 2013, California passed Assembly Bill 341, which requires a 75 percent reduction of solid waste sent to landfills by 2020. (It is expected that by 2025, a 90 percent reduction of solid waste sent to landfills will be required.) In September 2014, Assembly Bill 1594 was passed, requiring that green waste no longer qualifies for diversion credit when used as alternative daily cover at a landfill. When this bill is fully implemented January 1, 2020, the diversion credits that utilities currently receive will be eliminated.

  Approximately 30 percent of the solid waste stream sent to landfills is organic, which CalRecycle is working to eliminate from landfills in support of the Air Resources Board Assembly Bill 32 Scoping Plan's target to reduce greenhouse gas emissions to 1990 levels by 2020. Although the Assembly Bill 32 Scoping Plan does not explicitly state that organic waste streams are or will be prohibited from use as alternative daily cover, it does state that opportunities for phasing out landfilling organic material are being pursued.

Recycled Water. The current and future projected regulations are discussed below.

- **Current.** The City has served urban irrigation uses since 2015 and agricultural uses as early as 2016. The City plans to use recycled water as agricultural irrigation by early 2016 and aquifer storage and recovery (ASR) and groundwater recharge for indirect potable recharge/direct potable recharge (IPR/DPR). However, since DPR is currently not regulated, the permitting process is still somewhat uncertain and occurs on a case-by-case basis. Based on the uses of recycled water being considered by the City, the following regulations and policies apply:
  - Urban/Agricultural Reuse – California Code of Regulations (CCR), Title 22, Division 4, Chapter 3, Section 60301 et seq. (Title 22) & the Recycled Water Policy (SWRCB Res No. 2009-0011, recycled water (RW) Policy).
  - IPR/Groundwater Recharge – DDW's Groundwater Recharge Regulations and SWCRB's Recycled Water Policy and Anti-Degradation Policy.

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

covers non-potable reuse within the GREAT program.

- **Non-Potable.** The DDW is now California's primary agency responsible for protecting public health, regulating drinking water, and developing uniform water recycling criteria appropriate for particular water uses. The DDW published the Title 22 recycled water regulations (CDPH, 2014a). Based on the level of treatment the AWPF will provide, per Title 22, non-potable uses of the City's recycled water include surface irrigation of food crops, parks, playgrounds, school yards, residential and freeway landscaping, unrestricted access golf courses, and some construction uses. Recycled water can also be used in industrial or commercial cooling or boiler operations as well as recreational impoundments.
- **Indirect/Direct Potable Reuse.** The primary State agencies responsible for regulating an IPR project include DDW, Los Angeles Region Water Quality Control Board (LARWQCB), and the SWRCB. Because the purpose of IPR is to discharge to the existing Oxnard Plain Groundwater Basin and withdraw for potable reuse, several regulations apply. All of the applicable regulations that pertain to the installation and operation of IPR are summarized in Table 1-8.

Table 1-8
Summary of All Applicable Regulatory Requirements for Recycled Water Systems
Public Works Integrated Master Plan
City of Oxnard

Governing Agency	Applicable Regulation/Policy	Regulatory Concept/Objective
DDW	Title 22, Division 4, Chapter 3 of the California Code of Regulations	Stipulates criteria for both non-potable uses of recycled water and groundwater recharge for subsequent potable use, with the most recent version updated as of June 2014 (CDPH, 2014).
	60320.208	Requires that specific pathogen reduction targets must be met through multiple treatment processes. The log reduction requirements for viruses, *Giardia,* and *Cryptosporidium* are 12, 10, and 10, respectively.
	60320.210	Requires that a total nitrogen standard of ≤10 mg/L must be met at all times.
	60320.218	Requires a minimum TOC value of ≤0.5 mg/L is required.
	60320.226	Requires that, before operation, monitoring wells are placed in appropriate locations to monitor the movement and water quality of the injected water.
LARWQCB	Update WDRs Permit	Requires an amendment to the existing permit or a reissuance of a WDRs/WRR will be necessary prior to discharge.
SWRCB	Recycled Water Policy	Include Salt Nutrient Management Plans (SNMPs), Recycled Water Groundwater Recharge Projects (GRPs), anti-degradation, and monitoring constituents of emerging concern (CECs).
	SNMPs	Manages salts and nutrients from all sources "… on a basin-wide or watershed-wide basis in a manner that ensures attainment of water quality objectives and protection of beneficial uses."
	GRPs	Requires compliance with regulations adopted by CDPH (now DDW) for groundwater recharge projects (CDPH, 2014).
	Anti-Degradation Policy (Resolution 68-16)	"… [Ensures that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."
	CEC Monitoring	Requires implementation of a monitoring program for CECs and priority pollutants, consistent with recommendations from DDW.

- **Future (Potential).** For recycled water, endocrine-disrupting chemicals and other compounds of emerging concern (CECs) are most likely to be regulated in the future. The recycled water p olicy highlights CECs as a potential issue for recycled water. While there are no current regulations for these constituents in recycled water, in accordance with the Recycled Water Policy, the State Water Board convened a science advisory panel (Panel) to guide the future monitoring of CECs in recycled water. The Panel developed a report that recommended ways to monitor for specific CECs in recycled water used for groundwater recharge reuse.

Stormwater. Summarized below are the current and future projected regulations for stormwater quality and quantity.

- **Current.** In cooperation with the federal EPA, the SWRCB has issued stormwater permits under the NPDES program. The City is a co-permittee, along with nine other cities and the Ventura County Watershed Protection District (VCWPD), for the MS4 NPDES permit issued by the California Regional Water Quality Control Board (RWQCB). The current MS4 permit was issued on July 8, 2010 (Permit CAS004002, Order No. R4-2010-0108). Pursuant to the permit, VCWPD has developed a countywide Stormwater Quality Management Plan that includes management measures/best management practices (BMPs).

  Ventura County, through the use of a stormwater ordinance, also regulates stormwater quality in the County. The Ventura County Stormwater Ordinance (Ordinance No. 4142) prohibits non-stormwater discharges into County stormwater facilities and seeks to reduce pollutants in stormwater to the maximum extent practicable. Each co-permittee is responsible for adopting and enforcing stormwater pollution prevention ordinances, implementing self-monitoring programs and BMPs and conducting applicable inspections.

  Within Ventura County are a number of water bodies with TMDLs. The City of Oxnard is a participating party in the Santa Clara River Bacteria TMDL and implements the Harbor Beaches TMDL on its own. Santa Clara River Bacteria TMDL went into effect in March 2012. The TMDL Implementation Plan is currently being developed through an agreement among the County of Ventura and the cities of Fillmore, Oxnard, Santa Paula, and Ventura and is known as the Ventura County Watershed Protection District (VCWPD). In addition, the same parties have developed the receiving water monitoring plan.

  The Harbor Beaches TMDL went into effect in December 2008, and dry and wet weather implementation plans were submitted in 2009 and 2010. The City has implemented, and continues to implement, BMPs aimed at reducing sources and transporting bacteria into the receiving waters at Kiddie and Hobie Beaches.

  The Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program. To ensure compliance with the National Flood Insurance Program, communities must adopt a floodplain management ordinance addressing construction and habitation in flood zones. Ventura County adopted their Flood Plain Management Ordinance (Ordinance 3741) in 1985. Since then, several revisions have been made, with the latest ordinance adopted in 1990 (Ordinance 3954). The ordinance addresses the risks of development within the floodplain and includes a list of prohibited discharges, exemption procedures, and requirements for construction and permitting.

- **Future (Potential).** In January 2015, the VCWPD submitted their report of waste discharge (ROWD), which applies the renewal of waste discharge requirements set forth in the current

order (Order No. R4-2010-0108). While the provisions of the next permit are unknown, the VCWPD is anticipating that it will be based on the MS4 Permit for Los Angeles County. The VCWPD ROWD includes proposed recommendations for changing or modifying specific provisions of the Los Angeles County Permit (VCWPD, 2015), and the justification for these recommendations for the purpose of the VCWPD permit renewal process.

At the statewide level, California Stormwater Quality Association (CASQA) (2015) outlined their strategic visions and goals for stormwater management to achieve the goals of the Clean Water Act. For future regulations, CASQA identified the need for stormwater to be considered a non-point source rather than a point source and for regulations related to stormwater capture and use as a resource.

1.6 Purpose and Scope of this EIR

The California Environmental Quality Act (CEQA) requires every proposed project in the state of California to be examined for potential effects on the environment. The PWIMP proposes construction and operation activities within the City of Oxnard and unincorporated areas of Ventura County. Project elements include the expansion and upgrade of existing facilities and the construction of several new facilities within the Oxnard Plain in two phases. As the Lead Agency, the City has determined that the proposed project has the potential to have a significant effect on the environment. Section 15165 of the CEQA Guidelines requires that, "where individual projects are, or a phased project is, to be undertaken and where the total undertaking comprises a project with significant environmental effect, the Lead Agency shall prepare a single program EIR for the ultimate project as described in section 15168." Because this is a phased project, this Program Environmental Impact Report (PEIR) has been prepared to provide a comprehensive environmental analysis of construction and operation activities associated with elements of the PWIMP as a whole. However, many specifics of the individual projects within the overall PWIMP are not known at this time. Therefore, this PEIR provides a very general analysis instead of a project specific level of effort. As such, additional individual environmental documentation (i.e. Addendums, Categorical Exemptions, Initial Study/Mitigated Negative Declaration or Project Specific EIRs) will likely be required as projects are implemented.

Environmental Review Process. This PEIR has been prepared in accordance with CEQA. Guidance for preparation of this document was obtained from the CEQA Guidelines (State of California, 2002), City of Oxnard *2030 General Plan* (2011), City of Oxnard *Threshold Guidelines* (2017), *Ventura County General Plan Goals, Policies, and Programs* (2014), *Ventura County Initial Study Assessment Guidelines* (2014), and, as necessary, criteria of specific resource agencies and federal state regulations. This PEIR will be used by various local and state agencies in their consideration of actions required to: (1) approve, (2) approve with conditions or modifications or (3) deny the proposed project. The PEIR is intended to provide the public, agencies, and decision makers with a comprehensive analysis of:

- Components of the Proposed Project
- Potential environmental impacts of the Proposed Project
- Mitigation measures to avoid or reduce potential impacts
- Feasible alternatives to avoid or reduce identified significant impacts

CEQA encourages incorporation of information by reference as a means of shortening EIRs. This PEIR, therefore, incorporates reference information from relevant studies, as appropriate. The level of technical

detail, evaluation, and analysis herein is consistent with CEQA and is sufficient to provide an understanding of potential impacts. The PEIR is the first phase of the process for issuance of various permits or approvals for the Proposed Project. The second phase, portions of which may occur concurrently with the PEIR, involves preparation of appropriate applications for permits and approvals for Phase 1. Requirements that are anticipated for these permits are considered in this PEIR. The third and final phase is public and agency review of permit applications, development of specific permit conditions, and issuance of permits by regulatory agencies. This phase may result in minor modifications of the Proposed Project to meet various agency requirements or permit conditions.

For this analysis, we have reviewed prior and relevant existing technical and environmental documentation to assess the potential impacts of implementing the Proposed Project on endangered/threatened species, public health or safety, natural resources, regulated waters, and cultural resources, among others, to include and address specific issues associated with CEQA. This document focuses on the potential physical environmental issues associated with implementing the Proposed Project as it is currently defined and as presented in Section 2 – Project Description of this CEQA EIR document. For any potentially significant impact(s) identified, we have identified proposed mitigation measures and strategies to attempt to avoid and/or reduce those impacts to less-than-significant levels. The information in this CEQA EIR document is presented to assist the City and other decision makers of this concept to understand what the major potential physical environmental impacts are of constructing and operating the Proposed Project. Summarized below is an overview of the CEQA Process.

Notice of Preparation. In accordance with CEQA Guidelines, the City prepared a Notice of Preparation (NOP) of an EIR and published it on July 27, 2016 (SCH #: 2016071078). The NOP was circulated to the public, local, state and federal agencies, and other interested parties to solicit comments on the Proposed Project during the 30-day comment period.

During the scoping period, the City held a series of two (2) scoping meetings in the City of Oxnard to discuss the proposed project and to solicit public input as to the scope and content of this EIR. Scoping meetings were held on August 24, 2016. The NOP, the NOP Presentation, and all of the comments received are available for review in Appendix B.

Draft PEIR. This document constitutes a CEQA Program-level EIR, including site-specific impacts and mitigation analysis for the Proposed Project as it applies to implement the PWIMP. In addition, this Draft PEIR contains a description of the regulatory context, the environmental setting, identification of project impacts, mitigation measures for impacts found to be significant, and an analysis of project alternatives.

Public Review. This Draft PEIR document is being circulated to local, state, and federal agencies as well as to interested organizations and individuals who may wish to review and comment on the report and Proposed Project. The Public Draft PEIR is being circulated for a 45-day public review period, starting on July 15, 2019 and ending on August 30, 2019. The City will hold a public hearing on the Draft PEIR during the 45-day public review period.

Date:	August 15, 2019
Time:	7:00 pm
Location:	City of Oxnard City Council Chambers 305 West Third Street Oxnard, CA 93030

During this review period, **written comments will be received from July 15, 2019 through, but no later than 5p.m. on August 30, 2019,** by the City at the following address:

Kathleen Mallory, Planning & Sustainability Manager
City of Oxnard
214 "C" Street
Oxnard, CA 93030
kathleen.mallory@oxnard.org

Final PEIR and PEIR Certification. Written and oral comments received on the Draft PEIR will be addressed in a Response to Comments document. The Draft PEIR and changes and corrections to the Draft PEIR will result in a Final PEIR. After review of the Proposed Project and the Final PEIR, the City, at a public hearing, will decide whether to certify the Final PEIR and whether to approve or deny the Proposed Project or any identified and evaluated alternative contained within this PEIR.

The City may still approve the Proposed Project (or Alternative) even though significant impacts identified in the EIR cannot be mitigated to less-than significant levels. However, the City must state in writing the reasons for its actions/decision in a *Statement of Overriding Considerations* that also must be included in the record of the Project approval and mentioned in the Notice of Determination (NOD) (CEQA Guidelines Section 15093[c]).

Mitigation Monitoring and Reporting Program. CEQA Section 21081.6(a) requires lead agencies to "adopt a reporting and mitigation monitoring program for the changes to the project which it has adopted or made a condition of project approval in order to mitigate or avoid significant effects on the environment". The specific "reporting or monitoring" program required by CEQA is not required to be included in the PEIR. Throughout the PEIR, however, mitigation measures must be clearly identified and presented in language that will facilitate establishment of a monitoring and reporting program.

Chapter 2 Project Description

This chapter provides a detailed description of the Proposed Project. The PWIMP provides a phased program for constructing improvements to the City's infrastructure facilities that will accommodate planned growth while maintaining treatment reliability, meeting future regulatory requirements, and optimizing costs through the planning horizon (2030). Specifically, the PWIMP addresses future planning needs including infrastructure additions and upgrades for the City's water, recycled water, wastewater, and stormwater utilities. The PWIMP builds upon previous planning efforts using a coordinated methodology, which will allow the City to take full advantage of potential linkages and synergies between the four water utility systems. In addition, the PWIMP is also coordinated with a streets plan in an attempt to allow timing of future streets upgrades to be tied together with infrastructure upgrades. Detailed below is a discussion of each utility Master Plan element (i.e. water, recycled water, wastewater, and stormwater utilities) including a brief overview of the existing system and the proposed improvements.

2.1 Water System Master Plan

The City provides a blend of surface and groundwater through its water distribution system, which consists of six blending stations (BS) that take water from each of the City's water sources and combine it before distributing it throughout the City.

In addition to the overall PWIMP goals established in Chapter 1, planning efforts identified specific goals for the water supply. These goals are as follows:

- Goal 1: Provide reliable/resilient supply to meet future conditions (i.e., changes to demand, regulations, and water quality).
- Goal 2: Meet the City's water quality objectives.
- Goal 3: Protect existing water rights by maximizing use of groundwater allocation.
- Goal 4: Minimize future reliance on imports by maximizing use of AWPF-produced water.
- Goal 5: Attract industry and jobs.
- Goal 6: Keep rates affordable.

This section will provide an overview of the existing water system and its strengths and vulnerabilities, as well as the regulatory requirements and climate change issues the system will face. This chapter also makes recommendations for meeting the defined goals.

2.1.1 DESCRIPTION OF EXISTING FACILITIES

2.1.1.1 Source of Supply

To serve its constituents, the City of Oxnard gets water from the following sources:

- *Groundwater* from local wells that draw from the Oxnard Plain Groundwater Basin (some of which are treated through reverse osmosis).
- *Groundwater* from the United Water Conservation District (UWCD), which draws from the

Oxnard Plain Forebay.

- *Surface Water* imported from the State Water Project via the Calleguas Municipal Water District (CMWD).
- *Recycled Water* from the Advanced Water Purification Facility (AWPF).

2.1.1.2 Treatment/Blending

Although the exact ratio of the blend at the City's blending stations varies, the City stated that future blending will be in a 1:1 (surface water to groundwater) ratio. This ratio produces water with a total dissolved solids (TDS) level between 600 and 700 mg/L, which meets the upper limit of the secondary drinking water standards (1,000 mg/L) at a fairly cost-effective unit rate.

Figure 2-1 is a schematic of the City's water system, showing how the six blending stations are linked together. Figure 2-2 is a map of the City's water system facilities, including the locations of the blending stations. Table 2-1 summarizes the major characteristics of each blending station. The City's individual facilities are all described in the following sections.

2.1.1.3 Distribution System

To reflect the system's ongoing growth, the City's transmission and distribution system consists of a variety of pipe types and sizes. To manage these pipes, the City has implemented an infrastructure management system (GIS database) that it continually populates with pipe attributes (diameter, material, year installed, etc.).

Based on the 2013 March GIS database, the distribution system includes nearly 613 miles, or 3.25 million linear feet, of pipe, the majority of which is between 6- to 12-inches in diameter. Figure 2-3 illustrates the City's existing water distribution system.

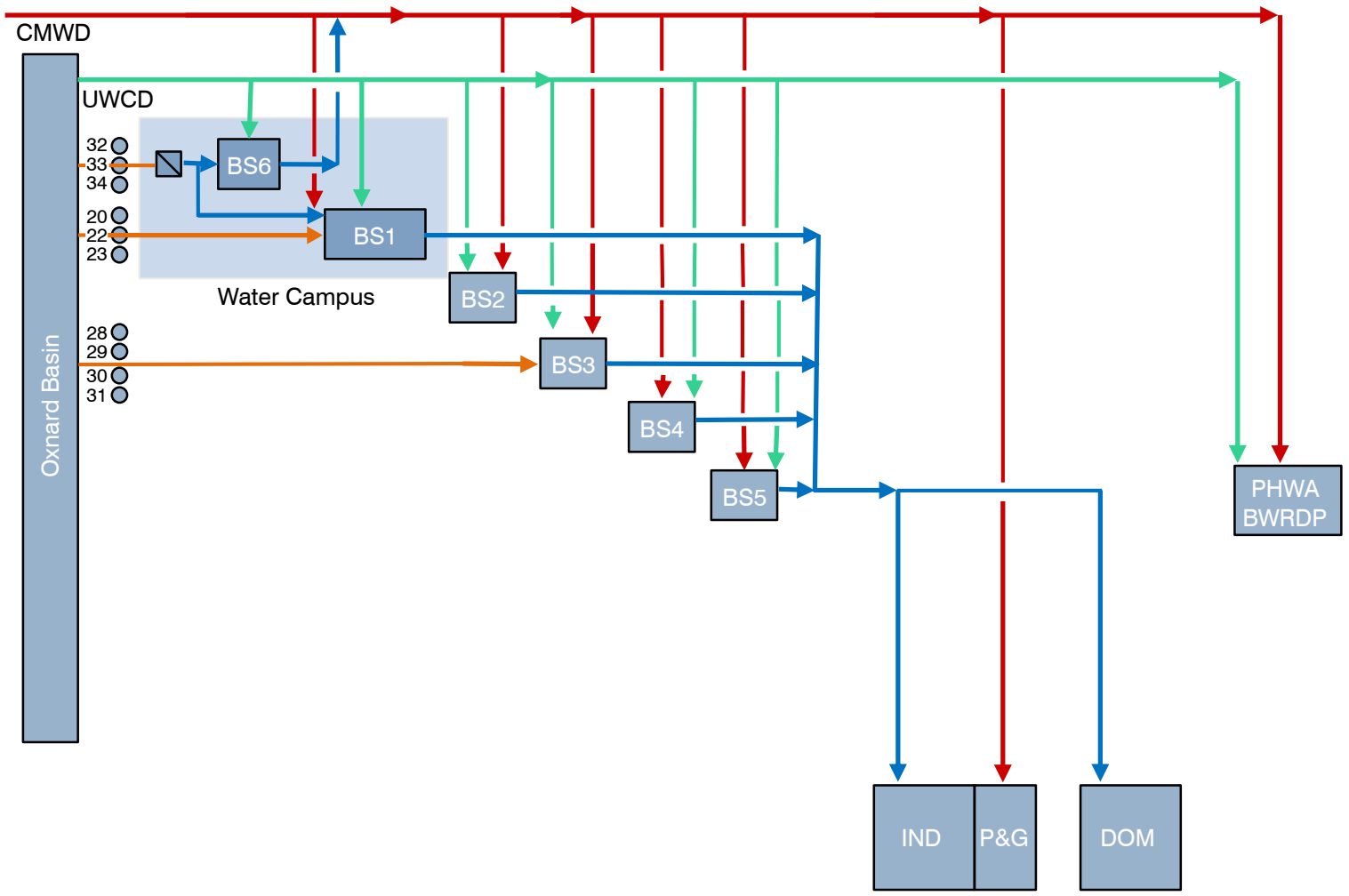
The City's water system currently operates in one pressure zone. However, some areas of the City have difficulties with pressures higher than the 80 pounds per square inch (psi) maximum pressure desired for the system while other areas need to be augmented to meet the minimum pressure targets.

The only above-ground engineered storage facilities within the system are the 600,000 gallons of permeate storage at Blending Stations (BS) No. 1 and No. 6, which are located adjacent to each other and referred to collectively as BS Nos. 1/6. The City also uses 70 percent of the 18.0 million-gallon (MG) Springville Reservoir owned by CMWD. In total, the City has 12.5 MG of above-ground storage.

2.1.1.4 Condition Assessment

A condition assessment was conducted to identify rehabilitation and replacement (R&R, or renewal) needs for the City's water system. For this effort, asset management methodology was used to identify existing water assets and to conduct a visual condition assessment of above-ground assets. The effort also included an evaluation of structures, a desktop evaluation of below-ground assets, and a cathodic protection system evaluation.

To prioritize the R&R needs, a risk assessment was also conducted that examined the vulnerability (likelihood of failure) and criticality (consequence of failure) for each asset. Consistent risk scoring methodology was applied to both above- and below-ground assets to prioritize each asset type.



OVERALL WATER SYSTEM SCHEMATIC

FIGURE 2-1

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

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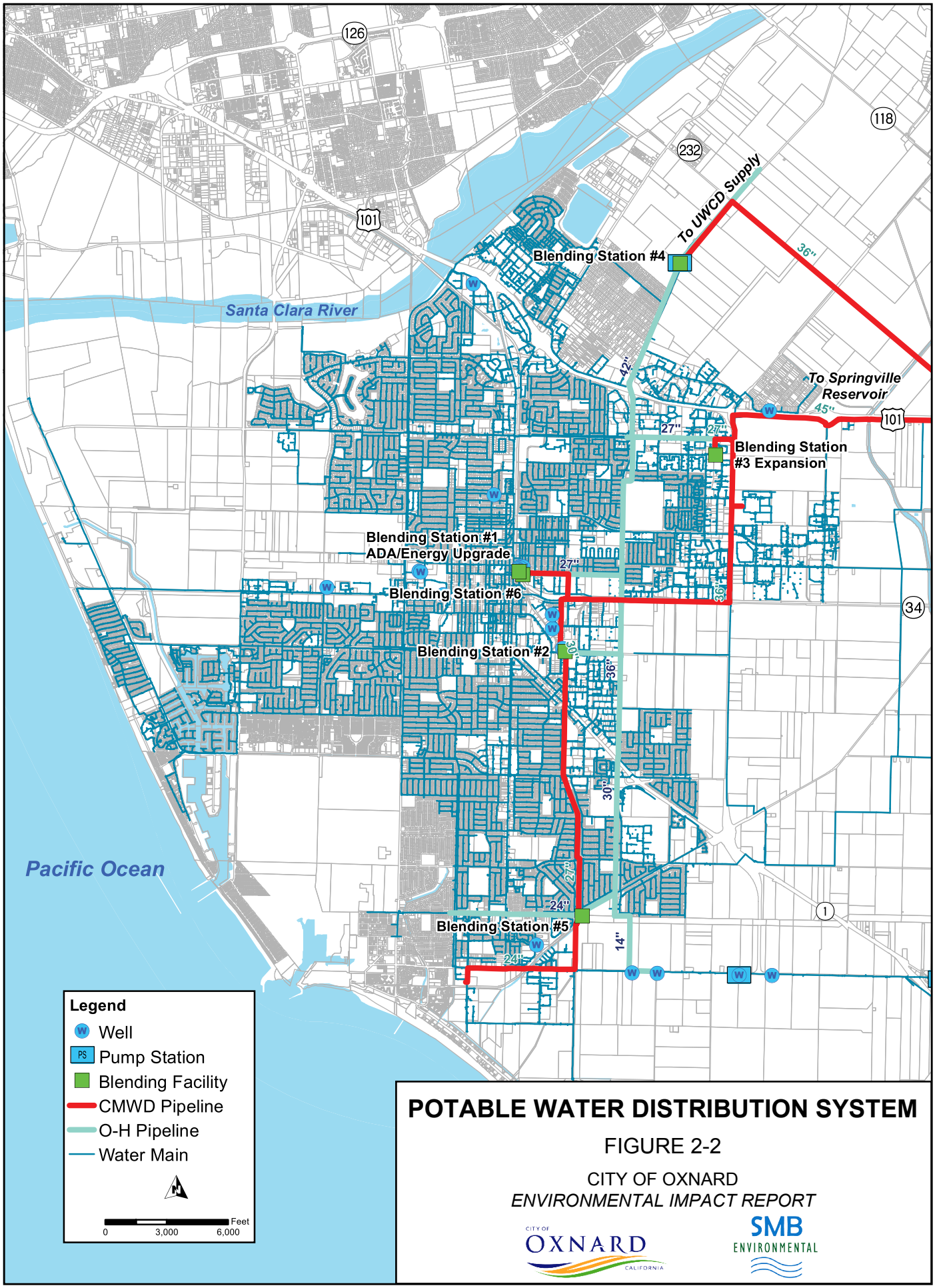

POTABLE WATER DISTRIBUTION SYSTEM

FIGURE 2-2

CITY OF OXNARD

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CITY OF OXNARD CALIFORNIA

SMB ENVIRONMENTAL

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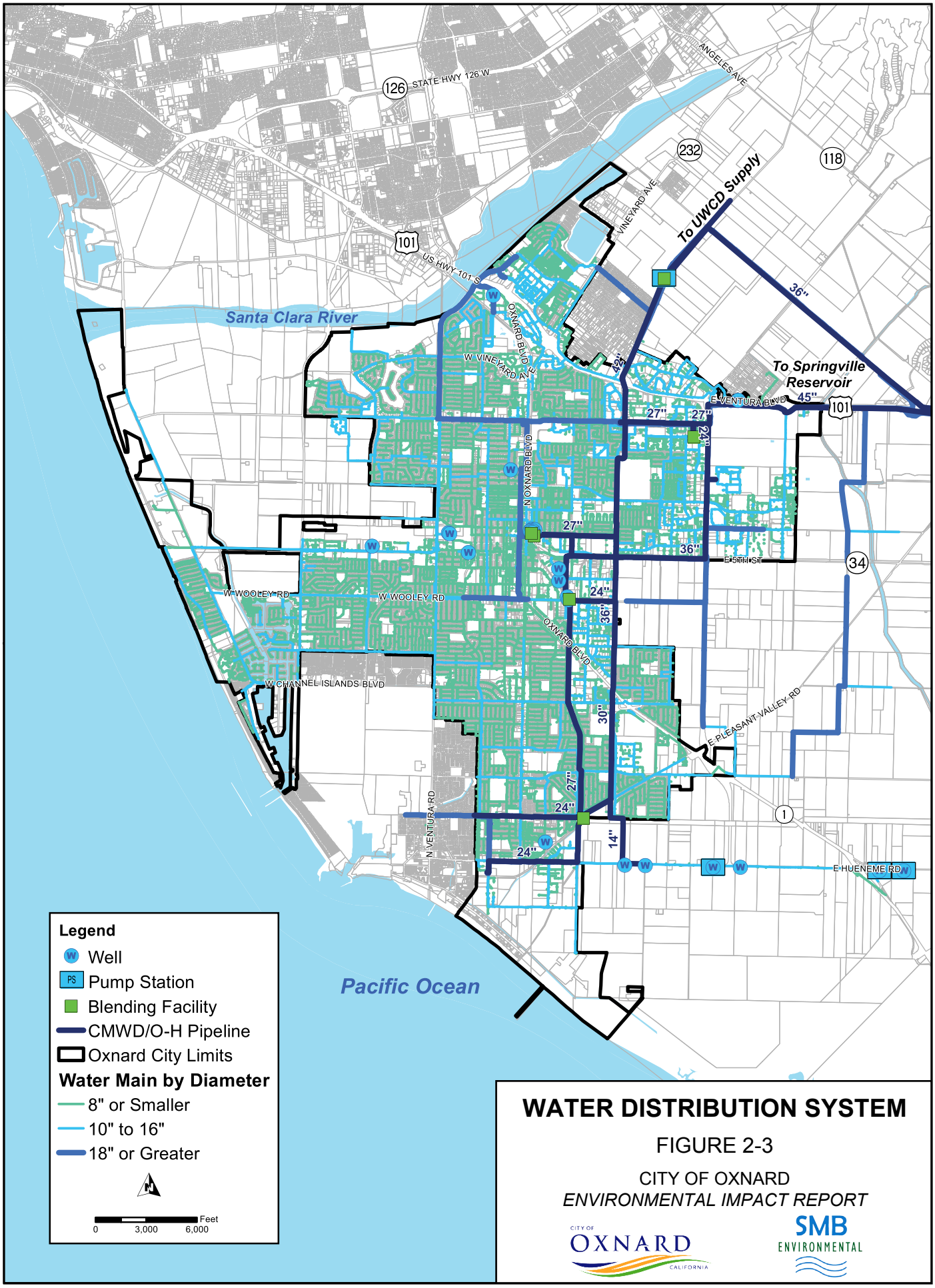


WATER DISTRIBUTION SYSTEM

FIGURE 2-3

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

CITY OF OXNARD CALIFORNIA

SMB ENVIRONMENTAL

ox0917rf4-9587-CEQA(EIR-Fig2-3).ai

Table 2-1
Blending Station Facility Summary
Public Works Integrated Master Plan
City of Oxnard

	BS No. 1	BS No. 2	BS No. 3	BS No. 4	BS No. 5	BS No. 6
Location	Third Ave. & Hayes	E Wooley & Richmond Rd	Southwest of Gonzales Rd and Rice Ave.	N Rose Ave South of Central Ave.	Pleasant Valley Rd East of Saviers Rd.	Co-Located with BS No. 1
Status	Operational	Stand-By	Operational	Operational	Operational	Operational
Construction Date	1900 Updates in 1965, 1986, 2008	1971	1975 Update in 2006	1994	2007	2010
Local Wells Available	**Yes**	**No**	**Yes**	**No**	**No**	**Yes**
Well No. - Capacity gallons per minute (gpm)	20 – 2,900 22 – 3,000 23 – 2,800	--	28 – 2,000 29 – 3,000 30 – 2,000 31 – 2,000	--	--	32 – 2,000(1) 33 – 3,000(1) 34 – 2,500(1)
Total Well Capacity, mgd	12.5	--	13	--	--	10.8
Imported Water Available						
CMWD Capacity, mgd	29.5	18.7	42	27.8	8	--
UWCD Capacity, mgd	29.5	27.8	29.5	30.2	8	--
Treatment	**Yes**	**No**	**Yes**	**No**	**No**	**Yes**
Type	Desalting [reverse osmosis (RO)] & Chloriniation	--	Chlorination	--	--	Desalting [reverse osmosis (RO)] & Chlorination
Capacity, mgd	--	--	--	--	--	7.5 (permeate)
Permeate Storage, gallons	--	--	--	--	--	600,000
Backup Generator	Yes 3 @ 750 kW	No --	Yes 1 @ 1,000 kW	Yes 1 @ 500 kW	No --	No --

Notes:
(1) These wells are fed directly to the desalter at BS No. 6. Due to water quality, the wells are not able to blend directly into the City's distribution system.

Above Ground Facilities

In total, 165 above-ground assets were assessed, including structures and equipment owned and operated by the City. Approximately 11 building structures, 41 pumps, 16 wells, and a variety of other assets, with the recorded age of each asset varying from 1965 to the present were assessed. Each asset was placed into an inventory and categorized according to its asset type and discipline.

Table 2-2 lists the assets with the highest above-ground risk, which was determined from the assessment. The results of the condition assessment analysis are as follows:

- Water Campus BS No. 1/6 – fair to good condition with a few exceptions noted in Table 2-2.
- BS No. 2 – fair to poor condition.
- BS No. 3 – fair to very good condition, with two wells (Well Nos. 30 and 31) in need of minor rehabilitation.
- BS No. 4 – fair to poor condition, with three Variable Frequency Drives (VFDs), two pumps, electrical equipment, and a central valve train in disrepair.
- BS No. 5 – fair to good condition.
- Wells – fair to good condition, except as noted in Table 2-2.

Table 2-2
Highest Above-Ground Risk Asset
Public Works Integrated Master Plan City of Oxnard

Site/Asset	Risk(1)
Blend Station 2	
Supervisory Control and Data Acquisition (SCADA) System	2.01
Water Campus (BS1 and BS6)	
RO Building RO Filter (#1-3)	0.48
RO Building Cartridge Filter (#1-4)	0.48
Chemical Building Lab PLC	0.33
Well 18	
Motor Control Center (MCC) Single Box	0.40
Pump	0.36
Well 27	
MCC Cabinet	0.40
Pump	0.36
Blend Station 4	
Standby Generator	0.30
MCC	0.30
Switchboard	0.30

Note:
(1) Risk = Criticality x Vulnerability; Criticality = consequence of failure; Vulnerability = likelihood of asset failure.

Below Ground Assets

Using GIS data of the Oxnard distribution system, a desktop evaluation was conducted on the City's below-ground water system assets. The dataset included information on the diameters and materials used for 30,632 of the 39,341 segments. The year of installation for each asset was available for 38,065 of the 39,341 segments.

A pipe's useful life will vary based on several factors, with pipe age and material the easiest to quantify. The majority (72 percent) of the City's distribution piping is of two types: asbestos cement pipe and polyvinyl chloride, which have relatively long useful lives of 65 and 85 years, respectively. However, approximately 87 percent of the asbestos cement pipe installed in the City is more than 30 years old. The polyvinyl chloride piping is relatively newer, with the majority installed within the last 20 years.

2.1.1.5 Cathodic Protection

A survey was conducted on the City's water infrastructure to assess the existing level of cathodic protection. From this assessment, the following improvements were identified:

- Several Key Pipelines: Install new test stations and replace rectifiers and anode-ground beds (Del Norte Pipeline, Oxnard Conduit, Wooley Road/United, 3rd Street Lateral, Industrial Lateral).
- Water Treatment Facility at BS No. 1/6: Investigate requirements of electrical isolation and cathodic protection (CP) of buried piping; design and install as needed.
- 600,000 Gallon Steel Water Tank at the Water Treatment Facility: Install internal CP system.

In addition to these projects, conducting an annual cathodic protection survey, providing a report for all City facilities, and bi-monthly rectifier monitoring is also recommended in the PWIMP.

2.1.1.6 Electrical Systems Protection

A study of the electrical systems for the existing six blending stations was performed. The study included a short circuit study, a protective device coordination evaluation, and an arc flash evaluation.

These evaluations were performed for distinct reasons. The short circuit study determined the short circuit current available at each piece of electrical equipment and identified underrated equipment. The protective device coordination evaluation identified protective devices (circuit breakers, fuses, etc.) that were not coordinated in the electrical system and might not minimize disruption of electrical power during a short circuit. The arc flash evaluation determined the maximum arc flash incident energy at each piece of electrical equipment and identified appropriate personnel protective equipment to be worn if work is performed on the equipment while it is being energized.

The results of the electrical systems investigation were then used to develop the electrical system study for each site. Study results identified pieces of existing electrical distribution equipment not sufficiently rated for the worst-case short circuit current and showed the arc flash incident energy at each piece of electrical equipment based on the existing protective device settings.

Concerns and code violations in the existing electrical equipment installations were observed and documented. Obsolete equipment and equipment nearing the end of its useful life were identified, as were

equipment in need of repair and possible changes in the existing installation from code violations, such as equipment needing painting or relocation or incorrectly labeled equipment.

2.1.1.7 Operational Approach and Strategy of Existing System

Generally, the blending stations are operated to provide a target blended water quality and to meet system pressure. Table 2-3 shows the overall production breakdown by blending station as well as the approximate blend of the three major sources at each blending station.

Table 2-3
Operational Approach to Blend Station Source Breakdown[1]
Public Works Integrated Master Plan
City of Oxnard

	BS No. 1	BS No. 2	BS No. 3	BS No. 4	BS No. 5	Desalter Permeate Flow[2]
Overall Annual Production[3]	23%	0.1%	30%	13%	3%	13%
Production by Source						
CMWD	22%	39%	47%	53%	46%	0%
UWCD	60%	61%	26%	47%	54%	0.5%
Local Wells	18%		27%			99.5%

Notes:
(1) Based on annual average production data provided by the City from 2009-2012.
(2) Based on permeate from the BS No. 6 desalter.
(3) For these to add up to 100 percent, contributions to industrial from UWCD (4 percent) and CMWD (13 percent) need to be added.

2.1.2 FUTURE WATER SUPPLY FACILITY NEEDS

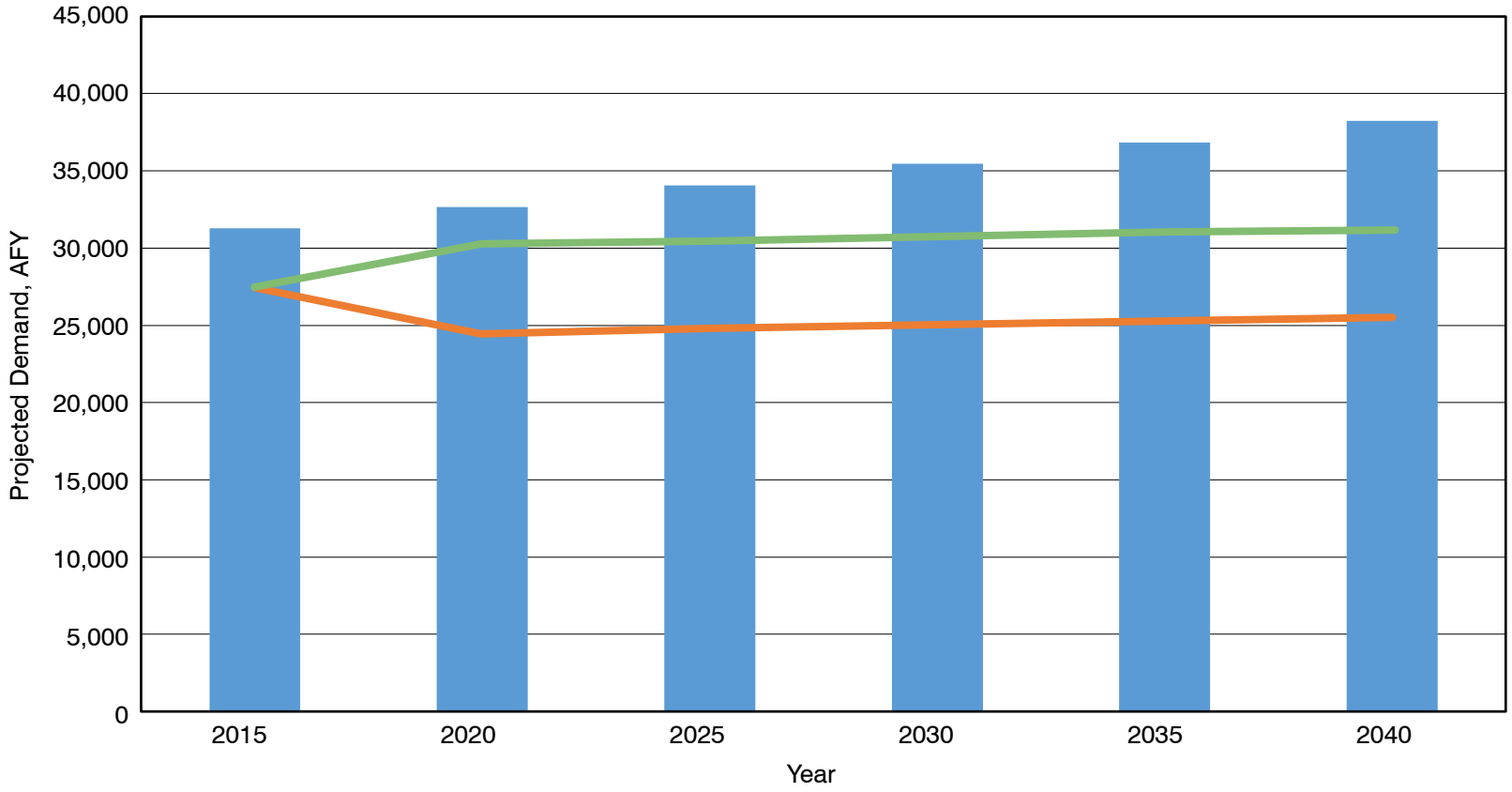
The existing water system's capacity and performance were compared with appropriate criteria to identify existing shortfalls in the system. Although the system generally has adequate capacity to meet current demand conditions, it does so with little reliability. Thus, if key components, such as pumps, wells, and/or treatment processes, are in disrepair, meeting demand requirements would be a challenge.

2.1.2.1 Water Supply

Volume of Supply – Though the City currently meets water demand requirements, projections for the PWIMP show a potential supply gap of between 3,800 and 10,700 AFY. This gap is based on available water quantity and groundwater pumping restrictions, which are expected to be between 50 and 75 percent of historical in the long-term. Figure 2-4 graphically compares the projected available supply with demand over the planning horizon.

Quality of Supply – From a water quality and regulatory standpoint, the system meets current regulations for drinking water quality. However, the City wishes to improve its taste and odor parameters.

Due to hardness in the water, many of the City's customers use point-of-use softeners that return salt to the wastewater system. As a result, the City aims for a more acceptable hardness level in the blended drinking water that would reduce or eliminate the need for point-of-use softeners.



LEGEND
Projected Total Potable Demand
Projected Supply (GMA 75%)
Projected Supply (GMA 50%)

PROJECTED AVAILABLE WATER SUPPLY VERSUS PROJECTED POTABLE WATER DEMAND OVER THE PLANNING HORIZON (2015 - 2040)

FIGURE 2-4

CITY OF OXNARD
ENVIRONMENTAL IMPACT REPORT

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Because the groundwater (both local and UWCD) sources have relatively high hardness levels, the City's desire for a more acceptable hardness level directly affects the water supply analysis. However, the City can use low hardness water from the AWPF through indirect potable reuse (IPR) / direct potable reuse (DPR), which has a hardness of approximately 10 mg/L.

2.1.2.2 Water Distribution

The conveyance (distribution) system was also evaluated for its ability to meet future water demands, and assessed for its capacity and performance. As with any water distribution system, conducting regular routine maintenance is imperative for maintaining a reliable system for the long term. Routine maintenance includes flushing the water lines, exercising the valves, and also conducting an active leak detection program. These actions along with other required maintenance help to routinely rehabilitate the pipelines thereby extending the useful life of the system. For this evaluation, four major areas were assessed in addition to the R&R needs identified. These areas are as follows:

Capacity Improvements – Pipeline capacity improvements are needed to meet level of service criteria (LOS) and to accommodate growth that requires additional demands to serve new customers. To estimate growth projections, the hydraulic model was run for existing conditions and the years 2020, 2030, and 2040. Pressure and velocity results were also investigated, and when either pressure or velocity exceeded LOS criteria (see Table 4.11), improvements were included to accommodate the demands.

Pressure Zone Separation – Meeting system pressure targets with a single pressure zone is a challenge and is expected to worsen with increased demands. As a result, a pressure zone analysis was conducted using the updated and calibrated system hydraulic model to assess whether the City would benefit from being split into two or three pressure zones.

Hydraulic modeling was conducted under two conditions: PHD conditions to identify minimum system pressures and minimum hour demand (MinHD) conditions to identify maximum system pressures. During PHD conditions, the modeling found pressures under 40 psi in the City's northeastern portion. However, during MinHD conditions, pressures in excess of 80 psi were seen in the City's southern portion. Thus, when considering the City's target minimum and maximum pressures, pressure zone separation seems warranted.

Fire Flow Requirements – The fire flow analysis tool was used in the system hydraulic model to calculate the available pressure and flow at each fire flow node on a case-by-case basis. Based on this analysis, when each respective fire flow demand was applied, 100 of the 980 fire flow nodes resulted in residual pressures of less than 20 psi. To correct the fire flow conditions for these 100 nodes, 39 projects were identified.

Storage Needs – The City currently has only 600,000 gallons of above-ground engineered storage reservoirs and in addition, relies on the Springville Reservoir (owned by CMWD) for its distribution system storage, with rights to 12.5 MG of the 18 MG reservoir's capacity. As such, an analysis was conducted to determine whether the existing storage is sufficient for operational, fire, and emergency needs. Although the storage requirements used for the analysis were based on MDD, they do vary based on the type of storage considered.

Based on the analysis, by 2040, an additional 1.5 MG of above-ground storage is recommended to meet fire and operational needs. It is assumed that groundwater pumping can provide water under emergency

conditions as long as the appropriate redundancy for backup power and sufficient well capacity are provided.

2.1.2.3 Summary of Water Supply Needs

Given the water system capacity and performance summary, future facility needs fell within four major categories:

- **Water Supply/Quality** – Includes system improvements needed to help the City maintain a sustainable water supply, meet projected demands, and sustain acceptable water quality through the planning period.
- **R&R** – Includes R&R of both the above- and below-ground assets deemed critical for reliable operation. Additional redundancy and reliability are also needed to provide a sustainable supply.
- **Operations Optimization** – Includes optimization projects that the City and AECOM identified for the City's water system operation.
- **Pressure Zone Separation** – Includes system improvements needed to separate the existing system into four distinct pressure zones.

2.1.3 PROPOSED WATER SUPPLY PROJECTS

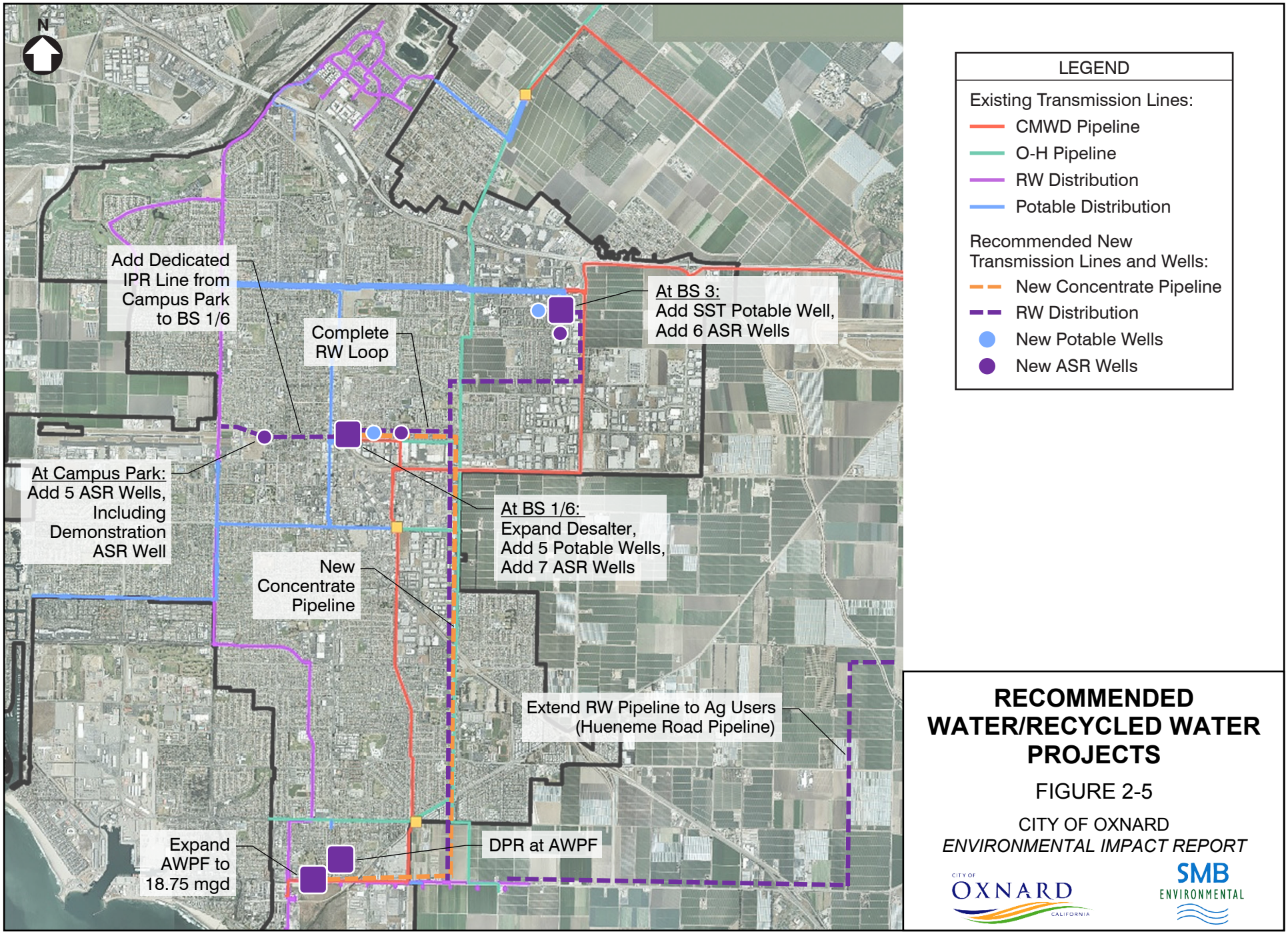
A combination of Groundwater and ASR/IPR was chosen as the recommended project for the water system plan. Given the unknown future of groundwater pumping within the Oxnard Basin, a groundwater pumping allocation of 50 percent of historical was assumed over the long-term. This means that approximately 12,000 AFY of additional supply is needed to cover the supply gap projected by 2040. Furthermore, it was assumed that a cap of 5,200 AFY could be presented to farmers with the hope of receiving pump-back groundwater credit. This means that more ASR wells will be needed to take full advantage of the AWPF effluent for IPR use.

Summarized in the following sections are the recommended projects for the water system's Capital Improvement Plan (CIP), which are based on the existing system condition assessment and capacity as well as the performance needs for meeting projected future demands and water quality objectives. These projects cover the needs through the planning period (2015-2040) and are summarized in Table 2-4 according to the project type or driver. Figure 2-5 illustrates the locations of the recommended water supply projects.

The projects were split into phases that loosely follow the project timing: 1) Phase 1 – Immediate Needs (First 2 years); 2) Phase 2 – Near-Term Needs (Years 2 to 10); and 3) Phase 3 – Long-Term Needs (Beyond 10 years).

The phases presented here are what are recommended based upon the technical needs identified within this assessment. However, the actual timing of implementation may defer when compared and balanced against the financial considerations of total implementation of the PWIMP.

Recycled water projects related to meeting water supply needs (e.g., AWPF expansion, ASR wells, etc.) are summarized in Section 2.2 below.



RECOMMENDED WATER/RECYCLED WATER PROJECTS

FIGURE 2-5

CITY OF OXNARD

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CITY OF OXNARD CALIFORNIA

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ox0917rf6-9587(EIR-Fig2-5).ai

2.1.3.1 Water Supply/Quality

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 BS No. 1/6 and BS No. 3 are the most favorable locations for potable groundwater pumping and have significant infrastructure in place, these were the two sites identified to build new additional potable wells.

In general, most of the City's distribution system can handle current and future demand flows, with the exception of some pipes in the immediate vicinity of the blending stations where velocities exceeded LOS criteria. The list of recommended projects involves replacing these pipes; however, the exact year for replacement still needs to be determined after detailed year-by-year coordination with the other master plans included in the PWIMP.

Additional desalting of the groundwater will be needed in the future to meet the hardness objective of 100 mg/L. The existing 7.5 mgd desalter located at BS No. 1/6 is built to be expanded to a total permeate capacity of 15 mgd; therefore, expanding the desalter is more cost effective than building desalting capacity at another location.

To avoid taking brine from the desalter back to the OWTP, which would then affect the AWPF effluent and cost of operation, a dedicated concentrate line is recommended. This concentrate line could be routed from the Water Campus (BS No. 1/6) to the City's ocean outfall from the OWTP. However, the use of the City's outfall is predicated on the RWQCB's permit of policy. A possible option to the dedicated concentrate line is a connection to the Salinity Management Pipeline (SMP) and agreement with CMWD.

Figure 2-6 illustrates the locations of the water system improvements recommended for securing the City's water supply. These are also shown in conjunction with the recycled water improvements, since they work in concert with one another.

2.1.3.2 R&R

A number of R&R related projects were identified through the efforts of this Plan and City staff. These improvements are broken into the two broad categories: above-ground assets (blending station/treatment) and below-ground assets (distribution system piping).

Table 2-4
Recommended Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
Water Supply/Quality - Treatment					
BS No. 1/6	Add potable water wells	2	5	wells	2,000 gpm (ea.)
BS No. 3	Add potable water well (stainless steel)	2	1	wells	2,000 gpm
BS No. 1/6	Expand existing desalter by 7.5 mgd (split into 2 phases at 3.75 mgd each)	2/3	1	--	Total: 15 mgd
BS No. 1/6	Construct a new permeate storage tank for operational storage	2	1	tank	2.0 MG
BS No. 1/6	Expand existing disinfection	2	1	--	--
BS No. 1/6	New connection to Oxnard-Hueneme (O-H)/UWCD Pipeline	2	--	--	--
Concentrate Conveyance	Construct brine line from OWTP to BS No. 1/6 (14 and 24 inch)	2	32,100	lf	--
Water Supply – Distribution System (Capacity Improvements)					

Table 2-4
Recommended Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
(Location Varies)	Replace 8" Pipeline	1	322	lf	--
	Replace 12" Pipeline	1	238	lf	--
	Replace 14" Pipeline	1	164	lf	--
	Replace 30" Pipeline	1	3,804	lf	--
	Replace 6" Pipeline	2	69	lf	--
	Replace 8" Pipeline	2	391	lf	--
	Replace 10" Pipeline	2	1,101	lf	--
	Replace 12" Pipeline	2	2,447	lf	--
	Replace 6" Pipeline	3	32	lf	--
	Replace 8" Pipeline	3	233	lf	--
	Replace 10" Pipeline	3	1,243	lf	--
	Replace 12" Pipeline	3	997	lf	--
	Replace 14" Pipeline	3	2,453	lf	--
	Replace 24" Pipeline	3	937	lf	--
R&R – Blending Stations/Treatment					
BS No. 1/6	Replace Mechanical, Electrical, and AUX Equipment(1)	1	--	--	--
BS No. 2	Replace Mechanical, Electrical, and AUX Equipment(1)	1	--	--	--
Varies	Make Water SCADA System Improvements	1	--	--	--
BS No. 3	Replace Mechanical, Electrical, and AUX Equipment(1)	2	--	--	--
BS No. 4	Replace Mechanical, Electrical, and AUX Equipment(1)	2	--	--	--
BS No. 5	Replace Mechanical, Electrical, and AUX Equipment(1)	2	--	--	--
BS No. 1/6	Install electrical isolation at all steel and cast iron water risers(2)	2	--	--	--
BS No. 1/6	Add Cathodic Protection System for Steel Storage Tank(2)	2	--	--	--
R&R – Distribution System					
Varies	Replace Automatic Meter Reader (AMR) Devices	1	--	--	--
Del Norte Forced Main	Cathodic Protection - Install 20 missing test stations Replace rectifiers and anodes; resurvey(2)	1	--	--	--
Oxnard Conduit	Cathodic Protection - Replace deep anode beds and rectifiers #1, #2, and #3 (2)	1	--	--	--
Wooley Road/United	Cathodic Protection - Replace 5 test stations Replace rectifier and anode; resurvey(2)	1	--	--	--
3rd Street Oxnard Extension	Cathodic Protection - Replace deep anode bed and rectifier; bond UWCD pipeline to Oxnard extension at rectifier (2)	1	--	--	--
Freemont North Neighborhood	GREAT Program Pipeline Replacements(3)	1	--	--	--
Bryce Canyon South Neighborhood	GREAT Program Pipeline Replacements(3)	1	--	--	--
Redwood Neighborhood	GREAT Program Pipeline Replacements(3)	1	--	--	--
La Colonia Neighborhood	GREAT Program Pipeline Replacements(3)	1	--	--	--
Well 23 & 31 Rehab	Rehabilitate Wells(4)	1	--	--	--
Varies	Electrical and VFD Replacement(4)	1	--	--	--
(Location varies)	Fire Flow Improvements	1			
	Add 8 inch-diameter pipeline		18,500	feet	--
	Add 12 inch-diameter pipeline		13,500	feet	--

Table 2-4
Recommended Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
	Add 14 inch-diameter pipeline		250	feet	--
Industrial Lateral	Cathodic Protection - Replace all test stations; resurvey(2)	2	--	--	--
Del Norte Force Main	Cathodic Protection - 48" & 36" CMCL PL - Locate and repair discontinuity near the ease end of Del Norte Pl(2)	2	--	--	--
3rd Street Oxnard Extension	Cathodic Protection - Locate and repair discontinuity near Chemical Building at BS No. 1/6(2)	2	--	--	--
Gonzales 36" Pipeline	Replace test station lids and test cathodic protection(2)	2	--	--	--
Oxnard Conduit	Install new test stations, conduct CIS, and locate/excavate/bond across approx. Add 3 points of electrical isolation.(2)	2	--	--	--
Del Norte Force Main	Cathodic Protection - Replace rectifiers and anodes; resurvey(2)	3	--	--	--
Del Norte Force Main	Cathodic Protection - Install new test stations and leads(2)	3	--	--	--
Wooley Road/United	Cathodic Protection - Replace test stations and install 2 additional stations(2)	3	--	--	--
Wooley Road/United	Cathodic Protection - Replace rectifier and anode; resurvey(2)	3	--	--	--
(Location Varies)	Age-Based Pipeline Replacements Replace 6" Pipeline	3	109,100	lf	--
	Replace 8" Pipeline		47,000	lf	--
	Replace 10" Pipeline		55,000	lf	--
	Replace 12" Pipeline		24,000	lf	--
	Replace 14" Pipeline		2,300	lf	--
	Replace 16" Pipeline		4,000	lf	--
	Replace 24" Pipeline		3,700	lf	--
	Replace 36" Pipeline		5,000	lf	--
	Replace 42" Pipeline		5,300	lf	--
	Replace 48" Pipeline		3,800	lf	--
Varies	Replace AMR Devices	1	--	--	--
Operations Optimization					
Well Nos. 30, 32, 33 & 34	Electrical Rehabilitation(4)	1	--	--	--
BS No. 1/6	Sodium Hypochlorite Piping Replacement(4)	1	--	--	--
BS No. 1/6	Emergency Turnouts Service(4)	1	--	--	--
BS No. 1/6	Generator and ATS Service(4)	1	--	--	--
Pressure Zone Separation					
North Zone Modification					
Three (3) locations on Gonzalez Road	Rehab 3 Pressure Reducing Station (PRS)	1	3	Valve	--
From BS#3 up Solar Road to Gonzalez Road	BS#3 Reconfigure 24" Pipeline to feed North Zone	1	--	--	--
Along Gonzalez Road	Make Minor Piping Modification	1	--	--	--
Coastal Zone Modification					
Three (3) locations on S. Victoria Avenue	Add 3 new PRS	1	3	Valve	--
S. Victoria Avenue	Add New 8" Parallel Pipeline	1	3,000	lf	--
Along S. Victoria Avenue	Make Minor Piping Modifications	1	--	--	--
South Zone Modifications					
Three (3) locations on	Add 3 new PRS	1	3	Valve	--

Table 2-4
Recommended Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
E. Pleasant Valley Road					
E. Pleasant Valley Road	Add New 8" Parallel Pipeline	1	6,000	lf	--
Along E. Pleasant Valley Road	Make Minor Piping Modification	1	--	--	--

Notes:

* General Note: For the pipeline replacement projects, see the hydraulic models developed as part of the PWIMP to identify the exact pipeline locations.

(1) Projects based on R&R recommendations done through the Condition Assessment.
(2) Projects developed from the Cathodic Protection Assessments.
(3) As documented in the City's GREAT program CIP, February 18, 2015.
(4) Projects provided by AECOM

The blending station/treatment R&R includes routine repair and replacement of elements identified through the condition assessment effort and staff input. Replacing the cathodic protection systems is needed for the desalter and steel permeate storage tank, and the water Supervisory Control and Data Acquisition (SCADA) system is slated for complete replacement and upgrade.

In addition, distribution system piping improvements are needed to meet reliability and redundancy and to protect public health. For these improvements, methodically replacing pipes by size and age is proposed. New piping is also recommended to provide adequate fire flow water, and cathodic protection was identified for several key water mains throughout the City. Also, conducting required routine maintenance such as flushing water lines, exercising valves, and leak detection is imperative to continually help to rehabilitate the system and extend its useful life.

2.1.3.3 Operations Optimization

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

2.1.3.4 Pressure Zone Separation

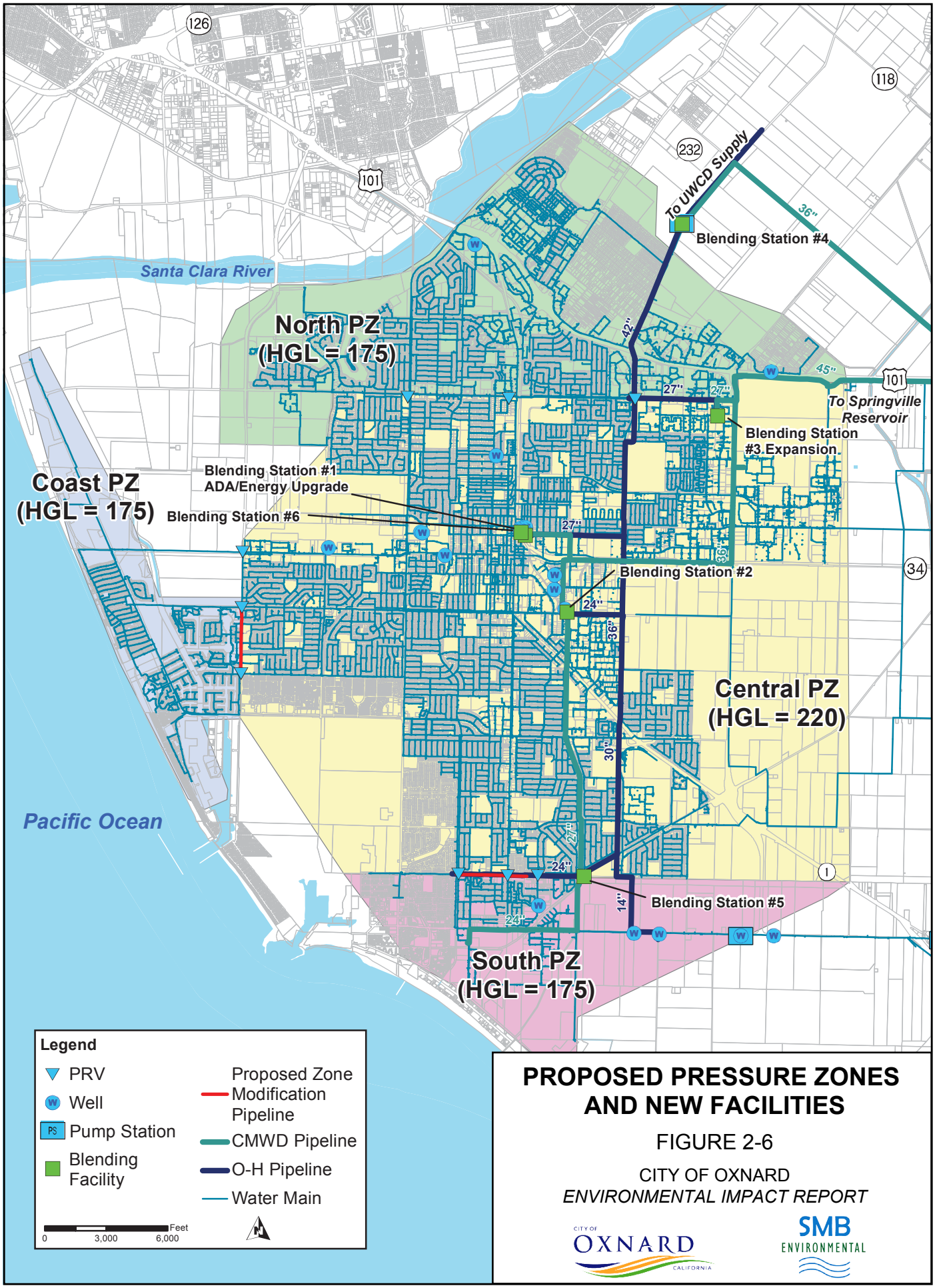
Based on the pressure zone analysis, it is recommended that the City reduce service pressures that exist outside of its established delivery pressure criteria by breaking the single pressure zone distribution system into four zones: the North, Coast, Central, and South. Figure 2-6 shows these pressure zone areas. The recommended improvements necessary for this conversion are summarized in Table 2-5.

2.1.3.5 Implementation Schedule

Figure 2-7 shows the implementation schedule for these water projects in the three phases previously described.

2.2 Recycled Water Master Plan

The City is committed to providing recycled water with its Groundwater Recovery Enhancement and Treatment (GREAT) Program, which gives the City access to a reliable and sustainable supply of high



PROPOSED PRESSURE ZONES AND NEW FACILITIES

FIGURE 2-6

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Potable Water CIP Projects Schedule

Design | Bid/Award Contract | Construction

Project [1]	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2
Production																								
Existing desalter upgrades																								
Desalter, piping and permeate tank cathodic protection																								
Expand water treatment facility and storage (incl. booster pump station)																								
Blending Station #2 upgrade																								
Blending Stations #1 and #6 upgrade																								
Water System CMMS																								
Water System SCADA Improvements																								
Security Improvements at Water Yard and Blending stations																								
Chemical Tank Replacements																								
Blending Station #3 Rehabilitation																								
Blending Station #4 Rehabilitation																								
Blending Station #5 Rehabilitation																								
Construct 3 new potable wells at BS 1/6																								
Construct 2 new potable wells (BS 1/6) and 1 new stainless steel well at BS 3																								
Transmission																								
Del Norte Transmission Main Cathodic Protection (CP)																								
Gonzalez 36-inch Pipeline CP																								
Oxnard Conduit CP																								
Wooley Road / United CP																								
3rd Street Lateral CP																								
Industrial Lateral CP																								
3rd St 27" UWCD CP																								
Condition assessment program																								
Distribution																								
Replacement of AMR Devices																								
Pipe Capacity Improvements																								
Neighborhood CIP Pipe Replacement [2]																								
La Colonia Neighborhood																								
Redwood Neighbohood																								
Freemond North Neighborhood																								
Bryce Canyon South Neighborhood																								
Large Valve Replacement Program																								
Small Valve Replacement Program																								
Air / Vac Valve Replacement Program																								
Hydrant Replacement Program																								
North Zone Modifications																								
Coast Zone Modifications																								
South Zone Modifications																								
Additional 2015 Projects																								
Electrical Rehabilitation - Well Nos. 30, 32, 33 & 34																								
Sodium Hypochlorite Piping Replacement																								
Generator and ATS Service																								
Fire Flow Improvements - Install/Replace 18,500 feet of 8" pipe																								
Fire Flow Improvements - Install/Replace 13,500 feet of 12" pipe																								
Fire Flow Improvements - Install 250 feet of 14" pipe																								
Blend Station Tie-In (@ Blending Station 1/6)																								
Construct new concentrate line from Oxnard Wastewater Treatment Plant (OWTP) to Blending Station 1/6																								
Blending Station 1/6 - Install electrical isolation at all steel and cast iron water risers																								
Well 23 & 31 Rehabilitation																								
Wells Electrical & Variable Frequency Drive (VFD) Replacement																								
Age Replacement - 109,100 feet of 6" pipe																								
Age Replacement - 47,000 feet of 8" pipe																								
Age Replacement - 55,000 feet of 10" pipe																								
Age Replacement - 24,000 feet of 12" pipe																								
Age Replacement - 2,300 feet of 14" pipe																								
Age Replacement - 4,000 feet of 16" pipe																								
Age Replacement - 3,700 feet of 24" pipe																								
Age Replacement - 5,000 feet of 36" pipe																								
Age Replacement - 5,300 feet of 42" pipe																								
Age Replacement - 3,800 feet of 48" pipe																								
Connection to OH / United pipeline																								
Expand desalter at Blending Station 1/6 to 15 mgd (3.75 mgd expansion)																								

Notes:

(1) Project start years correspond to refinements and updates provided by CIty after Dec. 2015 publication date.

(2) Neighborhood CIP Replaement projects (La Colonia, Redwood, Freemont North, and Bryce Canyon South neighborhoods) combined into single project.

RECOMMENDED WATER PROJECTS SCHEDULE

FIGURE 2-7

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quality water, thus decreasing the City's reliance on imported water. Key components of the GREAT program include the following:

- Recycled Water System - Treating and distributing wastewater to the most stringent levels [via the Advanced Water Purification Facility (AWPF)].
- Water Supply - Treating groundwater for total dissolved solids (TDS) and nitrate reduction through a desalter.
- Indirect Potable Reuse (IPR) / Direct Potable Reuse (DPR) Through Groundwater Injection - Adding wells that allow recycled water to be injected into and extracted from the local groundwater aquifer.
- Elements Related to the AWPF and Desalter - Collecting and treating concentrate (brine) from both AWPF and desalters.

A major part of the GREAT program is the use of recycled water, which the City has studied and made plans for over many years. When the GREAT program was formally established in 2002, its objectives were to:

- Increase the reliability of the water supply during drought.
- Reduce water supply costs.
- Secure the water supply's ability to meet a growing water demand.
- Enhance stewardship of the local water supply through recycling and reusing a substantial portion of the region's wastewater.
- Increase environmental benefits associated with developing and rehabilitating local saltwater wetlands.

Although the program has evolved over the years, it has generally maintained its support of water recycling and reuse, groundwater injection, storage and recovery, and groundwater desalination. Thus, the goal of the PWIMP is to build on the foundation already in place.

To build on this foundation, it's helpful to analyze past reports to understand the program's evolution. Two reports are of particular importance: *The 2002 Advanced Planning Study* and *The 2012 GREAT Program Update*. These reports are summarized below.

- 2002 – Advanced Planning Study (K/J, 2002) – This study recommended a series of projects aimed at providing a sustainable water supply for the City, including construction of tertiary and advanced recycled water treatment facilities, aquifer storage and recovery (both for IPR/DPR and seawater intrusion barrier), regional and local desalting to treat additional groundwater, and concentrate collection.
- 2012 – GREAT Program Update (City, 2012) – This report provided additional details for many of the projects established in 2002, updated the progress to date, and estimated costs for the program elements.

Over the years, utilities have shifted from using groundwater recharge for seawater intrusion barriers to using it for ASR. This is largely due to the high cost of the wells. In addition, because of recent pumping

cutbacks from the Fox Canyon Groundwater Management Agency (FCGMA), access to more local groundwater through pump-back credits is not guaranteed and is therefore of little direct benefit to the City.

At the same time, the City began to look at IPR/DPR with renewed interest because of its benefit to the City and the impending regulatory acceptance for it. As a result, the PWIMP focuses on recycled water for irrigation use as well as for IPR/DPR.

2.2.1 DESCRIPTION OF EXISTING RECYCLED WATER FACILITIES

Wastewater from the Oxnard Wastewater Treatment Plant (OWTP) provides secondary treated wastewater to the AWPF for recycled water treatment. In general, the collected flow is residential. About 75 percent of all wastewater is domestic, with the remaining 25 percent from industrial users. Average secondary effluent flows (2009- 2013) from the wastewater facility are 20.5 mgd at average dry weather flow (ADWF) conditions and 22.9 mgd for an average day maximum month day flow (ADMMF). The OWTP is permitted at a capacity of 31.7 mgd ADWF.

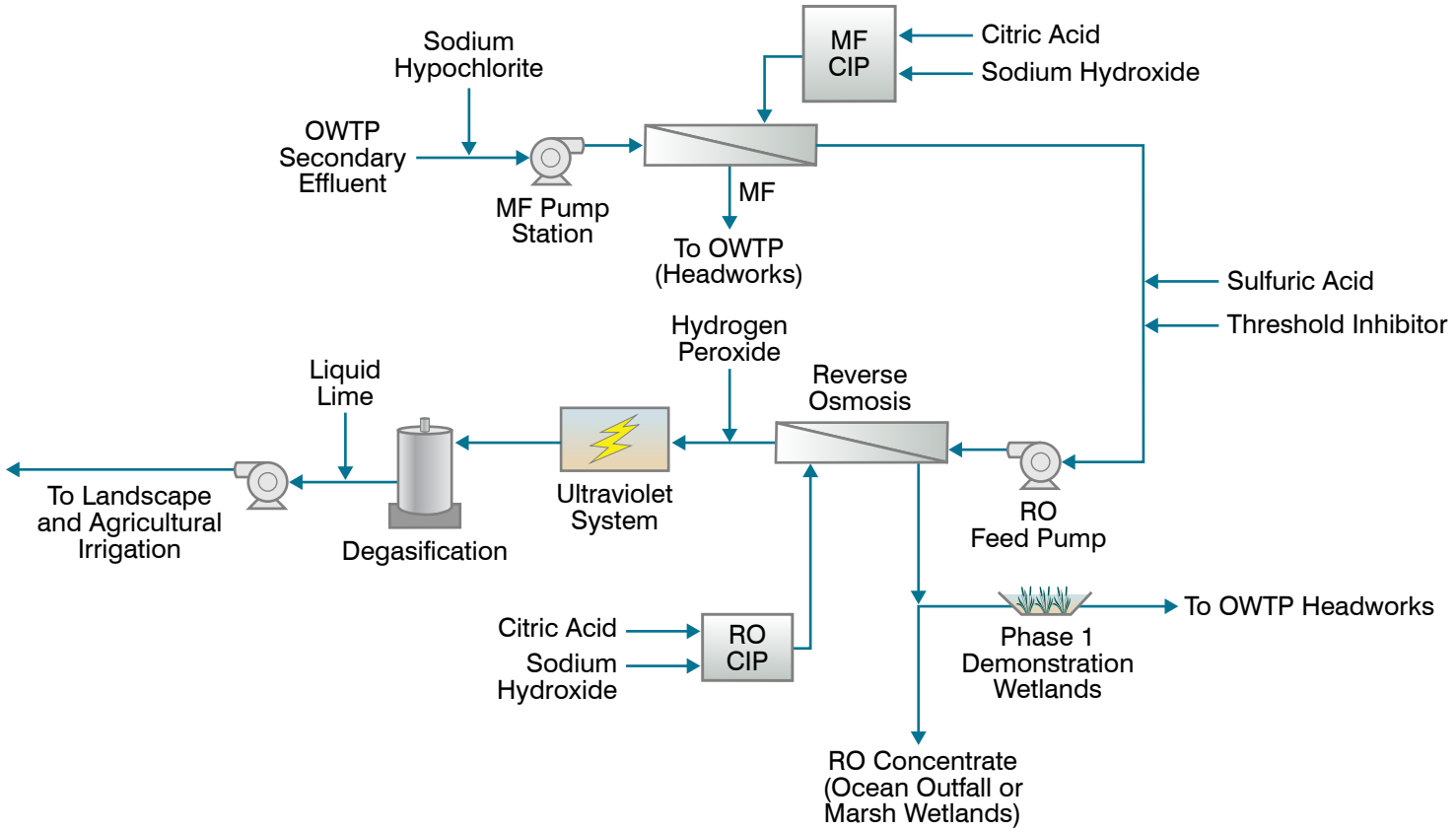
2.2.1.1 AWPF

The recycled water system currently consists of an AWPF and distribution pumping and conveyance. The AWPF consists of microfiltration (MF), reverse osmosis (RO), and advanced oxidation processes (AOP), including ultraviolet light and hydrogen peroxide and the necessary ancillary equipment for a fully functional facility. Figure 2-8 illustrates a schematic of the AWPF process in its current configuration.

2.2.1.2 Recycled Water Distribution System

The main components of the existing recycled water distribution system include the following:

- Recycled Water Backbone System (RWBS) - The constructed Phase 1 recycled water conveyance system is a combination of PVC and high-density polyethylene (HDPE) pipelines, with diameters ranging from 16-inches to 36-inches in the main transmission line and 6- to 8-inches in the distribution pipe to the River Park Development.
- Finished Recycled Water Pump Station - The AWPF recycled water pump station contains two variable frequency drive (VFD) pumps, each with a design capacity of 4,000 gallons per minute (gpm) with an output pressure of about 150 psi.
- Hueneme Road – Phase 1 - A 42-inch diameter pipeline was recently installed from the existing 36-inch diameter connection to the AWPF at the intersection of Hueneme Road and Perkins Road. The 42-inch diameter section of this pipeline continues to the intersection of Hueneme Road and Edison Drive. From there, a 36-inch diameter recycled water pipeline continues down Hueneme Road until the intersection at Olds Road where it terminates. A Phase 2 Hueneme Road pipeline, beginning where Phase 1 left off, is in the planning stages.
- Temporary Salinity Management Pipeline (SMP) Line - Because the Hueneme Road - Phase 2 pipeline will not be constructed and operational for several years, the City will temporarily deliver recycled water to the agricultural customers in the Oxnard Plain through the SMP. This is for two reasons: 1) the SMP's route runs parallel to the City's planned Hueneme Road pipeline, and 2) the SMP is underutilized at this time. For this to occur, the Los Angeles Regional Water Quality Control Board (LARWQCB) amended the City's Waste Discharge Requirements (WDRs), Order No. R4-2011-0079-A01 and Monitoring and Reporting Program, R4-2008-A01, in July of 2015 to allow the SMP to temporarily deliver AWPF effluent to farmers. Construction and planning for the temporary SMP connection are complete, with water



AWPF SCHEMATIC

FIGURE 2-8

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

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- delivery currently taking place.
- Ocean View Pump Station - This Pump Station contains two VFD pumps, each with a design capacity of 2,210 gpm with an output pressure of about 50-psi. These pumps will be used to supply the SMP Line.

Currently, no storage tanks are in the distribution system, meaning peak demands must be met directly from the AWPF. A map of the existing recycled water distribution system is shown in Figure 2-9 along with major users

2.2.1.3 ASR Demonstration Well

The City is constructing an ASR Demonstration well that is expected to be completed in 2018. The construction of this well is grant funded and will serve as a test well for the City to understand how ASR/IPR will work moving forward.

Initially, the ASR Demonstration well will be used as an ASR well for the recycled water system. Recycled water from the AWPF will be injected into the ground and then extracted and put back into the City's recycled water system for irrigation use. Ultimately, once all of the required start-up testing and monitoring are complete, the well will switch to IPR operation, and the extracted water will be conveyed to the BS No. 1/6 nearby for disinfection and injection into the potable system.

Elements of this ASR Demonstration Well installation include the following:

- One IPR/ASR well at the Campus Park site.
- Three monitoring wells (two shallow and one deep aquifer) for the one IPR/ASR well.
- 2,000 linear feet (lf) of recycled water piping connecting the IPR/ASR well to the Recycled Water Backbone piping located in Ventura Road.
- 4,000 lf of piping to convey IPR water from Campus Park to BS No. 1/6 for blending into the potable system, which will eventually be converted to a potable line when the IPR/ASR operation is fully approved.

A hydrogeological study was conducted (Hopkins, 2016) to assess the proposed location and capacity for this well at Campus Park. This study recommended an injection and extraction capacity of approximately 2,000 gpm and recommended operating the well on a 3-month rotation of recharge, retention, and recovery. Figure 2-10 illustrates the location of the proposed ASR well at Campus Park.

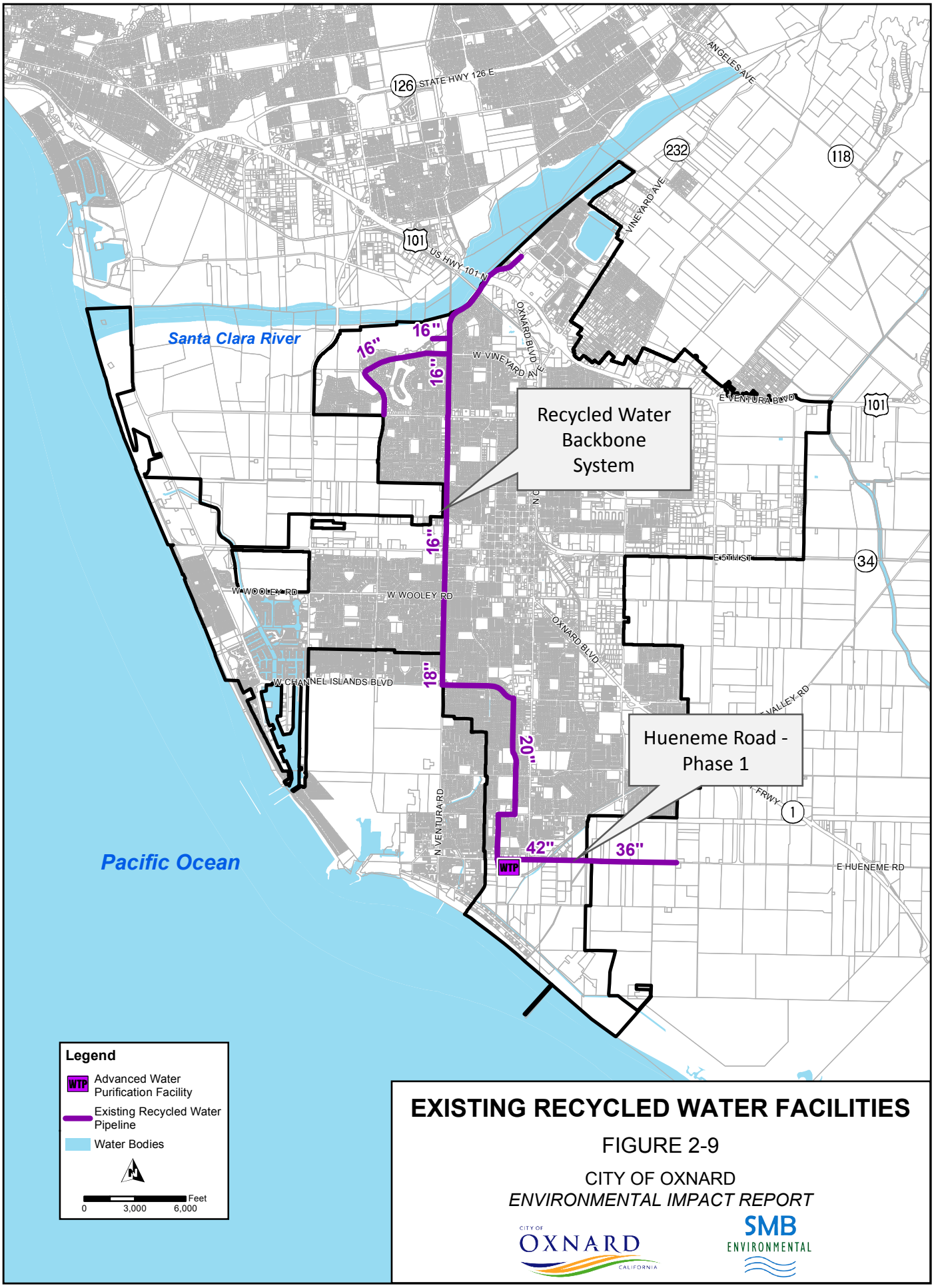
2.2.2 CURRENT RECYCLED WATER NEEDS

Detailed below is a summary of the current and projected recycled water demands.

2.2.2.1 Current Recycled Water Demands

The City projects that in the initial phases of the GREAT Program, approximately 7,000 AFY (acre-feet per year), or 6.25 mgd, of AWPF water will be produced. The City has an approved Full Advanced Treatment Recycled Water Management and Use Agreement, A-7651. According to this agreement, the following significant demands are accounted for:

- The City has the right to the first 1,500 to 1,800 AFY, which will be delivered to existing customers in lieu of potable water and to the River Ridge Golf Club. In addition, the City will deliver recycled water to River Park Development and New Indy Container Board for a total of approximately 2,800 AFY, or 2.5 mgd in Phase 1A. This recycled water will be used to offset



EXISTING RECYCLED WATER FACILITIES

FIGURE 2-9

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N

250 125 0 250

Feet

LEGEND

Proposed ASR Well Location

Proposed Monitoring Well Locations

DEMONSTRATION ASR WELL PROPOSED LOCATION

FIGURE 2-10

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- potable water demand along the completed RWBS that would otherwise be served through the City's potable water system.
- For Phase 1B, an additional 2,000 AFY, or 1.8 mgd, of AWPF water is dedicated to agricultural users along the (future) Hueneme Road Pipeline.
- According to Agreement A-7651, using the remaining 7,000 AFY of recycled water available from the AWPF is to be determined by the City, United Water Conservation District (UWCD), and Pleasant Valley County Water District (PVCWD).

Table 2-5 summarizes the existing and future recycled water demands as they are currently known. The City is also in the early stages of planning to implement 40 to 50 small urban recycled water irrigation projects along the RWBS to offset further potable use. The implementation would be phased over several years. Figure 2-11 illustrates the locations of the existing and planned customers, as they are known that this time.

2.2.2.2 Projected Recycled Water Demands

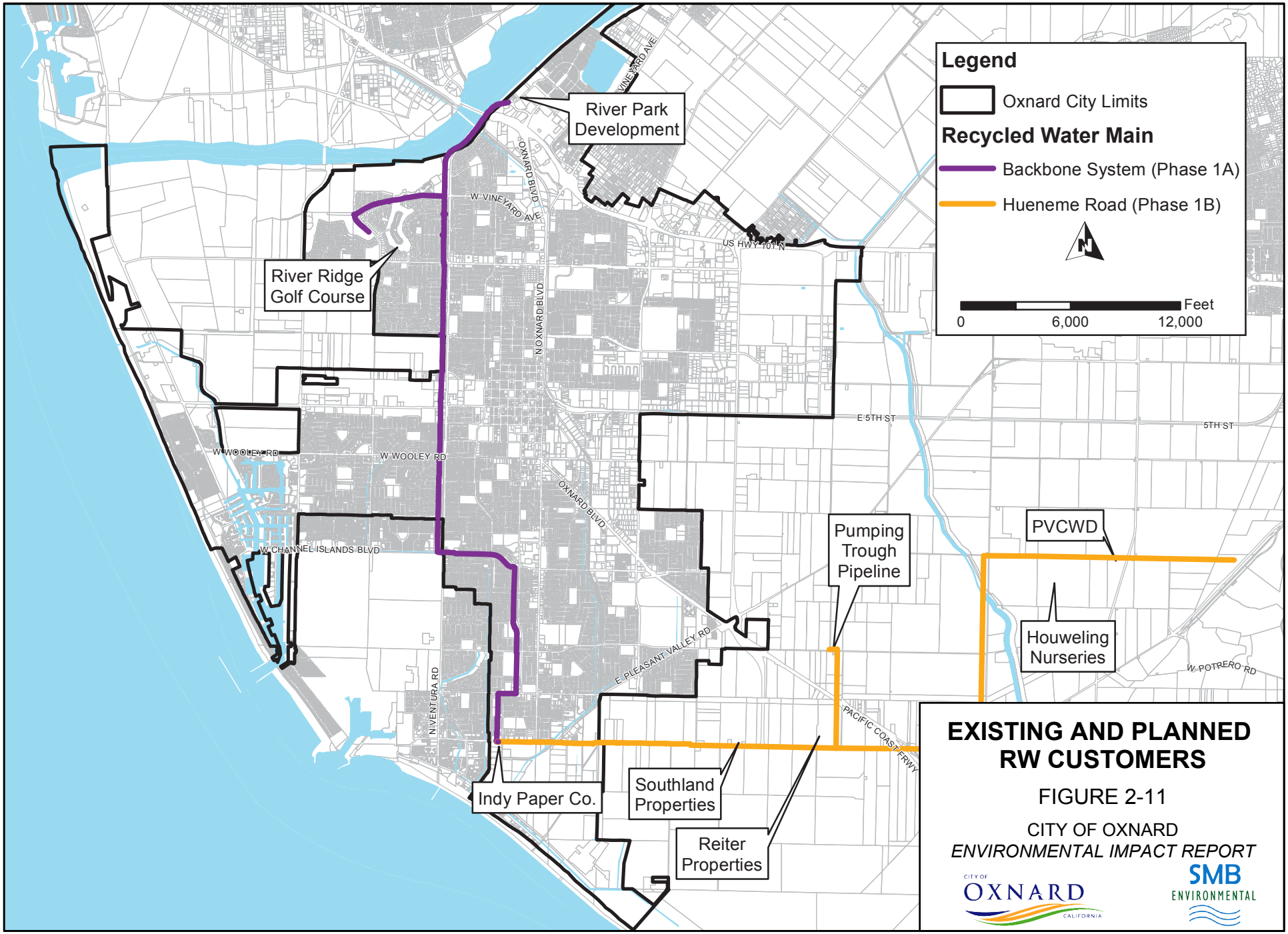
Under the GREAT Program, construction of the AWPF is planned in four phases that result in AWPF capacities of 7,000, 14,000, 21,000 and 28,000 AFY. As previously noted, the first phase of 7,000 AFY, which has been completed, is largely accounted for through urban and agricultural irrigation uses.

As subsequent phases of the AWPF come online, AWPF effluent will go first to recycled water users currently under contract, then to IPR/DPR, and then to additional agricultural users, which would benefit the City in the form of groundwater pump-back credits. Therefore, Phase 2 and 3 recycled water demands are shown as additional ASR capacity.

Table 2-5
Existing and Future Recycled Water Demands
Public Works Integrated Master Plan
City of Oxnard

Phase	Location	Recycled Water Use	Average Day Demand (gpm)	Delivery Pressure (psi)	Daily Demand Timing
1A	New Indy Paper Company	Irrigation	456	60	Constant
1A	River Park Development	Irrigation	651	60	10:00 a.m. - 6:00 p.m.
1A	River Ridge Golf Course	Irrigation	1,057	20(2)	Constant
1B	Houweling Nursery	Irrigation	1,000	60	6:00 p.m. - 6:00 a.m.
1B	Southland Sod	Irrigation	1,000	60	6:00 a.m. - 6:00 p.m.
1B	Reiter	Irrigation	1,400	60	6:00 a.m. - 6:00 p.m.
2	Blending Station (BS) 1/6	IPR	8,000(1)	20(3)	Constant
2	Campus Park	IPR	6,000(1)	20(3)	Constant
3	BS 3	IPR	8,000(1)	20(3)	Constant

Notes:
(1) There is no required amount for IPR; the required flow listed is equal to the maximum proposed capacity based on the recommended projects needed for water supply, per PM 2.5; IPR is to be maximized using excess flow after customer contracted flows are delivered.
(2) The customer pumps recycled water a lake onsite after delivery; therefore, lower delivery pressures are acceptable.
(3) Recycled water is delivered for ASR; lower delivery pressures are acceptable.



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2.2.2.3 Recycled Water Supply (Secondary Effluent)

The AWPF's water supply source is secondary effluent from the OWTP. Therefore, it is necessary to assess whether enough OWTP effluent exists to feed into the AWPF as capacity increases. In general, the AWPF's capacity cannot be expanded beyond what the OWTP can supply.

Table 2-6 summarizes the amount of OWTP effluent needed for the planned capacity expansions at the AWPF. Based on the future wastewater flow projections by 2040, ADWF to the OWTP is expected to reach only 27.4 mgd. Given this, it is unlikely that there would be sufficient supply to the AWPF for the Phase 4 expansion (see Table 2-6).

It is equally important to consider the diurnal variation of the average daily flow. While the AWPF is optimally operated at a constant (or relatively constant) flow, secondary effluent flow from the OWTP varies throughout the day. Therefore, storing secondary effluent may be required to allow the AWPF to draw a consistent supply. Table 2-7 summarizes the results of that analysis.

The OWTP currently has 5 MG of secondary effluent storage, which it uses for peak shaving of its effluent pumping. Based on the required storage noted in Table 2-7, it is believed that the existing secondary effluent storage will be sufficient to serve as both AWPF storage and peak shaving for effluent pumping.

Table 2-6
Secondary Effluent Storage Needs
Public Works Integrated Master Plan
City of Oxnard

AWPF Phase	AWPF Capacity, mgd	Secondary Effluent Needed (Avg Day), mgd(1)	Secondary Effluent Storage Required, MG
1	6.25	8.2	--
2	12.5	16.3	0.7
3	18.75	24.5	2.3
4	25	32.7	(2)

Notes:
(1) Estimated based on a MF recovery of 90% and RO recovery of 85%.
(2) Based upon wastewater flow projections for the PWIMP (by 2040, the average day flow is expected at 27.4 mgd), it is unlikely there will be enough secondary effluent flow to support an expansion of the AWPF up to 25 mgd.

Table 2-7
Recycled Water System Expansion Approach
Public Works Integrated Master Plan
City of Oxnard

Phase	AWPF Flow (mgd)	Recycled Water Distribution System(1)	ASR Well Capacity
Phase 1A	6.25	Recycled Water Backbone System Pipeline (completed) Hueneme Road Phase 2 Pipeline	1 Demonstration Well
Phase 1B	6.25	Pipeline from RWBS to Campus Park Pipeline from Campus Park to BS No. 1/6	1 Demonstration Well
Phase 2	12.50	• Complete Pipeline for Recycled Water Loop	4 duty + 4 standby
Phase 3	18.75	N/A	6 duty + 3 standby

Note:
(1) Additions are to the existing recycled water described in Section 6.8; each additional phase includes the addition of previous phases.

2.2.3 PROPOSED RECYCLED WATER PROJECTS

This section summarizes the proposed projects for the recycled water system based on the existing system capacity and performance needs for meeting projected future demands and water quality objectives. These projects cover needs through the PWIMP's planning period (2015-2040). The proposed projects are summarized in Table 2-8 and organized by project type. Figure 2-11 in Section 2.1.3 above illustrates all of the water and recycled water projects recommended for water supply purposes. For further details, refer to that figure.

The projects were split into phases that loosely follow the projects' timing: Phase 1 – Immediate Needs (First 2 years), Phase 2 – Near-Term Needs (Years 2 to 10), and Phase 3 – Long-Term Needs (Beyond 10 years).

The phases presented here are what are recommended based upon the technical needs identified within this assessment. However, the actual timing of implementation may defer when compared and balanced against the financial considerations of total implementation of the PWIMP.

2.2.3.1 Treatment

Phase 1 of the AWPF is already completed, with only minor improvements slated as immediate needs. A UV/AOP treatment system for the RO concentrate from the AWPF is recommended to address water quality-related issues.

Phase 2 will involve expanding the existing Phase 1 AWPF facility by an additional 6.25 mgd. The existing 6.25 mgd facility was constructed to allow for modular expansion of the MF, RO, and UV/AOP treatment trains without adding ancillary equipment (i.e., cleaning and support systems). Phase 3 will require adding more treatment and ancillary equipment to reach the 18.75 mgd capacity.

Table 2-8
Proposed Recycled Water Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
Recycled Water Treatment					
AWPF	Phase 1 Improvements (Disinfection conversion, security, A/V upgrade) (1)	1	--	Unit	--
AWPF	UV/AOP Brine Treatment	1	1		
AWPF	Phase 2 Expansion to 12.5 mgd (including backup power)	2	1	ea	6.25 mgd
AWPF	Phase 3 Expansion to 18.75 mgd	3	1	ea	6.25 mgd
Recycled Water Distribution					
Various	Recycled Water Distribution System Retrofits(2)	1	--	--	--
Campus Park to RWBS	Connect Initial ASR Well to RWBS Line in Ventura Road – 20"pipe(1	1	2,000	Lf	--
Campus Park to BS No. 1/6	Construct Dedicated IPR Pipeline along 2nd Street - 24" pipe(1)	1	4,000	lf	--
AWPF	Ag Recycled Water Storage	2	1	--	--
Hueneme Road - Phase 2 (to Ag Users)	24" pipe – Along Wood Road from Hueneme Road to Laguna Road and east on Laguna terminating before Lewis Road	2	20,700	Lf	--
Hueneme - Phase 2 (to Ag Users)	36" pipe – Along Hueneme Road from Olds Road to Wood Road	2	16,000	Lf	--
Recycled Water Loop	24" pipe – Along 2nd St to N Rose Ave	2	9,000	Lf	--

Table 2-8
Proposed Recycled Water Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
(to ASR Sites)					
Recycled Water Loop (to ASR Sites)	30" pipe – Along N Rose Ave from 2nd St to Hueneme Road	2	19,700	Lf	--
AWPF	DPR Storage Tanks	3	3	MG	3.1
Recycled Water Loop (to	24" pipe – North along N Rose Avenue from 2nd St. to Camino	3	10,600	LF	--
ASR Sites)	Del Sol; then east on Camino Del Sol to N Rice Ave; North along N Rice Ave to Wankel Way				
IPR/DPR					
Campus Park	Demonstration ASR Well(3)	1	1	Ea	2,000 gpm
BS No. 1/6 & BS No. 3	Land Acquisition and Improvements	1	10	Ac.	--
Campus Park	Recycled Water Pond for Off-Spec Water	1	1	MG	1.9
Campus Park	2 duty + 2 standby ASR wells(3)	2	4	Ea	2,000 gpm
BS No. 1/6	2 duty + 2 standby ASR Wells(3)	2	4	Ea.	2,000 gpm
BS No. 1/6	Chemical Feed Expansion	2	1	Ea.	--
BS No. 1/6	Operational Storage	2	1	MG	1
BS No. 1/6	Booster Pumping	2	1	HP	500
Well 18 @ Golf Course	Rehab to Groundwater Recharge Well	2	1	Ea.	3,000 gpm
BS No. 1/6	2 duty + 1 standby ASR Wells(3)	3	3	Ea.	2,000 gpm
BS No. 3	4 duty + 2 standby ASR Wells(3)	3	6	Ea.	2,000 gpm
BS No. 3	Chemical Feed Expansion	3	1	Ea.	--
BS No. 3	Operational Storage	3	1	MG	1
BS No. 3	Booster Pumping	3	1	HP	500

Notes:
(1) As documented in the City's GREAT program CIP, February 18, 2015.
(2) Assumed 10 retrofits per year for 4 years.
(3) Each ASR well installed will have 3 associated monitoring wells installed.

2.2.3.2 Distribution

Phase 1B of the recycled water distribution system expansion focuses on delivering recycled water to the agricultural users east of the City, which will be accomplished with Phase 2 of the Hueneme Road Pipeline. The pipeline's alignment will start at the end of the Hueneme Road Phase 1 Pipeline, at the intersection of Hueneme Road and Olds Road.

The 36-inch diameter pipeline continues east down Hueneme Road to Wood Road and then transitions to a 24-inch pipeline, heading north on Wood Road until the intersection of Wood Road and Laguna Road. From there, it runs east on Laguna Road where it terminates just before Lewis Road. The Hueneme Road Phase 2 pipeline will supply an agricultural demand to the farmers of up to 5,200 AFY or 3,225 gpm depending on the recycled water supply available.

Phase 2 involves constructing the recycled water loop that will feed the proposed ASR locations at Campus Park and BS Nos. 1/6. The recycled water Loop tees off the existing 16-inch RWBS pipeline at the intersection of S Ventura Road and W 2nd Street. From this location, a 20-inch diameter pipeline continues east down W 2nd Street to the Campus Park ASR Facility where it increases to a 24-inch pipeline and

continues past Campus Park and into BS No. 1/6. Once past BS No. 1/6, the 24-inch diameter pipeline continues east along E 2nd Street, intersecting at N Rose Avenue. There, it turns south on N Rose Ave, increasing to a 30-inch pipeline until it connects to the existing 36-inch Hueneme Road Pipeline.

Phase 3 involves constructing a 24-inch pipeline connecting BS No. 3 to the recycled water Loop. The pipeline starts from the recycled water Loop at the intersection of E 2nd Street and N Rose Avenue.

This 24-inch pipeline continues north on N Rose Avenue, then east on Camino Del Sol, and then north on N Rice Avenue to Wankel Way where it terminates at BS No. 3. Figure 2-12 shows the routings of these pipelines.

2.2.3.3 IPR/DPR

Implementing IPR as a supplemental water supply will occur in steps. The City is constructing one demonstration ASR well currently. With this demonstration well, the City can assess the feasibility of the IPR process in real time and refine the assumptions surrounding aquifer capacity and extracted water quality.

In addition, the well will establish the process for regulatory approval for the IPR process. A Title 22 Engineer's Report (Carollo, 2016) and a Report of Waste Discharge (ROWD) (Carollo, 2016) Report were developed for this demonstration ASR well.

Phase 2 contains the majority of the ASR installations for supplemental water supply use, which will also happen in steps. First, the Campus Park site will be built-out. Four additional ASR wells will be added, each with their own set of monitoring wells (i.e., 3 per ASR well). Currently, a built-out ASR site will also consist of operational storage, sized to offset PHDs, booster pumping, and additional conditioning facilities (i.e., disinfection and fluoride addition). However, because the Campus Park site is near BS No. 1/6, it makes more sense to house the ancillary equipment at BS No. 1/6. Thus, extracted IPR water will be conveyed from Campus Park to BS No. 1/6 for storage and conditioning.

After build-out of the Campus Park ASR wells, four ASR wells will be added near the BS No. 1/6 site. Additional property near BS No. 1/6 will need to be acquired, which the City has already discussed with property owners. Adding these wells will correspond to the Phase 2 expansion of the AWPF and should help to meet potable water demands through approximately 2030.

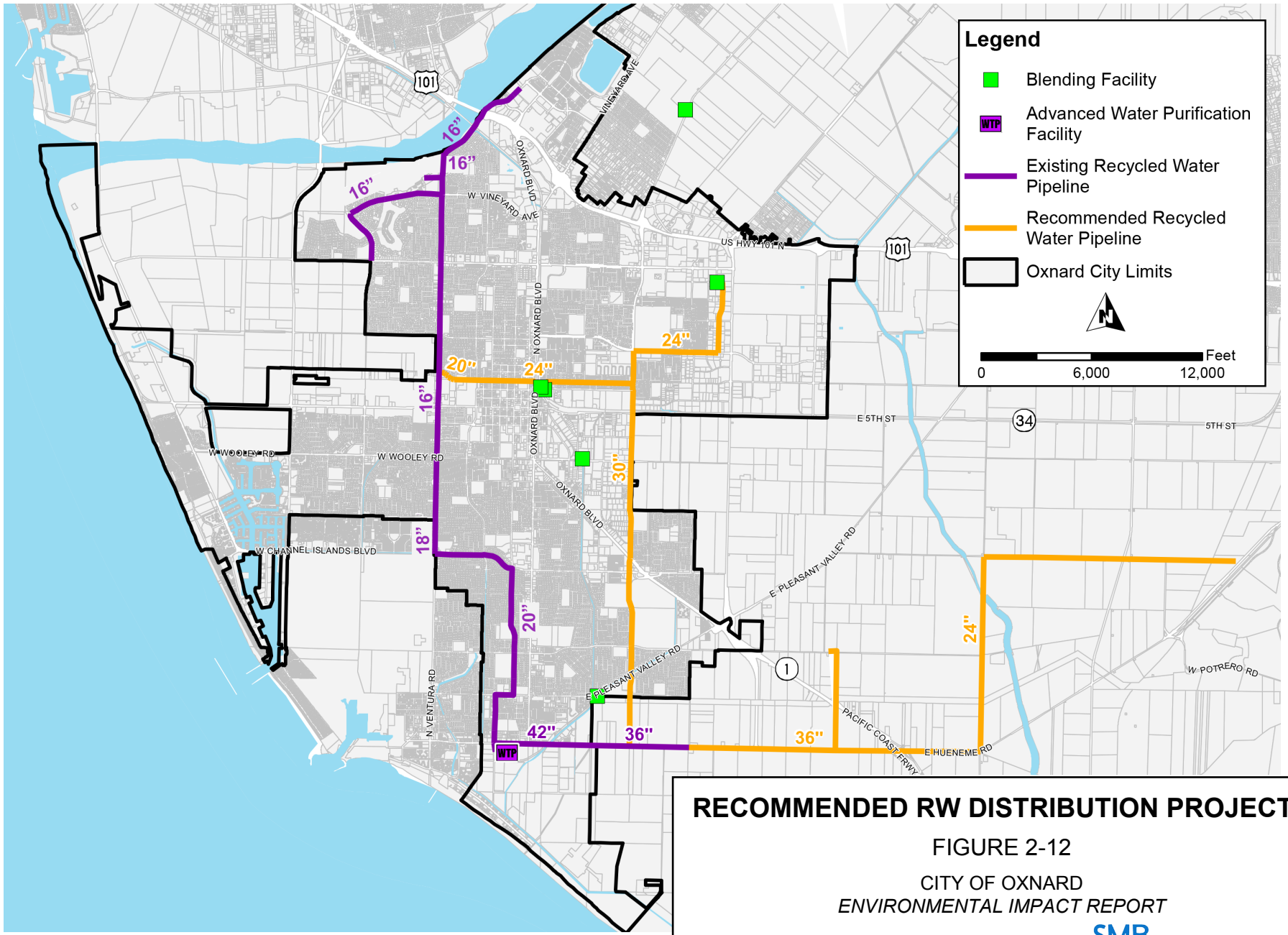
Phase 3 will then continue to expand the City's ASR capacity and will correspond to expanding the AWPF to 18.75 mgd. Build-out of the BS No. 1/6 site with the addition of three ASR wells will occur next, followed by the construction of six ASR wells at BS No. 3. As with BS No. 1/6, additional property will need to be acquired near BS No. 3 to make this feasible. Operational storage, booster pumping, and conditioning facilities will need to be added to BS No. 3 as well.

2.2.4 RECYCLED WATER SYSTEM IMPLEMENTATION SCHEDULE

Implementing these recycled water projects will occur in conjunction with the water system master plan projects as described in Section 2.1 above. The proposed schedule for these improvements is included in Figure 2-13.

2.3 Wastewater System Master Plan

The City owns and operates the Oxnard Wastewater Treatment Plant (OWTP) and the associated wastewater collection system. Through the OWTP, the City provides wastewater treatment to Oxnard and



RECOMMENDED RW DISTRIBUTION PROJECTS

FIGURE 2-12

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

CITY OF OXNARD CALIFORNIA

SMB ENVIRONMENTAL

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Recycled Water CIP Projects Schedule

Design | Bid/Award Contract | Construction | Land Acquisition

Project[1]	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2
Recycled Water Retrofits																								
Phase 1 Advanced Water Purification Facility (AWPF) Improvements																								
UV/Advanced Oxidation Process Brine Treatment																								
Construct ASR Demonstration Well @ Campus Park Site																								
Land Acquisition and Improvements - Near Blending Station 1/6 & 3																								
Recycled Water Pond for Off-Spec Water at Campus Park																								
Phase 2 - Expansion of AWPF to 12.5 mgd (including backup power)																								
Recycled Water Storage @ AWPF																								
Construct 1 duty + 1 standby ASR Wells @ Campus Park																								
Construct 1 duty + 1 standby ASR Wells @ Campus Park																								
Construct 1 duty + 1 standby ASR Wells @ Blending Station 1/6																								
Chemical Feed Expansion @ Blending Station 1/6																								
Operational Storage for ASR Wells @ Blending Station 1/6																								
Booster Pumping for ASR @ Blending Station 1/6																								
Construct 1 duty + 1 standby ASR Wells @ Blending Station 1/6																								
Rehabilitate Well 18 @ River Ridge Golf Course to GW Recharge Well																								
Phase 3 - Expand AWPF to 18.75 mgd																								
Construct 2 duty + 1 standby ASR Wells @ Blending Station 1/6																								
Construct 2 duty + 1 standby ASR Wells @ Blending Station 3																								
Chemical Feed Expansion @ Blending Station 3																								
Operational Storage for ASR Wells @ Blending Station 3																								
Booster Pumping for ASR @ Blending Station 3																								
Construct 2 duty + 1 standby ASR Wells @ Blending Station 3																								
Connect Initial ASR Well at Campus Park to Recycled Water Backbone Line in Ventura Road - 2,000 feet of 20" pipe																								
Construct Dedicated Indirect Potable Reuse (IPR) Pipeline from Campus Park to Blending Station 1/6 - 4,000 feet of 24" pipe																								
Hueneme Road - Phase 2 Recycled Water Pipeline Expansion to Ag Users																								
Install 20,700 feet of 24" pipe																								
Install 16,000 feet of 36" pipe																								
Recycled Water Loop to ASR Sites																								
Install 9,000 feet of 24" pipe																								
Install 19,700 feet of 30" pipe																								
Direct Potable Reuse - 3, 3.1 million gallon Storage Tanks																								
Recycled Water Loop to Blending Station 3 Connection – Install 10,600 feet of 24" pipe																								

Notes:
(1) Project start years adjusted with City input and do not correspond to Dec. 2015 publication start years.

RECOMMENDED RECYCLED WATER SYSTEM PROJECTS SCHEDULE

FIGURE 2-13

CITY OF OXNARD
ENVIRONMENTAL IMPACT REPORT

CITY OF OXNARD CALIFORNIA

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ox0917rf15-9587-CEQA(EIR-Fig2-13).ai

several surrounding communities (the City of Port Hueneme, the Port Hueneme Water Agency, the Naval Base Ventura County facilities at Port Hueneme and Point Mugu, Ventura Regional Sanitation District, Crestview Mutual Water Company, Nyeland Acres, and Las Posas Estates) and is permitted to discharge treated wastewater to the Pacific Ocean. In addition, a portion of the treated wastewater is used as recycled water after additional treatment through the City's Advanced Water Purification Facility (AWPF).

While considering improvements to the OWTP, a number of goals were established to help develop possible improvement scenarios. Consistent with the overall Master Plan goals established in Chapter 1, the five main goals for the City's wastewater facilities are as follows:

- Goal 1: Provide a compliant, reliable, resilient, and flexible system.
- Goal 2: Manage assets effectively (economic sustainability).
- Goal 3: Mitigate and adapt to the potential impacts of climate change.
- Goal 4: Protect and enhance environmental and resource sustainability.
- Goal 5: Investigate green and gray infrastructure with an emphasis on energy efficiency.

2.3.1 DESCRIPTION OF EXISTING WASTEWATER FACILITIES

This section describes the city's existing wastewater facilities.

2.3.1.1 Wastewater Collection System

The City's existing sanitary sewer collection system is comprised of roughly 384 miles of gravity collection system pipe ranging from 4- to 60-inches in diameter. As is typical for a community this size, most of the sewers (67 percent) are 8-inches in diameter and most (70 percent) are made of vitrified clay pipe. The rest (22 percent) are made of polyvinyl chloride.

The City currently operates and maintains 15 lift stations located throughout the City. Except for the Patterson & Hemlock Wastewater Lift Station, which has a wet well configuration, all of the lift stations utilize a submersible pump configuration. All of the pump stations have a duty and a standby pump.

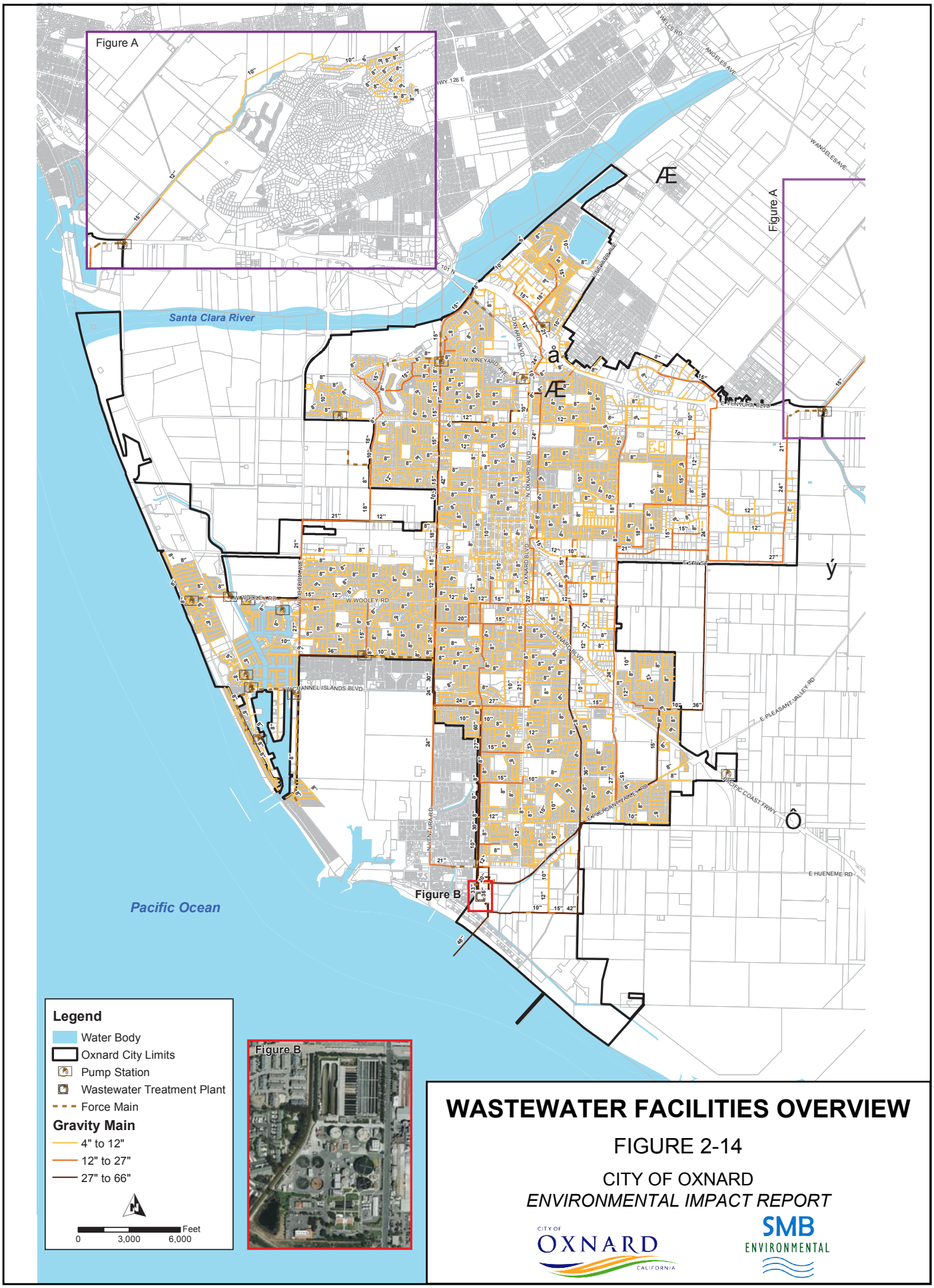
The force mains associated with the wastewater lift stations consist of approximately 4.7 miles of pressurized pipe ranging from 4- to 20-inches in diameter. The majority (67 percent) are 6- and 10-inches in diameter. Force main pipe are between 6 and 46 years old. Figure 2-14 shows the existing wastewater collection system infrastructure.

2.3.1.2 Wastewater Treatment Plant

The City's existing OWTP has a permitted capacity of 31.7 mgd and treats wastewater for discharge to the existing ocean outfall. The OWTP provides preliminary, primary, and secondary treatment, which are described below. Figure 2-15 provides a schematic of the OWTP process.

Preliminary treatment includes bar screens, screenings conveyance, grit removal, and grit conveyance to remove solids that might damage downstream equipment. After preliminary treatment, flow is gravity fed to the influent pump station wet well, which includes six dry-pit submersible pumps. Three of the six pumps are on duty during normal operations.

From the influent pump station wet well, raw wastewater flows to four primary sedimentation basins for primary treatment. The primary treatment process includes facilities in which ferric chloride are added to



WASTEWATER FACILITIES OVERVIEW

FIGURE 2-14

CITY OF OXNARD

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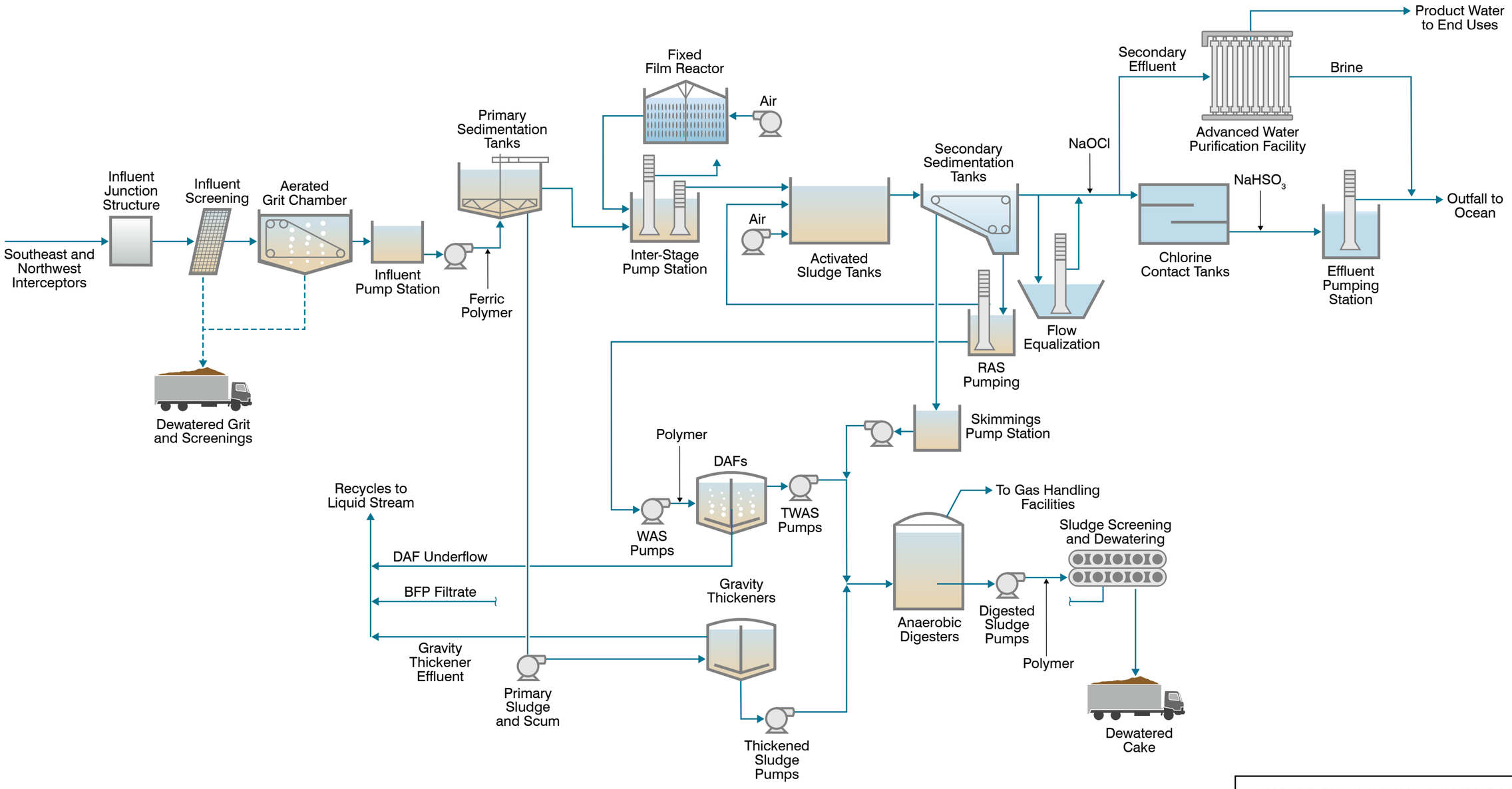

OWTP PROCESS SCHEMATIC

FIGURE 2-15

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

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enhance sedimentation. A polymer storage and feed system is planned to further enhance primary treatment performance.

After primary treatment, flow enters the secondary treatment system, which uses a fixed-film secondary treatment process followed by an air-activated sludge process to remove organic material. The City's discharge permit for the facility does not currently require nitrogen or phosphorus removal.

The secondary treatment system is comprised of two biotowers, two three-pass activated sludge tanks (ASTs), and 18 secondary sedimentation basins (SSTs). A plant utility water pumping station is provided downstream of the secondary sedimentation basins.

The maximum hydraulic capacity of the ocean outfall is 50 mgd, so two 2.5-million gallon (MG) secondary effluent equalization basins (EQ Basins) were included as part of the activated sludge facilities to equalize the portion of secondary effluent flows greater than 50 mgd during wet weather events. (Currently, plant staff also operates the EQ Basins during the dry weather season to equalize secondary effluent during the peak power cost period of the day to minimize the cost of final effluent pumping to the ocean outfall.)

Secondary effluent leaving the SSTs and/or EQ Basin either flows by gravity or is pumped through a 48-inch secondary effluent line to two three-pass chlorine contact tanks (CCTs).

Each pass is 145-feet long. Disinfected effluent is then pumped to the 6,800-linear feet (1.3 mile) ocean outfall from the effluent pump station, which has two engine-driven pumps, two electric motor variable frequency drive (VFD) pumps, and an additional motor-driven pump.

The solids handling facilities consist of 2 gravity thickeners for primary sludge thickening, two dissolved air flotation thickeners (DAFTs) for waste activated sludge (WAS) thickening, three anaerobic digesters, and 4 belt filter presses (BFPs) for dewatering.

2.3.1.3 Condition Assessment

To identify the City's wastewater system's R&R needs, a condition assessment was conducted. This effort involved using asset management methodology to identify existing water assets and conduct a visual condition assessment of above-ground assets, a seismic evaluation of structures, a desktop evaluation of below-ground assets, and a cathodic protection system evaluation.

To prioritize the R&R needs, a risk assessment was also conducted to examine the vulnerability, or likelihood of failure, and criticality, or consequence of failure, for each asset. Consistent risk scoring methodology was applied to both above- and below-ground assets to prioritize each asset type.

Above Ground Assets

Above-ground assets included structures and equipment owned and operated by the City. To assess and value all above-ground assets, a consistent approach was used regardless of whether they were in the treatment system or collection system. The above-ground asset inventory included approximately 26 structures, 160 pumps, 15 wet wells, and a variety of other assets across the OWTP and collection system. The recorded age of each asset varied from 1955 to the present.

Several tables summarize the results of the condition assessment analysis. Table 2-9 lists the OWTP's assets, including the highest above-ground risk determined from this assessment. Table 2-10 lists the assets at the collection system Lift Stations, including the highest above-ground risk determined from the assessment.

Below are the findings of the condition assessment for above-ground assets:

- Headworks - The headworks is in fair to good condition, with some concrete deterioration noted.
- Primary Clarification - Structurally, the primary sedimentation building and clarifier basins were found to be in fair to poor condition. Mechanical and electrical assets were in poor to very poor condition.
- Biofilters - The biofilters were in poor to very poor condition.
- Interstage Pumping Station - The pumps were found to be in fair to poor condition. The structure itself is in fair condition.
- Secondary Treatment - The structures were found to be in fair to poor condition. The equipment was found to be in very poor condition.
- Disinfection Facilities - These facilities are in fair condition; concrete repairs are needed.
- Effluent Pumping - Structurally, this facility is in poor condition. Mechanical assets were rated from fair to poor condition. Electrical assets were in very poor condition.
- Thickening - The facilities are in poor to very poor condition.
- Digestion - The facilities are in poor to very poor condition, and Digester 2 is currently non-operational.
- Dewatering - The facilities are in fair to poor condition.
- Cogeneration - The facilities are in fair to poor condition.
- Electrical Facilities - The facilities are in good to very poor condition. The emergency power facility is aging.

Table 2-9
High-Risk Assets at the OWTP
Public Works Integrated Master Plan
City of Oxnard

Process/Asset	Risk[(1)]
Primary Treatment	
Primary Clarifiers (1-4) Collector Drive, Walkways, and Launders	4.48
Sludge Pump Tanks (1-4)	
MCCs-DPIA, DPIB, DP2B, EDPIA	3.85
Scum Ejectors	3.85
	3.22
Primary Clarifiers (2 & 4)	1.7
Large Isolation Valves	1.04
Biofilters	
Recirculation Pumps Mag Drive 1 and 2	3.4
Distributors and Drives	2.17
Biofilter Tanks 1 and 2	1.7
Biofilter Media Tanks (1 & 2)	0.8
Secondary Treatment	

Table 2-9
High-Risk Assets at the OWTP
Public Works Integrated Master Plan
City of Oxnard

Process/Asset	Risk[1]
Collector, Skimmer, and Drives (17-18)	1.54
Effluent Pump Station	
MCCs	3.85
Gravity Thickening	
MCCs-DP3C, DP3D	3.85
Thickened Sludge Pumps (1-3)	0.51
Digestion	
Digester Heat Exchanger No. 2	3.22
Digester No. 2 Tank	1.52
Digested Sludge Pumps (1-3)	0.51
Digester Control Building	1.46
Digester Hot Water Pump 1	0.51
Digester Mixing Equipment and Draft Tubes Nos. 1-3	0.51
MCCs (DP2C, EDPIC, GF)	0.46
Dewatering	
Conveyors	2.8
Belt Filter Press 1-4	2.8
Dewatering Feed Pump 5	0.51
Washwater Booster Pumps (1-4)	0.51
Electrical	
Effluent Electrical Building Switchgear	5.11
Main Electrical Building Large Standby Generators	4.69
Effluent Electrical Building (DP2A, EBPIB)	3.85
Main Electrical 500 kW Generator	0.7
Older Transformers (1 & 2)	0.51
Main Electrical Building MCCs (DP4, DP4B, GB, GC, GD)	
Administration Building MCCs (DP2D, DP3A, EDPIE, HG)	
Buildings	
Main Switchgear Building	(1.46) Seismic[2]
Plant Control Center Building	(1.46) Seismic[2]
Vacuum Filter	(1.46) Seismic[2]
Blower Building	(1.1) Seismic[2]

Note:
(1) Risk = Criticality x Vulnerability; Criticality = consequence of failure; Vulnerability = likelihood of asset failure
(2) Indicates a seismic deficiency that requires concrete testing, further Tier 2 evaluation, or replacement.

Table 2-10
High Risk Assets at Lift Stations
Public Works Integrated Master Plan
City of Oxnard

Site/Asset	Risk[1]
Lift Station 23 Wagon Wheel	
Submersible Pumps (1-2)	4.27

Table 2-10
High Risk Assets at Lift Stations
Public Works Integrated Master Plan
City of Oxnard

Site/Asset	Risk[1]
MCC	3.85
Wet Well Structure	2.56
SCADA Panel	2.25
Valve Vault	0.68
Lift Station 6 Canal	
Submersible Pumps (1-2)	0.51
MCC	0.46
Lift Station 04 Mandalay & Wooley	
SCADA Panel	0.51
MCC	0.46

Note:
(1) Risk = Criticality x Vulnerability; Criticality = consequence of failure; Vulnerability = likelihood of asset failure.

Below Ground Assets

For the City's below-ground wastewater system assets, a desktop evaluation relying on GIS data from the Oxnard collection system was conducted. Collectively, only 18 percent of the collection system piping had a known installation year, with no year available for 206 of the 263 segments for sewer force mains and 7,123 of the 8,686 segments for sewer gravity mains. Because so few installation years were available, an installation year of 1965, which was based on a conservative estimate of development in the area, was assumed.

2.3.1.4 Seismic Assessment

Performing a seismic assessment of the OWTP structures established each structure's anticipated performance level during a seismic event and recommended retrofit strategies to meet established performance objectives for deficiencies identified. With Tier 1 screening, Tier 2 assessments of the buildings, and a seismic assessment of the water-retaining structures at the OWTP, structural and non-structural seismic vulnerabilities could be identified and evaluated. A seismic assessment was completed for a total of 18 buildings and eight water-retaining structures. The results of this analysis can be found in Table 2-11.

Table 2-11
Summary of Seismic Assessment and Preliminary Screening
Public Works Integrated Master Plan
City of Oxnard

Structure	Recommendations
Tier 1 Evaluation	

Table 2-11
Summary of Seismic Assessment and Preliminary Screening
Public Works Integrated Master Plan
City of Oxnard

Structure	Recommendations	
Primary Sedimentation	Replace	
Main Electrical/Main Switchgear Building	Replace	
Digester Control Building	Replace	
Operations Center/Plant Control Center Building	Replace	
Effluent Pumping Station	Replace	
Generator/Co-Generation Building	Replace	
Storage-Vacuum Filter Building	Replace	
Storage-Butler Building	Replace	
Tier 2 Evaluation		
	Structural Components	**Non-Structural Components**
Headworks Building	No Deficiencies	Retrofit Needed
Grit Screenings Building	No Deficiencies	Retrofit Needed
Blower Building	No Deficiencies	Retrofit Needed
North Area Electrical Building	No Deficiencies	Retrofit Needed
Solids Processing Building	No Deficiencies	Retrofit Needed
Maintenance Building	Retrofit Recommended: wall-to-diaphragm connection	Retrofit Needed
Collection System Maintenance Building	Retrofit Recommended: wall-to-diaphragm connection	Retrofit Needed
Chemical Handling Facilities	Retrofit Recommended: wall-to-diaphragm connection	Retrofit Needed
16 kW Switchgear/Effluent Electrical Building	Replace structure based on condition assessment and plant considerations.	--
Administration Building	No Deficiencies	Retrofit Needed
Concrete Testing and Assessment		
Activated Sludge Tanks/Aeration Basin	Repair/seal cracks	
Secondary Sedimentation Basin	Repair/seal cracks	
Flow Equalization Basin	Repair areas of damaged/cracked concrete; apply corrosion inhibitor to concrete surfaces	
Primary Clarifier Tanks	Repair areas of damaged/cracked concrete; coat interior surfaces of tank with 100 percent epoxy or polyurethane coating	
Gravity Thickeners	Replace	
Digester Nos. 1, 2 and 3	Replace structure based on condition assessment and plant considerations.	
DAF Tanks	Replace structure based on condition assessment and plant considerations.	
Chlorine Contact Tank	Remove and replace existing coating in the next 10 years.	

2.3.1.5 Cathodic Protection

A survey was conducted on the City's wastewater infrastructure to assess the existing level of cathodic protection. From this survey, the following needed improvements were identified:

- General Wastewater Treatment Plant: Almost all piping tested did not meet National Association of Corrosion Engineers Criteria for protection related to pipe-to-soil potentials. Thus, immediately replacing the entire cathodic protection system plantwide is recommended.
- Clarifiers and Digesters: Currently, no cathodic protection exists at these facilities. Thus, cathodic protection for the submerged surfaces of metallic components is recommended.

In addition to these projects, the project team recommends conducting an annual cathodic protection survey and report for all City facilities as well as bi-monthly rectifier monitoring.

2.3.1.6 Arc Flash Assessment

An electrical system study was also conducted for the existing OWTP. This study was comprised of a short-circuit study, a protective device coordination evaluation, and an arc flash evaluation.

Each analysis was performed for a particular reason. The short circuit study determined the available short circuit current at each piece of electrical equipment and identified underrated equipment. The protective device coordination evaluation identified protective devices (circuit breakers, fuses, etc.) not coordinated in the electrical system and not likely to minimize disruption of electrical power during a short circuit. The arc flash evaluation determined the maximum arc flash incident energy at each piece of electrical equipment and identified appropriate personnel protective equipment to be worn if working on the equipment while it is energized.

The results of the electrical systems investigation were used to develop the electrical system study for each site. With these results, pieces of existing electrical distribution equipment (e.g., the main breaker for PNL DP4) not sufficiently rated for the worst-case short circuit current could be identified. The results also showed the arc flash incident energy at each piece of electrical equipment based on the existing protective device settings.

Concerns (e.g., equipment that is damaged, scratched, rusty or not functioning, such as a broken indicator light) and code violations (e.g., insufficient working space around electrical equipment in the existing electrical equipment installations were observed and documented. Obsolete equipment (approximately 40 percent) and equipment nearing the end of its useful life (approximately 30 percent) and in need of repair were identified, and possible changes in the existing installation from code violations were noted as well. For example, electrical equipment installed prior to 1989 was identified and recommended for replacement due to obsolescence and poor condition.

2.3.2 FUTURE WASTEWATER FACILITY NEEDS

The existing wastewater system's capacity and performance were analyzed to locate system shortfalls. In general, the system has adequate capacity to meet current demand conditions but with little reliability. Much of the existing OWTP is in need of major rehabilitation and repair and is reaching the end of its remaining useful life.

This means that without substantial investment into the existing treatment system, the City has a high risk of treatment failure and regulatory fines.

2.3.2.1 Wastewater Collection System

Capacity

To determine the necessary collection system capacity, the existing collection system model was recalibrated with recent wastewater flow data and included both dry and wet weather flow monitoring. Dry weather flow monitoring occurred from August 2, 2014, to August 24, 2014, and wet weather flow monitoring occurred from December 9, 2014, to February 25, 2015.

The collection system capacity was assessed during existing and projected dry and wet weather flow conditions. According to this assessment, the existing system can adequately convey both peak dry and wet weather flow conditions using the level of service (LOS) criteria. However, as flows increase over time, the system will require upgrades to meet capacity restrictions. By 2040, certain sewers are expected to surcharge during peak dry weather flow conditions, which is not acceptable per the LOS criteria. Therefore, pipelines in these areas that exhibited potential capacity deficiencies should be upsized to convey peak dry weather flow without surcharge.

The collection system was also evaluated under peak wet weather flow conditions. The analysis indicated that no improvements are needed through 2040 based on the 10-year design storm event. Surcharging does occur throughout the system during these conditions. However, the peak hydraulic grade line is more than 3-feet above the manhole's rim elevation, meaning it does not violate the LOS criteria. Thus, since no sewers violated the peak wet weather flow criteria, no sewers require upgrades.

The pump stations within the system were also evaluated to determine if upgrades were necessary for projected flows. The City provided pump curves for the pump stations but could not provide the start and stop elevations within the wet wells for the pump operation. In general, the pump stations appear able to adequately convey future flows. However, without the actual stop and start elevations, it is difficult to definitively assess this.

R&R

Because of the limited information available on the existing condition and age of the collection system piping, a detailed system rehabilitation program could not be practically developed for the PWIMP. Instead, the CIP recommendations for rehabilitation projects are based on the City's understanding of project needs.

2.3.2.2 Wastewater Treatment Plant

R&R

As discussed in the condition assessment section, a large portion of the OWTP is in poor condition and reaching the end of its useful life. Because of this, major investment in R&R is needed in the near future for reliable plant operations and plant safety concerns.

Replacement is recommended for a number of process facilities, namely the primary clarifiers, DAFTs, digesters, interstage pump station, effluent pump station, and cogeneration facility. All of these facilities are nearing the ends of their useful lives. Additionally, due to safety concerns, demolishing the biotowers is recommended as soon as possible.

Process Performance

The performance assessment of the OWTP assessed the following:

- The plant's overall treatment performance for meeting discharge limits and other effluent requirements.
- Each unit process' historical loading and performance.

Approximately 1 to 3 years of daily operating data were reviewed to characterize the OWTP's overall performance. During the review period, the OWTP complied with all regulated conventional pollutants. However, while the OWTP met all the limits for conventional pollutants, there was one violation for benzidene cited in the fact sheet of the 2013 NPDES permit because the reported detection limit was greater than the discharge limit.

In general, the unit processes at the OWTP have operated at loading rates well within their original design values or typical operating ranges. In addition, performance has been adequate and there are a sufficient number of units in some of the unit processes to maintain a standby unit out of service for maintenance.

Removing the biotowers because they are a safety hazard will change the OWTP's treatment train configuration. The biotowers were originally designed to provide secondary treatment in the 1970s. In the 1980s, they were retained as part of the activated sludge system to reduce the organic load to the downstream aeration tanks. Currently, a significant portion of the biotower influent is untreated because of seal failures within the biotower itself. With the removal of the biotowers, the existing aeration tanks need to be modified to accommodate the increased organic load. As most of the increased organic load will be soluble BOD, it is recommended to add submerged baffle walls to create a biological selector zone in each aeration tank. The selector zone would be mechanically mixed, but unaerated, to maintain good sludge settling characteristics. Step feed capabilities, included as part of the original aeration basin design, can be used together with these recommended modifications to operate in a sludge reaeration (step feed) configuration to limit secondary clarifier sludge loading rates during periods of high wet weather flows and low sludge settleability. With these minor alterations, the aeration basins can treat higher loadings without expanding their footprint.

Capacity

As part of the PWIMP, the capacity of each unit process at the OWTP was assessed. This assessment considered a range of parameters, including flow, influent wastewater characteristics, treatment objectives, process configurations and limitations, and desired redundancy.

The peak hour wet weather flow (PHWWF) capacity was estimated for facilities that use peak flow to establish sizing. These facilities include the headworks, influent pumping, primary clarifiers, biotowers, and interstage pumping. Whereas pumping capacities are determined with the largest unit out of service, peak capacities for process units are determined with all units in service. Figure 2-16 summarizes the PHWWF capacity for each process.

Figure 2-17 illustrates the required EQ basin volume needed for the design storm based on flow rate treated at the OWTP. At the permitted capacity of 31.7 mgd, approximately 4.95 MG of storage will be needed in 2040, which is just under the available storage capacity. Historically, the EQ basins have never been filled to capacity. However, in 2040, the EQ basin capacity will approach its limit. Thus, determining whether additional capacity is needed will depend on how the EQ basins are operated as well as the needs of both the AWPF and the outfall.

The ADWF capacity was estimated for facilities using average flows or influent BOD_5 and TSS loading to establish sizing. To estimate this capacity, a plant process model was developed and calibrated to historical operating data from 2013. Figure 2-16 summarizes the capacity for each process.

As shown in Figure 2-17, all of the liquid treatment processes have sufficient capacity for projected flows through 2040. However, although the existing secondary treatment process has sufficient treatment capacity to meet the City's NPDES BOD_5 limits through the planning horizon, it does not have sufficient capacity to nitrify with or without denitrification. The City's existing NPDES permit is not expected to require nitrification/denitrification in the near future, but increased recycled water production by the AWPF will increase constituent concentrations, particularly ammonia, above those in the secondary effluent.

Table 2-12
Recommended Collection System Projects
Public Works Integrated Master Plan
City of Oxnard

Project	Location	Driver	Start Year	Years to Implement
Central Trunk Manhole Rehabilitation Phase 1	Rehabilitate 47 existing manholes	R&R	2018	1
Headworks Meter Vault/Vortex Structure Coating Rehabilitation		R&R	2018	1
Harbor Blvd Manhole Rehabilitation	Rehabilitate 12 existing manholes	R&R	2019	1
Pleasant Valley Manhole Rehabilitation	Rehabilitate 14 existing manholes	R&R	2019	1
Redwood Tributary Manhole Rehabilitation	Rehabilitate 38 existing manholes	R&R	2019	1
Existing asbestos concrete pipe (ACP) Replacement	Various locations throughout the collection system	R&R	2019	8
Annual Existing Pipe Repair	Various locations throughout the collection system based on sewer inspection	R&R	2019	8
Collection System Chemical Addition	Various locations throughout the collection system	Performance	2019	2
Devco Development Lift Station	Devco development, Village (Wagon Wheel) developments.	R&R Performance	2019	1
Existing Lift Station #4 (Mandalay & Wooley) Rehabilitation	Lift Station #4	R&R	2019	1
Existing Lift Station #6 (Canal) Rehabilitation	Lift Station #6	R&R	2019	1
Existing Lift Station #20 (Beardsley) Rehabilitation	Lift Station #20	R&R	2019	1
Central Trunk Manhole Rehabilitation Phase 2	Rehabilitate 27 existing manholes	R&R	2020	1
Rice Avenue Sewer Improvement	Rice Avenue from Latigo to Camino Del Sol	R&R	2020	2
Existing Sewer Deficient Capacity Replacement	Ventura Road Trunk Sewer from Doris Avenue to Oxnard Airport	Capacity	2020	2
	Conduit 4943	Capacity	2020	2
	Conduit 4956	Capacity	2020	2
	Conduit 1429	Capacity	2020	2
	Conduit 1431		2020	2
	Conduit 1432	Capacity	2020	2
	Conduit 1443	Capacity	2020	2
	Conduit 4276	Capacity	2020	2
	Conduit 1460	Capacity	2020	2
	Conduit 1461	Capacity	2020	2
	Conduit 1462	Capacity	2020	2
	Conduit 1463	Capacity	2020	2
Existing Sewer Deficient Capacity Replacement	Sewers in the La Colonia Neighborhood, Third Street & Navarro Street	Capacity	2021	1
	Conduit 2888	Capacity	2021	1

Table 2-12
Recommended Collection System Projects
Public Works Integrated Master Plan
City of Oxnard

Project	Location	Driver	Start Year	Years to Implement
	Conduit 2889	Capacity	2021	1
Annual Existing Manhole Rehabilitation	Various locations throughout the City based on sewer inspection	R&R	2022	5
Project 3: S Victoria Ave and W Hemlock St	Sewers in the Channel Islands Neighborhood Conduit 501	Capacity	2027*	2
	Conduit {74B96752-98B2- 4F5D-AF2A-21B06EE4909C}	Capacity		2
	Conduit P-2471	Capacity	2027*	2
Phase 1 Central Trunk Replacement		R&R	2033**	2
Phase 2 Central Trunk Replacement		R&R	2036**	2

Notes:
(1) 2017 Project ID's were arbitrarily assigned for Project ease. C = Collection system project.
* Projects start year correspond to refinements and updates provided by City after Dec. 2015 publication date.
** Projects start year was adjusted by City at 8/7/17 meeting, based on recent CCT inspection.
General Note: For the pipeline replacement projects, see the hydraulic models developed as part of this integrated master plan to identify the exact pipeline locations.

One way to address the insufficient capacity is to nitrify and denitrify in the secondary treatment process. To accommodate this, the OWTP may need to consider expanding the secondary treatment capacity or switching to an alternative process configuration such as membrane bioreactors (MBR), should the conversion be necessary with AWPF expansion.

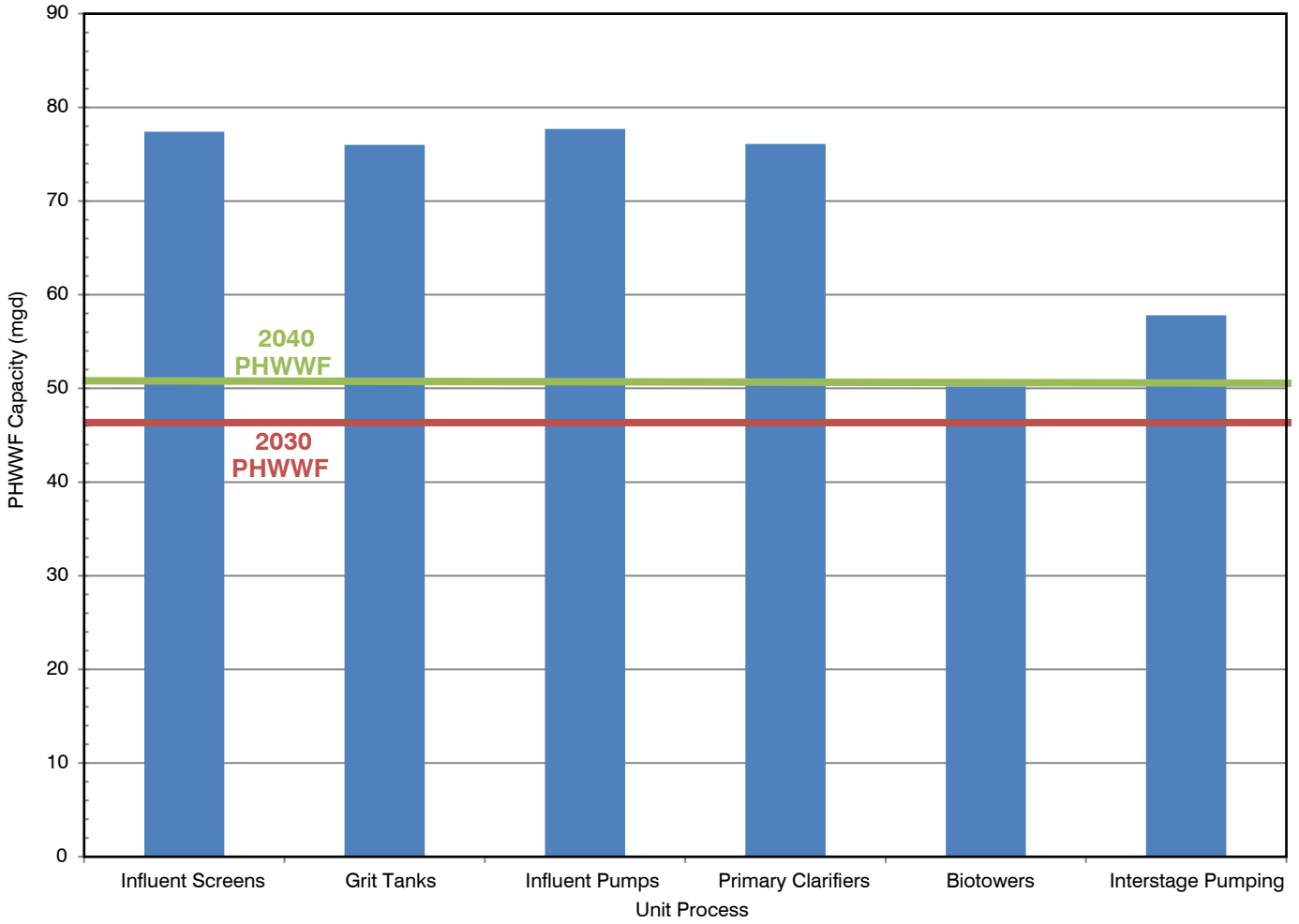
According to Figure 2-18, the solids handing facilities do not have sufficient capacity. OWTP sludge production is expected to increase, in part because the biotowers will need to be removed and an anaerobic selector will need to be added in the ASTs. Because of the anticipated changes to sludge production, additional DAFT units, digesters, and dewatering units are needed.

2.3.3 PROPOSED WASTEWATER PROJECTS

This section summarizes the proposed projects for the wastewater system. These projects are based on the existing system condition assessment and capacity and performance needs for meeting projected future demands and discharge requirements through the PWIMP's planning period. The projects and phasing here represent one possible solution to upgrading the Oxnard Wastewater Treatment Plant. Between the times of original publication of the Final Draft PWIMP in 2015 and the Revised Final Draft PWIMP publication in 2017, the City continued to review and optimize the recommended policies, projects, and programs. Therefore, certain wastewater projects have been refined and updated. However, the overall intent is the same – to upgrade the facilities that have served their useful life to achieve improved financial and implementation strategies, to accommodate technology updates, and address climate change strategies. It should be noted that these refinements and optimizations were generally not related to capacity needs.

The projects were each assigned a phase that loosely follows when they will be implemented. These phases include Phase 1 – Immediate Needs; Phase 2 – Near-Term Needs; and Phase 3 – Long-Term Needs. The phases were recommended based on the technical needs identified from the condition assessment.

Note that the actual timing of implementation may differ when compared with and balanced against the financial considerations for the PWIMP's total implementation.



OWTP PEAK HOUR WET WEATHER FLOW CAPACITY BAR GRAPH

FIGURE 2-16

CITY OF OXNARD
ENVIRONMENTAL IMPACT REPORT

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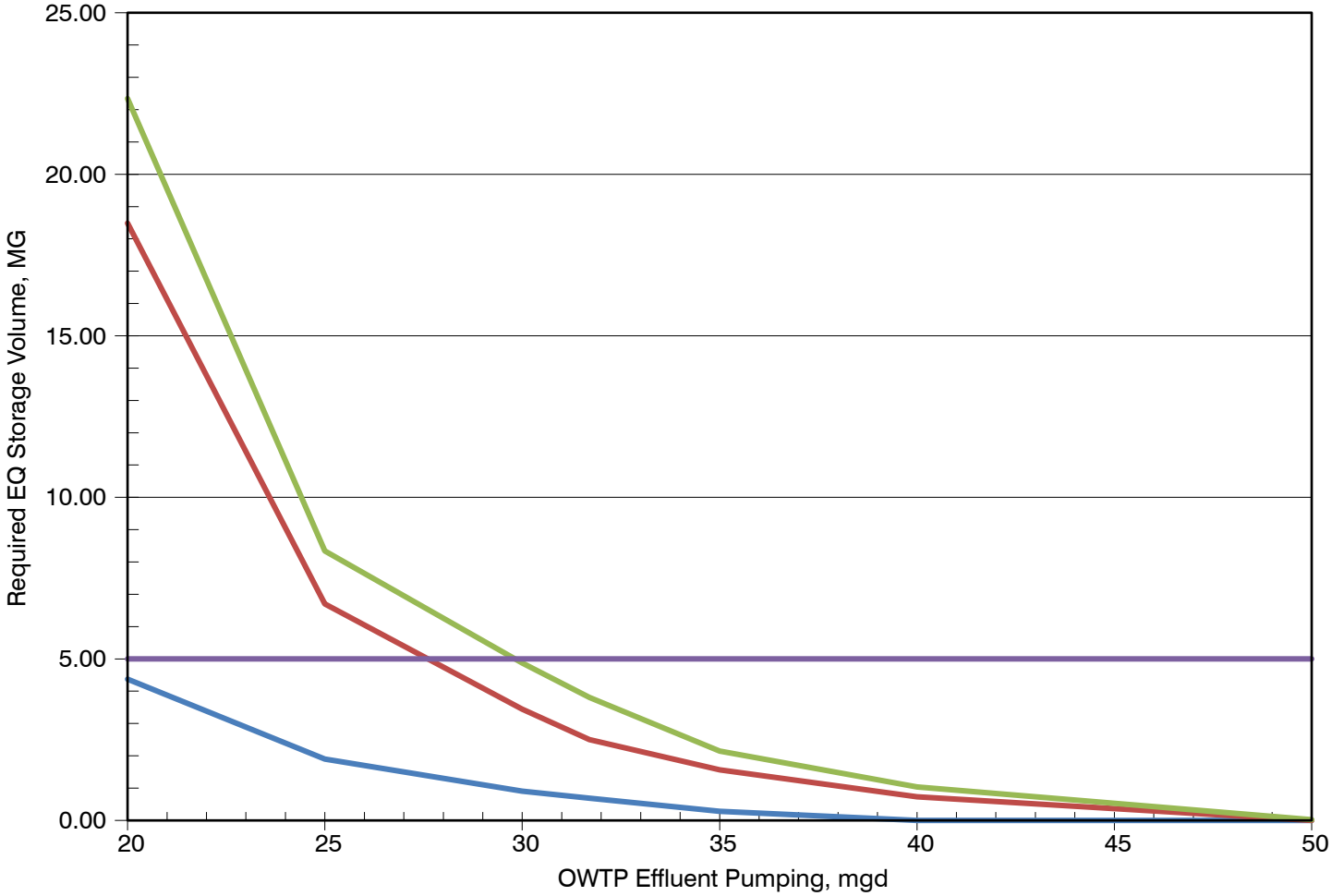

LEGEND

Current | 2030 | 2040 | Current EQ Basin Volume (5 MG)

REQUIRED EQUALIZATION (EQ) STORAGE FOR PEAK WET WEATHER FLOWS

FIGURE 2-17

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

CITY OF OXNARD CALIFORNIA

SMB ENVIRONMENTAL

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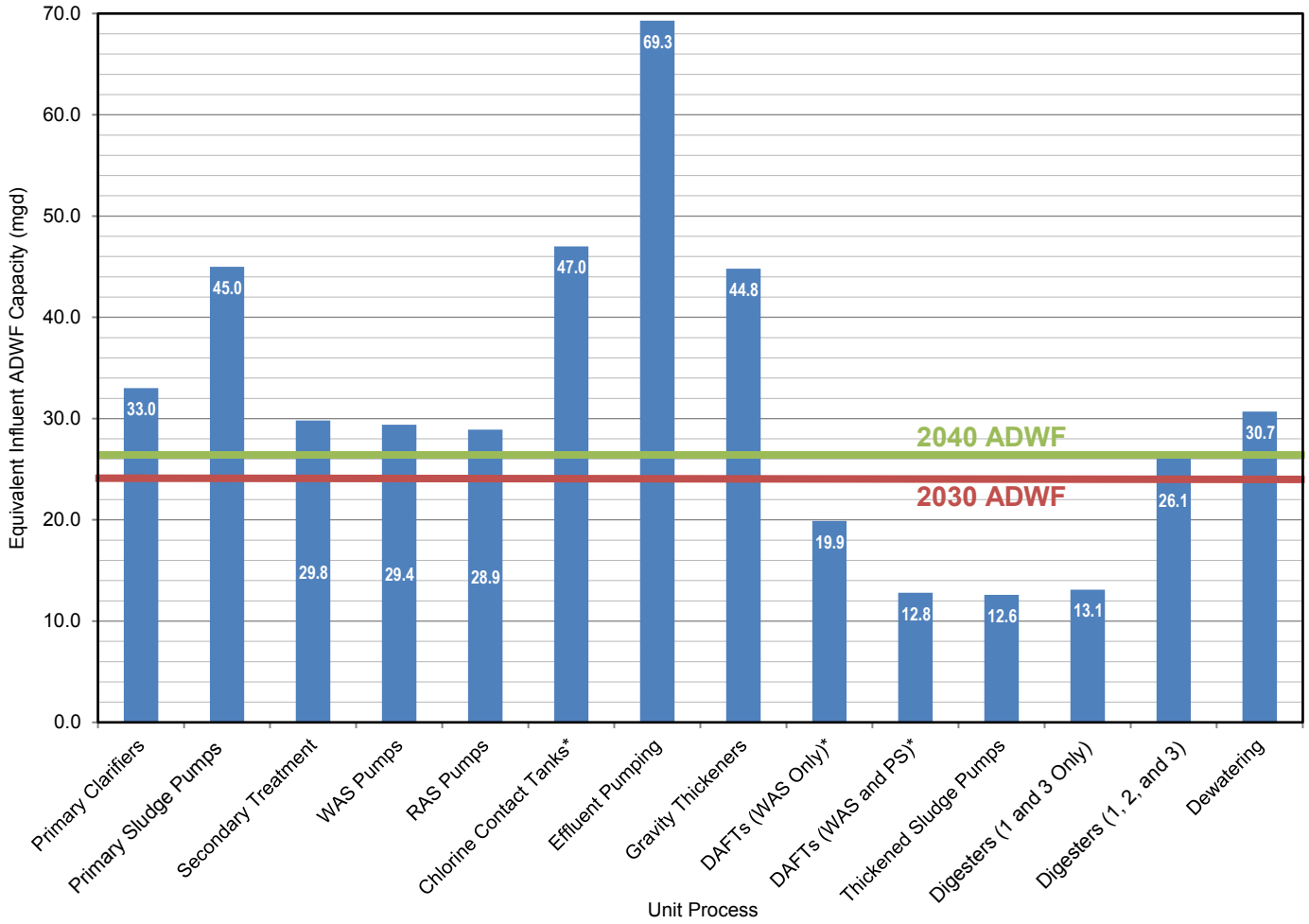

**All unit processes assume the largest unit is out of service except for those starred.*

OWTP AVERAGE DRY WEATHER FLOW CAPACITY BAR GRAPH

FIGURE 2-18

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

CITY OF OXNARD CALIFORNIA

SMB ENVIRONMENTAL

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2.3.3.1 Wastewater Collection System

Collection system improvements, based on collection system modeling, focused on capacity needs, R&R needs, and conversations with the City. Using the capacity, three main capacity projects and fifteen R&R and performance-based projects were identified. Each project is summarized in Table 2-12.

2.3.3.2 Wastewater Treatment Plant

The City has two options for implementing improvements needed at the OWTP. The first is to invest in the existing plant, and the second is to relocate most facilities. Both options require investing in a different set

of wastewater treatment-related improvement projects. If the City chooses to invest in the existing plant, the proposed improvement projects will focus on rehabilitating aging infrastructure. If the City chooses to relocate the plant, the proposed improvement projects will focus on investing in new facilities. Table 2-13 provides a summary of the proposed projects for within the fence-line of the existing wastewater treatment plant if the City decides to invest in the existing plant.

Table 2-13
Recommended Projects for Within Fence-line Wastewater System
Public Works Integrated Master Plan
City of Oxnard

Project	Driver	Start Year	Years to Implement
Accelerated design for renewal improvements (year 6-10)[2]		2018	6
Preliminary Treatment / Headworks			
Headworks Odor Control System[3]	Small Equipment Replacement	2018	1
Headworks Fiberglass Covers Replacement & Concrete Coating Repair[3]	R&R	2018	2
Headworks Rehabilitation[3]	R&R	2020	2
Small Equipment Replacement - Headworks 2	Small Equipment Replacement	2023*	3
Non-hazardous Waste Receiving Station	Performance	2026	1
Primary Treatment			
Primary Clarifier Rehabilitation	R&R	2017	1
Primary Clarifier Abandonment	R&R	N/A	0
Primary Clarifiers, Old Headworks Structure and Primary Building Demolition[3]	R&R	2025	1
Secondary Treatment			
Biotowers Rehabilitation	R&R	2017	1
Activated Sludge Tank (AST) Rehabilitation[3] Biotower Demolition[3]	R&R	2017	1
Activated Sludge Tank (AST) Upgrades	R&R, Performance	2023	1
Modify Activated Sludge Tank (AST) for MBR or other technology operation	Performance	2023	2
Remove existing Secondary Clarifiers and prepare for new MBR or other Technology	R&R	2023	2
New MBR or other technology Tanks	R&R, Resource Sustainability	2023	2
MBR or other Technology Building	Resource Sustainability	2023	2
Convert Activated Sludge Tanks conversion to Flow Equalization Tank	R&R, Performance	2024	1
Convert Existing Secondary Clarifier to Screening & Transfer Pump Station	R&R	2024	1
Disinfection and Effluent Pumping	Small Equipment Replacement, R&R	2024	1
Relocate Existing Primary Influent Piping	R&R	2024	1
Convert Secondary Clarifiers to Primary Clarifiers	R&R	2025	1
Small Equipment Replacement - wet weather storage 2	Small Equipment Replacement R&R	2026*	3
Add UV/AOP after MBR	Resource Sustainability	2026*	2
Add Baffle Walls in ASTs	R&R	2027*	1
Coating Replacement on Chlorine Contact Tanks	R&R	2028*	2
Solids Treatment			
Replace Belt Filter Presses & Conveyor	R&R	2017	4

Table 2-13
Recommended Projects for Within Fence-line Wastewater System
Public Works Integrated Master Plan
City of Oxnard

Project	Driver	Start Year	Years to Implement
Digester 2 Cover Replacement and Clean Digesters 1 & 3[3]	R&R	2019	3
Digesters 1 and 3 Rehabilitation[3]	R&R	2025	2
Sludge Thickening Facility[3]	R&R, Performance	2026	1
FOG Receiving Station[3]	R&R	2026	1
Demolish Operations Center and Vac Filter Bld	R&R	2027*	1
New Digester Control Building	R&R	2029*	5
New Digester 2	R&R	2030*	3
Move Dewatering Facility and add New Centrifuges	Performance	2030*	3
Add Dewatering Capacity	Performance	2030*	3
Add Sludge Silos	Performance	2032*	3
Pump Station			
Effluent Pump Station Rehabilitation	R&R	2019	3
Interstage Pump Station Rehabilitation[3]	R&R	2020	2
Electrical / Instrumentation			
Electrical Building ARC Flash Protection	Performance	2017	2
Cogenerators Rehabilitation[3]	R&R	2017	3
Electrical/Instrumentation Manhole Rehabilitation	R&R	2017	1
Computerized Maintenance Management System (CMMS)	R&R	2017	1
Supervisory Control and Data Acquisition and (SCADA) System	R&R	2017	1
Emergency Standby Generator Replacement[3]	R&R	2020	2
Plant Motor Control Center (MCC) Panel Replacement[3]	R&R	2020	2
New Main Electrical Building[3]	R&R	2020	2
New SCADA System	R&R	2020	2
New North Electrical Building	R&R	2024	2
Site Electrical Improvements	R&R	2024	2
New Supervisory Control and Data Acquisition (SCADA) system	R&R	2024	3
Small Equipment Replacement - Cogen	Small Equipment Replacement	2026*	2
Small Equipment Replacement - Electrical 1	Small Equipment Replacement	2026*	3
New Cogen Building	R&R	2032*	
Small Equipment Replacement - Electrical 2	Small Equipment Replacement	2032*	2
Small Equipment Replacement - Electrical 3	Small Equipment Replacement	2036*	2
Site Work			
Site Security	R&R	2019	2
Storm water Site Improvements	R&R	2019	3
Site Piping Replacements	R&R	2020	5
Building			
Laboratory HVAC Unit	R&R	2017	1
Administration Building and Laboratory Rehabilitation[3]	R&R	2025	1
Plant Control Center Building Rehabilitation	R&R	2025	1
New Chemical Storage Building[3]	R&R	2026	1
Collection System Maintenance Building Rehabilitation[3]	R&R	2026	1
Maintenance Building Rehabilitation	R&R	2026	1
Storage Warehouse Building	R&R	2026	1
Rehab Grit Screening Building - Seismic Retrofit	R&R	2027*	2
Solar or Alternative Energy Facility	Resource Sustainability	2027*	10
Plant Paving Resurfacing	R&R	2030*	3
Seawall	Resource Sustainability	2033	5

Notes:
(1) 2017 Project ID's were arbitrarily assigned for Project ease. T = Treatment system project.
(2) Cost added by City consultant after Dec. 2015 publication during facilities pre-design/planning.
(3) Projects correspond to refinements and updates provided by City after Dec. 2015 publication date.

Existing Site

Recommended projects to keep the existing OWTP operational include R&R projects for almost every unit process. This includes replacing equipment and making structural repairs. Facilities that are unsafe or are at

the end of their useful lives, including the primary clarifiers, DAFTs, digesters, interstage pump station, effluent pump station, and cogeneration facility, will also need to be replaced. Presented here is one process treatment option for replacing the OWTP and aged facilities. Several options will be considered and screened during the facilities' pre-design phase.

In addition to these recommendations, a major electrical system overhaul is recommended to provide more reliable backup power and to replace many plant MCCs and electrical buildings. A new dewatering facility, a new operations center and administration building, a non-hazardous liquid receiving station, a FOG receiving station, and a water quality early warning system are also recommended. Furthermore, in the future, the City should consider switching to MBR, adding an ultraviolet/advanced oxidation process (UV/AOP), constructing a solar facility, and adding a sea wall as needed. Figure 2-19 illustrates a layout of the proposed wastewater projects color-coded by phase. Figures 2-20A and 2-20B present a schedule for the recommended projects.

New Location

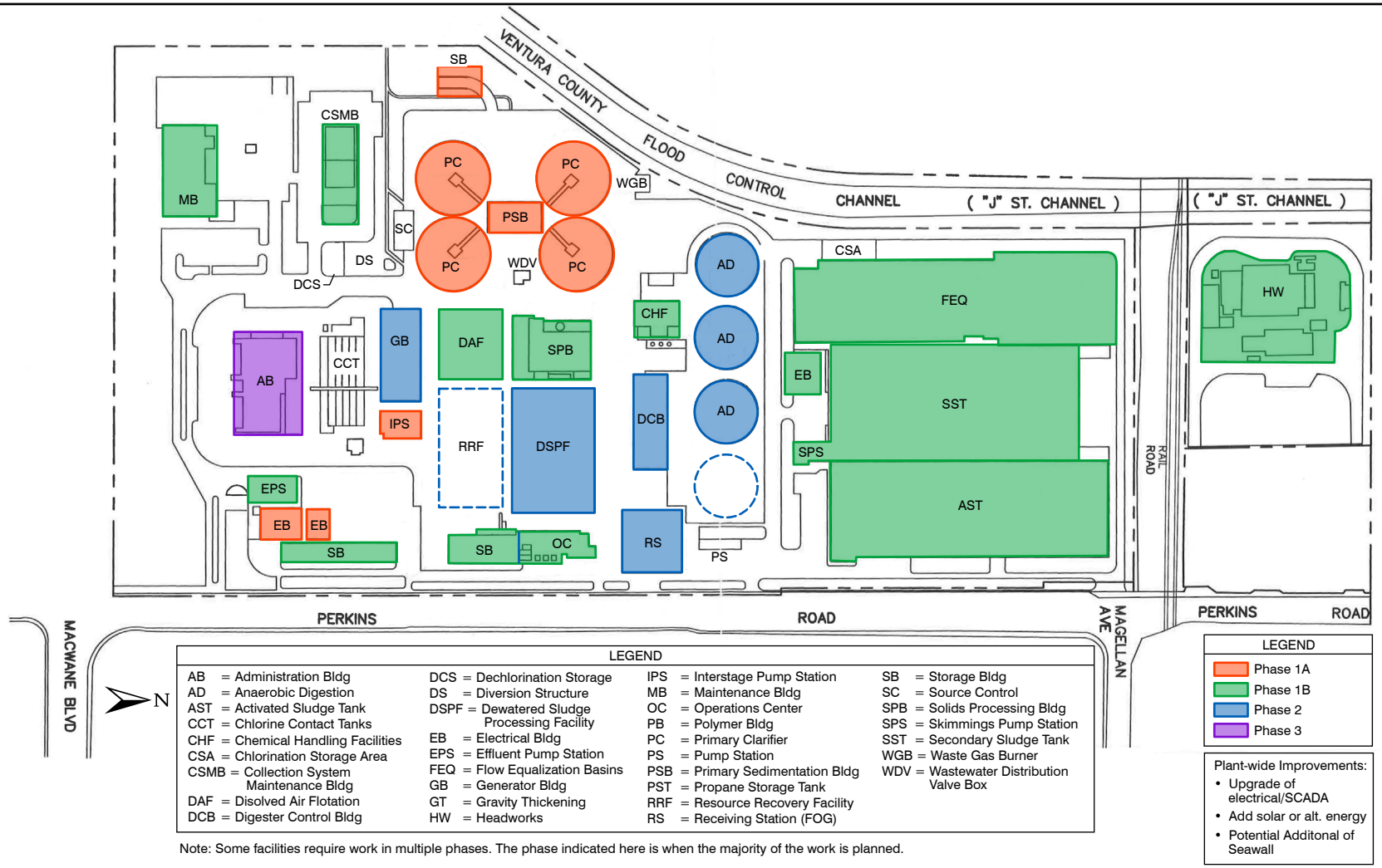
To move many of the OWTP facilities to a new location, the City would need to consider the move's feasibility, taking into account the regulatory, timing, and financial needs. It is estimated that this upfront work could take approximately five to ten years to complete.

Given this timeframe and the condition of many of the existing OWTP facilities, a number of critical improvement projects at the OWTP will need to occur regardless of whether the OWTP is relocated. Table 2-14 shows a list of the projects requiring immediate attention (Phase 1).

Table 2-14
Immediate CIP Project Needs at the OWTP to Keep the Plant Operational For 5 - 10 Years
Public Works Integrated Master Plan
City of Oxnard

Project Name	Driver	Phase	Years to Implement
Headworks Odor Control with Screen Walls, Concrete Repair, and Cover Replacemen	Immediate Need	1	3
Headworks Below Cover Coating Repairs	Immediate Need	1	4
Replace Primary Clarifier Equipment and secure launders	Immediate Need	1	2
Demolish Biotowers	Immediate Need	1	1
Add Baffle Walls in ASTs	Immediate Need	1	1
Replace/Refurbish Interstage and Effluent Pump Station Pumps	Immediate Need	1	2
Clean Digesters #1 and #3, add Dystor Cover to #2	Immediate Need	1	2
Rebuild/Rehab the Gravity Thickeners	Immediate Need	1	1
Refurbish the Belt Filter Presses	Immediate Need	1	1
Refurbish 2 of 3 Cogen Units	Immediate Need	1	2
Replace Standby Generators	Immediate Need	1	3
Replace Some Plant MCCs	Immediate Need	1	5
Plantwide Utilities	Immediate Need	1	2
SCADA System Upgrades	Immediate Need	1	1

For relocating the plant, a phased approach would be recommended. The City would start Phase 2 after implementing the projects with immediate needs (Phase 1). Phase 2 would involve moving all primary



Note: Some facilities require work in multiple phases. The phase indicated here is when the majority of the work is planned.

RECOMMENDED WASTEWATER TREATMENT PLANT PROJECTS BY PHASE

FIGURE 2-19

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

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Oxnard - Wastewater Collection System CIP Schedule

Design | Bid/Award Contract | Construction

Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2
Wastewater Collection System																								
Central Trunk Manhole Rehabilitation Phase 1																								
Central Trunk Manhole Rehabilitation Phase 2[1]																								
Harbor Blvd Manhole Rehabilitation																								
Pleasant Valley Manhole Rehabilitation																								
Redwood Tributary Manhole Rehabilitation																								
Annual Existing Manhole Rehabilitation																								
Rice Avenue Sewer Improvement																								
Existing Sewer Deficient Capacity Replacement																								
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Collection System Chemical Addition																								
Devco Development Lift Station																								
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Existing Lift Station #6 (Canal) Rehabilitation																								
Existing Lift Station #20 (Beardsley) Rehabilitation																								
Meter Vault/Vortex Structure Coating Rehabilitation[1]																								
S Victoria Ave and W Hemlock St - Sewers in the Channel Islands Neighborhood[2]																								
Phase 1 Central Trunk replacement[3]																								
Phase 2 Central Trunk Replacement[3]																								

Notes:
(1) Projects correspond to refinements and updates provided by City after Dec. 2015 publication date.
(2) Projects start year correspond to refinements and updates provided by City after Dec. 2015 publication date.
(3) Projects start year was adjusted by City at 8/7/17 meeting, based on recent CCT inspection.

RECOMMENDED COLLECTION SYSTEM PROJECTS SCHEDULE

FIGURE 2-20A

CITY OF OXNARD
ENVIRONMENTAL IMPACT REPORT

CITY OF OXNARD CALIFORNIA

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Oxnard - Wastewater Treatment System CIP Schedule

Design | Bid/Award Contract | Construction

Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2
Wastewater Treatment System																								
Accelerated design for renewal improvements (year 6 - 10)[1]																								
Preliminary Treatment / Headworks																								
Headworks Odor Control System[1]																								
Headworks Fiberglass Covers Replacement & Concrete Coating Repair[1]																								
Headworks Rehabilitation[1]																								
Non-hazardous Waste Receiving Station																								
Small Equipment Replacement - Headworks 2[2]																								
Primary Treatment																								
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Primary Clarifiers, Old Headworks Structure and Primary Building Demolition[1]																								
Secondary Treatment																								
Biotowers Rehabilitation																								
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Activated Sludge Tank (AST) Rehabilitation[1]																								
Activated Sludge Tank (AST) Upgrades																								
Modify Activated Sludge Tank (AST) for MBR or other technology operation																								
Convert Activated Sludge Tanks conversion to Flow Equalization Tank																								
Convert Secondary Clarifiers to Primary Clarifiers																								
Remove existing Secondary Clarifiers and prepare for new MBR or other Technology																								
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Disinfection and Effluent Pumping																								
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Coating Replacement on Chlorine Contact Tanks[2]																								
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Replace Belt Filter Presses & Conveyor																								
FOG Receiving Station[1]																								
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Add Dewatering Capacity[2]																								
Add Sludge Silos[2]																								
Pump Station																								
Interstage Pump Station Rehabilitation[1]																								
Effluent Pump Station Rehabilitation																								
Electrical / Instrumentation																								
Electrical Building ARC Flash Protection																								
Cogenerators Rehabilitation[1]																								
Electrical/Instrumentation Manhole Rehabilitation																								
Emergency Standby Generator Replacement[1]																								
Plant Motor Control Center (MCC) Panel Replacement[1]																								
New Main Electrical Building[1]																								
New North Electrical Building																								
Site Electrical Improvements																								
Computerized Maintenance Management System (CMMS)																								
Supervisory Control and Data Acquisition and (SCADA) System																								
New SCADA System																								
New Supervisory Control and Data Acquisition (SCADA) system																								
New Cogen Building[2]																								
Small Equipment Replacement - Electrical 1[2]																								
Small Equipment Replacement - Electrical 2[2]																								
Small Equipment Replacement - Electrical 3[2]																								
Small Equipment Replacement - Cogen[2]																								
Site Work																								
Site Piping Replacements																								
Site Security																								
Storm water Site Improvements																								
Building																								
Laboratory HVAC Unit																								
New Chemical Storage Building[1]																								
Collection System Maintenance Building Rehabilitation[1]																								
Administration Building and Laboratory Rehabilitation[1]																								
Plant Control Center Building Rehabilitation																								
Maintenance Building Rehabilitation																								
Storage Warehouse Building																								
Rehab Grit Screening Building - Seismic Retrofit[2]																								
Plant Paving Resurfacing[2]																								
Solar or Alternative Energy Facility[2]																								
Seawall																								

Notes:
(1) Projects correspond to refinements and updates provided by City after Dec. 2015 publication date.
(2) Projects start year correspond to refinements and updates provided by City after Dec. 2015 publication date

RECOMMENDED WASTEWATER SYSTEM PROJECTS SCHEDULE

FIGURE 2-20B

CITY OF OXNARD
ENVIRONMENTAL IMPACT REPORT

CITY OF OXNARD CALIFORNIA

SMB ENVIRONMENTAL

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treatment, solids handling, and support facilities to the new site as well as rehabilitating facilities remaining in their existing location until Phase 3. These facilities include secondary treatment, disinfection, and effluent pumping facilities. The biotowers and gravity thickeners should also be demolished and the headworks rehabilitated. Assuming that the permitting and the environmental process takes five to ten years, Phase 2 could start around 2023, and Phase 3 could start around 2035.

At this time, the new plant location is assumed to be less space-limited than the existing site. Thus, to reduce costs, conventional activated sludge treatment and chlorine disinfection could be installed for secondary treatment instead of MBR and ultraviolet light (UV) facilities. All other new facilities recommended for the existing plant option, such as a FOG receiving station and Chemically Enhanced Primary Treatment (CEPT), are still recommended with this option. Table 2-15 lists the details of these projects.

Table 2-15
List of Projects Needed with New Relocated Treatment Plant Option
Public Works Integrated Master Plan
City of Oxnard

Project Name	Driver	Phase
New Primary Clarifiers	R&R	2
CEPT	Performance	2
New Digesters	R&R	2
New DAFTs	Performance	2
New Chemical Handling Facilities	R&R	2
New Primary Sedimentation Building	R&R	2
New Chemical Handling Building	R&R	2
New Non Hazardous Liquid Receiving Station	Performance	2
New FOG Receiving Station	Resource Sustainability	2
New Digester Control Building	R&R	2
New Polymer Building	R&R	2
New Solids Processing Facility	Performance	2
New Sludge Silos	Performance	2
New Cogeneration Facility	R&R	2
New Operations Center and Lab Building	R&R	2
New Collection System Maintenance Building	R&R	2
New Storage/Warehouse	R&R	2
New Effluent Electrical Building	R&R	2
New North Area Electrical Building	R&R	2
New Main Electrical Building	R&R	2
Solar Facilities	Resource Sustainability	2
SCADA System Upgrade	R&R	2
AST Blower and Diffuser Replacement	R&R	2
Secondary Small Equipment Replacement	Small Equipment Replacement	2
Secondary Sedimentation Tanks Replace Skimmers, Collectors, Drives and RAS Pumps	R&R	2
EQ Basin Small Equipment Replacement	Small Equipment Replacement	2
AST Concrete Rehabilitation	R&R	2
SST Concrete Rehabilitation	R&R	2
EQ Concrete Rehabilitation	R&R	2
Chlorine Contact Tanks Rehabilitation	Small Equipment Replacement	2
Chlorine Contact Tanks Coating	R&R	2
Effluent Pump Station Rehabilitation	R&R	2
CMMS	R&R	2
New Activated Sludge Tanks	R&R	3
New Secondary Sedimentation Tanks	R&R	3
New EQ Basin	R&R	3
New Chlorine Contact Tanks	R&R	3
New Effluent Pump Station	R&R	3
Headworks Rehabilitation	R&R	3

2.4 Stormwater Master Plan

The City's stormwater system serves the City and surrounding areas that drain into Oxnard, approximately 35 square miles in drainage area. Within this system, the City maintains a network of storm drains comprised of gravity pipes, force mains, lift stations, and additional infrastructure associated with a stormwater drainage system.

The Ventura County Watershed Protection District (VCWPD) has either partial or complete jurisdiction over each of the City's drainage channels. As such, the City's drainage facilities discharge either directly into the ocean or into the VCWPD facilities first and then into the ocean.

When evaluating improvements to the stormwater collection system, a number of goals were established to help develop scenarios. Consistent with the overall goals established in the PWIMP, the five main goals for stormwater improvements are as follows:

- Goal 1: Provide a compliant, reliable, resilient, and flexible system.
- Goal 2: Manage assets in a way that maximizes economic sustainability.
- Goal 3: Mitigate and adapt to the potential impacts of climate change.
- Goal 4: Protect and enhance environmental and resource sustainability.
- Goal 5: Investigate green and gray infrastructure with an emphasis on energy efficiency.

As shown, these goals aim for more than simply maintaining the existing system. Instead, they seek to produce stormwater projects that can enhance the quality of stormwater entering the environment and potentially harvest some of it as an additional water supply. In doing this, the City aims for a more robust, adaptable, and cost-efficient system overall.

This section provides an overview of the existing stormwater system, including its strengths and vulnerabilities, as well as the regulatory requirements and climate change issues the system might face. This section also defines the proposed stormwater projects for meeting the defined goals.

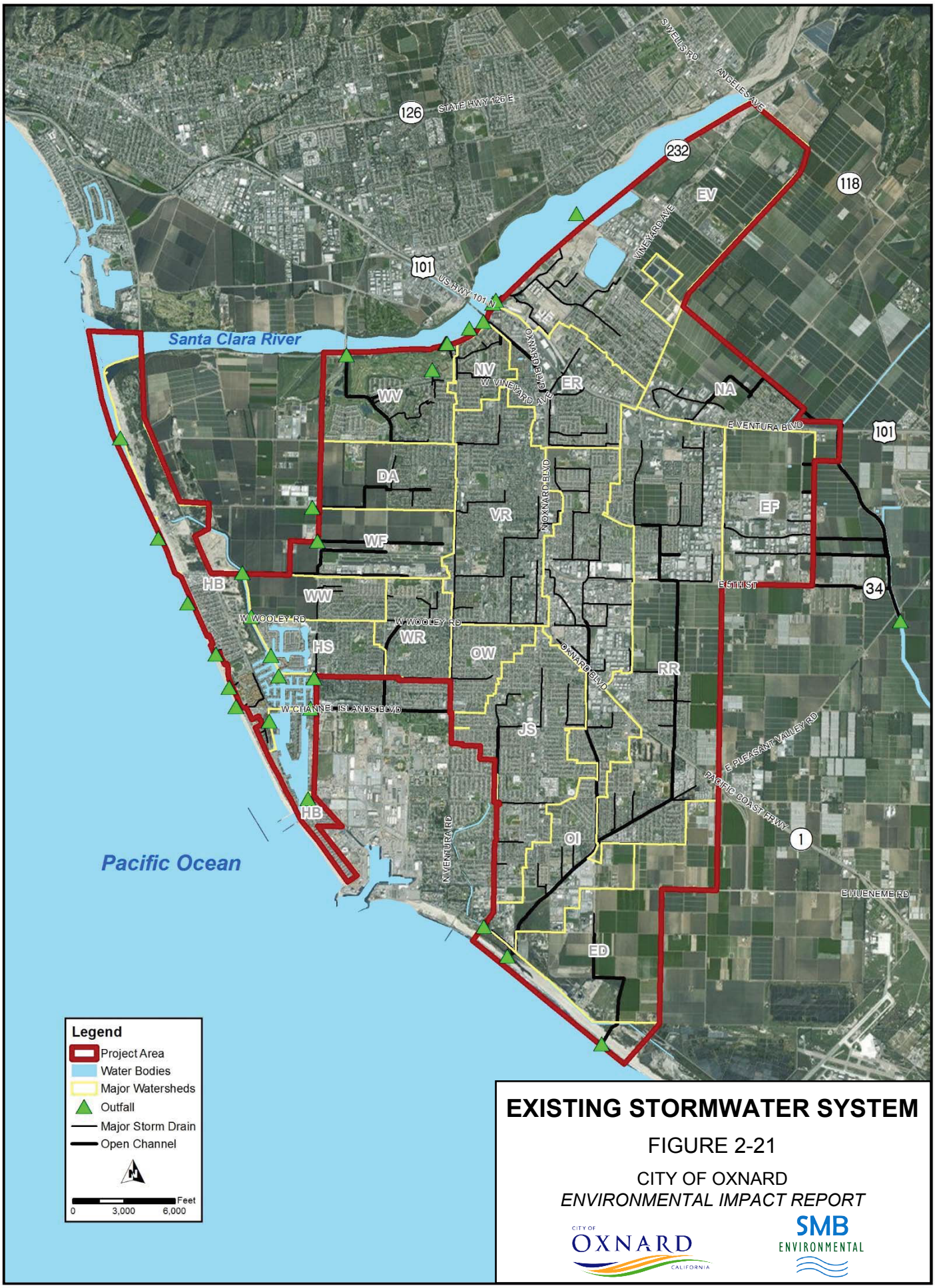
2.4.1 DESCRIPTION OF EXISTING STORMWATER FACILITIES

This section provides a description of the City's existing stormwater facilities.

2.4.1.1 Stormwater Collection System

The City's existing storm drainage system collects and conveys stormwater runoff from developed and undeveloped areas throughout the City. The system includes circular pipelines from 4- to 96-inches in diameter, rectangular pipes up to 264- by 96-inches wide, open channels, 5 stormwater pump stations and associated force mains, and various valves and diversion structures throughout the system. The majority (approximately 63 percent) of the pipes were built using reinforced concrete pipes (RCP).

Figure 2-21 shows the existing storm drainage system, including storm drain diameters, detention/retention ponds, pump stations, canals, and outfall locations. In total, the City owns approximately 162 miles of storm drains and open channels, and VCWPD has jurisdiction over 28 miles of open channels.



EXISTING STORMWATER SYSTEM

FIGURE 2-21

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

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The VCWPD, previously called the Ventura County Flood Control District (VCFCD), was formed in 1944 to perform drainage services not readily performed by local agencies. The City resides in the VCWPD Flood Zone 2 and City drainage facilities discharge into the VCWPD channels whenever possible. Major drainage channels within Oxnard include Doris Avenue Drain, Fifth Street Drain, Wooley Road Drain, Oxnard West Drain, Ormond Lagoon Waterway, Rice Road Drain, Tsomas Creek, El Rio Drain, Camarillo Drain, and Nyeland Drain.

2.4.1.2 Condition Assessment

Between September 12, 2014, and September 18, 2014, a condition assessment was conducted of select storm drain facilities throughout the City. Assets for inspection were chosen based on age, slope, and proximity to areas prone to flooding. Groupings of old assets with small slopes located near flood-prone areas were assessed first.

This evaluation involved visually inspecting the topsides of 304 manholes, catch basins, pipes, channels, flood zones, and outfalls, as well as select areas that have flooded in the past. In total, 29 sites were assessed, representing 2 percent of the entire stormwater collection system.

Although the majority of the assets were in excellent condition, the assessment found that approximately 12 percent are in need of immediate attention or attention within the next five years. Furthermore, although the majority of assets showed negligible amounts of sediment, sediment build-up is a concern in approximately 12 percent of the stormwater collection system assets. These assets had moderate to significant sediment buildup and should be cleaned within five years. Figure 2-22 illustrates the locations of assets in poor condition. Priority 4 assets in orange are in poor condition, and priority 5 assets in red require immediate attention.

2.4.2 FUTURE STORMWATER FACILITY NEEDS AND OPPORTUNITIES

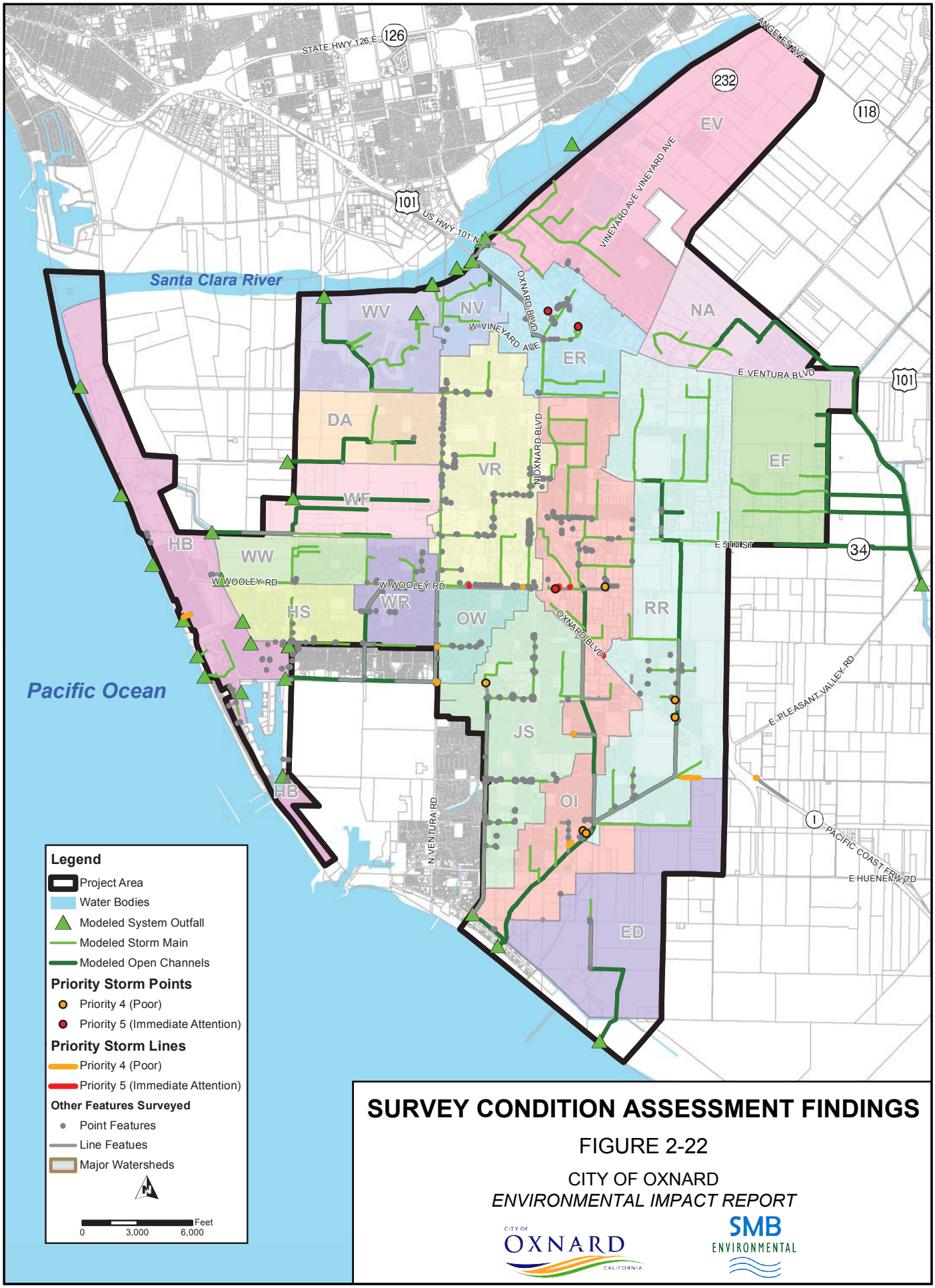
The capacity and performance of the existing stormwater system were compared with LOS criteria to locate system shortfalls. In general, the system has adequate capacity to meet current and future demand conditions. However, some capacity deficits and R&R needs exist.

2.4.2.1 Stormwater Collection System

Capacity

As part of the planning effort, Carollo developed a storm drainage hydrologic and hydraulic model for the City in SewerGEMS. The model was used to identify existing system deficiencies, characterize infrastructure needs for future growth, and develop capital improvements to mitigate deficiencies and meet the City's planning criteria.

To develop the model, a capacity analysis was performed on pipelines 24-inches in diameter and larger as well as other critical facilities of all sizes. The first step in the capacity analysis was to divide the 22,709 acres within the service area into 418 individual subcatchments. In addition, appropriate outlet points (i.e., drainage inlets and catch basins in City Streets or nearby manholes) were defined. The resulting subcatchments range from 1.7 acres to 374.9 acres and average approximately 54.3 acres.



SURVEY CONDITION ASSESSMENT FINDINGS

FIGURE 2-22

CITY OF OXNARD

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CITY OF OXNARD CALIFORNIA

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Rainfall data were used to generate the basis for stormwater evaluations. As shown in Figure 2-23, a 10-year 24-hour storm (total rainfall of 4-inches) and a 100-year 24-hour storm (total rainfall of 6.4-inches) were used for the capacity assessment.

Results from the modeling effort indicate that during the 10-year, 24-hour design storm, the hydraulic grade line (HGL) in the Ventura channels is elevated, which causes significant surcharging in the City's storm pipes that drain to the channels. However, because the Ventura channels have insufficient conveyance capacity and the City's pipes are not capacity deficient, no improvements to the City's drainage pipes are proposed. Instead, the recommendation is to improve the Ventura channel conveyance to lower the HGL and allow more stormwater to drain to the canals without being held upstream in the City's system.

The modeling effort also indicated that the majority of the surcharging and flooding problems under the 10-year design storm are located in Ventura Road, Tsomas Creek, Ormond Lagoon Waterway, and north of Rice Road Avenue watersheds, which correspond to the City's downtown core. The existing storm drain system also lacks sufficient capacity to convey the 100-year design runoff while meeting the flooding criteria.

The project team evaluated the reasonableness of the model results by comparing them with the City's observations. Based on staff observations during storm events, the model results confirmed areas around the City that typically experience flooding.

In addition to the sewerGEMS model, the City recently completed a Green Alleys Plan. This plan had two goals: to identify the City's alleys that are good candidates for green alley projects and to provide a framework for the future design and implementation of these projects.

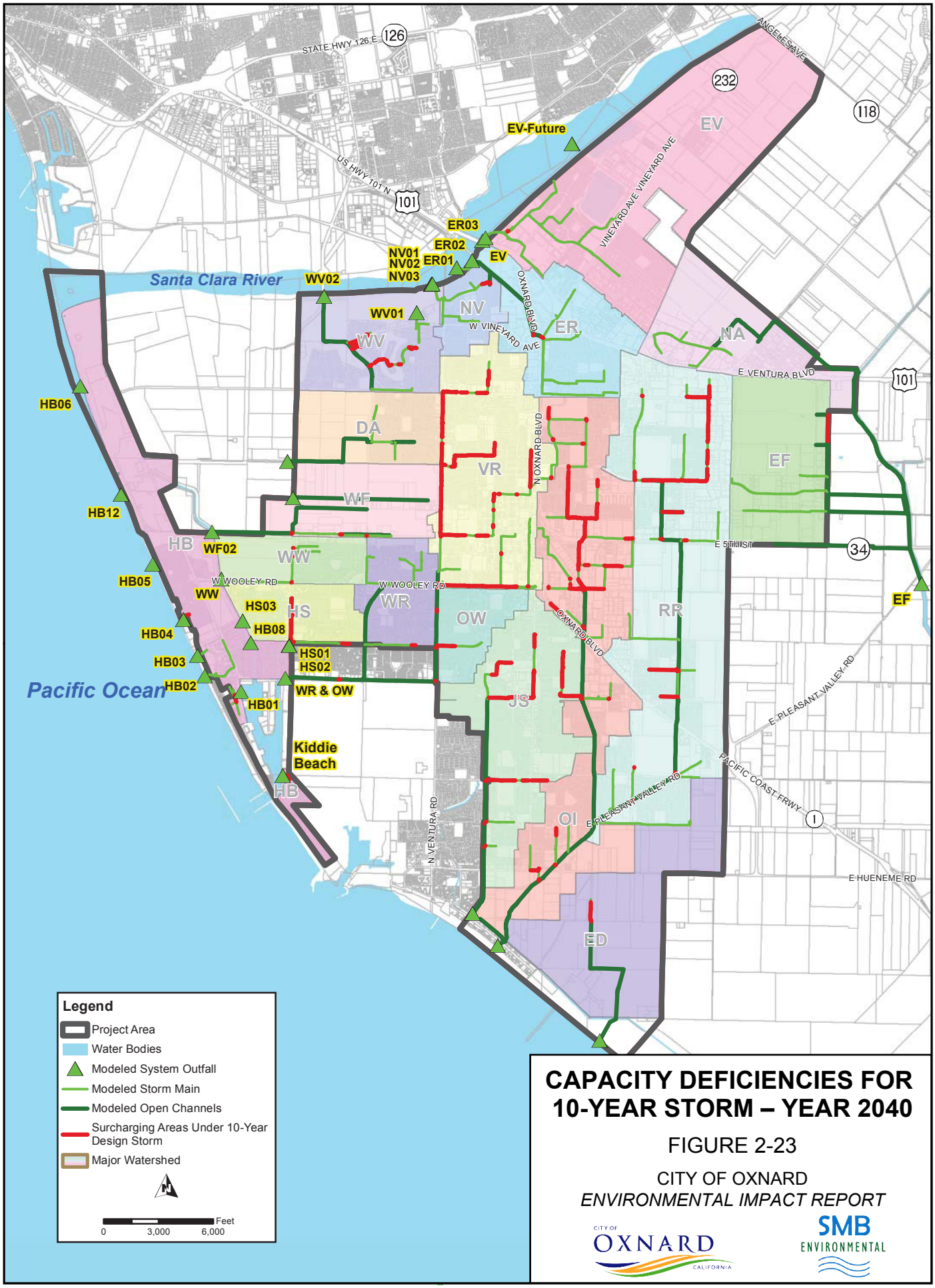
After comparing the environmental prioritization results performed in the Green Alley program, some of the high priority public alleys were noted to overlap with the observed areas of flooding. As a result, it is recommended, where appropriate, that the City incorporate bioswales, permeable paving, or rain barrels (for community gardens) to help decrease flooding in these locations. Figure 2-24 shows the areas of high priority for Green Alleys projects and the existing flooding areas.

R&R

As previously mentioned, approximately 12 percent of the assets need immediate attention or attention within the next five years. These assets are in poor or very poor condition. In addition, sediment build-up was a problem in approximately 12 percent of the assets.

2.4.2.2 New Stormwater Projects

A number of new stormwater projects were considered to achieve the goals outlined in the PWIMP. The goal of these projects is to improve stormwater quality so it can be harvested as an additional water source and meet regulatory requirements. Once an initial list of stormwater project options was identified, all options went through a fatal flaw screening to determine which were the most viable. From this screening, three new stormwater projects were selected: dry weather diversion, a citywide incentive program, and total maximum daily load (TMDL) compliance. Each project is described in the following sections.



CAPACITY DEFICIENCIES FOR 10-YEAR STORM – YEAR 2040

FIGURE 2-23

CITY OF OXNARD

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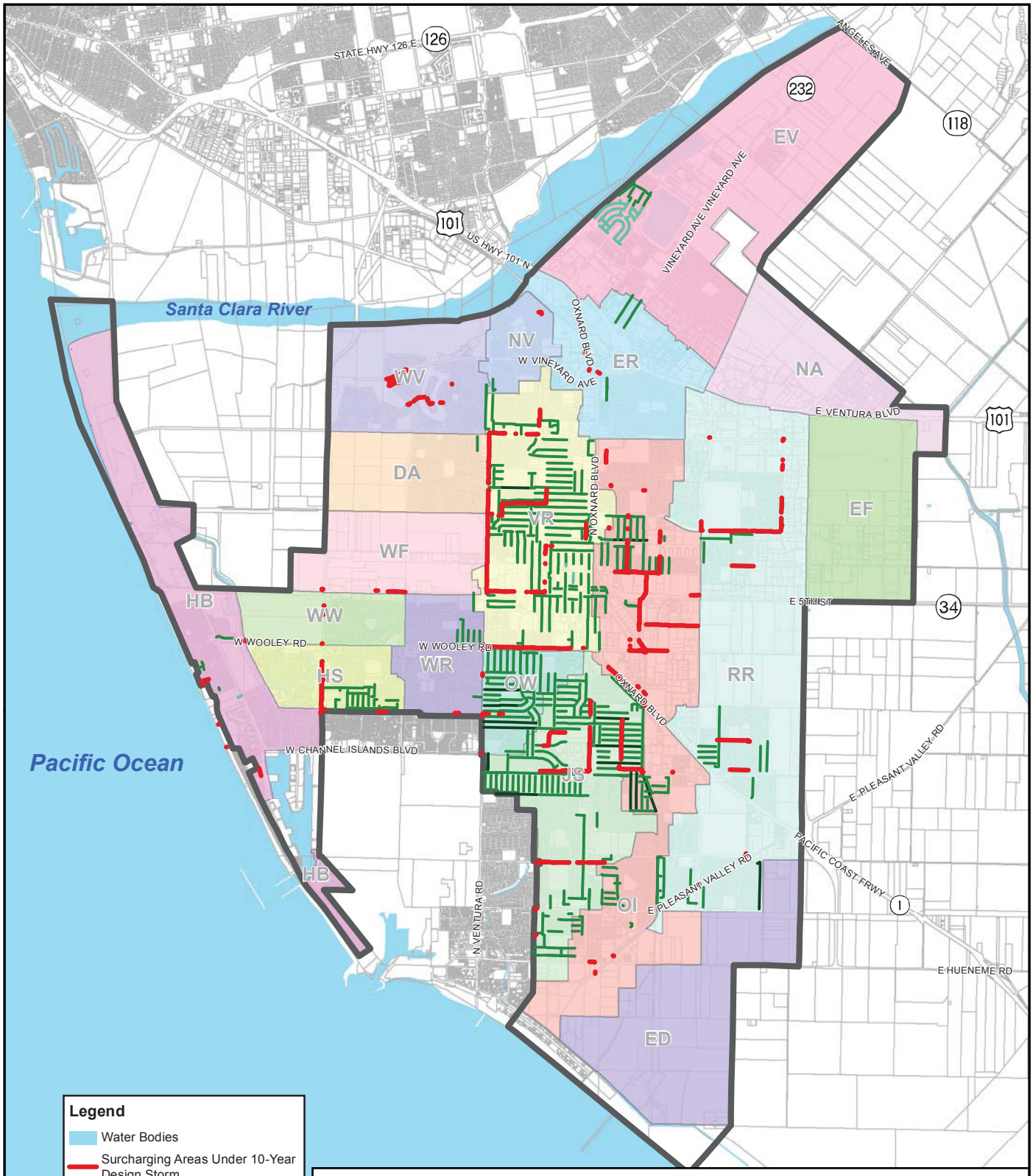

GREEN ALLEYS ENVIRONMENTAL IMPROVEMENTS AND FLOODING AREAS PRIORITIZATION

FIGURE 2-24

CITY OF OXNARD

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Dry Weather Diversion

The first project would divert dry weather stormwater channel flows to the Oxnard Wastewater Treatment Plant (OWTP) to be treated and potentially reused at the Advanced Water Purification Facility (AWPF). Dry weather flows include flow from irrigation runoff, pool draining, washdown water, construction work, and other related activities. In Oxnard, shallow groundwater infiltration is likely another component of dry weather 'stormwater' flow.

Water could be diverted from the stormwater collection system in a number of ways. Typically, stormwater diversion structures in California are constructed to first screen water for trash and then pumping water from a stormwater pump station to a sanitary collection system. However, water can also be diverted in an open channel by installing an inflatable dam or mechanical gate. Water that builds up behind the dam or gate can then be pumped into the sanitary collection system. The diverted stormwater would be treated downstream at the OWTP and potentially the AWPF.

A dry weather diversion could be used only when the OWTP has excess capacity. In Oxnard's case, storage would not be required because dry weather flows in stormwater channels occur year-round. To prevent significant water quality degradation of OWTP influent, however, dry weather diversions should be kept small in proportion to OWTP influent.

Before this project could be implemented, the City should consider the effects removing this dry weather storm channel flow could have on downstream habitat. Additionally, water quality implications should be studied further.

City-wide Incentive Program

The second project is a citywide incentive program that would involve capturing stormwater to offset potable water use. A program like this would encourage new developers to invest in rainwater harvesting and onsite reuse. It would also give interested residents the opportunity to retrofit their homes with rain barrels or rain cisterns. These measures would lower the risk of flooding and would encourage residents and developers to take a proactive stance on stormwater.

The City could encourage such rainwater collection in several ways. It could provide discounted rain barrels and cisterns for purchase or offer a discount on water utilities bills. Such incentives could be provided for both existing landowners and developers. The cost for such an incentive program would depend entirely on its size and the amount the City is willing to offset.

Since the City is located on a shallow perched aquifer, the PWIMP recommends focusing any incentive program on onsite capture and use instead of infiltration. This focus will decrease customers' potable water use for landscape irrigation the most.

TMDL Compliance

The final project involves meeting a TMDL for indicator bacteria. The Los Angeles Regional Water Quality Control Board (LARWQCB) adopted a TMDL for indicator bacteria in the Santa Clara River Estuary. This TMDL requires participating agencies like the City to prepare an implementation plan outlining proposed activities to achieve a reduction in bacteria load.

In March 2015, a draft implementation plan was developed that located potential infiltration basins and subsurface infiltration basins for both dry and wet weather stormwater throughout the watershed. South

Bank Park in Oxnard was one of the locations identified. This location, shown in Figure 2-25, is the proposed site for a subsurface infiltration basin.

This infiltration basin would be sized to treat the 85th percentile volume from the local drainage area and would require approximately 85,000 square feet. It would be approximately 2-feet deep and infiltrate at a rate of 0.5-inches per hour.

2.4.3 PROPOSED STORMWATER PROJECTS

Detailed below is a summary of the proposed stormwater projects.

2.4.3.1 Stormwater Collection System

Stormwater collection system improvements were focused on capacity and R&R needs and based on the capacity assessment and condition assessment, respectively. Through these assessments, 13 main capacity projects were identified. These projects are summarized in Table 2-16.

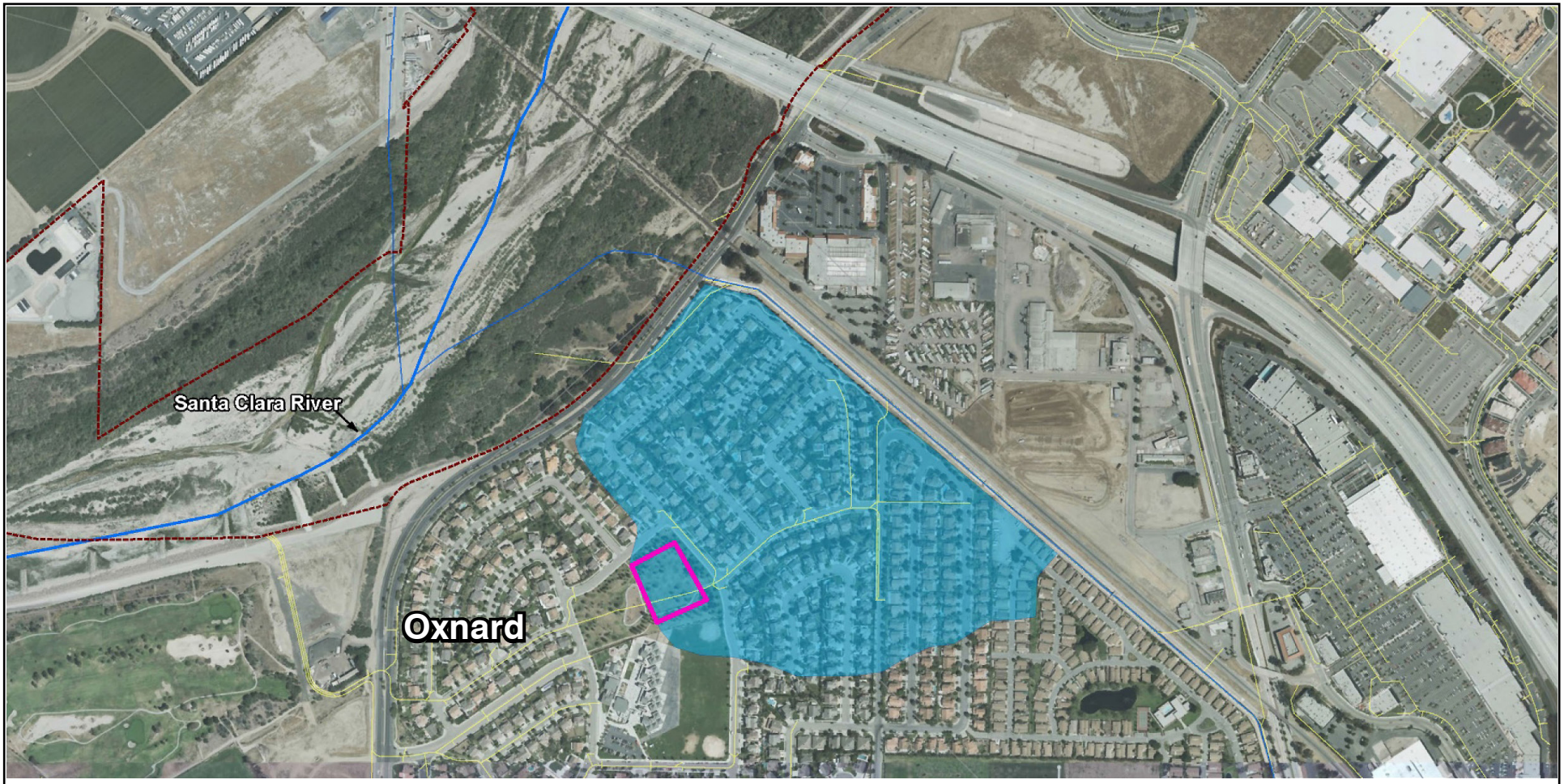
In addition, a total of 21 assets with a Level 4 rating were identified, as was an asset with a Level 5 rating that requires R&R. An overall schedule for these R&R needs can be found in Figure 2-26.

2.4.3.2 New Stormwater Projects

As outlined above, three new stormwater projects have been proposed for the PWIMP. The infiltration basin, recommended for TMDL compliance, should be implemented, since it is required to meet the Santa Clara River's indicator bacteria TMDL. The remaining two projects, a dry weather diversion and an incentive program, should be considered for future implementation. For more information about these projects, refer to Table 2-17. For an overall schedule, refer to Figure 2-26.

Table 2-16
Recommended Collection System Projects
Public Works Integrated Master Plan
City of Oxnard

Project Name	Driver	Phase
Drainage Basin WV (444 ft)	Capacity	2
Drainage Basin WV (748 ft)	Capacity	4
Drainage Basin OI (607 ft)	Capacity	2
Drainage Basin RR (2,436 ft)	Capacity	3
Drainage Basin OI (2,388 ft)	Capacity	4
Drainage Basin VR (5,872 ft)	Capacity	1
Drainage Basin JS (1,421 ft)	Capacity	1
Drainage Basin JS (1,292 ft)	Capacity	2
Drainage Basin JS (426 ft)	Capacity	2
Drainage Basin JS (457 ft)	Capacity	2
Drainage Basin JS (655 ft)	Capacity	2
Drainage Basin JS (701 ft)	Capacity	2
Drainage Basin HS (1,552 ft)	Capacity	2
22 assets	R&R	1
General Note: For the pipeline replacement projects, see the hydraulic models developed as part of the PWIMP to identify the exact pipeline locations.		



N

0.1 0.05 0 0.1 Miles

LEGEND

- Regional BMP Parcel
- BMP Drainage Area
- IP Area
- Santa Clara River
- Santa Clara River Watershed
- Tributaries to SCR
- Storm Drains

Source: "Draft Lower Santa Clara River TMDL Implementation Plan," Geosyntec, March 2015.

PROPOSED INFILTRATION BASIN FOR TMDL COMPLIANCE

FIGURE 2-25

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Stormwater CIP Projects Schedule

Design | Bid/Award Contract | Construction

Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2
Drainage Basin: WV - Length 444 ft																								
Drainage Basin: WV - Length 748 ft																								
Drainage Basin: OI - Length 607 ft																								
Drainage Basin: RR - Length 2,436 ft																								
Drainage Basin: OI - Length 2,388 ft																								
Drainage Basin: VR - Length 5,872 ft																								
Drainage Basin: JS - Length 1,421 ft																								
Drainage Basin: JS - Length 1,292 ft																								
Drainage Basin: JS - Length 426 ft																								
Drainage Basin: JS - Length 457 ft																								
Drainage Basin: JS - Length 655 ft																								
Drainage Basin: JS - Length 701 ft																								
Drainage Basin: HS - Length 1,552 ft																								
22 assets identified in the condition assessment																								
Dry Weather Diversion Structure																								
City-Wide Incentive Program																								
Santa Clara River Total Maximum Daily Load (TMDL) Infiltration Basin																								
Mandalay Beach Areas																								

Notes:
(1) Project start year moved two years later compared to 2015 CIP.
(2) Project start year adjusted with City input and do not correspond to Dec. 2015 publication start year.

RECOMMENDED STORMWATER PROJECTS SCHEDULE

FIGURE 2-26

CITY OF OXNARD
ENVIRONMENTAL IMPACT REPORT

CITY OF OXNARD CALIFORNIA | SMB ENVIRONMENTAL

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Table 2-17
Recommended New Stormwater Projects
Public Works Integrated Master Plan
City of Oxnard

Project Name	Driver	Start Year	Phase Ranking
Dry Weather Diversion Structure	Resource Sustainability	2021	2
City-Wide Incentive Program	Resource Sustainability	2021	2
TMDL Infiltration Basin	Resource Sustainability	2023	2

2.5 Construction Considerations

Construction of the PWIMP is expected to spring of 2019 and will likely continue into for 15-20 years through 2040. Construction work will typically be done within normal working hours, weekdays between the hours of 7 a.m. and 8 p.m., and possibly on Saturdays between the hours of 10 a.m. and 6 p.m. The PWIMP would be constructed primarily within existing easements, roadways, and rights-of-ways. Any damages occurring during construction will be returned to the pre-construction condition or better. The following describes typical construction methods to be used for PWIMP project/facility components:

- Construction of stationary facilities (e.g., AWPF expansion, desalter expansion, pump stations, reservoirs, and wells) would include site preparation, equipment delivery, and building construction. Some excavation and grading would be required for locations with uneven gradient. Ground clearing and excavation of the sites would be performed using heavy construction equipment such as bulldozers, backhoes, cranes, and graders. Upon completion of excavation, construction activities would also include pouring concrete footings for tanks, laying pipeline and making connections, installing support equipment such as control panels, and fencing the perimeter of the site.
- Proposed new and rehabilitated/replaced pipelines and conveyance facilities would be installed using both conventional open-trench and horizontal directional drilling construction techniques, with most of the construction using the former method. Pipe sections would be placed in a trench of varying depth depending on pipe size and topography, and covered using conventional equipment such as backhoes and compactors. For portions of the alignment where it is not feasible to perform open-cut trenching (such as State highway crossings, stream and drainage crossings, and high utility congestion areas), tunneling technology methods such as boring and jacking, micro-tunneling or horizontal directional drilling may be used.
- All construction activities would be restricted to the ROW approved by the applicable landowner or agency. All roadways disturbed during pipeline/conveyance facility installation would be restored. Generally, trench spoils would be temporarily stockpiled within the construction easement, then backfilled into the trench after pipeline/conveyance facility installation.

2.6 Potential Responsible Agencies, Permits and Approvals

The Proposed Project, with its myriad distinct components and range of alternatives, is a complex project. Numerous federal, state, and local regulations and permit requirements would apply to the construction and operation of the Proposed Project. Table 2-18 lists the major federal, state, and local permits, approvals, and consultations identified likely to be required for the construction and operation of the Proposed Project. Table 2-18 is not intended to be exclusive and/or an exhaustive list. Other permits and approvals may be required. If so, the lead agency(s) would be bound by law to comply with such requirements.

Table 2-18
Potential Regulatory Requirements, Permits, and Authorizations for Project Facilities
Public Works Implementation Plan
City of Oxnard

Agency	Permit or Approval	Activity Requiring Permit or Approval/Comment
Federal		
Bureau of Reclamation	Discretionary Funding Approval	Required if federal funding is used for construction of any PWIMP Program element
State		
California Coastal Commission	Coastal Development Permit	Required because portions of the projects would be located within the coastal zone
	Federal Consistency Review	Required if federal funding is used for construction of project facilities
California Department of Health Services	Domestic Water Permit Amendment	Required to add operation of new water supply facilities to the City of Oxnard's current Domestic Water Permit
	Title 22 Engineering Report Approval	Required for approval to operate the water recycling element of the PWIMP
California Department of Transportation, District 7	Encroachment Permit	Required for use of Caltrans road right-of-ways
California Division of Occupational Safety and Health	Construction Permit	Required for construction of facilities
	Trenching and Excavation Permit	Required for the construction of conveyance pipelines
	Tunneling Permit	Required for portions of the water supply and/or recycled water delivery system that are tunneled beneath roadways or drainage crossings
California Regional Water Quality Control Board, Los Angeles Region (4)	National Pollutant Discharge Elimination System (NPDES) Permit	Required for discharges to surface or groundwater
	Waste Discharge Requirements (WDR)	Required for desalination and brine discharge
	Construction General Permit 99-08- DWQ	Required for projects that disturb more than 5 acres (including trenching and staging areas)

Chapter 3 Environmental Analysis

3.0 Introduction

This section presents potential environmental impacts of the PWIMP or Proposed Project. The scope of the analysis and key attributes of the analytical approach are presented below to assist readers in understanding the manner in which the impact analyses have been conducted in this EIR.

3.0.1 Scope of the Environmental Impact Analysis

Based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines, this Program EIR addresses the following environmental resource topics in detail:

Subsection #	Subsection Title
3.1	Aesthetics/Visual Resources
3.2	Agricultural and Soil Resources
3.3	Air Quality
3.4	Biological Resources
3.5	Climate Change and Greenhouse Gases
3.6	Cultural, Paleontological, and Tribal Resources
3.7	Geology, Seismic, and Soils Hazards
3.8	Hazards and Hazardous Wastes
3.9	Hydrology, Water Quality, and Water Utilities
3.10	Land Use Planning
3.11	Mineral Resources
3.12	Noise
3.13	Traffic and Transportation

For each resource topic, the CEQA EIR describes the existing environmental setting and regulatory framework, evaluates potential project impacts, and recommends mitigation measures that could reduce or avoid potentially significant impact(s).

3.0.2 Environmental Resources Eliminated From Further Discussion

As discussed in Chapter 1, Introduction, the primary purpose of the PWIMP is to improve the City's existing water, recycled water, wastewater, and stormwater systems to accommodate existing and projected planned and City Council approved growth based on the City's current and approved 2030 General Plan. As such, the PWIMP, in and of itself, will not cause or affect population growth, housing, community, environmental justice, and/or the need for additional public services. Further, the PWIMP will not affect socioeconomics, minority populations, or employment within the City and/or Ventura County. Many of these categories are very similar and related to potentially accommodating planned and

approved growth by the City Council. Therefore, it would be repetitive to repeat them as individual chapters or discussions. Population and growth inducing effects are discussed in **Chapter 5, Growth Inducing Impacts** as required by CEQA. The following specific categories are thereby eliminated from further discussion for the following reasons/justifications:

Population. The PWIMP is anticipated to employ approximately 10-to-85 construction workers during any given day of the approximately 15-to-20-year construction period. Although there might be a slight increase in the population of the City during the construction phase of the project, it is anticipated that sufficient skilled labor could be provided locally or regionally, resulting in workers commuting to the project area on a daily or weekly basis. Due to the short-term and temporary nature of construction and use of local and regional skilled labor, the proposed project would not induce substantial growth, cause a concentration of population, or displace people. The operation of the new PWIMP facilities would employ less than 10 additional employees on a full-time basis. Given the relatively small number of new jobs and local and/or regional fulfillment of labor needs, project operation would not induce substantial growth, cause a new concentration of population, or displace people. As a result, the construction and operation of the PWIMP, in and of itself, would not significantly affect population and this topic is not discussed further.

Housing. With respect to housing, as the source of temporary skilled labor for the project being local or regional, substantial amounts of short-term housing would not be required for construction workers. Any short-term housing needs would be met by existing capacity of local hotel or motel rooms. Further, extensive housing would not be needed for the 10 additional full-time workers. Although the housing markets in both the City and Ventura County are tight, the short-term and permanent housing needs associated with the PWIMP would not result in a significant impact to existing housing resources. As a result, this topic is not discussed further.

Community. Construction of PWIMP facilities would primarily involve expansion of existing facilities or placement of new facilities within vacant parcels in industrial areas of the City. Pipeline/conveyance facilities are proposed within or immediately adjacent to existing road rights-of-way. Therefore, no disruption or division of an established community is anticipated and no impacts would occur. As a result, this topic is not discussed further.

Socioeconomics and Employment. The PWIMP is an approximately $1 Billion improvements project that would definitely benefit the City, portions of Ventura County, and/or the region. This would be a beneficial socioeconomic impact. The construction of the PWIMP is expected to result in a temporary increase in construction-related jobs. The PWIMP is anticipated to employ approximately 10-to-85 construction workers during any given day of the approximately 15-to-20-year construction period. Although there might be a slight increase in the population of the City during the construction phase of the project, it is anticipated that sufficient skilled labor could be provided locally or regionally, resulting in workers commuting to the project area on a daily or weekly basis. Due to the short-term and temporary nature of construction and use of local and regional skilled labor, the proposed project would not induce substantial growth, cause a concentration of population, or displace people. This is expected to be beneficial and would not be a significant adverse impact. The operation of the new PWIMP facilities would employ less than 10 additional employees on a full-time basis. Based on availability of the local work force, it is anticipated that sufficient skilled labor could be provided from the local or regional Oxnard/Ventura County area. Given the relatively small number of new jobs and local and/or regional fulfillment of labor needs, project operation would not induce substantial growth, cause a new

concentration of population, or displace people. Because the City is seeking to acquire private land to construct the proposed project, the loss of this private property from the tax rolls is likely to have a small but insignificant negative impact on property tax revenues. The construction jobs are likely to result in a slight but temporary increase in personal income as well as sales tax revenues. Thus, changes in income are not expected to be significant. As a result, this topic is not discussed further.

Environmental Justice. According to the data provided in the City's 2030 General Plan and as updated, the City has a greater percentage of disadvantaged, minority, and/or Hispanic populations than the County. However, the construction and operation of the PWIMP is located City-wide as well as portions of Ventura County and does not focus or discriminate against any one area, community, minority, and/or disadvantaged population. In fact, implementation of the PWIMP would help the entire population of the City and portions of Ventura County equally. As a result, this topic is not discussed further.

Public Services, Other Utilities, and Recreation. The construction and/or operation of the PWIMP would not increase the need for additional public services and other utilities within the City and portions of Ventura County in the PWIMP Area beyond those described in this Program EIR's Project Description. Specifically, the PWIMP involves improving the City's water, recycled water, wastewater and srormwater systems to accommodate planned and approved growth as described in the City's 2030 General Plan. As such, the PWIMP, in and of itself, will not require additional needs from the City or County, including but not limited to, the police, fire, social services, education, other utilities, parks, and/or recreation facilities. Construction activities could affect other existing utilities within the existing roadways or rights-of-ways such as gas, electrical, cable, and telecommunications lines or infrastructure, but these potential impacts are already addressed in **Section 3.9 Hydrology, Water Quality, and Water Utilities** and would be returned to service and existing conditions or better after construction. Also, there is a low percentage possibility that the PWIMP's new wells and/or storage tanks could be located on or near existing parks or recreational facilities. However, these kinds of impacts are already addressed in **Section 3.10 - Land Use Planning.** As a result, these are not repeated in individual chapter(s).

3.0.3 Definition of Baseline or Existing Conditions

The Existing Conditions subsections present the existing environmental setting of the region and study area in relation to each of the resource topics. According to CEQA Guidelines Section 15125 (Environmental Setting), an EIR must include a description of the existing physical environmental conditions in the vicinity of the project, to provide the "baseline physical conditions" against which project-related changes can be compared. Based on the CEQA Guidelines, the baseline condition is normally the physical condition that exists when the Notice of Preparation is published. The Notice of Preparation for the proposed project was published on July 27, 2016, establishing the baseline for this Program EIR as 2016. Throughout this Program EIR, 2016 data is used for the description of the environmental setting to the extent available. Where such information is not available, data from the City's 2030 General Plan and other appropriate data is used to be representative of baseline conditions.

3.0.4 Definition of Project Area and Study Area

The project area consists of areas within the City of Oxnard and portions of unincorporated Ventura County as were previously described in **Chapter 2, Project Description**, and are further described throughout this section. The extent of any additional study area beyond the project area itself varies among resource topics, depending on the extent of the area in which impacts could be expected. A study area for each environmental topic is defined beyond the project area, as necessary and warranted, in the

various subsections of this section. For purposes of this document, the PWIMP Project/Study Area is essentially the same as the City's General Plan Area as shown on Figure 3.0-1.

3.0.5 Programmatic Environmental Impact Analysis

As described in Chapter 2, Project Description, the PWIMP establishes how the City's water, recycled water, wastewater, and stormwater systems would be upgraded and expanded in the coming years to meet the City's anticipated demands through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of the project-level projects are not precisely known at this time and will likely change significantly. As such, the environmental impact analysis has been prepared at a programmatic level of detail as it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but in some cases the analysis is general and more qualitative than quantitative. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

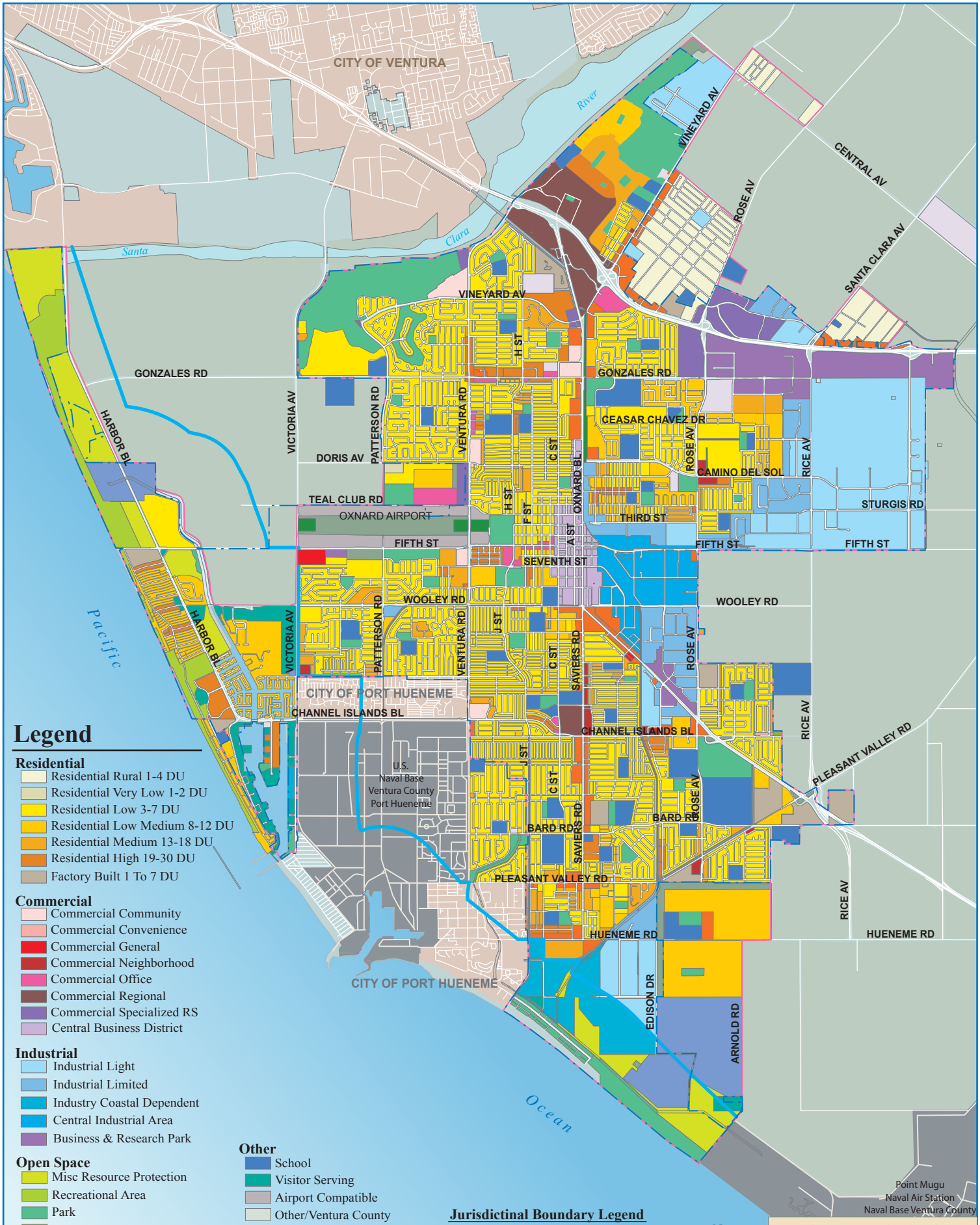
It is expected that each of the future project-level projects within the PWIMP will require further environmental and project-level analysis to be compliant with CEQA. These future project-level projects would tier off of this document for the full range of direct, indirect, cumulative, and growth inducing impacts. Depending on the type, location, timing, and potential environmental impacts of these future project-level projects, CEQA compliance can be achieved by a combination of individual project specific Addendums, Categorical Exemptions, Initial Study/Mitigated negative Declarations, and/or focused EIRs.

3.0.6 Impact Determinations

As required by CEQA, an EIR must identify and evaluate the significance of impacts caused by a proposed project. Evaluation of the significance of an impact involves a variety of factors, such as the applicable standards of significance, the use of standard analytical methodologies and modeling approaches, an assessment of the extent and characteristics of the project effect, consistency with conclusions reached for similar projects, and principles derived from CEQA case law. The standards of significance, analytical methodologies, and other aspects of the analyses are described in detail in each section. The impact significance determinations listed below were used in this analysis.

- **Significant Unavoidable (SU) –** This category applies to those impacts that have been determined to be significant or potentially significant and cannot be mitigated to less than significant. This determination is made when there is no mitigation available, or the available feasible mitigation measures would not reduce the impact to less than significant. A *Statement of Overriding Considerations* must be made by the City for any project approval that will involve significant impacts that cannot be mitigated to less than significant.

- **Less-than-Significant with Mitigation (LTSM) –** This category applies to those impacts that may be significant or potentially significant, but can be reduced to less than significant through either project modifications or feasible mitigation measures.
- **Less-than-Significant (LS) –** This category applies to effects of the project on the environment that could be adverse but are not significant or potentially significant, and therefore, do not require mitigation.



Legend

Residential
- Residential Rural 1-4 DU
- Residential Very Low 1-2 DU
- Residential Low 3-7 DU
- Residential Low Medium 8-12 DU
- Residential Medium 13-18 DU
- Residential High 19-30 DU
- Factory Built 1 To 7 DU

Commercial
- Commercial Community
- Commercial Convenience
- Commercial General
- Commercial Neighborhood
- Commercial Office
- Commercial Regional
- Commercial Specialized RS
- Central Business District

Industrial
- Industrial Light
- Industrial Limited
- Industry Coastal Dependent
- Central Industrial Area
- Business & Research Park

Open Space
- Misc Resource Protection
- Recreational Area
- Park
- Misc Ag/Planning Reserve
- Misc Open Space
- Open Space Buffer
- Misc Agriculture

Other
- School
- Visitor Serving
- Airport Compatible
- Other/Ventura County
- Military Base
- Public Utility/Energy Facility
- Public/Semi Public
- Easement

Jurisdictinal Boundary Legend
- Oxnard City Limits
- Oxnard Sphere of Influence
- Coastal Zone Boundary

N W E S

Figure 3.0-1
PWIMP and General Plan Map

Source: City of Oxnard GIS
Created By: City of Oxnard Planning & Environmental Services, 11-2005

0 1 2 3 4 Miles

- **No Impact (NI) –** This category refers to effects of the project on the environment that are not considered adverse.
- **Beneficial Impacts (B) –** CEQA does not require that beneficial impacts of a proposed project be identified and evaluated. However, this document identifies beneficial impacts if they are significant and address one or more of the identified project objectives, as identified in **Chapter 2, Project Description**.

3.0.7 Numbering Systems

Each of the environmental resource topics is evaluated in the numbered subsections shown above. The standards of significance and the impacts and mitigation measures in each subsection are also numbered. An example of the number system for each resource topic is provided below:

Numbering System for **Chapter 3.12, Noise**:

- **Environmental Impacts** – The impacts are numbered Impact 3.12-1, Impact 3.12-2, Impact 3.12-3, etc. Impacts are discussed as construction and/or operational impacts as appropriate.
- **Mitigation Measures** – The mitigation measures are numbered based on which impact they address. For example, mitigation measures for Impact 3.12-1 are numbered Mitigation Measure 3.12-1a, Mitigation Measure 3.12-1b, Mitigation Measure 3.12-1c, etc.

3.0.8 Alternatives

In addition to the potential for direct and indirect impacts associated with the Proposed Project, alternatives to the Proposed Project are considered and evaluated. CEQA requires an EIR to describe and evaluate a reasonable range of alternatives to the Proposed Project that could feasibly attain most of the basic objectives of the Proposed project, while avoiding or substantially lessening any significant impacts (CEQA Guidelines Section 15126(a)). There is no iron clad rule governing the nature or scope of the alternatives to be discussed other than the rule of reason. The discussion of alternatives must focus on those alternatives that are capable of avoiding or substantially lessening the significant environmental effects of the proposed project. **Chapter 4, Alternatives,** identifies, considers, and evaluates various Alternatives that would meet the goals and objectives of the Proposed Project.

3.0.9 Growth Inducing Impacts

CEQA requires that an EIR evaluate the growth-inducing impacts of a proposed project[1]. A growth-inducing impact is defined as follows:

> *[T]he ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects, which would remove obstacles to population growth.... It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.*

The environmental effects of induced growth are secondary or indirect impacts of the project. Growth can result in significant increased demand on community services and public service infrastructure; increased traffic, noise, degradation of air and water quality; and conversion of agricultural land to urban uses.

[1] CEQA Guidelines Section 15126.2(d).

Based on the CEQA definition above, assessing the growth-inducement potential of a water, wastewater, recycled water, and stormwater project such as the Proposed Project involves answering the question:

> *Will construction and/or operation of the proposed water, wastewater, recycled water, and stormwater facilities and/or related infrastructure remove an obstacle to growth and thus directly or indirectly support more economic or population growth or residential construction in the surrounding environment?*

Chapter 5, Growth Inducement, evaluates the growth inducement potential of the PWIMP as well as any alternatives that may be carried forward for consideration of project approval.

3.0.10 Cumulative Effects

In addition to the potential for direct and indirect impacts associated with the PWIMP, the project may contribute to broader cumulative impacts, when considered together with other development that may cause related impacts. **Chapter 6, Cumulative Effects,** analyzes these potential effects.

3.1 Aesthetics/Visual Resources

This section describes the existing regulatory setting, the visual character of the PWIMP Planning Area(s), and evaluates how construction and operation of the components of the PWIMP could impact these aesthetic/visual resources. This evaluation of aesthetic resources was based on an initial review of existing reports and literature from the City of Oxnard. Additional sources of information included the California Department of Transportation's (Caltrans) Designated Scenic Route Map for Ventura County.

3.1.1 Introduction

Aesthetic (or visual resources) is a broad term used to identify the particular scenic qualities that define a place or landscape. The landscapes that define a particular area are a combination of four visual elements: landforms, water, vegetation, and human-made structures. The Program Area's location between the Pacific Coast and the Coastal Mountain Range provide an opportunity for a variety of unique aesthetic resources. Some key concepts and terminology include the following:

- **Coastal Zone.** A coastal zone is a land and water area of the State of California that extends seaward to the State's outer limit of jurisdiction, including all offshore islands, and extends inland generally 1,000 yards from the mean high tide line of the sea. In significant coastal estuarine, habitat, and recreational areas it extends inland to the first major ridgeline paralleling the sea or five miles from the mean high tide line of the sea, whichever is less, and in developed urban areas the zone generally extends inland less than 1,000 yards. The actual Coastal Zone boundary is delineated on a set of maps adopted by the State Legislature.
- **Greenbelt Agreement.** Greenbelt agreements are adopted by a joint resolution ordinance of the affected agencies and represent a policy commitment to the ongoing preservation of agricultural and open space areas.
- **Scenic Highway Corridor.** The area outside of a highway right-of-way that is generally visible to persons traveling on the highway.
- **Scenic Highway/Scenic Route.** A highway, road, drive, or street that, in addition to its transportation function, provides opportunities for the enjoyment of natural and human-made scenic resources and access or direct views to areas or scenes of exceptional beauty (including those of historic or cultural interest). The aesthetic values of scenic routes often are protected and enhanced by regulations governing the development of property or the placement of outdoor advertising. Until the mid-1980's, General Plans in California were required to include a Scenic Highways Element.
- **Scenic Area.** An open or mostly undeveloped area, the natural features of which are visually significant, or geologically or botanically unique.

3.1.2 Regulatory Context

The project is subject to specific state and local laws, ordinances, regulations, and standards for visual resources. There are no specific federal regulations that apply to the visual resources associated with the Project. Relevant State and local guidelines specific to aesthetic resource issues are discussed in this section.

3.1.2.1 State Regulations

The relevant state regulations include the following.

California Scenic Highway Program

California's Scenic Highway Program was created by the Legislature in 1963 to preserve and protect scenic highway corridors from change, which would diminish the aesthetic value of lands adjacent to highways. The State laws governing the Scenic Highway Program are found in the Streets and Highways Code, Section 260 et seq.

The State Scenic Highway System includes a list of highways that are either eligible for designation as scenic highways or have been so designated. These highways are identified in Section 263 of the Streets and Highways Code. A list of California's scenic highways and a map identifying their locations may be obtained from the Caltrans Scenic Highway Coordinators. According to the California Department of Transportation's (Caltrans) Map of Designated Scenic Routes, there are no official State-designated routes in the PWIMP Planning Area.

California Coastal Act

Portions of the Project study area are in the California Coastal Zone, as defined by the California Coastal Commission (CCC). The California Coastal Act requires that local government carry out its goals and policies through the Local Coastal Program (LCP) process. Each local jurisdiction with land in the Coastal Zone is required to prepare an LCP that contains a land use plan and land use regulations that implement the provision of the Coastal Act. The CCC works with local governments to shape each LCP and ensure that it conforms to Coastal Act goals and policies. Proposed developments within the coastal zone are required to obtain a Coastal Development Permit. One of the key standards used in the permitting of projects within the coastal zone is that they protect scenic landscapes and views of the sea. The following excerpt from the Coastal Act underscores its scenic protection policy:

Section 30251 Scenic and Visual Qualities – The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas. New development in highly scenic areas such as those designated in the California Coastline Preservation and Recreation Plan prepared by the Department of Parks and Recreation and by local government shall be subordinate to the character of its setting.

3.1.2.2 Local Regulations

The relevant local regulations include the following.

City of Oxnard – Coastal Land Use Plan

The Coastal Land Use Plan, drafted by the City of Oxnard in February of 1982, contains the policies by which all new development projects are assessed. Policies have been developed to address the issues of access, recreation, marine environment, land resources, new development and industrial development. Broadly, the policies mandate that an equal opportunity to enjoy coastal resources shall be provided through:

- Maximum public access for all economic segments of society shall be provided;
- Coastal areas suitable for recreational use should be preserved for that use;
- Marine resources shall be maintained and enhanced, where feasible, and restored;
- Sensitive habitats, prime agricultural land, and archaeological resources are to be preserved;
- New residential and commercial development is to be concentrated in existing developed areas, and consistent with service capacities; and
- Industrial developments, including coastal-dependent and energy facilities, are also to be concentrated and consolidated as much as possible.

Priorities are established for competing uses of local coastal resources. Preservation of sensitive habitat areas and coastal resources and the provision of coastal access are the highest priority. Preservation of lands suitable for agriculture is also given a high priority. In areas that are determined to be neither sensitive areas nor suitable for agriculture, coastal-dependent uses, including public recreational uses, coastal- dependent industries and energy facilities receive the highest priority.

Other private development is permitted on the areas not reserved for habitat preservation, agriculture, public recreation or coastal-dependent uses. Within the areas for private development, visitor-serving commercial uses receive priority over private developments.

Oxnard 2030 General Plan

As described above, the City has adopted an LCP that consists of a Coastal Land Use Plan and Coastal Zoning Regulations and Maps. Goals and policies provided in the City's combined Open Space/Conservation Element are consistent with the local coastal program.

Greenbelt Agreements

Within Ventura County, several cities, the County, and the Local Agency Formation Commission (LAFCO) have adopted greenbelt agreements between jurisdictions to assist in preserving agriculture and other open space lands located between cities. Greenbelt agreements are joint or co-adopted resolutions by cities, the County (when applicable) and LAFCO, whereby it is agreed to jointly administer a common policy of non-annexation and non-development in an agreed upon area. The basic purpose of the greenbelt is to establish a mutual agreement

between the participating jurisdictions regarding the limits of urban growth for each city. Allowable uses within these greenbelt areas are limited to various agricultural and open space uses.

The City of Oxnard is a participant in the following greenbelt agreements:

- **Oxnard-Camarillo Greenbelt Agreement.** During the 1980's the City signed a joint resolution with the City of Camarillo and the County of Ventura to create the Oxnard-Camarillo Greenbelt Agreement. This agreement calls for the preservation of a large agricultural area (approximately 27,000 acres) between the cities of Oxnard and Camarillo (see Figure 5-2).
- **Oxnard-Ventura Greenbelt Agreement.** The City also entered into an agreement with the City of Ventura back in 1994 for the preservation of 2,460 acres of agricultural land. This greenbelt area is located in the northwest portion of the Planning Area (see Figure 5-2).

As further evidence of Oxnard's commitment to agricultural preservation, the 2030 Oxnard General Plan encourages the expansion of the Oxnard-Camarillo Greenbelt in the eastern and southeastern areas of the PWIMP Planning Area. The City's existing 2030 General Plan also encourages the establishment of new greenbelts in the northwestern portion of the PWIMP Planning Area and north of the Santa Clara River in cooperation with the City of San Buenaventura and County of Ventura. Establishment and expansion of future greenbelt areas would only be made if these jurisdictions commit to prohibiting incompatible land uses (such as detention facilities and other non-agricultural and institutional uses) within the greenbelt boundaries.

3.1.3 Environmental Setting

The City and the PWIMP's Planning area is located in western Ventura County, midway between the cities of Santa Barbara and Los Angeles. The western and southern edges of the City are framed by the Pacific Ocean; the northern edge is bounded by the Santa Clara River, and the northeastern and eastern sides are bounded by agricultural lands that comprise the Oxnard-Camarillo Greenbelt.

The PWIMP Planning Area is defined by several natural and human-made aesthetic resources, including open spaces, beaches and coastline, agricultural areas, low rise commercial and residential development, as well as tall buildings which are visible in the City's skyline. To maintain the low profile character of the community, urban development is clustered in compact core areas surrounded by rural open areas and agricultural uses. Although the topography of the Planning Area is relatively flat, several prominent vertical features are visible throughout the area including several tall eucalyptus and cypress windrows (which provide a windscreen) and by new office/commercial development along the Ventura Freeway corridor.

Roadways also serve as important view corridors in the Planning Area. Access to the PWIMP Planning Area is provided by U.S. Route 101 (Ventura Freeway), State Route 1 (Pacific Coast Highway & Oxnard Boulevard), State Route 254 (Vineyard Avenue), and State Route 34 (Fifth Street). Many roadways traverse key scenic areas (i.e. coastal areas) and

provide travelers with a variety of views.

Scenic Areas/View Corridors

Key aesthetic resources (including scenic areas and view corridors) are described below. An overview of where these key scenic areas occur within the PWIMP Planning Area is provided in Figure 3.1-1, with several typical views provided in Figures 3.1-2 through 3.1-7.

Local Waterways

The primary waterway in the PWIMP Planning Area is the Santa Clara River, which forms a strong natural boundary north of the City (see Figure 3.1-1). The entire river flows approximately 100 miles from its headwaters near Acton, California, to the Pacific Ocean. Extensive patches of high-quality riparian habitat, totaling over 4,000 acres, are present along the entire length of the river, whose large sediment deposits contribute greatly to beaches west of the City. Threats to the ecological health of the river include urban development, channelization, oil spills, stormwater runoff pollution, and the possible resumption of large-scale aggregate mining in the channel. Numerous smaller waterways also traverse the Planning Area (including Beardsley Wash, Revolon Channel, etc.) and provide valuable natural scenery, recreational areas, and wildlife habitat. Many of these local waterways are visible from several view points including local roadways (see Figure 3.1-2).

Agricultural Open Space

Lands on the periphery of the City are largely agricultural in nature. These agricultural greenbelt areas are found in the northeastern, eastern and northwestern portions of the Planning Area (see Figure 3.1-1). Agricultural greenbelt areas provide an important open space quality to the Planning Area and allow unrestricted views of the Coastal Mountain Range to the east, south, and north. Figure 3.1-3 provides one example of this important scenic resource, with a typical motorist view of agricultural areas along West Gonzalez Road, looking south. Figure 3.1-3 provides a view of the greenbelt area south of Hueneme Road near Point Mugu.

Beaches and Coastline

The City's beaches and coastline are recognized as the City's primary natural scenic resource, with three State beaches located within the overall PWIMP Planning Area: McGrath State Beach, Oxnard State Beach and Mandalay Beach State Park (see Figure 3.1-3). Local and State beaches provide unique views of the Pacific Ocean and the offshore Channel Islands on clear days (see Figure 3.1-4). Other visual resources in the Coastal Zone include tall sand dunes near the Mandalay Beach (see Figure 3.1-4) and the wetlands in the Ormond Beach area; though, they are largely undeveloped and difficult to access. In order to preserve the aesthetic quality of the Planning Area's coastline, the City's Coastal Land Use Plan greatly regulates development along the Coastal Zone.

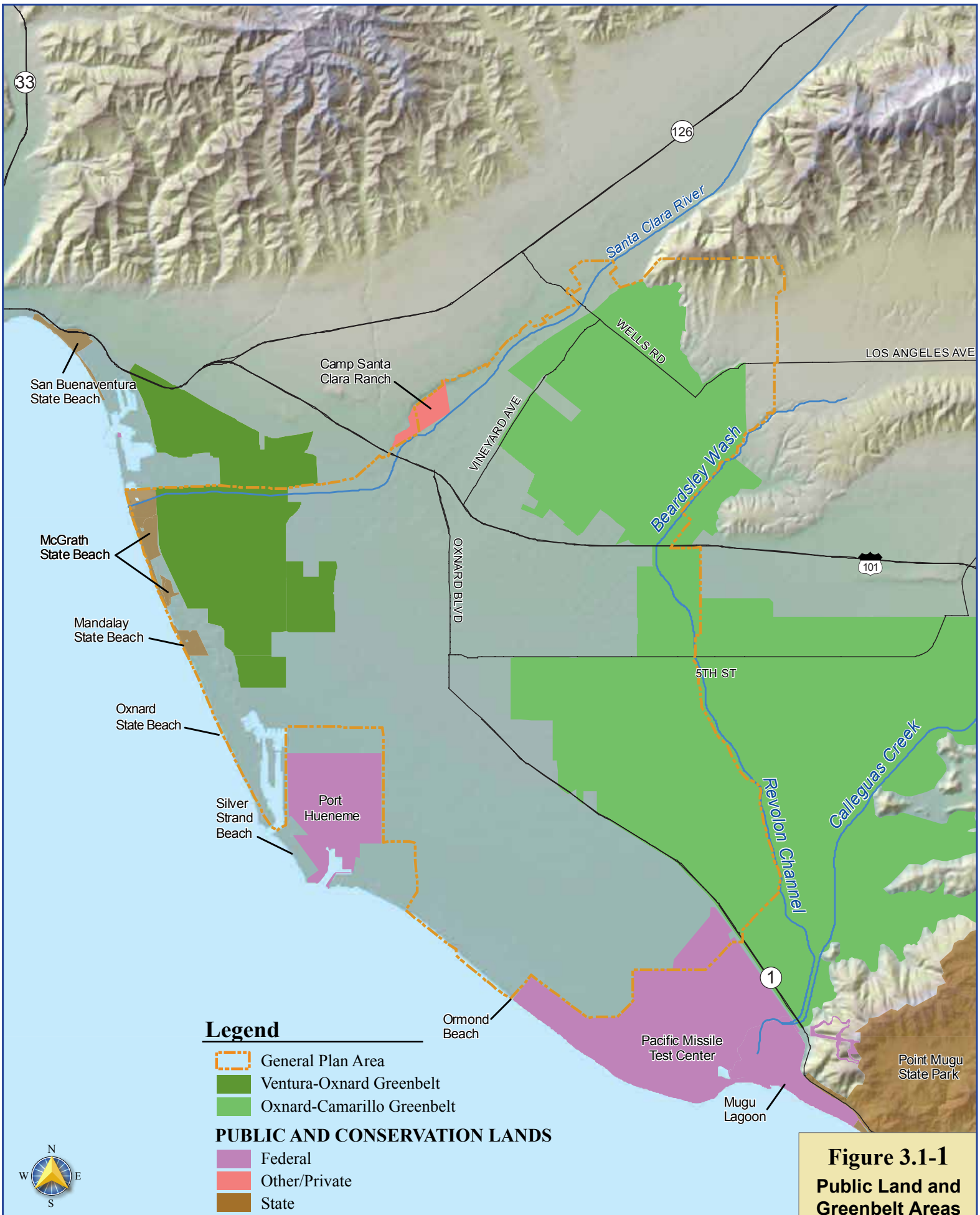


Figure 3.1-1
Public Land and Greenbelt Areas

Source: USG and City of Oxnard, 2016

VIEW: Motorist's view of Edison Canal from West Fifth Street.

VIEW: Motorist's view of Revolon Channel.

Figure 3.1-2
Local Waterways

Source: City of Oxnard, 2016

VIEW: Motorist's view looking south from W. Gonzales Road

VIEW: Pedestrian/motorist's view of the Oxnard-Camarillo Greenbelt looking south toward Pt. Mugu State Park/Santa Monica Mountains.

Figure 3.1-3
Agricultural Open Space

Source: City of Oxnard, 2016

VIEW: Pedestrian's view from the jetty on Silver Strand Beach looking west toward Anacapa Island.

VIEW: Pedestrian's view from Mandalay Beach looking northeast toward sand dunes and the Los Padres Mountains.

Figure 3.1-4
Beaches and Coastline

Source: City of Oxnard, 2016

VIEW: Motorist's view of the Union Bank tower while driving north on Oxnard Boulevard.

VIEW: Motorist's view of the intersection of Los Angeles Avenue and State Route 118 looking West toward the City of Oxnard.

Figure 3.1-5
Roadways

Source: City of Oxnard, 2016

VIEW: Pedestrian/motorist's view of Heritage Square.

VIEW: Pedestrian/motorist's view of Heritage Square.

Figure 3.1-6
Urban Landscapes

Source: City of Oxnard, 2016

VIEW: Pedestrian/motorist's view of Plaza Park area.

VIEW: Motorist's view of Henry T. Oxnard Historic District.

Figure 3.1-7
Urban Landscapes

Source: City of Oxnard, 2016

Scenic Highways/Roadways

According to the Caltrans Map of Designated Scenic Routes, there are no official State-designated routes in the Planning Area. However, State Route 1, which runs through the City of Oxnard, is under consideration. State Route 33 in Ventura is the closest officially designated scenic route to the Planning Area (see Figure 3.1-5). The City, in conjunction with Ventura County and the City of Port Hueneme has selected routes for the City's Scenic Highway System. These routes are summarized below:

- Los Angeles Avenue through Oxnard's Sphere of Influence
- Vineyard Avenue between Los Angeles Avenue and Patterson Road Oxnard Boulevard/Pacific Coast Highway between U.S. Route 101 (Ventura Freeway) and Point Mugu
- Victoria Avenue between the Santa Clara River and Channel Islands Boulevard, continuing east on Channel Islands Boulevard to Victoria Avenue
- U.S. Route 101 through Oxnard's Sphere of Influence
- Fifth Street between Mandalay Beach Road and Revolon Slough
- Central Avenue between Vineyard Avenue and Santa Clara Avenue
- Santa Clara Avenue between U.S. Route 101 and the Sphere of Influence boundary
- Gonzales Road between Harbor Boulevard and Del Norte Boulevard Wooley Road between Harbor Boulevard and Rice Avenue
- Channel Islands Boulevard between Ventura Road and Rice Avenue
- Pleasant Valley Road between Port Hueneme city limits and State Route 1 (Pacific Coast Highway)
- Hueneme Road between Port Hueneme city limits and State Route 1 (Pacific Coast Highway)
- Del Norte Boulevard between U.S. Route 101 and Fifth Street
- Rose Avenue between U.S. Route 101 and State Route 1 (Pacific Coast Highway)
- Rice Avenue between U.S. Route 101 and State Route 1 (Pacific Coast Highway)
- Saviers Road between Oxnard Boulevard and Channel Islands Boulevard
- Ventura Road between U.S. Route 101 and Teakwood Street
- Patterson Road between Fifth Street and Hemlock Street and between Vineyard Avenue and Doris Avenue
- Doris Avenue between Victoria Avenue and Patterson Road

Typical motorist views throughout the PWIMP Planning Area, range from foreground (0 to ½ mile), to middle ground (1/2 mile to 2 miles), to background (greater than 2 miles).

Owing to the flat topography, views within the urban center are generally limited to foreground elements such as houses, stores, factories, and streetscapes. However background views of the Coastal Mountain Range are also possible along several roadways (see Figure 3.1-5).

Urban Landscapes

The City's urban landscape is also considered an important aesthetic resource. As previously described, the City has clustered urban development in smaller compact core areas, with several neighborhoods maintaining many of their original architectural features (see Figure 3.1-6). Park or plaza features also provide important open space areas within these neighborhoods (see Figure 3.1-7).

3.1.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.1.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on aesthetics would occur if the project would:

- Have a substantial adverse effect on a scenic vista such as an ocean or mountain view from an important view corridor or location as identified in the 2030 General Plan or other City planning documents;
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway, or route identified as scenic by the County of Ventura or City of Oxnard;
- Substantially degrade the existing visual character or quality of the site or its surroundings such as by creating new development or other physical changes that are visually incompatible with surrounding areas or that conflict with visual resource policies contained in the 2030 General Plan or other City planning documents;
- Add to or compound an existing negative visual character associated with the project site; and/or
- Create a source of substantial light or glare that would adversely affect day or nighttime views in the area.

Note that per the Public Resources Code, aesthetic impacts of a residential, mixed-use residential, or employment center project on an infill site within a transit priority area are not considered significant impacts on the environment. Transit priority areas those areas within one-half mile of an existing or planned major transit stop.

3.1.4.2 Approach and Methodology

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

For this section, the *severity* of visual impacts of each major PWIMP facility(s) is determined by evaluating the degree to which the proposed project contrasts with site setting, the dominance of project in the view-shed and whether views of appealing features (such as trees, water, skyline, or distinctive landforms) are blocked or obscured. Specifically, and depending on the nature of the resource and the complexity of the PWIMP facility(s), the analysis can range from simple informal evaluations to complex analyses. The visual resource analysis involves describing three essential items or components, including:

- **The nature and quality of the visual resource.** Any of the significant visual resources, as identified in the 2030 General Plan Goals and Policies or in the 2030 General Plan Background Report, that may be affected by the PWIMP is noted and described. This would include local waterways, agricultural greenbelts, beaches and coastlines, scenic roadways, and well-preserved urban landscapes associated with historic neighborhoods and parks and open plazas.
- **The viewpoint and the identity of the viewers and their sensitivity to changes in the view.** Viewers who would be the most sensitive to alterations in the landscape or existing views would be residents or visitors enjoying the recreational uses in open spaces, beaches, coastal areas, or scenic roadways viewing these areas. People using smaller parks, open spaces, or plazas within urban areas would also be sensitive to the views of urban landscapes in the area.
- **The effect of the PWIMP in altering the nature of the view.** A PWIMP project component that introduces a manmade feature that contrasts strongly with the existing natural or cultural landscape affecting sensitive viewers would normally have a significant impact. The impact may be project-specific if the project is inharmonious or discordant with the existing landscape, or if it would introduce a feature that blocks views of important resources, even if the view is already partially blocked. The effect may also be part of a cumulative impact if it occurs in combination with similar projects or man-

made features that adversely affect the same visual resource

3.1.4.3 Impacts and Mitigation Measures

Evaluation of potential impacts to aesthetic resources from construction and operation of the PWIMP included reviewing relevant city and county standards and policies, characterizing the existing visual and aesthetic environment throughout the study area, and projecting the visual effects from construction and operation of project facilities. Impacts were assessed by comparing the aesthetic resource value of PWIMP project sites to the impact severity of construction and operation of the visible PWIMP facilities. For any identified significant impacts, recommended mitigations measures are listed in order to avoid or reduce the impacts to less than significant levels. Routine operations and maintenance activities would not affect aesthetic or visual resources and are not further discussed.

Temporary Construction Impacts and Mitigation Measures

Impact 3.1-1: Construction associated with PWIMP facilities could temporarily degrade the existing visual character of a site or surroundings.

Equipment spoils, machinery, and dust associated with construction of new project components would be temporarily visible to motorists and sensitive observers. Therefore, construction can be expected to have an adverse effect on the visual character of construction sites and its surroundings. While the visual effect of construction activity could be adverse and pronounced, the impact would be temporary and therefore the visual impact severity is considered low.

Construction of certain project components such as the pipelines and conveyance facilities would occur in areas of high visual sensitivity, including near local waterways, agricultural greenbelts, beaches and coast lines, scenic roadways, and well-preserved urban landscapes associated with historic neighborhoods and parks and open plazas. The policies contained in the City's 2030 General Plan is aimed at projects or developments that result in visually permanent features, and not the visual effects of construction activity. There is no policy in the 2030 General Plan that strictly prohibits construction within these zones, and because the visual effect of construction activity would be short lived; the resulting aesthetic impact would be less than significant.

The aesthetic resource value of each project component could vary from low to high depending on its location. However, because the visual impact severity of temporary construction effects is considered low, the resulting aesthetic impact for construction activities would be considered less than significant in all cases.

Significance Determination: Less-than-Significant Impact.

Long-Term Operational Impacts

Evaluation of potential long-term operational impacts to aesthetic resources from the placement of new and visible PWIMP facilities are evaluated below.

Impact 3.1-2: Permanent facilities could have an adverse effect on scenic vistas, damage

scenic resources, or degrade the existing visual character or quality of the site and its surroundings.

The permanent facilities proposed for the PWIMP could have an adverse impact on scenic vistas, scenic resources or the existing visual quality of areas surrounding the sites, depending on where they are placed. At this time, none of the new facilities would be located in a place that would affect any scenic vista(s) or resources. However, it is possible that the location of these facilities could change during final design phases. Any potentially significant impacts would be reduced to less than significant levels with implementation of **Mitigation Measures 3.1-2a, 2b, and 2c** below. The impact of each project component varies depending upon the type of structure and its location. The types of impacts and mitigation measures that would be applicable to individual project components are described below. Impact 3.1-2 would only apply to the permanent, new, and visible facilities. However, due to insufficient information regarding the potential relocation and siting of a new wastewater treatment plant, this analysis does not cover this potential PWIMP component. As a result, additional analysis would be necessary. These new PWIMP facilities or components comprise the following:

- Wells (Water Supply and IPR/DPR)
- Storage Tanks (Water and Recycled Water)
- Expanded Existing Desalter
- Expanded Existing Advanced Treatment System
- Upgraded Existing Wastewater Treatment Plant
- TMDL Infiltration Basin
- Dry Weather Diversion Structure

All other project components would result in no permanent impact to scenic vistas, scenic resources or visual quality, either because; a) they represent an existing condition, or b) they would not be visible from publicly accessible vantage points or sensitive observers (e.g. underground pipelines).

Long-Term Operational Mitigation Measures

These mitigation measures are intended to address the potentially significant visual impacts of the Proposed Project facilities.

> **Mitigation Measure 3.1-2a: Blend in with the Existing Environment.** The City shall implement architectural features into the facility(s) design so they complement the building styles of the community and minimize visual mass. Exterior finishes should avoid reflective surfaces. Colors for larger visible tanks and structures should be earth tones to reduce contrasts with the ground plain and increase compatibility with the visual setting. Primary structures should combine multiple complementary colors such in ranges of browns, tans, greys, greens, or other colors agreed upon with the appropriate permitting agency.
>
> **Mitigation Measure 3.1-2b: Fencing.** The City shall design fencing to be minimally intrusive to the community yet complementary to the architectural character of the facility and the community. Fencing will be coordinated with landscaping and facility design to help further enhance the local aesthetics and to blend the facility with the surrounding community and/or natural setting. Vegetative screening using native plants, trees or shrubs will be used if it is not out of character with the site setting, and walled perimeters will be avoided in natural settings to minimize the dominance of structures in the scene.

Significance After Mitigation: Less than Significant.

Impact 3.1-3: Exterior lighting associated with proposed facilities would create new sources of light and glare in the surrounding areas.

Dark, nighttime sky and the ability to see stars are aesthetic qualities of the area to be considered. Impact 3.1-3 would only apply to facilities that require exterior lighting, and therefore the pipelines, conveyance, and underground facilities are considered to result in no aesthetic impact with regard to exterior lighting. Also, as there is no expected or proposed nighttime construction, no impacts of light or glare would occur.

For all other facilities, increased lighting and glare emanating from planned lighting locations could detract from nighttime views, particularly for nearby residences or passing motorists. Most project components would be constructed on undeveloped land where surrounding light sources are limited to sporadic light fixtures on farm buildings and security lighting in adjacent industrial areas. New lighting would be necessary for site safety and security at many of these new and visible facilities and would create new sources of light or glare that could adversely affect day or nighttime views. Parking areas associated with the new facilities would include minimal nighttime lighting for security purposes. Potential remedies for adverse impacts from light and glare include new standard design practices such as directional lighting and glare control, use of daylight and motion detectors, as well as timers for controlling exterior lighting. The new PWIMP facilities would each have a less than significant impact with implementation of Mitigation Measures 3.1-3a and 3.1-3b below.

Mitigation Measures

Mitigation Measure 3.1-3a: Shielded Lighting. To ensure that the project's exterior lighting does not spill over onto the adjacent uses, all exterior light fixtures, including street lighting, shall be shielded or directed away from adjoining uses.

Mitigation Measure 3.1-3b: Security Lighting. Outdoor light intensity shall be limited to that necessary for adequate security and safety. All outside lighting shall be directed to prevent spillage onto adjacent properties and shall be shown on the site plan and elevations.

Significance After Mitigation: Less-than-Significant Impact.

3.1.5 Cumulative Effects

The proposed PWIMP will mostly take place within already-developed roadways and parcels in urbanized areas. Most of the project area has no to very low aesthetic and visual sensitivity. The project is not likely to affect built environment resources, and little or no ground-disturbing activity in undeveloped areas will occur. Mitigation measures are detailed above that would reduce individual impacts to less than significant. Given these factors, the PWIMP will not result

in significant impacts to aesthetic and visual resources, and would not contribute to potential significant cumulative impacts. No mitigation measures for cumulative impacts are thus proposed.

3.2 Agricultural and Soil Resources

This section describes the existing regulatory setting, the agricultural and soil resources in the PWIMP Planning Area(s), and evaluates how construction and operation of the components of the PWIMP would impact these agricultural and soil resources. This evaluation of agricultural and soil resources was based on an initial review of existing reports and literature from the City of Oxnard. Additional sources of information included the California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP), the California Department of Water Resources, and the Ventura County Agricultural Commissioner's Office.

3.2.1 Introduction

Agricultural activities have played an important role in the City's economic, cultural, and environmental framework since the first arrival of the Spanish missionaries during the 1700's. Ventura County is recognized as one of the principal agricultural counties in the State, with annual gross revenues from the sales of agricultural commodities of approximately 2.2 billion dollars. Ventura County consistently ranks among the highest in agricultural revenues of the 58 counties in the State. Agriculture generates a substantial number of jobs ranging from crop production to processing, shipping and other related industries.

The seasonal row crop production pattern throughout west Ventura County is divided into two general categories: cool season and warm season crops. The cool season crops are generally harvested from fall through spring or early summer and include: broccoli, cauliflower, celery, lettuce and spinach. The warm season crops are harvested from mid-summer through fall and include: Fordhook green lima beans, snap beans, cucumbers, peppers and tomatoes. Year around crops include: cabbage (all year), strawberries (early spring to early summer) and lemons (January to mid-June). Fruit and nut crops and vegetable crops comprise the most valuable crop groups. Strawberries are consistently among the leading crops in revenue. Other high value crops include citrus fruits, raspberries, and nursery stock. Based on information in the City's 2030 General Plan Background Report, over 24,500 acres within the City's Planning Area was designated for Agricultural use, which is just over half of the entire Planning Area.

The California Department of Conservation prepares maps of important farmland throughout the state, based on categories of agricultural land defined by the U.S. Department of Agriculture land inventory and monitoring criteria, and regularly reports on the conversion of farmland to other uses (pursuant to Government Code Section 65570). The categories of Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance designations are often referred to collectively as "Important Farmlands". The General Plan Background Report indicates that there are approximately 23,000 acres of land meeting this definition within the Oxnard Planning Area.

The 2030 General Plan EIR concluded that the ultimate development of land, consistent with the land use designations of the 2030 General Plan, would result in the conversion of 2,215 acres of Important Farmlands to other uses. This anticipated conversion of land was identified as a significant impact. Several aspects of the 2030 General Plan Goals and Policies were identified as

contributing to the preservation of agricultural lands. Even with implementation of these goals and policies, however, the 2030 General Plan EIR concluded that the conversion of important farmland to non-agricultural uses would still be considered a significant and unavoidable impact.

The 2030 General Plan EIR analyzed several other issues related to the preservation of agricultural lands, and concluded for each of these issues that there would be a less than significant impact associated with implementing the General Plan. The conclusion is based primarily on implementation of policies within the General Plan, and associated requirements of the zoning ordinance and other programs designed to minimize conflicts between other land uses and agriculture and to address the planned conversion of agricultural lands to other uses within the structure of land use planning in the City of Oxnard.

The Agricultural Greenbelts between Oxnard and Camarillo to the east, and between Oxnard and the unincorporated areas of Ventura County, figure prominently in growth management, land use planning, and other resource values described in the General Plan.

Key Terms and concepts include the following:

- **Commodities.** Any unprocessed or partially processed good (e.g., fruits, vegetables, or grains) used for trade or commerce.
- **Greenbelt Agreement.** Greenbelt agreements are adopted by a joint resolution of the affected agencies and represent a policy commitment to the ongoing preservation of agricultural and open space areas.
- **Important Farmlands.** Collective term for farmlands designated as Prime, Unique, or as Farmlands of Statewide Importance under the Department of Conservation's FMMP.
- **K-Factor.** Provides an indication of a soil's inherent susceptibility to erosion, absent of slope and groundcover factors. Values of "K" range from 0.05 to 0.43. The higher the value, the more susceptible the soil is to sheet and rivulet (or small stream) erosion by water.
- **Soil Quality.** The capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation.
- **Williamson Act Contract –Active.** A contract between a landowner and a City or County to restrict land to agricultural or open space uses in return for lower than normal property tax assessments. The minimum term for a Williamson Act contract is 10 years. Since the term automatically renews for 10 more years on each anniversary date of the contract, the actual term can be indefinite.
- **Williamson Act Contract – Cancellation.** Under a set of specifically defined circumstances, a contract may be cancelled without completing the process of term non-renewal. Contract cancellation, however, involves a comprehensive review and approval process, and the payment of fees by the landowner equal to 12 percent of the full market value of the subject property. Once a contract has been canceled, the land cannot be converted for non-agricultural uses for 10 years. Upon cancellation of the contract, the land cannot be converted for agricultural uses for 10 years.

- **Williamson Act Contract – Notice of Non-Renewal.** Contracts may be terminated at the option of the landowner or local government by initiating the process of tem non-renewal. Under this process, the remaining contract term (nine years in the case of an original term of 10 years) is allowed to lapse, with the contract null and void at the end of the term. Property tax rates gradually increase during the non-renewal period, until they reach normal (i.e., non-restricted) levels upon termination of the contract.
- **Williamson Act Contract – Expired.** Expired parcels are those parcels that have previously been subject to a Williamson Act contract and have since been removed from the contract through non-renewal, cancellation, or annexation.

3.2.2 Regulatory Context

Relevant State and local guidelines specific to agricultural and soils resource issues are discussed in this section.

3.2.2.1 State Regulations

The relevant state regulations include the following.

Farmland Mapping and Monitoring Program. The California Department of Conservation (DOC), under the Division of Land Resource Protection, has developed the FMMP that monitors the conversion of the State's farmland to and from agricultural use. County-level data is collected and a series of maps are prepared that identify eight classifications and uses based on a minimum mapping unit size of 10 acres. The program also produces a biannual report on the amount of land converted from agricultural to non-agricultural use. The program maintains an inventory of State agricultural land and updates the "Important Farmland Series Maps" every two years. Table 3.2-1 provides a summary of the rating categories used by the FMMP. The FMMP is an informational service only and does not constitute State regulation of local land use decisions. Agricultural land is rated according to several variables including soil quality and irrigation status with Prime Farmland being considered the most optimal for farming practices.

California Land Conservation Act of 1965 (Williamson Act). The California Land Conservation Act (CLCA) of 1965, Sections 51200 et seq. of the California Government Code, commonly referred to as the "Williamson Act", enables local governments to restrict the use of specific parcels of land to agricultural or related open space use. Landowners enter into contracts with participating cities and counties and agree to restrict their land to agriculture or open space use for a minimum of 10 years. In return, landowners receive property tax assessments that are much lower than normal because they are based upon farming and open space uses as opposed to full market (speculative) value. Local governments receive an annual subvention of forgone property tax revenues from the State via the Open Space Subvention Act of 1971.

The DOC reports that the Land Conservation Act Program has remained stable and effective as a mechanism for protecting agricultural and open space land from premature conversion of land to urban uses. The DOC indicates that the program might have remained small if not for the addition of Article 28 (now part of Article 13) to the State Constitution. Article 13 declares the interest of the State in preserving open space land and provides a constitutional

basis for valuing property according to its actual use. The amendment originated with groups interested in the preservation of open space land. Agricultural interests added their support after recognizing the importance of a constitutional backing for preferential tax assessments. Article 13 allows preferential assessments for recreational, scenic, and natural resource areas as well as areas devoted to the production of food and fiber. Legislation affecting the Williamson Act include the following is discussed below.

- **Farmland Security Zones.** In August 1998, the Williamson Act's farmland security zone (FSZ) provisions were enacted with the passage of Senate Bill 1182 (California Government Code Section 51296-51297.4). This sub-program, dubbed the "Super Williamson Act," enables agricultural landowners to enter into contracts with a specific county for 20-year increments with an additional 35 percent tax benefit over and above the standard Williamson Act contract.
- **Senate Bill 1835 (Johnston, Chapter 690, Statutes of 1998) and the Cortese-Knox Local Government Reorganization Act.** Senate Bill 1835 requires the appropriate Local Agency Formation Commission (LAFCO), to determine whether a particular City is required to succeed (adhere) to the rights, duties and powers of the county under the contract or whether the City may exercise an option to not succeed to the rights, duties and powers of the county. The determination would be required pursuant to any proposal by a City that would result in the annexation of Williamson Act contracted land.

Table 3.2-1
Description of FMMP Designations

Designation	Description
Prime Farmland	Land that has the best combination of physical and chemical characteristics for the production of crops. It has the soil quality, growing season, and moisture supply needed to produce sustained yields of crops when treated and managed, including water management, according to current farming methods. It must have been used for the production of irrigated crops within the last three years. It does not include publicly owned lands for which there is an adopted policy preventing agricultural use
Unique Farmland	Similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to hold and store moisture. Considered to have an excellent combination of physical and chemical characteristics for the production of crops.
Farmland of Local Importance	Farmlands not covered by the categories of Prime, Statewide, or Unique. They include lands zoned for agriculture by County Ordinance and the California Land Conservation Act as well as dry farmed lands, irrigated pasture lands, and other agricultural lands of significant economic importance to the County and include lands that have a potential for irrigation from local water suppliers

Table 3.2-1
Description of FMMP Designations

Designation	Description
Urban Build-up Land	Land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.
Water	Perennial water bodies with an extent of at least 40 acres.

Source: *California Department of Conservation, 2016*

- **Senate Bill 2227 (Monteith, Chapter 590, Statutes of 1998).** Senate Bill 2227 added new requirements to the Cortese-Knox Local Governmental Reorganization Act regarding any proposed annexation of Williamson contract land. If the proposal would result in the annexation of land that is subject to the Williamson Act, then the petition shall state whether the City shall succeed (adhere) to the contract or whether the City intends to exercise its option to not succeed to the contract.

3.2.2.2 Local Regulations

The relevant local regulations include the following.

Oxnard 2030 General Plan. The combined Open Space/Conservation Element's of the City's existing 2030 General Plan contains an objective and several policies pertinent to agriculture and soils resources.

3.2.3 Environmental Setting

The City of Oxnard lies entirely within the Oxnard Plain, which contains some of the most fertile land in Ventura County. Agricultural areas are found in the northeastern and eastern edges of the City, as well as in large "pockets" within the northwestern portion of the Planning Area. These "pockets" are green buffers surrounding the developed areas and are marked by tall eucalyptus and cypress windrows. According to the California Department of Conservation's FMMP, there are currently about 23,380 acres of agricultural land in the Planning Area. Additionally, the City of Oxnard is a party to the Oxnard-Camarillo Greenbelt Agreement that covers approximately 27,000 acres located between the two cities.

Existing Soils Conditions

The deep, alluvial soils of the PWIMP Planning Area and surrounding area have been classified by the U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) to determine soil capability for agricultural production. The SCS mapping program rates the agricultural suitability of soils in terms of both the Land Use Capability Classification System and the Storie Index.

The SCS Land Use Capability Classification System takes into consideration soil limitations and the way in which soils respond to treatment. Capability classes range from Class I soils, which have few limitations restricting their use for agriculture, to Class VIII soils, which are unsuitable for agriculture.

The majority of soils in the PWIMP Planning Area are Class I and II, which by definition constitute "prime agricultural soils" under the SCS Land Use Capability Classification System. The Storie Index, the second method for soil classification, expresses the relative degree of soil suitability for general intensive farming, based solely on soil conditions and characteristics. Soils in Grade 1 are rated excellent and are very well suited to general intensive farming. Grade 2 soils are rated good and are well suited to general farming. Grade 3 soils are only fairly suited, Grade 4 soils are poorly suited and Grade 5 are very poorly suited to general intensive farming. Soils and miscellaneous areas that are not suited for farming are in Grade 6. The following soil associations are present within the Oxnard area:

- **Pico-Metz-Anacapa Association.** Level to moderately sloping, very deep, well-drained sand loams and very deep, somewhat excessively drained loamy sands. Soil depth can be up to 60 inches or more. The soils of this association are Class II and Class III and are some of the most productive soils. Their agricultural use is for irrigated vegetables, citrus crops, field crops, strawberries, walnuts and avocados.
- **Mocho-Sorrento-Garretson Association.** Level to moderately sloping, very deep, well-drained loams to silty clay loams. Soil depth can be up to 60 inches or more. The soils in this association are Class I and Class II, and are some of the most productive soils in the City. Their agricultural use is for irrigated vegetables, citrus crops, field crops, strawberries, walnuts and avocados.
- **Camarillo-Hueneme-Pacheco Association.** Level and nearly level, very deep, poorly drained loamy sands and silty clay loams. Soil depth can be up to 60 inches or more. The soils in this association are Class II soils and are also some of the most productive in the City. They are used for irrigated vegetables, field crops, lemons and strawberries. In undrained areas, there is a seasonal water table within a depth of 2 feet and periodically the soils contain soluble salts.
- **Riverwash-Sandy Alluvial Land-Coastal Beaches Association.** Level to gently sloping, excessively drained to poorly drained stratified sand, gravelly and cobbly material with only a small amount of silt and clay. This soil association is subject to flooding, scouring and deposition during and immediately following storms. This soil association has a Class VIII rating and is unsuitable for agriculture.
- **Rincon-Huerhuero-Azule Association.** Level to moderately steep, very deep, well drained and moderately well drained, very fine sandy loams to silty clay loams that have slowly and very slowly permeable sandy clay subsoil.

The locations of the soil associations previously described are identified in Figure 3.2-1, with an estimate of the number of acres for each soil association within the Planning Area provided in Table 3.2-2. The Camarillo- Hueneme-Pacheco association covers almost all of the PWIMP Planning Area, with an estimated 28,070 acres (see Table 3.2-2 and Figure 3.2-1). Limited amounts of the Pico-Metz-Anacapa association are located along the Santa Clara River. A finger of the Mocho-Sorrento-Garretson association (an estimated 2,270 acres) extends into the Planning Area from the north and is located east of Oxnard Boulevard and north of west

Fifth Street. As shown in Figure 3.2-1, the Riverwash-Sandy Alluvial Land- Coastal Beaches Association is located along the entire coastline of the City. The Rincon Ricon-Huerhuero-Azule Association occupies a small area (670 acres) in the northeast portion of the Planning Area.

Erosion

Rates of erosion can vary depending on a number of factors including climate conditions, soil material, soil structure, and levels of human activity. The erosion potential for soils in the Planning Area depend on several soil characteristics, including surface texture, overall permeability, organic matter content, depth, and quantity and type of ground cover. Depending on the local landscape and climatic conditions, erosion may be very slow to very rapid. The City is located within a Mediterranean climatic regime, which is characterized by moist winters and dry summers. The PWIMP Planning Area is therefore, subject to erosion from both natural and human activities depending on the time of year.

Table 3.2-2
Soil Associations and Other Land Uses within the PWIMP Planning Area

Soil Association/Land Use Type	Acreage
Pico-Metz-Anacapa Association	7,530
Mocho-Sorrento-Garretson Association	2,270
Camarillo-Huneme-Pacheco Association	28,070
Riverwash-Sandy Alluvial Land-Coastal Beaches Association	3,040
Rincon-Huerhuero Association	670
Gullied Land-Pits and Dumps	670
Water	1,200
Other	1,800
Total	**45,250**

Other: *The other category includes currently unclassified soil types*
Source: *United States Geological Service, 2016*

Excessive soil erosion can lead to damage of building foundations, roadways, dam embankments, and result in increased sedimentation to local drainage ways. Figure 3.2-2 identifies the K-factor for soil surfaces within the Planning Area. As shown in the figure, several locations are identified as areas easily susceptible to erosion processes. However, the development of structures consistent with local building regulations and the implementation of a variety of commonly used post-construction best management practices minimize the negative effects of erosion.

Beach Erosion

The City's coastline is part of an overall littoral cell that extends from Point Conception to Point Mugu. The concept of a littoral cell is based upon the natural production, transport, and loss or disposal of sediment materials, chiefly sand, along an ocean frontage or beach. The geographic extent of a littoral cell is based upon where sand is generated or introduced to the cell and where sand is eventually lost from the cell. The most common end or termination for a littoral cell is a submarine canyon, where sands tend to flow or sink away from the coast, making them unavailable to be transported to the next littoral cell. The most common source for sand generation within a cell is typically local waterways that deliver sand to the beach.

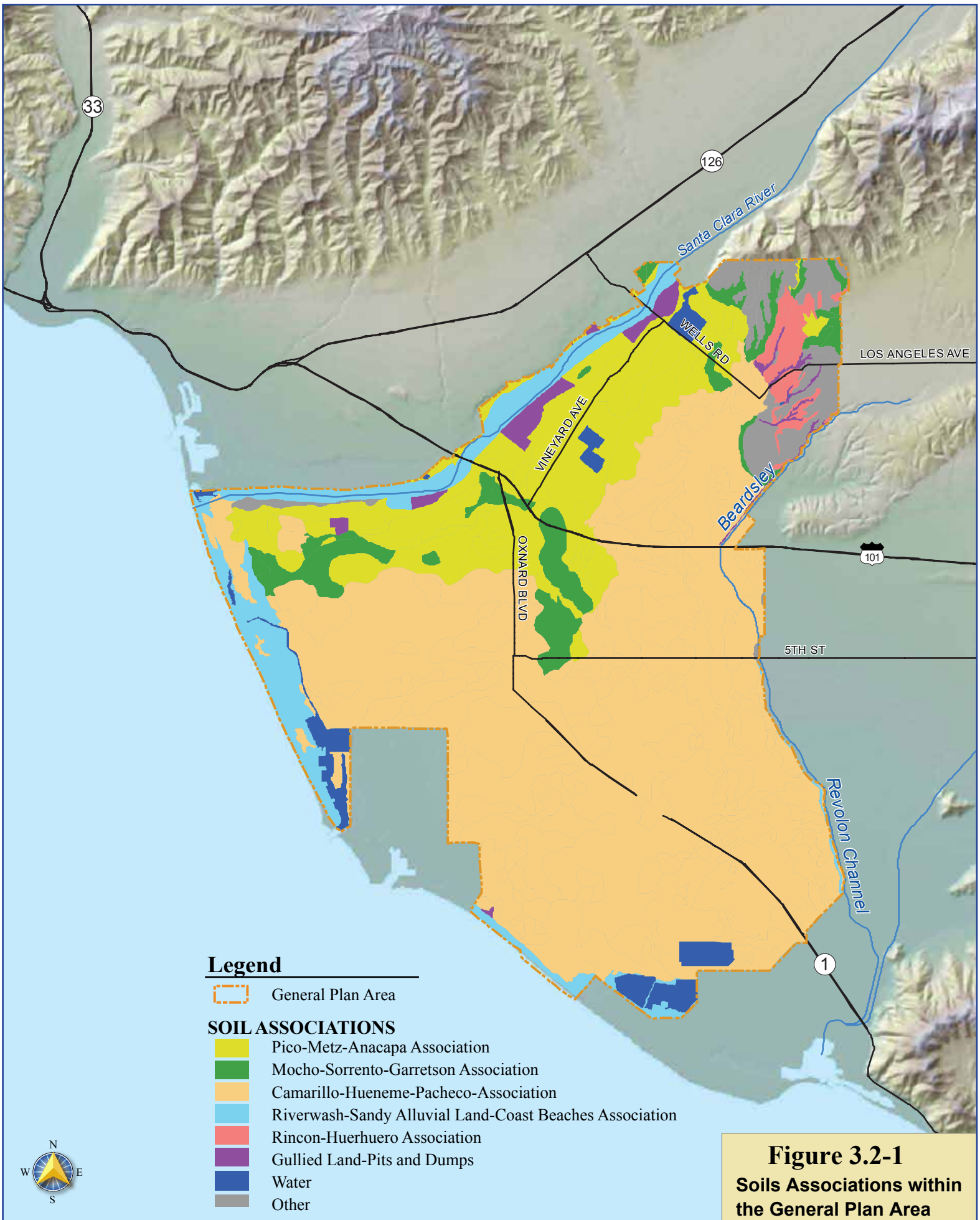


Figure 3.2-1
Soils Associations within the General Plan Area

Source: USGS, 1993r USDA, 2005r City of Oxnard, 2016

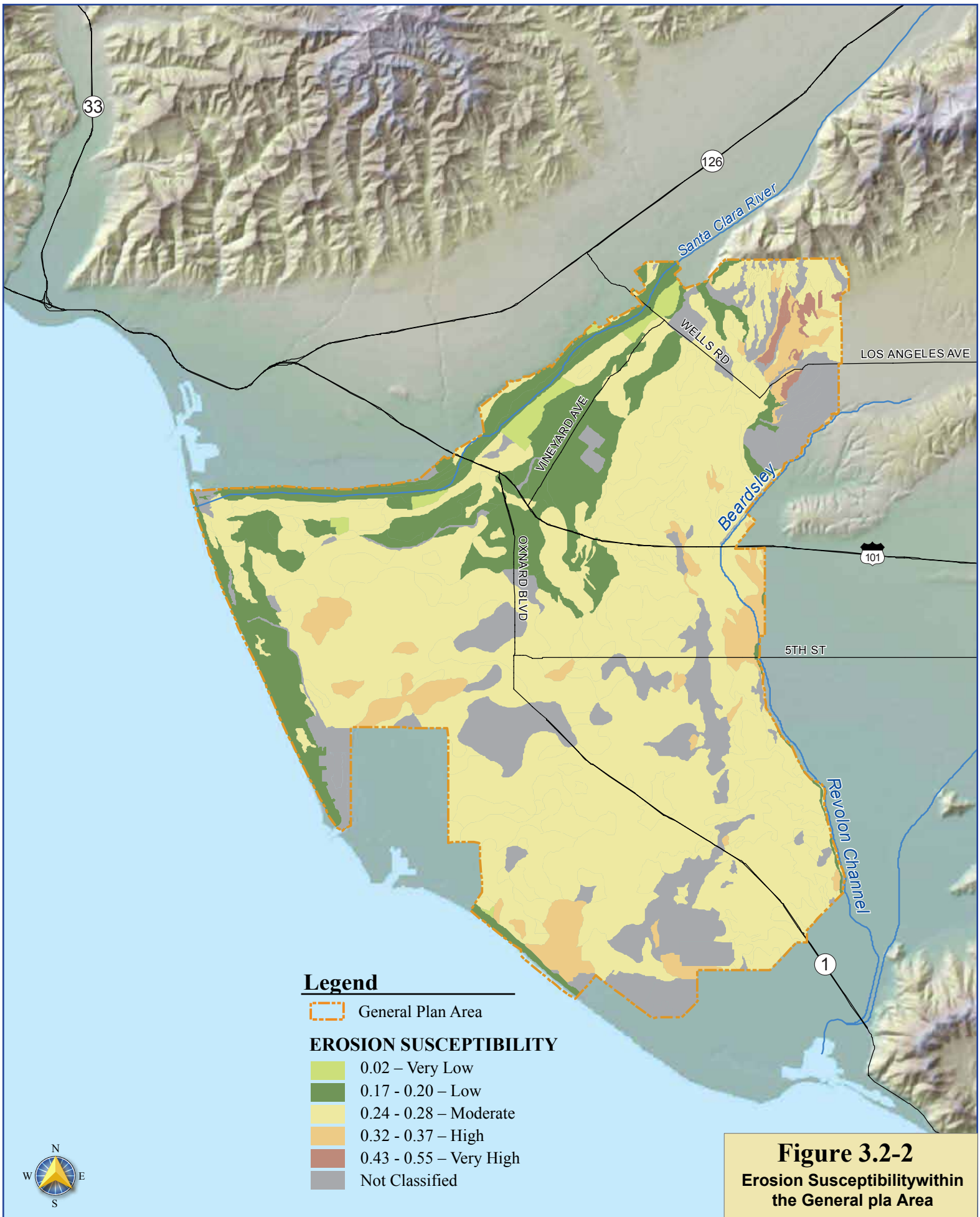


Figure 3.2-2

Erosion Susceptibilitywithin the General pla Area

Source: USGS, 1993r USDA, 2005r City of Oxnard, 2016

Two major rivers, the Ventura and Santa Clara Rivers, and two submarine canyons strongly influence the littoral processes in the PWIMP Planning Area. The entire Oxnard littoral cell is considered very active; that is, substantial volumes of sand are transported annually by littoral currents. The down- coast segment of the Oxnard littoral cell, which includes the City and extends from the Ventura River to Point Mugu, is characterized by relatively wide beaches and low backshore areas. This area has been affected by human activities, including construction of the Ventura and Channel Islands small craft harbors, and the Port of Hueneme. As a result of the construction of these harbors, a regular program of sand bypassing has been implemented to maintain navigation channels and sandy beaches.

Because of the past shoreline erosion and beach sand replenishment problems, a joint powers authority was formed in 1986 to encourage coordination and cooperation between public and private agencies in efforts to protect, maintain, and enhance beaches and the coastline in Santa Barbara and Ventura counties. This joint powers authority, called BEACON (Beach Erosion Authority for Control Operations and Nourishment), recently released a draft Coastal Sand Management Plan. The purpose of this report is to promote consideration of a regional program for beach protection and sand replenishment for the Santa Barbara/Ventura coast.

According to the draft Coastal Sand Management Plan, the following conditions characterize the existing shoreline from the Ventura River to Point Mugu:

- The primary sources of sand for this area are the Ventura and Santa Clara Rivers.
- Historically, these rivers supplied an abundance of sand, resulting in broad beaches backed by extensive sand dunes.
- Dam construction and sand mining activities have reduced the rate of fluvial sand replenishment to the coast.
- Imbalances in the amount of littoral sand for this area imply that beach erosion will accelerate beginning in the mid-1990s.

Beaches in this area will continue to be dependent on dredging and sand by-pass operations. Within the PWIMP Planning Area, the McGrath Beach and Oxnard Shores areas are cited by BEACON as erosion "hot spots" because of expected reductions in the delivery of sand to the coast by the Santa Clara River. The report also indicated that a yearly deficit of sand creates chronic erosion problems down-coast of Ormond Beach.

Important Farmlands within the Planning Area

The FMMP monitors the conversion of the State's farmland to and from agricultural use. Land within the City's Planning Area is represented by the breakdown in use between agricultural and urban land. An estimated 23,380 acres (roughly half of the total Planning Area) is designated for some type of agricultural use. As shown in Table 3.2-3, lands designated as Prime Farmland account for an estimated 22% of the Planning Area. The Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance designations are often referred to collectively as "Important Farmlands". Important Farmlands account for the majority of farmland (22,960 acres) within the Planning Area (see Table 3.2-3). These Important Farmlands are identified in Figure 3.2-3.

Table 3.2-3 Land Use by FMMP Designation, Oxnard Planning Area		
FMMP Designation	**Acreage**	**Percentage**
Prime Farmland	9,890	22
Farmland of Statewide Importance	11,990	27
Unique Farmland	970	2
Farmland of Local Importance	110	Less than 1
Grazing	420	Less than 1
Urban and Built-Up Land	16,520	37
Other Categories	5,250	12
Total	**45,150**	**100**
Source: *California Department of Conservation, 2016*		

Williamson Act Contracts

As more fully described above under the "Regulatory Setting" section, a Williamson Act contract represents an agreement to restrict land to agricultural or open space uses in return for lower than normal property tax assessments. Figure 3.2-3 provides the locations of parcels within the PWIMP Planning Area that have an active Williamson Act Contract.

Agricultural Production

The Ventura County Agricultural Commissioner's Office provides a variety of county specific agricultural statistics (i.e., crop types, production values, etc.) on an annual basis. This section provides a summary of the key agricultural commodities or crops produced in the County. The general location of key agricultural resources within the Planning Area is provided in Figure 3.2-4.

Farming in Ventura County has always been a major contributor to the nation's food supply, as well as an important part of the rural lifestyle, which exists throughout much of the county. Agriculture also generates a substantial number of jobs ranging from crop production to processing, shipping and other related industries. Ventura County is recognized as one of the principal agricultural counties in the State, with gross revenues from the sales of agricultural commodities in the billions of dollars (see Table 3.2-4). Ventura County ranks tenth among the highest in agricultural revenues of the 58 agricultural counties in the State, and approximately 19,600 jobs were created in 2000 by agriculture in the County.

The seasonal crop production pattern through out Ventura County is divided into two general categories: cool season and warm season crops. The cool season crops are generally harvested from fall through spring or early summer and include: broccoli, cauliflower, celery, lettuce and spinach. The warm season crops are harvested from mid-summer through fall and include: Fordhook green lima beans, snap beans, cucumbers, peppers and tomatoes. Year around crops include: cabbage (all year), strawberries (early spring to early summer) and lemons (January to mid- June). The overall mix of agricultural crops within the County has varied

over the past years, but the top three agricultural crops are strawberries, nursery stock, and lemons (see Table 3.2-4).

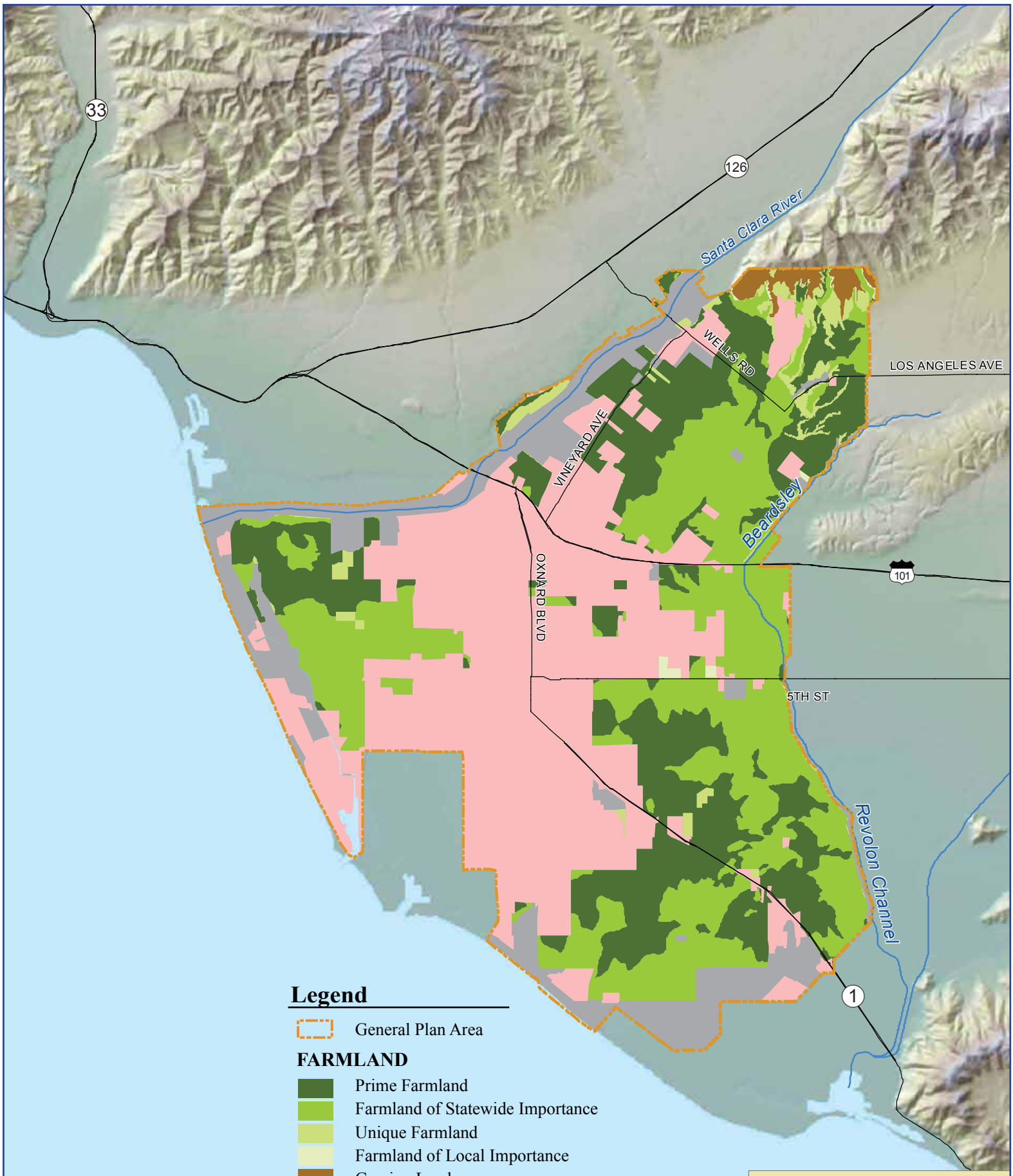


Figure 3.2-3

Important Farmlands within the General Plan Area

Source: USGS, 1993r California Department of Conservation, 2004r City of Oxnard, 2016

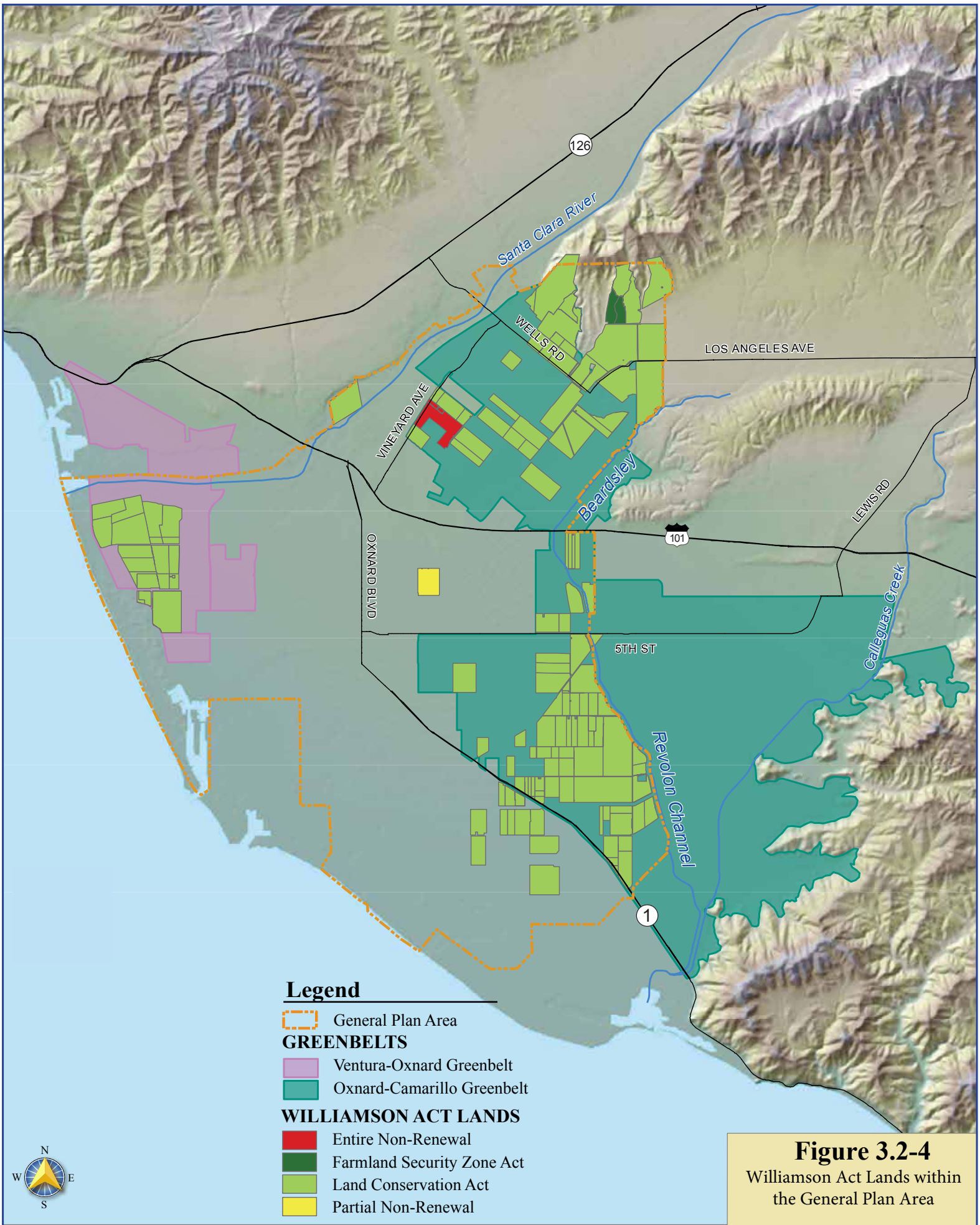


Figure 3.2-4
Williamson Act Lands within the General Plan Area

Source: City of Oxnard, 2016

Table 3.2-4
Leading Crops for Ventura County, 2004

Rank	Crop	Value
1	Strawberries	$363,646,000
2	Nursery Stock	$221,999,000
3	Lemons	$176,361,000
4	Avocados	$124,661,000
5	Celery	$122,832,000
6	Tomatoes	$71,735,000
7	Cut Flowers	$65,663,000
8	Raspberries	$48,586,000
9	Peppers	$34,628,000
10	Valencia Oranges	$20,525,000

Source: *Ventura County, 2016*

In spite of pressures such as increased agricultural land values, increased water cost, and compatibility problems with urban uses, agriculture activities have remained economically viable in the County because of the area's climate, soils and air quality. The total value in constant dollars of Ventura County's agricultural production has been increasing since the 1930's.

Urban Encroachment

The fact that produce makes up such a large part of the County's economy makes protecting agricultural land an important issue. Legislation such as the Williamson Act has been put in place to protect the State's agricultural lands and to avoid their "premature and unnecessary" urbanization.

Greenbelt policies, such as the Oxnard-Camarillo and Oxnard-Ventura greenbelt agreements, have also been put into place in order to protect against urban encroachment. The Oxnard-Camarillo Agreement comprises approximately 27,000 acres of agricultural land between the two cities, combined with an additional 2,200 acres that was added in the Del Norte area when the County of Ventura became a party to the agreement as well. The Oxnard-Ventura Agreement comprises 2,460 acres of land of which a portion lies within the northwestern corner of the Planning Area. The City of Oxnard's 2030 General Plan has supported the expansion of the Oxnard-Camarillo Greenbelt south of State Route 1 (approximately 2,672 acres). Despite these efforts, however, urban encroachment is still an issue facing the City's agricultural resources. Future development will reduce the amount of open land within the Planning Area.

Water Supply Availability

Agricultural operations within the southern portion of Ventura County receive the majority of their water from groundwater (generally privately- owned wells) and public water districts that divert surface water from the Santa Clara River and various lakes and stream watersheds through an extensive network of canals and natural waterways. The United Water Conservation District (UWCD) is responsible for groundwater recharge throughout most of the Santa Clara River Valley and for the wholesale distribution of water to purveyors on the

Oxnard Plain. Lake Piru is UWCD's reservoir for water, which is released into the Santa Clara River for subsequent recharge into the underground aquifers for later urban and agricultural use. The Calleguas Municipal Water District is responsible for providing imported water for wholesale purposes to retail water purveyors serving municipal/industrial customer in the southeastern portions of the County.

Groundwater is the single most important source of water in the County. In 1985, it provided about 67% of the water utilized in the County. It is pumped extensively by individual well owners as well as purveyors who sell it at either retails sales to individuals or at wholesale to other purveyors. Since, overall, more groundwater is used than is replaced, the County's groundwater reserves are slowly decreasing (i.e., water is being extracted more rapidly than it is being replaced).

3.2.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.2.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on agricultural resources would occur if the PWIMP would:

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use;
- Conflict with existing zoning for agricultural use or an existing Williamson Act contract; and/or
- Involve other changes in the existing environment that, due to their location or nature, could result in conversion of off-site farmland to non-agricultural use.

3.2.4.2 Approach and Methodology

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

For purposes of this analysis, the PWIMP and each major component/facilities are considered in relation to farmland (identified on the FMMP Map) in the immediate site vicinity to identify any potential disruption that might cause temporary (during construction) or permanent (siting or operating on land that is currently in agricultural use). In addition, the PWIMP and major components/facilities are examined for its potential to affect land under a Williamson Act contract and/or compatibility with the City's 2030 General Plan.

3.2.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts to agricultural resources are discussed below.

Impact 3.2-1: Implementation of the PWIMP and/or identified components/facilities could result in the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

Implementation of the PWIMP, including the construction of the new facilities and the rehabilitation and/or replacement of existing facilities would not result in the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide importance. As shown in Figure 3.2-3, the Prime Farmland, Unique Farmland, and Farmland of Statewide Importance resources are located to the north and east of the urban areas where the PWIMP facilities would be located. Implementation of the PWIMP, including the construction of the new facilities and the rehabilitation and/or replacement of existing facilities would be predominately located within the urban areas and built up areas of the City of Oxnard. Specifically and as described and shown in Chapter 2, Project Description, the location of the new or expanded facilities including the storage tanks, treatment facilities, wells, the desalter, and the TMDL infiltration would not be located on any agricultural lands, let alone on Prime Farmland, Unique Farmland, or Farmland of Statewide importance. Further, construction of the new pipelines and conveyance facilities as well as the rehabilitation and/or replacement of the existing pipelines and conveyance facilities, the existing blending stations, and the other existing facilities would be located within existing paved roads, disturbed urban areas, and/or existing rights-of-ways and would not result in the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide importance. As a result, there would be no impact and no mitigation measures are required.

Significance Determination: No Impact

Long-Term Operational Impacts

As described above and shown in Chapter 2, Project Description and Figure 3.2-3, the location of the new or expanded facilities including the storage tanks, treatment facilities, wells, the desalter, and the TMDL infiltration would not be located on any agricultural lands, let alone on Prime Farmland, Unique Farmland, or Farmland of Statewide importance. Further, the new pipelines and conveyance facilities as well as the rehabilitation and/or replacement of the existing pipelines

and conveyance facilities, the existing blending stations, and the other existing facilities would be located within existing paved roads, disturbed urban areas, and/or existing rights-of-ways and would not result in the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide importance. Once constructed, implementation of the PWIMP would not result in the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide importance. In addition, the routine maintenance and operations of the new and/or rehabilitated/replaced PWIMP facilities would not result in the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide importance. As a result, there would be no impact and no mitigation measures are required.

Significance Determination: No Impact

Impact 3.2-2: Implementation of the PWIMP and/or identified components/facilities could conflict with existing zoning for agricultural use or an existing Williamson Act contract. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

Implementation of the PWIMP, including the construction of the new facilities and the rehabilitation and/or replacement of existing facilities would not conflict with existing zoning for agricultural use or an existing Williamson Act contract. As shown in Figure 3.2-4, the location of the new or expanded facilities including the storage tanks, treatment facilities, wells, the desalter, and the TMDL infiltration would not be located on any agricultural lands, let alone on land with an existing Williamson Act contract. Further, the construction of the new pipelines and conveyance facilities as well as the rehabilitation and/or replacement of the existing pipelines and conveyance facilities, the existing blending stations, and the other existing facilities would be located within existing paved roads, disturbed urban areas, and/or existing rights-of-ways and would not conflict with existing zoning for agricultural use or an existing Williamson Act contract. As a result, there would be no impact and no mitigation measures are required.

Significance: No Impact

Long-Term Operational Impacts

As described above and shown in Chapter 2, Project Description and Figure 3.2-3, the location of the new or expanded facilities including the storage tanks, treatment facilities, wells, the desalter, and the TMDL infiltration would not be located on any agricultural lands, let alone on an existing Williamson Act Contract. Further, the new pipelines and conveyance facilities as well as the rehabilitation and/or replacement of the existing pipelines and conveyance facilities, the existing blending stations, and the other existing facilities would be located within existing paved roads, disturbed urban areas, and/or existing rights-of-ways and would not conflict with existing zoning for agricultural use or an existing Williamson Act contract. In addition, the routine maintenance and operations of the new and/or rehabilitated/replaced PWIMP facilities would not conflict with existing zoning for agricultural use or an existing Williamson Act contract. As a result, there would be no impact and no mitigation measures are required.

Significance Determination: No Impact

Impact 3.2-3: Implementation of the PWIMP and/or identified components/facilities could result in conversion of off-site farmland to non-agricultural use. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

Implementation of the PWIMP, including the construction of the new facilities and the rehabilitation and/or replacement of existing facilities would not result in conversion of off-site farmland to non-agricultural use. The location of the new or expanded facilities including the storage tanks, treatment facilities, wells, the desalter, and the TMDL infiltration would not be located on any agricultural lands and would not result in conversion of off-site farmland to non-agricultural use. Further, the construction of the new pipelines and conveyance facilities as well as the rehabilitation and/or replacement of the existing pipelines and conveyance facilities, the existing blending stations, and the other existing facilities would be located within existing paved roads, disturbed urban areas, and/or existing rights-of-ways would not result in conversion of off-site farmland to non-agricultural use. As a result, there would be no impact and no mitigation measures are required.

Significance: No Impact

Long-Term Operational Impacts

As described above and shown in Chapter 2, Project Description and Figures 3.2-3 and 3.2-4, the location of the new or expanded facilities including the storage tanks, treatment facilities, wells, the desalter, and the TMDL infiltration would not result in conversion of off-site farmland to non-agricultural use. Further, the new pipelines and conveyance facilities as well as the rehabilitation and/or replacement of the existing pipelines and conveyance facilities, the existing blending stations, and the other existing facilities would be located within existing paved roads, disturbed urban areas, and/or existing rights-of-ways and would not result in conversion of off-site farmland to non-agricultural use. In addition, the routine maintenance and operations of the new and/or rehabilitated/replaced PWIMP facilities would not result in conversion of off-site farmland to non-agricultural use. As a result, there would be no impact and no mitigation measures are required.

Significance Determination: No Impact

3.2.5 Cumulative Effects

The proposed PWIMP will mostly take place within already-developed roadways and parcels in urbanized areas. The construction and operation of the PWIMP would not result in conversion of off-site farmland to non-agricultural use. Given these factors, the PWIMP will not result in significant impacts to agricultural and soil resources, and would not contribute to potential significant cumulative impacts. No mitigation measures for cumulative impacts are thus proposed.

3.3 Air Quality

This section describes the existing regulatory setting, the air quality in the PWIMP Planning Area(s), and evaluates how construction and operation of the components of the PWIMP would impact air quality. This evaluation of air quality was based on an initial review of existing reports and literature from the City of Oxnard. Additional sources of information included air quality monitoring data provided from the Ventura County Air Pollution Control District (VCAPCD) and the California Air Resources Board (CARB).

3.3.1 Introduction

With the continuing growth in both local and regional population, air quality has become an issue of increasing concern for the South Central Coast Air Basin. To provide a better understanding of the current air quality conditions in the Planning Area, this section describes:

- Federal and State ambient air quality standards;
- Air quality planning and management for the City's General Plan Area;
- Existing regional topography and climate;
- Existing air quality conditions in the Planning Area; and
- Sensitive receptors in the Planning Area.

Key Terms and concepts include the following:

- **PM_{10}. Particulate Matter**. Dust and other particulates come in a range of particle sizes. Federal and State air quality regulations reflect the fact that smaller particles are easier to inhale and can be more damaging to health. PM_{10} refers to dust/particulates that are 10 microns in diameter or smaller.
- **$PM_{2.5}$. Particulate Matter.** The Federal government has recently added standards for smaller dust particles. $PM_{2.5}$ refers to dust/particulates that are 2.5 microns in diameter or smaller.
- **Ozone.** Ozone is a pungent, colorless toxic gas created in the atmosphere by a photochemical reaction rather than emitted directly into the air. Motor vehicles are the major sources of ozone precursors.
- **South Central Coast Air Basin**. An air basin is a geographic area that exhibits similar meteorological and geographic conditions. California is divided into 15 air basins to assist with the statewide regional management of air quality issues. The City falls within the South Central Coast Air Basin. The South Central Coast Air Basin is comprised of Ventura, Santa Barbara, and San Luis Obispo counties.
- **Ventura County Air Pollution Control District (VCAPCD).** The VCAPCD is the regulatory agency responsible for developing air quality plans, monitoring air quality,

and reporting air quality data for the City's PWIMP Planning Area.

3.3.2 Regulatory Context

Air quality conditions are subject to various federal, state, and local regulations. This section begins with a brief introduction to ambient air quality standards and follows with a brief overview of key regulations.

3.3.2.1 Ambient Air Quality Standards

Air quality in a given location is described as the concentration of various pollutants in the atmosphere, generally expressed in units of parts per million (ppm) or in micrograms per cubic meter ($\mu g/m^3$). The type and amount of regulated air pollutants emitted into the atmosphere, the size and topography of the regional air basin, and the prevailing meteorological conditions determine air quality.

The significance of a given pollutant's concentration is determined by comparison with Federal and State ambient air quality standards. Both the State of California and the Federal Government have established ambient air quality standards for several different pollutants, expressed as maximum allowable concentrations. For some pollutants, separate standards have been set for different periods of time. Most standards have been set to protect public health, although for some pollutants, standards have been based on other values (such as protection of crops, protection of materials, or avoidance of nuisance conditions). A summary of State and Federal ambient air quality standards is provided in Table 3.3-1. The pollutants of greatest concern in the City's Planning Area are ozone and inhalable particulate matter (PM10 and PM2.5).

Table 3.3-1
Ambient Air Quality Standards

Pollutant	Average Time	California Standards[1]		Federal Standards[2]		
		Concentration[3]	Method[4]	Primary[3, 5]	Secondary[3, 5]	Method[7]
Ozone (O3)	1 Hour	0.09 ppm 180 µg/m^3	Ultraviolet Photometry	0.12 ppm 235 µg/m^3, 8	Same as Primary Standard	Ultraviolet Photometry
	8 Hours	0.070 ppm 137 µg/m^3*		0.08 ppm 157 µg/m^3, 8		
Respirable Particulate Matter (PM10)	24 Hours	50 µg/m^3	Gravimetric or Beta Attenuation*	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		50 µg/m^3		
Fine Particulate Matter (PM2.5)	24 Hours	No Separate State Standards		65 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean		Gravimetric or Beta Attenuation	15 µg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm 10 µg/m^3	Non-Dispersive Infrared Photometry (NDIR)	9 ppm 10 µg/m^3, 8	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm 23 µg/m^{3}3		35 ppm 40 µg/m^3, 8		
	8 Hours (Lake Tahoe)	6 ppm 7 µg/m^3		-	-	-
Nitrogen Dioxide (NO^2)	Annual Arithmetic Mean	-	Gas Phase Chemiluminescence	0.053 ppm 100 µg/m^3	Same as Primary Standard	Gas Phase Chemilumine scenc
	1 Hour	0.25 ppm				

Table 3.3-1
Ambient Air Quality Standards

Pollutant	Average Time	California Standards[1]		Federal Standards[2]		
		Concentration[3]	Method[4]	Primary[3, 5]	Secondary[3, 5]	Method[7]
		470 µg/m³		-		
Sulfur Dioxide (SO^2)	Annual Arithmetic Mean	-	Ultraviolet Fluorescence	0.030 ppm 80 µg/m³		Spectrophotometry (Paraosanilin e Method)
	24 Hours	0.04 ppm 105 µg/m³		0.14 ppm 365 µg/m³		
	3 Hours	-		-	0.5 ppm 1,300 µg/m³	
	1 Hours	0.25 ppm 655 µg/m³		-	-	-
Lead	30 Day Average	1.5 µg/m³	Atomic Absorption	-	-	-
	Calendar Quarter	-		1.5 µg/m³	Same as Primary Standard	High Volume Sampler and Atomic Absorption
Visibility Reducing Particles	8 Hours	Extinction coefficient of 0.23 per km – visibility of ten miles or more (0.07–30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hours	25 µg/m³	Ion Chromatography	No Federal Standards		
Hydrogen Sulfide	1 Hour	0.03 ppm 26 µg/m³	Ultraviolet Fluorescence	No Federal Standards		
Vinyl Chloride [9]	24 Hours	0.01 ppm 26 µg/m³	Gas Chromatography	No Federal Standards		

Notes: *This concentration was approved by the Air Resources Board on April 28, 2005 and became effective in early 2006.

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hours), nitrogen dioxide, suspended particulate matter–PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National Standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24- hour standard is attained when 99 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. For PM2.5, the 24- hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current Federal policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent procedure which can be shown to the satisfaction of the CARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

8. New Federal 8-hour ozone and fine particulate matter standards were promulgated by U.S. EPA on July 18, 1997. Contact U.S. EPA for further clarification and current Federal policies.

9. The CARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

Source: California Air Resources Board, 2016

Particulate Matter. Dust and other particulates come in a range of particle sizes. Federal and State air quality regulations reflect the fact that smaller particles are easier to inhale and can be more damaging to health. Very small particles of certain substances may produce injury by themselves in the respiratory tract, or may contain absorbed gases that are injurious. Suspended in the air, particulates of aerosol size can both scatter and absorb sunlight, producing haze and reducing visibility. They can also cause a wide range of damage to materials.

The State PM_{10} standards are 50 $\mu g/m^3$ as a 24-hour average and 20 $\mu g/m^3$as an annual geometric mean. The Federal PM_{10} standards are 150 $\mu g/m^3$ as a 24-hour average and 50 $\mu g/m^3$ as an annual arithmetic mean.

The State $PM_{2.5}$ standard is 12 $\mu g/m^3$ as an annual geometric mean. The Federal standards are 65 $\mu g/m^3$ as a 24-hour average and 15 $\mu g/m^3$ as an annual average.

Particulate matter concerns within the City's Planning Area reflect a mix of rural and urban sources, including agricultural activities, industrial emissions, dust suspended by vehicle traffic, and secondary aerosols formed by reactions of nitrogen and sulfur oxides in the atmosphere.

Ozone. An oxidant, ozone, can cause damage to vegetation and other materials, such as untreated rubber. Ozone in high concentrations can also directly affect the lungs, causing respiratory irritation and possible changes in lung functions.

State standards for ozone have been set for 1-hour and 8-hour averaging times. The State 1-hour ozone standard is 0.09 ppm, not to be exceeded. The State 8-hour ozone standard is 0.07 ppm, not to be exceeded. The 8-hour standard was approved by the CARB on April 28, 2005 and is expected to become effective in early 2006.

The Federal government has set an 8-hour ozone standard, which is 0.08 ppm for an 8-hour averaging time. This standard is violated if the 3-year average of the third-highest daily 8-hour maximum exceeds 0.08 ppm.

3.3.2.2 Federal Regulations

The relevant federal regulations are discussed below.

Federal Clean Air Act

The Federal Clean Air Act, adopted in 1970 and amended twice thereafter (including the 1990 amendments), establishes the framework for modern air pollution control. The act directs the Environmental Protection Agency (EPA) to establish ambient air standards for six pollutants: ozone, carbon monoxide, lead, nitrogen dioxide, particulate matter, and sulfur dioxide. The standards are divided into primary and secondary standards; the former are set to protect human health with an adequate margin of safety and the latter to protect environmental values, such as plant and animal life.

Areas that do not meet the ambient air quality standards are called "non-attainment areas." The Federal Clean Air Act requires each state to submit a State Implementation Plan (SIP) for nonattainment areas. The SIP, which is reviewed and approved by the EPA, must demonstrate how the Federal standards will be achieved. Failing to submit a plan or to secure

approval could result in denial of Federal funding and permits for such improvements as highway construction and sewage treatment plants. For cases in which the SIP is submitted by the state but fails to demonstrate achievement of the standards, the EPA is directed to prepare a Federal implementation plan.

3.3.2.3 State Regulations

The relevant state regulations are discussed below.

California Clean Air Act (CCAA)

The CCAA establishes an air quality management process that generally parallels the Federal process. The CCAA, however, focuses on attainment of the State ambient air quality standards, which, for certain pollutants and averaging periods, are more stringent than the comparable Federal standards. Responsibility for meeting California's standards lies with the CARB and local air pollution control districts (such as the VCAPCD, which covers the City's Planning Area). Compliance strategies are presented in district-level air quality management plans that are incorporated into the State implementation plan.

The CCAA requires that air districts prepare an air quality attainment plan if the district violates State air quality standards for carbon monoxide, sulfur dioxide, nitrogen dioxide, or ozone. No locally prepared attainment plans are required for areas that violate the State PM10 standards. The CCAA requires that the State air quality standards be met as expeditiously as practicable but does not set precise attainment deadlines. Instead, the act established increasingly stringent requirements for areas that will require more time to achieve the standards.

The air quality attainment plan requirements established by the CCAA are based on the severity of air pollution problems caused by locally generated emissions. Upwind air pollution control districts are required to establish and implement emission control programs commensurate with the extent of pollutant transport to downwind districts.

3.3.2.4 Local Regulations

The relevant local regulations are discussed below.

Ventura County Air Pollution Control District (VCAPCD)

The Planning Area is located within the South Central Coast Air Basin. Air quality planning for the City is under the authority of the VCAPCD. The VCAPCD is responsible for developing air quality plans, monitoring air quality, and reporting air quality data for the City's Planning Area. The VCAPCD works with other regional and local governments to reduce air pollutant emissions through regulation of various sources.

The air pollutants of most concern in the Planning Area are ozone and particulate matter. Motor vehicle emissions are the major source of ozone precursors in the Planning Area. The main sources of particulate matter include fugitive dust from agricultural and construction operations and emissions from industrial processes.

The VCAPCD developed the 1991 Ventura County Air Quality Management Plan (AQMP) in response to the CCAA. The 1991 AQMP addressed attainment of the California air quality standards for ozone. The 1991 AQMP was amended in 1994, 1995, and 1997 to provide

further emissions reduction guidance. The VCAPCD is currently revising the AMQP to comply with the Federal requirements regarding conformity of transportation activities to federally-approved air quality plans (transportation conformity).

City of Oxnard - Oxnard 2030 General Plan

The Safety Element of the City's existing General Plan contains several policies pertinent to air quality issues.

3.3.3 Environmental Setting

The City of Oxnard lies entirely within the Oxnard Plain, which is in Ventura County. Ventura County's diverse topography, which affects the County's air quality, is characterized by mountains to the north, hills to the east between Ventura and Los Angeles Counties, two major river valleys (the Santa Clara River which flows east-west and the Ventura River which flows roughly north-south), and the Oxnard Plain to the south and west. The Santa Monica Mountains rise above the Oxnard Plain to the south and continue east into Los Angeles County. The mountainous topography surrounding the lower lying portions of Ventura County, where most pollutants are emitted, contributes to poor air quality by acting as a barrier, which prevents winds from blowing away polluted air.

3.3.3.1 Climate and Atmospheric Conditions

The air above the PWIMP Planning Area often exhibits weak vertical and horizontal dispersion characteristics. The region experiences temperature inversions, which limit atmosphere mixing and trap pollutants, resulting in high pollutant concentrations near ground level. Surface inversions (0 - 500 feet) are most frequent during winter; subsidence inversions (1,000 – 2,000 feet) are most frequent during summer. Generally, the lower the inversion base height and the greater the temperature increase from the top, the more pronounced the effect the inversion will have on the inhibiting dispersion. The City's climate is characterized by cool winters and generally moderate summers. Marine air influences the climate throughout the year. According to the Western Regional Climate Center, average temperatures range from about 75 degrees F (24 degrees C) in summer to 65 degrees F (18 degrees C) in winter. Annual rainfall averages about 15 inches per year, with most rainfall occurring between November and April.

3.3.3.2 Existing Emission Sources and Emission Levels

Emissions are divided into two main categories: stationary and mobile. Stationary sources are those emission sources, such as industrial processes, burning crop residuals, and exposed soils/minerals (source of dust or Particulate Matter - PM_{10}) that are fixed in place. Within the City, stationary-source pollutants include ozone precursors associated with local industrial processes and PM_{10} emissions associated with road dust, burning, construction and demolition activities, and fuel combustion (at stationary locations, such as industry residences). Natural sources of PM_{10} emissions include those resulting from wildfires. The primary source of mobile emissions is vehicles (automobiles, passenger trucks, trucks, and buses). Vehicle emissions are also the primary source of ozone precursors.

The VCAPCD has established several monitoring stations in the South Central Coast Air Basin to measure air quality conditions. The nearest monitoring station to the City is located in El Rio, which is adjacent and to the north of the City of Oxnard. Monitoring data from the El

Rio monitoring station is shown in Table 3.3-2.

PM_{10} and $PM_{2.5}$. The State 24-hour PM10 standard was exceeded between 0 and 5 times from 1999 to 2004 at the El Rio monitoring station. There is no State 24-hour PM2.5 standard. The Federal 24-hour $PM_{2.5}$ standard was exceeded one time in 2003 and at no other time from 1999 to 2004.

Ozone. The State 1-hour ozone standard was exceeded once in 1999 and has not been exceeded since. The State 8-hour standard is not expected to become effective until early 2006. Initial 8-hour monitoring data indicates that the State 8-hour standard may occasional be exceeded at the El Rio monitoring station.

Table 3.3-2
Summary of PM10, PM2.5, and Ozone Air Quality Monitoring Data (1999-2004)

Pollutant Monitoring Station		Standard		Year					
	Parameter	Federal	California	1999	2000	2001	2002	2003	2004
PM10 ($\mu g/m^3$)									
El Rio	Annual geometric mean	NA	20	29	28	29	29	NA	29
	Annual arithmetic mean	50	NA	28	27	28	28	31	28
	24-hour maximum	150	50	50	52	53	100	127	59
	Days above State standards	-	-	0	1	3	2	5	1
$PM_{2.5}$									
El Rio	Annual geometric mean	N/A	12	N/A	N/A	13	N/A	N/A	11
	Annual arithmetic mean	15	N/A	N/A	N/A	N/A	13	12	11
	24-hour maximum	65	N/A	37	46	41	29	82	29
	Days above State standards			0	0	0	0	1	0
Ozone (ppm)									
El Rio	1-hour maximum	NA	0.09	0.10	0.08	0.09	0.09	0.08	0.08
	Days above State Standards			1	0	0	0	0	0
	8-hour Maximum	0.08	0.076	0.08	0.07	0.07	0.07	0.07	0.08
	Days above State Standards			N/A	N/A	N/A	N/A	N/A	N/A

Notes: N/A = not available. Days above standard means days with one or more exceedance of the 1-hour ozone standards – The State 8-hour ozone standard was approved by the CARB on April 28, 2005 and is expected to become effective in early 2006.

Table 3.3-2
Summary of PM10, PM2.5, and Ozone Air Quality Monitoring Data (1999-2004)

Pollutant Monitoring Station		Standard		Year					
	Parameter	Federal	California	1999	2000	2001	2002	2003	2004

Source: California Air Resources Board, 2016

As of 2015, the Ventura County air basin is in attainment with, or is unclassified with respect to, all federal and state ambient air quality standards except for ozone and PM_{10}.

3.3.3.3 Sensitive Receptors in the City

Sensitive receptors are typically defined as populations or uses that are more susceptible to the effects of air pollution than the general population. For the PWIMP Planning Area, sensitive receptors include the following populations or uses: long-term healthcare facilities, rehabilitation centers, convalescent centers, retirement homes, residences, schools, playgrounds, childcare centers, and athletic facilities.

3.3.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.3.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on agricultural resources would occur if the PWIMP would:

- Conflict with population or other growth forecasts contained in the Ventura County AQMP or otherwise obstruct implementation of the Ventura County AQMP;
- Violate any federal or state air quality standard or contribute substantially to an existing or projected air quality standard violation;
- Result in a net increase of any criteria air pollutant in excess of quantitative thresholds recommended by the VCAPCD;
- Expose sensitive receptors to pollutant concentrations exceeding state or federal standards or in excess of applicable health risk criteria for toxic air contaminants; and/or
- Create objectionable odors affecting a substantial number of people.

3.3.4.2 Approach and Methodology

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

Evaluation of potential impacts to air quality from construction and operation of the PWIMP was based on reviewing relevant regulatory guidelines, characterizing the existing air quality environment throughout the study area, and comparing potential emissions from construction and operation of the PWIMP facilities.

3.3.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts to agricultural resources are discussed below.

Impact 3.3-1: Implementation of the PWIMP could conflict with population or other growth forecasts contained in the Ventura County AQMP or otherwise obstruct implementation of the Ventura County AQMP. The potential impacts are discussed below.

The PWIMP is located within the jurisdiction of VCAPCD, the regional agency empowered to regulate air pollutant emissions from stationary sources in the Ventura County. VCAPCD regulates air quality through its permit authority over most types of stationary emission sources and through its planning and review process. The PWIMP would provide for additional water supplies to serve planned growth in the 2030 Oxnard General Plan area. The City's General Plan EIR document determined that the population forecasts for the City of Oxnard were less than those used in the Ventura County AQMP and that the 2030 General Plan was consistent with and would not obstruct the Ventura County AQMP. Further, build out of the 2030 General Plan area would have a less than significant impact and consistent with the Ventura County AQMP. The PWIMP would not exceed these estimates and thus does not conflict with population or other growth forecasts contained in the Ventura County AQMP and/or otherwise obstruct implementation of the Ventura County AQMP.

Construction and Long-Term Operational Mitigation Measures

No significant impacts would occur and no mitigation measures are required.

Significance Determination: Less-than-Significant Impact

Impact 3.3-2: Implementation of the PWIMP and/or identified components/facilities could violate any federal or state air quality standard or contribute substantially to an existing or projected air quality standard violation. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

The construction of the new PWIMP facilities and the rehabilitation and/or replacement of existing facilities could violate any federal or state air quality standard or contribute substantially to an existing or projected air quality standard violation. This is a potentially significant impact.

The PWIMP would be located within the jurisdiction of VCAPCD, the regional agency empowered to regulate air pollutant emissions from stationary sources in the Ventura County. VCAPCD regulates air quality through its permit authority over most types of stationary emission sources and through its planning and review process. Construction activities generate Reactive Organic Compounds (ROC) and Nitrogen Oxides (NOx) and fugitive dusts PM_{10} and $PM_{2.5}$. Construction emissions are considered by VCAPCD to be temporary in nature and are not included in overall emissions when determining if project impacts are significant. However and pursuant to VCPACD policy, construction-related emissions should be mitigated if estimates of ROC and NOx emissions exceed 25 pounds per day. PWIMP construction activities would occur over many years, but any one individual project, or a collection of several projects being constructed at the same time have the potential to exceed theses estimates. Further, PWIMP construction activities have the potential to temporary increase fugitive dusts and contribute to San Joaquin Valley Fever[1], which VCAPCD does not have any established significant thresholds.

VCAPCD's approach to analyses of construction impacts is to emphasize implementation of effective and comprehensive basic construction control measures in all aspects of construction. With implementation of the **Mitigation Measures 3.3-2a through 3.3-2e** below, the PWIMP's construction-related impacts would be considered to be less than significant.

Construction Mitigation Measures

The following mitigation measures shall be implemented.

Mitigation Measure 3.3-2a: Calculate Air Emissions. For each individual or group of PWIMP projects to be constructed, the City shall calculate air quality emissions using an appropriate air emissions computer program, as appropriate. VCAPCD recommends using the URBEMIS computer program that was originally developed by the California Air Board. However, other models such as the Sacramento Metropolitan Air Quality Management District's (SMAQMD) Roadway Construction Emissions Model can be effective in assessing the emissions of linear construction projects. The model run(s) will establish estimated construction emissions,

[1] San Joaquin Valley Fever (Coccidioidomycosis) is a common cause of community-acquired pneumonia in the endemic areas of the United States. Infections usually occur due to inhalation of the arthroconidial spores after soil disruption. The disease is not contagious. In some cases the infection may recur or become chronic.

which will be used to establish a construction emissions control plan as described in **Mitigation Measure 3.3-2b** below.

Mitigation Measure 3.3-2b: Construction Emissions Control Plan. For each individual or group of PWIMP projects to be constructed, the City shall prepare a Construction Emissions Control Plan that outlines an approach for phasing construction activities to ensure that daily construction emissions do not exceed the VCAPCD's significance thresholds for construction activities. The plan shall be submitted to the VCAPCD for review and approval at least 30 days prior to the estimated start of construction activities. The City shall require the approved plan to be implemented during all construction activities by including the approved plan in construction contracts. The plan shall include, at a minimum, a detailed description of the construction equipment inventory and use requirements for each component of the project, including daily activity phasing. The plan shall include documentation that the equipment used to construct the project(s) is properly maintained and shall include the maintenance schedule of the equipment, consistent with manufacturers' specifications. To ensure that emissions remain below VCAPCD's daily significance threshold of 25 pounds per day of ROC and NOx, the plan shall be designed to achieve emission levels that are no higher than 22.5 pounds per day of ROC and NOx (i.e., 90 percent of the daily threshold). All aspects of construction activity, including but not limited to truck trips per day, miles per trip, miles of dirt road travel per day, daily equipment inventories, equipment hours, and amounts of total areas and volumes of material to be disturbed shall be clearly defined in the plan and implemented in the field so that it can be determined by a third party construction monitor that the agreed upon plan is adequately implemented.

Mitigation Measure 3.3-2c: Construction Fugitive Dust Control Plan. For each individual or group of PWIMP projects to be constructed, the City shall, to the extent applicable, require its construction contractor(s) to implement a dust control plan that shall include a minimum of the following dust control measures.

- The area disturbed by clearing, grading, earth moving, or excavation operations shall be minimized to prevent excessive amounts of dust.

- Pre-grading/excavation activities shall include watering the area to be graded or excavated before commencement of grading or excavation operations. Application of water (preferably reclaimed, if available) should penetrate sufficiently to minimize fugitive dust during grading activities.

- Fugitive dust produced during grading, excavation, and construction activities shall be controlled by the following activities:

    - All trucks shall be required to cover their loads as required by California Vehicle Code §23114.

    - All graded and excavated material, exposed soil areas, and active portions of the construction site, including unpaved on-site roadways, shall be treated to prevent fugitive dust. Treatment shall include, but not necessarily be limited to, periodic watering, application of environmentally-safe soil stabilization materials, and/or roll-compaction as appropriate. Watering shall be done as often as necessary and reclaimed water shall be used whenever possible.

- Graded and/or excavated inactive areas of the construction site shall be monitored by the City (or designee) at least weekly for dust stabilization. Soil stabilization methods, such as water and roll-compaction, and environmentally-safe dust control materials, shall be periodically applied to portions of the construction site that are inactive for over four

days. If no further grading or excavation operations are planned for the area, the area should be seeded and watered until grass growth is evident, or periodically treated with environmentally-safe dust suppressants, to prevent excessive fugitive dust.

- Signs shall be posted on-site limiting traffic to 15 miles per hour or less.

- During periods of high winds (i.e., wind speed sufficient to cause fugitive dust to impact adjacent properties), all clearing, grading, earth moving, and excavation operations shall be curtailed to the degree necessary to prevent fugitive dust created by on-site activities and operations from being a nuisance or hazard, either off-site or on-site. The site superintendent/supervisor shall use his/her discretion in conjunction with the Ventura County APCD in determining when winds are excessive.

- Adjacent streets and roads shall be swept at least once per day, preferably at the end of the day, if visible soil material is carried over to adjacent streets and roads.

- Personnel involved in grading operations, including contractors and subcontractors, should be advised to wear respiratory protection in accordance with California Division of Occupational Safety and Health regulations.

Mitigation Measure 3.3-2d: San Joaquin Valley Fever Prevention Plan. For each individual or group of PWIMP projects to be constructed, the City shall, to the extent applicable and possible, require its construction contractor(s) to implement a San Joaquin Valley Fever Prevention Plan that shall include a minimum of the following measures.

- Restrict employment to persons with positive coccidioidin skin tests (since those with positive tests can be considered immune to reinfection).

- Hire crews from local populations where possible, since it is more likely that they have been previously exposed to the fungus and are therefore immune.

- Require crews to use respirators during project clearing, grading, and excavation operations in accordance with California Division of Occupational Safety and Health regulations.

- Require that the cabs of grading and construction equipment be air-conditioned.

- Require crews to work upwind from excavation sites.

- Pave construction roads.

- Where acceptable to the fire department, control weed growth by mowing instead of discing, thereby leaving the ground undisturbed and with a mulch covering.

- During rough grading and construction, the access way into the project site from adjoining paved roadways should be paved or treated with environmentally-safe dust control agents.

Mitigation Measure 3.3-2e: ROC and NOx Construction Measures. For each individual or group of PWIMP projects to be constructed, the City shall, to the extent applicable and possible, require its construction contractor(s) to implement ROC and NOx construction measures.

- Minimize equipment idling time.
- Maintain equipment engines in good condition and in proper tune as per manufacturers' specifications.
- Lengthen the construction period during smog season (May through October), to minimize the number of vehicles and equipment operating at the same time.
- Use alternatively fueled construction equipment, such as compressed natural gas (CNG), liquefied natural gas (LNG), or electric, if feasible.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

With regard to long-term operations, there would be no permanent stationary sources associated with the PWIMP, with the exception of emergency generators, and mobile sources would be limited to commuting workers to PWIMP facilities and limited truck trips to inspect the pipeline and conveyance facilities. As a result, the PWIMP operations would not exceed the ROC and NOx thresholds of 25 Pounds per day. Further, many of the PWIMP activities involve the rehabilitation and replacement of existing facilities or expansions. The addition of the new facilities and/or expansion of existing facilities would not require any significant change in operations or a substantial additional staff. As a result, operational impacts are expected to be less than significant and no additional mitigation measures are required.

Long-Term Operational Mitigation Measures

No significant impacts would occur and no mitigation measures are required.

Significance Determination: Less-than-Significant Impact

Impact 3.3-3: Implementation of the PWIMP and/or identified components/facilities could result in a net increase of any criteria air pollutant in excess of quantitative thresholds recommended by the VCAPCD. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

As stated above, the PWIMP would be located within the jurisdiction of VCAPCD, the regional agency empowered to regulate air pollutant emissions from stationary sources in the Ventura County. VCAPCD regulates air quality through its permit authority over most types of stationary emission sources and through its planning and review process. Construction activities generate Reactive Organic Compounds (ROC) and Nitrogen Oxides (NOx) and fugitive dusts PM_{10} and $PM_{2.5}$. Construction emissions are considered by VCAPCD to be temporary in nature and are not included in overall emissions when determining if project impacts are significant. However and

pursuant to VCPACD policy, construction-related emissions should be mitigated if estimates of ROC and NOx emissions exceed 25 pounds per day. PWIMP construction activities would occur over many years, but any one individual project, or a collection of several projects being constructed at the same time have the potential to exceed theses estimates. Further, PWIMP construction activities have the potential to temporary increase fugitive dusts and contribute to San Joaquin Valley Fever, which VCAPCD does not have any established significant thresholds.

Construction Mitigation Measures

VCAPCD's approach to analyses of construction impacts is to emphasize implementation of effective and comprehensive basic construction control measures in all aspects of construction. With implementation of the **Mitigation Measures 3.3-2a through 3.3-2e**, the PWIMP's construction-related impacts would be considered to be less than significant and would not result in a cumulatively considerable net increase of any criteria air pollutants.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

With regard to long-term operations, there would be no permanent stationary sources associated with the PWIMP, with the exception of emergency generators, and mobile sources would be limited to commuting workers to PWIMP facilities and limited truck trips to inspect the pipeline and conveyance facilities. As a result, the PWIMP operations would not exceed the ROC and NOx thresholds of 25 Pounds per day. Further, many of the PWIMP activities involve the rehabilitation and replacement of existing facilities or expansions. The addition of the new facilities and/or expansion of existing facilities would not require any significant change in operations or a substantial number of additional staff. As a result, operational impacts are expected to be less than significant and no additional mitigation measures are required.

Mitigation Measures

No significant impacts would occur and no mitigation measures are required.

Significance Determination: Less-than-Significant Impact

Impact 3.3-4: Implementation of the PWIMP and/or identified components/facilities could expose sensitive receptors to pollutant concentrations exceeding state or federal standards or in excess of applicable health risk criteria for toxic air contaminants. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

A toxic air contaminant (TAC) is an air pollutant that may cause or contribute to an increase in mortality or serious illness, or that may pose a hazard to human health. TAC are usually present in very low concentrations quantities in the ambient air; however, their high toxicity or health risk may pose a threat to public health even at low concentrations. Diesel exhaust is a complex mixture of numerous individual gaseous and particulate compounds emitted from diesel-fueled

combustion engines. In August 1998, the CARB identified diesel particulate matter (DPM) as an air toxic

Diesel emissions would result both from diesel-powered construction vehicles and any diesel trucks associated with Project operations. Typically, heath risks are estimated based on a chronic exposure period of 70 years. Given that construction emissions would be relatively low, short-term in nature, and move throughout the PWIMP Planning area site (limiting the potential long-term exposure to any sensitive receptors), it is not anticipated that exposure to construction-related DPM would result in an elevated health risk. As a result, the cancer risks from the construction of the PWIMP associated with diesel emissions over a 70-year lifetime are very small. Therefore, the construction related impacts related to DPM would be less-than-significant. Likewise, as noted previously, the PWIMP construction activities could exceed 25 pounds per day of ROC and NOx should be mitigated to be in compliance with the Ventura County AQMP and VCAPCD's *Air Quality Guidelines*.

Construction Mitigation Measures

With the implementation of **Mitigation Measures 3.3-2a through 3.3-2e,** any effects would be further reduced. Therefore, the Project would not expose sensitive receptors, including residents in the Project vicinity, to substantial pollutant concentrations.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

As discussed previously and with regard to long-term operations, there would be no permanent stationary sources associated with the PWIMP, with the exception of emergency generators, and mobile sources would be limited to commuting workers to PWIMP facilities and limited truck trips to inspect the pipeline and conveyance facilities. As a result, the PWIMP operations would not exceed the ROC and NOx thresholds of 25 Pounds per day, over existing conditions. Further, many of the PWIMP activities involve the rehabilitation and replacement of existing facilities or expansions. The addition of the new facilities and/or expansion of existing facilities would not require any significant change in operations or a substantial number of additional staff. As a result, PWIMP operational impacts are expected to be less than significant and would not result in a cumulatively considerable net increase of any criteria air pollutant. No additional mitigation measures are required.

Long-Term Mitigation Measures

No significant impacts would occur and no mitigation measures are required.

Significance Determination: Less-than-Significant Impact

Impact 3.3-5: Implementation of the PWIMP and/or identified components/facilities could create objectionable odors affecting a substantial number of people. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts and Mitigation Measures

Odors are generally regarded as an annoyance rather than a health hazard. Manifestations of a person's reaction to odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting and headache). The ability to detect odors varies considerably among the population and overall is quite subjective. People may have different reactions to the same odor. An odor that is offensive to one person may be perfectly acceptable to another (e.g., coffee roaster). The occurrence and severity of odor impacts depend on the nature, frequency, and intensity of the source; wind speed and direction; the number of receptors, and the sensitivity of receptors. Odor impacts should be considered for any proposed new odor sources located near existing receptors.

During construction of the Project, the various diesel-powered vehicles and equipment in use on-site could create minor odors. These odors would not affect a substantial number of people or sensitive receptors. Any odors produced are not likely to be noticeable beyond the immediate area and, in addition, would be temporary and short-lived in nature. Therefore, odor impacts as a result of construction activities would be less-than-significant. No specific mitigation measures are required.

Temporary Construction Mitigation Measures

No significant impacts would occur and no mitigation measures are required.

Significance Determination: Less-than-Significant Impact

Long-Term Operational Impacts

The occurrence and severity of odor impacts depends on numerous factors, including: the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of the receptors. While offensive odors rarely cause any physical harm, they still can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and regulatory agencies. Projects with the potential to frequently expose a substantial number of members of the public to objectionable odors would be deemed to have a significant impact.

The PWIMP includes expanding the capacity of the existing WWTP in the City of Oxnard. The VCAPCD considers wastewater treatment plants a common land use type that has high odor-generation potential. Type of odor source, distance from the source to the nearest sensitive receptor, meteorology of the project location, and odor complaint history in the project vicinity are all parameters that affect the magnitude of an odor impact and thus, are considered in this analysis.

The PWIMP would result in additional treatment capacity and open-air treatment processes in proximity to existing sensitive receptors (i.e., residents to the north and west). During operations of the expanded wastewater facilities, chemical storage and feed facilities would be essentially the same or better than existing conditions as closed systems and ventilation units would be equipped with odor control scrubbers. For open air facilities, odors would continue to be managed through operational controls. For example, operators would reduce detention times in basins, use a technique known as "enclosure, capture, and treatment," or use chemical stabilization to control

odors. The mechanical dewatering process would be enclosed within a simple structure. The air would be "captured" through the ventilation system and treated with a scrubber. Operators would also use chemical stabilization techniques to control odor of residuals. For example, they could apply chemicals such as lime directly to the sludge drying bed and prevent odors from releasing to the atmosphere. Because the nature of the odor-generating source would not change, it is not expected that the expansion of treatment capacity would result in significant increased intensity and frequency of odors at the WWTP or to the sensitive receptors. If odors are detected outside of the project site and complaints would be received by the City or VCAPCD, VCAPCD would enforce its Nuisance Rule, which prohibits odorous emissions that cause annoyance or detriment to public health. Further, the area to the east and south are zoned industrial and agricultural and would not expected to be developed as residential according to the 2030 General Plan. As a result, there would not be additional sensitive receptors in the future.

Due to the specifications and odor control features of the Project as described above and the relative position and distance of sensitive receptors, odor impacts during operations would be less than significant.

Long-Term Operational Mitigation Measures

No significant impacts would occur and no mitigation measures are required.

Significance Determination: Less-than-Significant Impact

3.3.5 Cumulative Effects

The construction of the new PWIMP facilities and the rehabilitation and/or replacement of existing facilities could violate any federal or state air quality standard or contribute substantially to an existing or projected air quality standard violation. Further, these projects in conjunction with other projects being constructed at the same time could lead to temporary cumulative impacts to air quality within the region. This is a potentially significant impact. However, the PWIMP would be located within the jurisdiction of VCAPCD, the regional agency empowered to regulate air pollutant emissions from stationary sources in the Ventura County. VCAPCD's approach to analyses of construction impacts is to emphasize implementation of effective and comprehensive basic construction control measures in all aspects of construction. Construction emissions are considered by VCAPCD to be temporary in nature and are not included in overall emissions when determining if project impacts are significant. However, with implementation of the **Mitigation Measures 3.3-2a through 3.3-2e** above, the PWIMP's construction-related impacts would be considered to be less than significant. Further, the City would need to further analyze the construction of each of these PWIMP facilities on a project-level basis at the appropriate time with a full understanding of other projects being constructed in the area at the same time to be able to further assess the potential for the PWIMP to have cumulative air quality impacts.

With regard to long-term operations, there would be no permanent stationary sources associated with the PWIMP, with the exception of emergency generators, and mobile sources would be limited to commuting workers to PWIMP facilities and limited truck trips to inspect the pipeline and conveyance facilities. As a result, the PWIMP operations would not exceed the ROC and

NOx thresholds of 25 Pounds per day or create any cumulative impacts. Further, many of the PWIMP activities involve the rehabilitation and replacement of existing facilities or expansions. The addition of the new facilities and/or expansion of existing facilities would not require any significant change in operations or a substantial number of additional staff. As a result, operational impacts are expected to be less than significant and would not lead to any cumulative impacts. Therefore, no mitigation measures are required.

3.4 Biological Resources

This section describes the existing regulatory setting, the biological resources in the PWIMP Planning Area(s), and evaluates how construction and operation of the components of the PWIMP would impact biological resources. This evaluation of biological resources was based on an initial review of existing reports and literature from the City of Oxnard. The City's PWIMP Planning Area contains a variety of biological communities, which provide habitat for both rare and common species. This section describes key biological resources, including sensitive natural communities and special status species. The results of this assessment may be used in planning and management decisions that may affect biological resources in the PWIMP Planning Area.

3.4.1 Introduction

This evaluation of biological resources includes a review of vegetation and wildlife habitat, special-status species, and jurisdictional "waters of the United States" that occur or potentially occur at or in the vicinity of the Planning Area. The results of this assessment are based upon field reconnaissance of the Planning Area, literature searches, and database queries. The sources of reference data reviewed include the following:

- U.S. Fish and Wildlife Service (USFWS) Species List for Ventura County;
- California Natural Diversity Database (CNDDB), Rarefind 3 computer program for the Plan Area and a 5-mile radius beyond the Plan Area;
- California Native Plant Society (CNPS), Electronic Inventory computer program for the following USGS quadrangles: Oxnard, Saticoy, Santa Paula, Ventura, Camarillo, and Point Mugu, California;
- California Department of Fish and Wildlife (CDFW) Special Vascular Plants, Bryophytes, and Lichens List CDFW Special Animals List;
- California Department of Forestry and Fire Protection Multi-Source Land Cover Data v2;
- United States Geological Survey (USGS) Digital Orthophoto Quarter Quadrangles

Key Terms and concepts include the following:

- **Sensitive Natural Community.** A sensitive natural community is a biological community that is regionally rare, provides important habitat opportunities for wildlife, are structurally complex, or are in other ways of special concern to local, State, or Federal agencies. The California Environmental Quality Act (CEQA) identifies the elimination or substantial degradation of such communities as a significant impact. The CDFW tracks sensitive natural communities in the California Natural Diversity Database. Examples of sensitive natural communities in the Planning Area include Southern California Coastal Lagoon, Coastal and Valley Freshwater Marsh, Southern Coast Live Oak Riparian Forest, Southern Coastal Salt Marsh, Southern Sycamore Alder Riparian Woodland, Valley Needlegrass Grassland,

and Southern Riparian Scrub.

- **Special-Status Species.** Special-status species are those plants and animals that, because of their recognized rarity or vulnerability to various causes of habitat loss or population decline, are recognized for protection by Federal, State, or other agencies. Some of these species receive specific protection that is defined by Federal or State endangered species legislation. Others have been designated as "sensitive" on the basis of adopted policies and expertise of State resource agencies or organizations with acknowledged expertise, or policies adopted by local governmental agencies such as counties, cities, and special districts to meet local conservation objectives. These species are referred to collectively as "special status species" in this document, following a convention that has developed in practice but has no official sanction. For the purposes of this assessment, the term "special-status" includes those species that are:
    - Federally listed or proposed for listing under the Federal Endangered Species Act (50 CFR 17.11-17.12);
    - Candidates for listing under the Federal Endangered Species Act (61 FR 7596-7613);
    - State listed or proposed for listing under the California Endangered Species Act (14 CCR 670.5);
    - Species listed by the U.S. Fish and Wildlife Service (USFWS) or the California Department of Fish and Game (CDFG) as a species of concern (USFWS), rare (CDFG), or of special concern (CDFG);
    - Fully protected animals, as defined by the State of California (California Fish and Game Code Section 3511, 4700, and 5050);
    - Species that meet the definition of threatened, endangered, or rare under CEQA (CEQA Guidelines Section 15380);
    - Plants listed as rare or endangered under the California Native Plant Protection Act (California Fish and Game Code Section 1900 et seq.); and
    - Plants listed by the California Native Plant Society (CNPS) as rare, threatened, or endangered (List 1A and List 2 status plants in Skinner and Pavlik 1994).

Wetlands and Other Waters of the U.S. Wetlands are ecologically complex habitats that support a variety of both plant and animal life. In a jurisdictional sense, the Federal government defines wetlands in Section 404 of the Clean Water Act as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support (and do support, under normal circumstances) a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3[b] and 40 CFR 230.3). Under normal circumstances, the Federal definition of wetlands requires three wetland identification parameters be present: wetland hydrology, hydric soils, and hydrophytic vegetation. Examples of wetlands include saline and freshwater marshes, seasonal wetlands, and vernal pool

complexes that have a hydrologic link to other waters of the U.S (see definition below for "other waters of the U.S."). The U.S. Army Corps of Engineers (Corps) is the responsible agency for regulating wetlands under Section 404 of the Clean Water Act, while the Environmental Protection Agency (EPA) has overall responsibility for the Act.

"Other Waters of the U.S." refers to those hydric features that are regulated by the Clean Water Act but are not wetlands (33 CFR 328.4). To be considered jurisdictional, these features must exhibit a defined bed and bank and an ordinary high-water mark. Examples of other waters of the U.S. include rivers, creeks, intermittent and ephemeral channels, ponds, and lakes.

The CDFW does not normally have direct jurisdiction over wetlands unless they are subject to jurisdiction under Streambed Alteration Agreements or they support State-listed endangered species; however, CDFW has trust responsibility for wildlife and habitats pursuant to California law.

Examples of jurisdictional waters that occur in the Planning Area would include the Santa Clara River, Beardsley Wash/Revolon Slough, McGrath Lake, Ormond Beach Lagoon (a seasonal wetland feature), and other potentially jurisdictional features such as agricultural and urban drains, especially where they replaced natural waterways.

3.4.2 Regulatory Context

Relevant Federal, State, and local guidelines specific to biological resource issues are discussed in this section.

3.4.2.1 Federal Regulations

The relevant federal regulations are discussed below.

Clean Water Act – Section 404. Wetlands and other waters of the U.S. (as defined above) are subject to jurisdiction by the Corps and EPA under Section 404 of the Clean Water Act. Wet areas that are not regulated by this act would include stock watering ponds, agricultural ditches created in upland areas, and isolated wetlands that do not have a hydrologic link to other waters of the U.S., either through surface or subsurface flow. The discharge of fill into a jurisdictional feature requires a permit from the Corps.

The Corps has the option to issue a permit on a case-by-case basis (individual permit) or at a program level (general permit). Nationwide permits (NWPs) are an example of general permits; they cover specific activities that generally have minimal environmental effects. Activities covered under a particular NWP must fulfill several general and specific conditions, as defined by the NWP. If a proposed project cannot meet these conditions, an individual permit may be required.

Federal Endangered Species Act. The USFWS administers the Federal Endangered Species Act (16 USC Section 153 et seq.) and thereby has jurisdiction over federally listed threatened, endangered, and proposed species. Projects that may result in "take" of a listed species must consult with the USFWS. Federal agencies that propose a project that may affect a listed species are required to consult with the USFWS under Section 7 of the Federal Endangered Species Act. If it is determined that a federally listed species may be adversely affected by the Federal action, the USFWS will issue a Biological Opinion to the Federal

agency that describes minimization and avoidance measures that must be implemented as part of the Federal action. Projects that do not have a Federal nexus must apply for a take permit under Section 10 of the Act. Section 10 of the Act requires that the project applicant prepare a habitat conservation plan as part of the permit application.

Under the Federal Endangered Species Act the USFWS designates critical habitat, areas that are essential for the conservation of a threatened or endangered species and which may require special management considerations. A designation only applies to projects with a Federal nexus; it has no specific regulatory impact on landowners who take actions on their land that do not involve Federal funding. However, Federal agencies must consult with the USFWS before taking actions that could harm or kill protected species or destroy their habitat.

Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act. The Migratory Bird Treaty Act (MBTA, 16 USC Section 703-711) and the Bald and Golden Eagle Protection Act (16 USC Section 668) protect certain species of birds from direct take. The MBTA protects migrant bird species from take through the establishment of hunting limits and seasons and protecting occupied nests and eggs. The Bald and Golden Eagle Protection Act prohibits the take or commerce of any part of these species. The USFWS administers both acts, and reviews Federal agency actions that may affect species protected by the acts.

3.4.2.2 State Regulations

The relevant state regulations are discussed below.

California Fish and Wildlife Code Sections 1600 – 1616. The CDFW regulates the modification of streams, rivers, and lakes under Sections 1600-1616 of the California Fish and Wildlife Code. Modification includes diverting, obstructing, or changing the natural flow or bed, channel, or bank of a regulated feature. While most of the features regulated by the Fish and Wildlife Code meet the definition of other waters of the U.S., the Code may regulate some ephemeral features that do not have all the criteria to qualify as other waters of the U.S. A project proponent, including both private parties and public agencies, proposing an activity that may modify a feature regulated by the Fish and Wildlife Code must notify the CDFW before project construction. The CDFW will then decide whether to enter into a Streambed Alteration Agreement with the project proponent.

California Endangered Species Act. The CDFW administers the California Endangered Species Act of 1984 (Fish and Game Code Section 2080), which regulates the listing and "take" of endangered and threatened species. A "take" may be permitted by CDFW through implementing a management agreement. Under the State laws, the CDFW is empowered to review projects for their potential impacts to listed species and their habitats. CDFW maintains lists for Candidate-Endangered Species (SCE) and Candidate-Threatened Species (SCT). California candidate species are afforded the same level of protection as listed species. California also designates Species of Special Concern (CSC), which are species of limited distribution, declining populations, diminishing habitat, or unusual scientific, recreational, or educational value. These species do not have the same legal protection as listed species, but may be added to official lists in the future. The CSC list is intended by CDFW as a management tool for consideration in future land use decisions.

3.4.2.3 Local Regulations

The relevant local regulations are discussed below.

Oxnard 2030 General Plan. The combined Open Space/Conservation Element's of the City's existing 2030 General Plan contains several Natural Resources policies pertinent to biological resources.

3.4.3 Environmental Setting

A description of the key wildlife habitats (including plant and wildlife species) found within the Planning Area is described in this section. The section begins with a brief description of the key wildlife habitats.

Wildlife Habitats

Wildlife habitats provide food, shelter, movement corridors, and breeding opportunities for a variety of wildlife species. Habitats are classified in broad terms with an emphasis on vegetation structure, and include other elements such as vegetation species composition, soil structure, and water availability. Some wildlife species are generalists and may use a variety of habitats, while other species may be restricted to one habitat. Species that are restricted to a single habitat type are more susceptible to habitat loss than are generalists, and are more likely to experience population declines. These species are presented in greater detail later in this section.

Habitats are not distinct features that can be managed in isolation from each other. More common wildlife species, such as red-shouldered hawk (*Buteo lineatus*), great-horned owl (*Bubo virginianus*), northern flicker (*Colaptes auratus*), brown-headed cowbird (*Molothrus ater*), raccoon (*Procyon lotor*), and western toad (*Bufo boreas*) frequently use more than one habitat type. They may use riparian habitat for breeding sites, resting sites, cover while moving from one area to another, or thermal cover, and range into open upland grasslands, scrub, or over open water to forage. Frequently it is at the edges of habitats, or where they transition from one habitat to another, that the greatest number of these more common wildlife species will be found.

The PWIMP Planning Area contains mostly human-modified habitats. The vast majority of these areas include urban, industrial, or agricultural production areas. In some areas (especially in the northern part of the Planning Area), a series of industrial oil fields within agricultural lands exists. Native habitats exist mostly on the edges of the Planning Area (i.e., Santa Clara River, coastal areas, etc.) where they experience fairly heavy recreational pressure. These habitats, as classified in California Habitats (CDFG, 2000), are listed and briefly described below. Habitats present in the Plan Area, and acreage calculations, are based on the California Department of Forestry and Fire Protection's Multi-source Land Cover Data v2 (2002), which was re-classified following a reconnaissance survey and using aerial photo interpretation. A summary of the acreages for each habitat type are provided below in Table 3.4-1 below.

Table 3.4-1
Summary of Habitats, City of Oxnard and PWIMP Planning Area

Habitat Type	Acreage

Table 3.4-1
Summary of Habitats, City of Oxnard and PWIMP Planning Area

Habitat Type	Acreage
Urban	18,250
Agriculture	23,650
Eucalyptus	30
Valley Foothill Riparian	930
Coastal Scrub and Mixed Chaparral	470
Coastal Oak Woodland	20
Annual Grassland	130
Saline Emergent Wetland	190
Marine (intertidal zone)	440
Total	**44,110**

Notes: *Barren, Fresh Emergent Marsh, Lacustrine, Riverine, and Estuarine habitats occur in patches too small to have been mapped*
Source: *California Department of Forestry and Fire Protection's Multi-source Land Cover Data, 2002*

Urban. Large portions of the Planning Area (roughly 18,250 acres) are best characterized as urban habitat. A distinguishing feature of the urban wildlife habitat is the mixture of native and exotic species. This habitat type varies structurally, and can be categorized into three zones: downtown, urban residential, and suburbia. Downtown, the most heavily developed, is usually at the center, followed by concentric zones of decreasing development and increasing vegetative cover through urban residential to the suburbs. Both native and exotic plant species are valuable, with exotic species providing a good source of additional food in the form of fruits and berries, and cover. Wildlife species richness and diversity increases along this same gradient. These areas provide cover and foraging opportunities for some wildlife species, especially those adapted to human disturbance. Common examples include raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), northern mockingbird (*Mimus polyglottos*), mourning dove (*Zenaida macrocoura*), Anna's hummingbird (*Calypte anna*), wrentit (*Chamaea fasciata*), and black-bellied slender salamander (*Battrachoseps nigriventris*).

Irrigated Row and Field Crops. Even larger portions of the Planning Area (about 23,650 acres) contain agricultural habitats. As shown in Figure 5-1, these agricultural habitats are included within both the existing City limits and within surrounding lands that comprise the City's Planning Area. Vegetation in this habitat includes a variety of sizes, shapes and growing patterns, with individual locations representing various intensities of use that range from highly farmed to more fallow agricultural uses. Plants may be either annual (e.g. lettuce) or perennial (e.g. strawberries), and when grown in rows provide a varying amount of bare ground between rows. Annual crops are usually planted in spring and harvested in summer or fall. However, they may be planted in rotation with other irrigated crops. In some areas of southern California three crops may be grown in a year. For example, on the Oxnard plain, cool weather crops such as lettuce and cabbage are grown in the fall and winter followed by tomatoes, corn, or peppers in the spring and summer. Crops are typically grown on the most fertile soils, and have lower habitat values than the native habitats they replace. However, many species of rodents and birds have adapted to agricultural areas. Croplands provide food and water for these species, but do not generally provide long-term shelter due to the frequency of disturbance.

Eucalyptus. About 30 acres of this habitat occurs in windbreaks, small copses, and within riparian habitats located throughout the Planning Area. Usually only one or to species of

Eucalyptus trees occur together. Although planted for horticultural values and as windbreaks, these non-native trees will invade and displace native habitats (e.g. riparian habitat). Raptors such as red-shouldered hawk may nest in Eucalyptus, which also serves as a food source for birds such as Anna's hummingbird and yellow-rumped warbler; however, sticky gum produced by Eucalyptus can effectively glue shut the bills of birds foraging on nectar, resulting in their death (William, 2002). Monarch butterflies commonly use large stands of Eucalyptus trees for roosts along the California Coast.

Valley Foothill Riparian. Within the Planning Area, riparian habitat occurs over an estimated 930 acres mostly along the Santa Clara River, and to a lesser extent along other waterways such as Calleguas Creek and Revolon Slough. This habitat is principally composed of a sparse cottonwood overstory and a dense willow subcanopy mixed with introduced giant reed, Myoporum, and tamarisk. Many species of wildlife use this habitat type for movement corridors, foraging, cover, and breeding. Recent estimates of this habitat remaining in California range from 2–15%; native riparian habitats have been recognized as an important component of properly-functioning ecosystems, and have been identified as the most important habitat to land-bird species (RHJV, 2000).

Coastal Scrub and Mixed Chaparral. These fairly open habitats occur over a small (470 acres) area in the northwest part of the Planning Area, in rear dunes between the coast and agricultural lands. They are principally composed of a discontinuous canopy of coyote brush, California sagebrush, and iceplant with a mixed herbaceous layer. They provide foraging habitat for many species of wildlife, and breeding habitat for a more limited number of common species such as California ground squirrel and white-crowned sparrow. Coastal sage scrub also supports more than 100 species of plants and animals that are considered rare, sensitive, threatened, or endangered by California or U.S. Federal wildlife agencies (Atwood 1993, McCaull 1994 in CalPIF. 2004).

Coastal Oak Woodland. Several small inclusions of this habitat are mapped within the Valley Foothill Riparian on the Santa Clara River, and in the vicinity of Mandalay Beach. About 20 acres occurs within the Planning Area. The structure of this habitat is extremely variable. Within the Planning Area Coastal Oak Woodland provides habitat values similar to Valley Foothill Riparian and Coastal Scrub.

Annual Grassland. This habitat is annual herbaceous vegetation with little structural complexity. Within the Planning Area it is composed of the non-native grass series, which occurs in small areas on fallowed fields and other unused and disturbed ground. It is a minor type (mapped at about 130 acres) of habitat within the Planning Area.

Fresh Emergent Marsh. This habitat is composed of bulrush and cattail, and occurs in small patches throughout the Planning Area within suitable aquatic areas. Fresh Emergent Marsh occurs in patches too small to have been mapped for the purpose of this document, but is associated with freshwater systems within the Planning Area. Examples include the eastern edge of McGrath Lake, within the estuary of the Santa Clara River, and in un-lined portions of Revolon Slough. This habitat provides important cover and nest or nursery sites for aquatic-associated wildlife species such as waterfowl.

Saline Emergent Marsh. This habitat occurs in about 190 acres of undeveloped coastal areas within the Planning Area, and is characterized by pickleweed (*Salicornia*) and saltgrass

(*Distichlis*) vegetation. The majority of saline emergent wetlands occur at the terminus of the Hueneme and Industrial Drains, which flow to the coast between Port Hueneme and the Edison power plant to the south. This habitat type has been severely reduced throughout California. As a consequence, the populations of a large number of wildlife species, including many special status species dependent on this habitat have also declined. Altered hydrologic regimes (i.e., freshwater input, artificial breaching of the sandbars) can alter the functioning of these areas of saline emergent marsh. Saline Emergent Marsh habitats are used extensively by a variety of waterfowl species.

Lacustrine. This open water habitat type is fairly limited within the Planning Area (with patches too small to have been mapped for the purpose of this document), and occurs where agricultural drains back up behind sandbars at their mouths. McGrath Lake, at the southern end of the park, is an example of a 10-acre back-dune lake that receives agricultural runoff from farming activities east of Harbor Boulevard. This habitat consists of open water, which is bordered by fresh emergent marsh. Lacustrine habitat typically provides roosting and foraging opportunities for wildlife. Near marine environments, they also provide bathing opportunities to wildlife. Under conditions where pollutants accumulate in lakes or ponds, they can become a hazard to wildlife using the habitat.

Riverine. The Santa Clara River is the longest free-flowing river in Southern California and is one of the few remaining rivers in the area that remain in a relatively natural state. The total river length is approximately 70 miles, extending from its headwaters at Mount Pinos to the Santa Clara River Estuary adjacent to McGrath State Beach. In the lower 30-mile stretch in Ventura County, the channel becomes wide and sandy. The bed and banks in the lower reaches are composed of unconsolidated sand and gravel, which are easily eroded, and are mapped as "barren" habitat. Historically, the floodplain of the river contained a dense riparian zone with marshy areas. Agricultural land reclamation and urban development throughout the 1900's have resulted in a narrowing of the river and its riparian area and a concurrent increase in erosion damage in the floodplain (PWA, 1996).

Current aquatic habitat values in the floodplain reaches are low, primarily due to very low to entirely absent surface flows during most of the year. The construction of a 20-foot tall concrete diversion dam, Vern Freeman Diversion Dam near Saticoy, was completed in 1991 and replaced the temporary diversion dikes used at this location since the 1920's. The dam is operated by the UWCD and delivers water to underground recharge basins via percolation areas. The dam is equipped with a fish ladder to enhance steelhead passage, but the National Marine Fisheries Service (NMFS) is currently reviewing the operation and design of the fish ladder.

In addition to water diversions and steelhead migration issues, other stressors on the Santa Clara River include water quality problems associated with agricultural and urban runoff, in-channel gravel and sand mining, and non-native species invasions.

Estuarine. Principally unvegetated, this habitat occurs at the mouth of the Santa Clara River. It is characterized by a mixing of freshwater and saltwater influences, and is a rich source of phyto- and zooplankton. These plankton form the basis of a rich food web which support a wide variety of wildlife species, including steelhead, terns, shorebirds, and waterfowl. This is a dynamic habitat, due to seasonal flooding and breaching of the sandbar at the mouth of the river. Depending on the timing of flooding, breaching, and tides, it can form a large lagoon or

mudflats. The Santa Clara River mouth, including the estuary (as lagoon and mudflats), riparian vegetation, and adjacent beach and dunes has been designated as a California Important Bird Area (Cooper, 2001).

Marine. This unique habitat extends from the ocean to the upper limit of the unvegetated shore and comprises four zones. The pelagic zone is characterized by open water with depths greater than required for growth of canopy-forming kelps and extends offshore 12-miles. The subtidal zone includes the area from the depth that supports canopy-forming kelps to the low-low tide line. The intertidal zone includes the area exposed by lowest-low tide up to and including the spray zone. Finally, the shore zone consists of any barren land between the spray zone to where terrestrial vegetation exceeds 10 percent canopy closure and may vary in width from a few feet to several hundred meters.

The intertidal zone covers about 440 acres in the Planning Area. This zone provides foraging opportunities for shorebirds and opportunistic feeders such as crows, ravens, turkey vultures, and, historically, California condor. The shore zone extends from the spray zone inland to vegetated habitat. Sand dunes and salt flats are included in the shore zone, including areas where vegetation cover is sparse. Wildlife that use salt flats and dunes for breeding, roosting, or foraging (including the federally-listed western snowy plover and California least tern) find cover under or near drift wood and other debris deposited by high tides and moved by wind. Seed-eating small mammals and birds find forage in vegetated portions of the shore zone. Much of this habitat experiences strong recreation pressure on both public and private land.

Special Status Species in the Planning Area

On November 22, 2017 a record search of CDFW's California Natural Diversity Database (CNDDB) and USFWS' Species List was conducted for the area within a five-mile radius of the Project area to identify previously reported occurrences of state and federal special-status plants and animals (See Appendix C). In addition, field visits for the major PWIMP project facilities was conducted on May 2 and 3, 2018 to determine the potential for special-status species to occur within the general vicinity of the PWIMP Study Area (i.e. Construction Area) as described in Chapter 2 – Project Description. This field visit was not intended to be a protocol-level survey to determine the actual absence or presence of special-status species, but was conducted to determine the potential for special-status species to occur within the Proposed Project/Action Area. During the field visits no special status species were observed. Special status plant and wildlife species known or having the potential to occur in the PWIMP Planning Area is provided below in Table 3.4-2 and shown on Figure 3.4-1. Information in the table includes a brief description of each species along with a list of habitat areas where the species may occur.

Table 3.4-2
Potential of Special Status Species to Occur in the PWIMP Planning Area

Species	Status	Habitat	Potential for Occurrence	Recommendations
Plants				
California Orcutt Grass *Orcuttia californica*	FE	Small, hairy annual grass with prostrate stems sometimes forming small	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.

Table 3.4-2
Potential of Special Status Species to Occur in the PWIMP Planning Area

Species	Status	Habitat	Potential for Occurrence	Recommendations
		tufts or mats associated with vernal pools.		
Coulter's goldfields *Lasthenia glabrata ssp. coulteri*	CNPS 1B.1	Occurs over a range of habitat, such as meadows, shrubland and open forest, but tend towards semiarid conditions. They are commonly found at ephemeral pools and are important plants in coastal regions.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Gambel's Watercress *Rorippa gambellii*	FE	A perennial herb growing decumbent to erect, its branching stems reaching up to 2 meters long. It is aquatic or semi-aquatic, its herbage sometimes floating on standing water or sprawling over wet ground.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Marsh Sandwort *Arenaria paludicola*	FE	It is present in two native locations in San Luis Obispo County, California, and it has been reintroduced nearby in Nipomo and Los Osos	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Mexican malacothrix *Malacothrix simillis*	CNPS 2A	An annual herb native to California.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Salt Marsh Bird's-beak (*Cordylanthus Maritimus)*	FE, SE, CNPS 1B.1	In areas with sandy soils and often in disturbed sites within closed-cone coniferous forest, maritime chaparral, cismontane woodland, coastal dunes, and coastal scrub habitats.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Spreading Navarretia *Navarretia fossalis*	FT	Known only from vernally wet areas, such as vernal	Unlikely. Suitable habitat for this species does not	No further actions are recommended for this species.

Table 3.4-2
Potential of Special Status Species to Occur in the PWIMP Planning Area

Species	Status	Habitat	Potential for Occurrence	Recommendations
		pools, ditches, and other areas that are wet or flooded during the rainy season and dry the rest of the year.	occur in the Study Area.	
Ventura Marsh milk-vetch (*Astragalus pycnostachyus*)	FE, SE, CNPS 1B.1	Coastal dunes, sandy areas in coastal bluff scrub, and mesic areas in coastal prairie habitats.	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
White Rabbit-tobacco *Pseudognaphalium leucocephalum*	CNPS 2B.2	A perennial herb that is native to California and is also found outside of California, but is confined to western North America.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Birds				
Bank swallow *Riparia riparia*	ST	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
Belding's savannah sparrow *Passerculus sandwichensis beldingi*	SE	Forages on the ground or in low bushes; particularly in winter they are also found in grazed low-growth grassland.	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
Burrowing Owl *Athene cunicularia*	CSSC	Grassland habitat with ground squirrel burrows (used for nesting).	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
California black rail *Lateralus jamaicensis coturniculus*	ST, FPT	Inhabits freshwater marshes, wet	Low. Suitable habitat could be wholly or partially	As a precautionary measure, pre-construction surveys

Table 3.4-2
Potential of Special Status Species to Occur in the PWIMP Planning Area

Species	Status	Habitat	Potential for Occurrence	Recommendations
		meadows & shallow margins of saltwater marshes bordering larger bays. Nests and forages in tidal emergent wetland with pickleweed and cordgrass.	in the Study Area.	should be conducted for any major construction activities between February 1 and August 31.
California Condor *Gymnogyps californianus*	FE, SE	Forages for carrion over a variety of open habitats.	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
California Least Tern *Sterna antillarum browni*	FE	Breeds primarily in bays of the Pacific Ocean within a very limited range of Southern California, in San Francisco Bay and in northern regions of Mexico.	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
Least Bell's Vireo *Vireo bellii pusillus*	FE, SE	Breeds in thick willow riparian groves. Range, once thought to be limited to southern California, is expanding.	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
Light-footed Clapper Rail *Rallus longirostris obsoletus*	FE, SE	Found in tidal salt marshes of the San Francisco Bay. Requires mudflats for foraging and dense vegetation on higher ground for nesting.	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
Marbled Murrelet *Brachyramphus marmoratus*	FT	Feeds at sea both in pelagic offshore areas (often associating with upwellings) and inshore in protected bays and fiords.	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
Southwestern Willow Flycatcher *Empidonax trailii*	FE, SE	Breeds in mature riparian habitat. Now extirpated	Low. Suitable habitat could be wholly or partially	As a precautionary measure, pre-construction surveys

Table 3.4-2
Potential of Special Status Species to Occur in the PWIMP Planning Area

Species	Status	Habitat	Potential for Occurrence	Recommendations
extimus		from coastal California.	in the Study Area.	should be conducted for any major construction activities between February 1 and August 31.
Western Snowy Plover *Charadrius alexandrinus nivosus*	FT	Resident on coastal beaches and salt panne habitat.	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
Western Yellow-billed cuckoo Coccyzus *americanus occidentallis*	FT, SE	A secretive, difficult to detect, neotropical migrant that formally bred in riparian regions throughout the western United States	Low. Suitable habitat could be wholly or partially in the Study Area.	As a precautionary measure, pre-construction surveys should be conducted for any major construction activities between February 1 and August 31.
Fish				
Tidewater goby *Eucyclogobius newberryi*	FE, CSSC	Shallow lagoons and lower stream reaches with fairly still, but not stagnant water.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Amphibians				
California Red-legged Frog *Rana aurora draytoni*	FT, SP, CSSC	Streams, freshwater pools and ponds with overhanging vegetation. Requires pools of > 0.5 m depth for breeding.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Western Pond Turtle *Emys marmorata*	SSC	Occurs in perennial ponds, lakes, rivers and streams with suitable basking habitat (mud banks, mats of floating vegetation, partially submerged logs) and submerged shelter.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Crustaceans				
Riverside Fairy Shrimp *Streptocephalus woottoni*	FE	Lives in vernal pools or other seasonal pools at least 30 centimeters in depth, and can be observed in January through March.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Vernal pool fairy shrimp	FT	Inhabit small, clear-	Unlikely. Suitable	No further actions

Table 3.4-2
Potential of Special Status Species to Occur in the PWIMP Planning Area

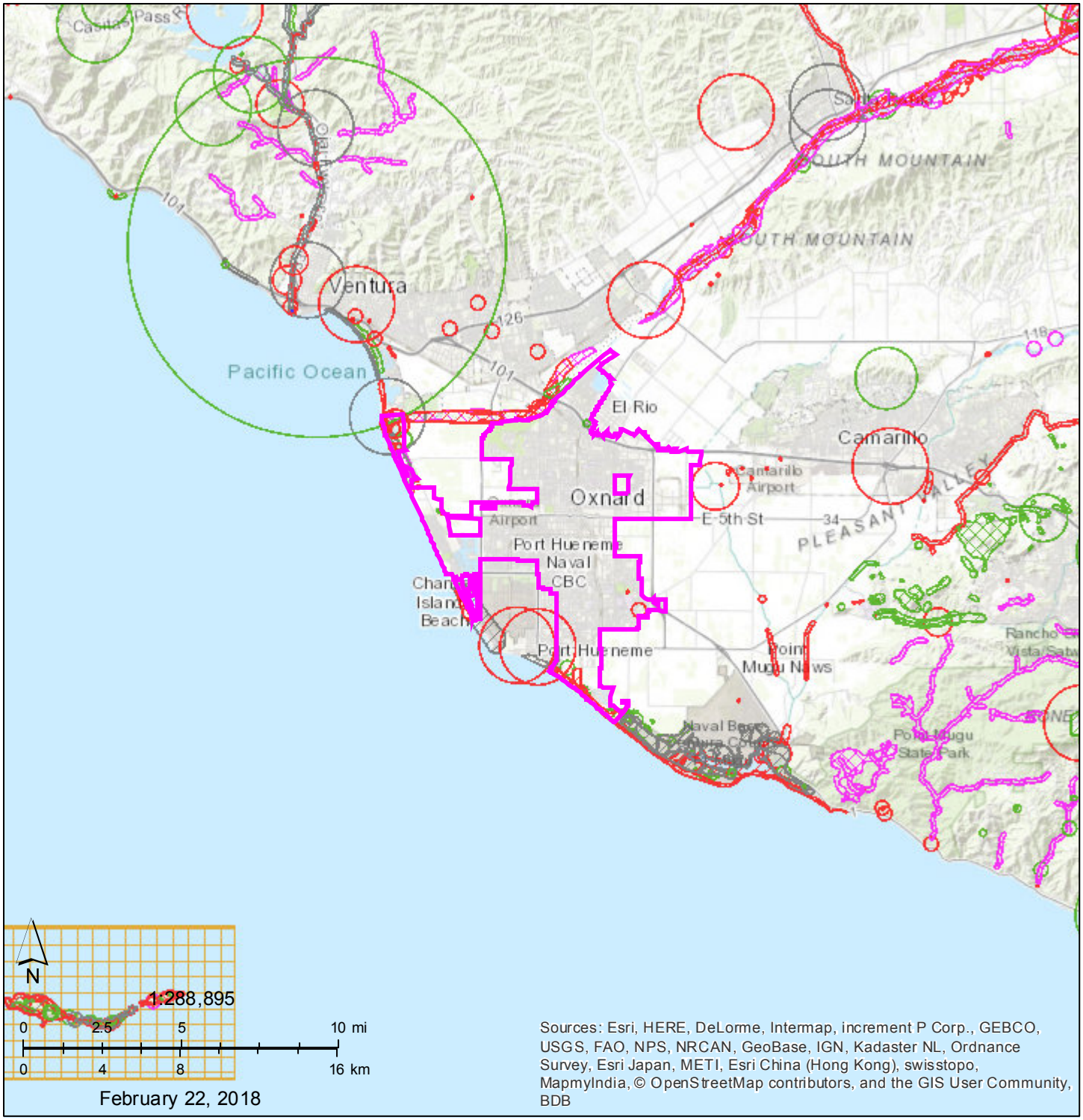
Species	Status	Habitat	Potential for Occurrence	Recommendations
Branchinecta lynchi		water sandstone depression pools, grassy swales, slumps, or basalt-flow depression pools.	habitat for this species does not occur in the Study Area.	are recommended for this species.
Reptiles				
Coast Horned Lizard *Phrynosoma blainvillii*	CSSC	A species of phrynosomatid lizard, which can be found in Baja California Sur.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.
Southern California legless lizard *Anniella Stebbinsi*	CSSC	Mostly found in coastal sand dunes and a variety of interior habitats, including sandy washes and alluvial fans. They live mostly underground, burrowing in the loose, sandy soil.	Unlikely. Suitable habitat for this species does not occur in the Study Area.	No further actions are recommended for this species.

Key to status codes:
FE Federal Endangered
FT Federal Threatened
FC Federal Candidate
FD Federal De-listed
FPD Federal Proposed for De-listing
FPT Federal Proposed Threatened
NMFS Species under the Jurisdiction of the National Marine Fisheries Service
BCC USFWS Birds of Conservation Concern
RP Sensitive species included in a USFWS Recovery Plan or Draft Recovery Plan
SE State Endangered
ST State Threatened
SR State Rare
SSC CDFW Species of Special Concern
Draft SSC 4 April 2000 Draft CDFG Species of Special Concern
CFP CDFW Fully Protected Animal
WBWG Western Bat Working Group High Priority species
SLC Species of Local Concern
List 1A CNPS List 1A: Plants presumed extinct in California
List 1B CNPS List 1B: Plants rare, threatened or endangered in California and elsewhere
List 2 CNPS List 2: Plants rare, threatened, or endangered in California, but more common elsewhere
List 3 CNPS List 3: Plants about which CNPS needs more information (a review list)
SLC Species of Local Concern
List 1A CNPS List 1A: Plants presumed extinct in California
List 1B CNPS List 1B: Plants rare, threatened or endangered in California and elsewhere
List 2 CNPS List 2: Plants rare, threatened, or endangered in California, but more common elsewhere
List 3 CNPS List 3: Plants about which CNPS needs more information (a review list)

3.4.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

Figure 3.4-1
Special Status Species in Project Area



California Natural Diversity Database (CNDDB) Commercial [ds85]

- Plant (80m)
- Plant (specific)
- Plant (non-specific)
- Plant (circular)
- Animal (80m)
- Animal (specific)
- Animal (non-specific)
- Animal (circular)
- Terrestrial Comm. (80m)
- Terrestrial Comm. (specific)
- Terrestrial Comm. (non-specific)
- Terrestrial Comm. (circular)
- Aquatic Comm. (80m)
- Aquatic Comm. (specific)
- Aquatic Comm. (non-specific)
- Aquatic Comm. (circular)
- Multiple (80m)
- Multiple (specific)
- Multiple (non-specific)
- Multiple (circular)
- Sensitive EO's (Commercial only)

Author: cnddb_com
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3.4.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on agricultural resources would occur if the PWIMP would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations adopted by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;
- Have a substantial adverse effect on federally protected waters of the U.S. as defined by Section 404 of the federal Clean Water Act or protected waters of the state as defined by Section 1600 et seq. of the California Fish and Game Code (including, but not limited to, marshes, vernal pools, and coastal wetlands) through direct removal, filling, hydrological interruption, or other means;
- Interfere substantially with the movement of any native resident or migratory fish or
- wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources; and/or
- Conflict with an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

3.4.4.2 Approach and Methodology

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

As identified above in Table 3.4-2, a record search of CDFW's California Natural Diversity Database (CNDDB) and USFWS' Species List was conducted for the area within a five-mile radius of the Project area to identify previously reported occurrences of state and federal special-status plants and animals. Figure 3.4-1 shows the location of known state and federal listed species within the Project/Action Area. In addition, field visits for the major PWIMP project facilities was conducted on May 2 and 3, 2018 to determine the potential for special-status species to occur within the general vicinity of the PWIMP Study Area (i.e. Construction Area) as described in Chapter 2 – Project Description. This field visit was not intended to be a protocol-level survey to determine the actual absence or presence of special-status species, but was conducted to determine the potential for special-status species to occur within the Proposed Project/Action Area. During the field visits no special status species were observed.

3.4.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts to biological resources are discussed below.

Impact 3.4-1: Implementation of the PWIMP and/or identified components/facilities could have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

The PWIMP Study area is located in a highly urbanized area and the potential for presence of special-status plants and animals at the project sites is very low and unlikely. As identified above in Table 3.4-2, a record search of CDFW's California Natural Diversity Database (CNDDB) and USFWS' Species List was conducted for the area within a five-mile radius of the Project area to identify previously reported occurrences of state and federal special-status plants and animals. Figure 3.4-1 shows the location of known state and federal listed species within the Project/Action Area. In addition, field visits for the major PWIMP project facilities was conducted on May 2 and 3, 2018 to determine the potential for special-status species to occur within the general vicinity of the PWIMP Study Area (i.e. Construction Area) as described in Chapter 2 – Project Description. This field visit was not intended to be a protocol-level survey to determine the actual absence or presence of special-status species, but was conducted to determine the potential for special-status species to occur within the Proposed Project/Action Area. During the field visits no special status species were observed.

However, due to the fact that the PWIMP would be implemented over time, there is the potential that the construction of the PWIMP project facilities to have an adverse impact on current and future listed special status species. The type of impact depends on the type, location, and the timing of the construction of each PWIMP Project-level component. The type of impacts that would be applicable to each project component type is discussed below.

Inside Versus Outside the Fence Projects

Many of the PWIMP projects and components will occur within the fence line of the City's water, wastewater treatment, and/or recycled water facilities which are very developed sites that are maintained to be free of vegetation and therefore would have a low or no potential to affect special-status species. This would include the proposed expansions of the wastewater treatment plant, the recycled water treatment improvements, and the expanded desalter, among others. However, some of the PWIMP facilities such as the new storage tanks, the TMDL infiltration pond, and water supply and IPR/DPR wells could be located or located near areas of natural, high quality habitat, and disturbance in these areas could result in impacts to special-status species, especially birds. For animals, impacts are sometimes due to movement into the construction area from nearby habitat, and associated risks from vehicles and equipment traffic, by falling into excavations, or when dewatering aquatic habitat. Construction noise could result in abandonment of nests or other breeding areas used by special-status animals.

Construction of Linear Projects

The PWIMP's linear projects (i.e. rehabilitation/replacement or new water supply pipelines, wastewater and stormwater collection facilities, manholes, and etc.) are and would be located within existing paved existing roadways and other disturbed areas and would have a low or no potential to affect special-status species. However, some of these facilities could be near trees and could result in abandonment of nests of migratory birds and other special status bird species. In addition, these projects have the potential to cross creeks and drainages which could have adverse impacts to special status plant and animal specie sat or downstream of the construction area(s).

Temporary Construction Mitigation Measures

The potential impact of the PWIMP facilities and components would be considered less-than-significant with the implementation of **Mitigation Measures 3.4-1a through 3.4b** below.

Mitigation Measure 3.4-1a: Conduct Pre-construction Biological Survey(s). For each individual or group of PWIMP projects to be constructed, the City shall have the project site and area screen by a qualified biologist to determine whether biological resources may be affected by construction activities. In the event further investigation is necessary, the City will comply with all requirements for investigation, analysis and protection of biological resources. The biologist will review standard information sources to determine special status species with the potential to occur on the project site. The biologist would carry out a site survey by walking or driving over the project site, as appropriate, to note the general resources and whether any habitat for special-status species is present. The biologist would then document the survey with a brief letter report or memo, setting forth the date of the visit, whether habitat for special-status species is present, providing a map or description showing where sensitive areas exist within the site, and identifying any appropriate avoidance measures.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

Operational impacts would be similar to those of existing facilities. Biological resources could be subject to increases in noise, traffic, night-lighting and further habitat disturbance during routine

or emergency repairs. However, PWIMP operations are not expected to have significant impacts on any known special status plant or animal species.

Long-Term Operational Mitigation Measures

PWIMP operations are not expected to have significant impacts on special status plant or animal species and no mitigation measures are required

Significance Determination: Less-than-Significant Impact

Impact 3.4-2: Implementation of the PWIMP and/or identified components/facilities could have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations adopted by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

As discussed above, the PWIMP area would be located in a highly disturbed area from a biological resources standpoint. However, sensitive habitats, including riparian habitats could be affected by the construction of the PWIMP linear projects in particular as they can cross existing creeks and/or drainages and potentially cause impacts at and downstream of the location(s). These would be temporary, but potentially significant.

Temporary Construction Mitigation Measures

The potential impact of the construction of PWIMP facilities on riparian habitats or other sensitive natural communities would be less than significant with implementation of **Mitigation Measures 3.4-2a and 3.4-2b**. The type of impact depends on the project component and the species present.

Mitigation Measure 3.4-2a: Avoid Construction Impacts on Riparian Habitat. PWIMP Project facilities and construction activities shall be designed in a manner that avoids and/or minimizes impacts on riparian habitats to the maximum extent feasible. Temporary disturbance and/or permanent loss of riparian habitat requires a Streambed Alteration Agreement from the California Department of Fish and Game (CDFW) and ESA Section 7 or 10 consultation with USFWS and NMFS if there is a potential impact to listed species or critical habitat.

Unavoidable impacts on riparian habitat shall be formally assessed to satisfy the requirements of the California Department of Fish and Game (CDFW) 1601 Streambed Alteration Agreement) and federal consultation, which typically include compensatory mitigation. Acceptable riparian mitigation ratios shall be based on habitat quality characteristics, such as vegetation structure and complexity, that correspond to fish and wildlife habitat value. Impact ratios of 3:1, 2:1, and 1:1 shall be applied for impacts on high-, medium-, and low-quality habitats, respectively:

- *High-Quality Habitat* – Native overstory with continuous understory or occurring in dense thickets; dense native overstory with sparse, non-native, or no understory; and native willow thicket.

- *Medium Quality Habitat* – Sparse native overstory with sparse, non-native, or no understory; non-native overstory with native understory; and dense non-native overstory with sparse, non-native, or no understory.

- *Low Quality* – Sparse non-native overstory with sparse, non-native, or no understory; and any areas not included in the medium- or high-quality habitats that will be covered with riprap, gabions, etc. (e.g., ruderal habitat and bare ground).

Furthermore, impacts from encroachment into riparian buffer zones may be considered significant. Appropriate riparian setbacks can be as great as 100-feet and are assessed on a case-by-case basis. A Riparian Restoration Plan shall be prepared by the City and approved by the USFWS, NMFS, and CDFW as appropriate.

Mitigation Measure 3.4-2b: Avoid Construction Impacts on Critical Habitats. The USFWS and CDFW indicated that the PWIMP Study Area overlaps critical habitat for Southwestern Willow Flycatcher, Ventura Marsh Milk-vetch, and Western Snowy Plover habitat. In addition, the PWIMP facilities could also disturb other migratory birds within the area. As a result, and in conjunction with **Mitigation Measure 3.4-1a** above, construction activities for new facilities and conveyance systems shall be sited in a manner that avoids sensitive upland habitats to the maximum extent feasible. Sensitive upland habitats shall be preserved where possible through facility siting within degraded or non-native vegetation. Sensitive areas shall be flagged for avoidance to minimize the possibility of inadvertent encroachment during construction. Construction staff shall be educated on the sensitive habitats located within and adjacent to the Project's footprint, and a biological monitor shall be present to ensure compliance with off-limits areas.

When avoidance is not feasible during construction activities; sensitive upland habitats temporarily disturbed during construction activities shall be quantified and appropriate restoration strategies shall be set forth in a Habitat Restoration Plan which shall be developed in consultation with the USFWS and the CDFW. The Plan shall include the following elements: specific location of restoration site, details on soil preparation, seed collection, planting, maintenance, and monitoring, and quantitative success criteria. At a minimum, temporarily disturbed areas shall be restored by the Applicant to the natural (preconstruction) conditions, which may include the following actions: salvage and stockpiling of topsoil from maritime chaparral, central dune scrub, and oak woodland; re-grading of disturbed sites with salvaged topsoil; and re-vegetation with native, locally collected species.

Where restoration is not feasible (i.e., the impact is permanent), the City shall purchase and/or preserve similar undisturbed habitat off-site, or restore nearby disturbed areas at a ratio to be determined by the USFWS, CDFW, and other responsible resource agencies with jurisdiction over the project area.

Significance after Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

PWIMP operational impacts would be similar to those of existing facilities. Biological resources could be subject to increases in noise, traffic, night-lighting and further habitat disturbance during routine or emergency repairs. However, PWIMP operations are not expected to have significant impacts on any known riparian, Southwestern Willow Flycatcher, Ventura Marsh Milk-vetch, Western Snowy Plover and/or any other sensitive habitats.

Long-Term Operational Mitigation Measures

PWIMP operations are not expected to have significant impacts on any known riparian, Southwestern Willow Flycatcher, Ventura Marsh Milk-vetch, Western Snowy Plover and/or any other sensitive habitats.

Significance: Less-than-Significant Impact

Impact 3.4-3: Implementation of the PWIMP and/or identified components/facilities could have a substantial adverse effect on federally protected waters of the U.S. as defined by Section 404 of the federal Clean Water Act or protected waters of the state as defined by Section 1600 et seq. of the California Fish and Game Code (including, but not limited to, marshes, vernal pools, and coastal wetlands) through direct removal, filling, hydrological interruption, or other means. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

Some of the PWIMP project elements could affect streams or wetlands that fall under state or federal jurisdiction. Most impacts would be associated with construction activities and thus would be temporary. Wetland resources could also be affected by siltation or degradation of water quality from spills during construction. The extent of wetlands affected by a project is highly dependent on the final project design.

Temporary Construction Mitigation Measure

Mitigation Measure 3.4-3a: Avoid Federally Protected Wetlands and Waters of the U.S. In conjunction with **Mitigation Measure 3.4-1a** above, **t**he City shall implement the following measures for those PWIMP facilities sited on or adjacent to wetlands.

- The PWIMP project facilities shall avoid areas of potentially jurisdictional wetland habitats to the maximum extent feasible through Project siting and construction avoidance. The project shall implement Best Management Practices[1] during construction to minimize impacts associated with erosion and sediment deposition into wetland and aquatic habitats. Temporary disturbance and/or permanent loss of wetlands or other waters of the U.S. require permits from both the U.S. Army Corps of Engineers (USACE) and (for areas within the Coastal Zone) the California Coastal Commission (CCC) as well as the Regional Water Quality Control Board (RWQCB).

- A wetland delineation per the USACE Wetland Delineation Manual, and using the one-parameter approach in areas within the Coastal Zone, shall be conducted prior to construction.

- A delineation report shall be prepared and submitted to the USACE and CCC for verification, and approval. Through this process, final calculations of wetland area present

[1] Best Management Practices are subject to review and approval, and may be expected to include BMPs as described in Caltrans (2003) Caltrans Storm Water Quality Handbooks; *Construction Site Best Management Practices Manual*.

in the Project area would be obtained for Project permitting. In addition, plans for proposed alteration to any watercourse shall be submitted to the CDFW for review.

- The wetland habitat that would be lost under any given project element shall be functionally replaced as part of the Mitigation and Monitoring Plan required for permit issuance. In-kind and on-site replacement of lost wetland habitats must be done where possible. If multiple impacts on wetlands occur from the construction of facilities, larger wetland mitigation areas shall be created that provide greater functions and values than numerous small mitigation sites. The determination of wetland impacts and the subsequent location and design of potential mitigation sites be determined by qualified biologists in coordination with resource agency personnel. Mitigation and Monitoring Plans shall require the following of the City:

    - Replacement of lost acreage and functions of wetland habitat;
    - Identification of the restoration opportunities, complete with an analysis of the technical approach to create high quality wetlands;
    - Prior to construction of any project element that may impact wetland habitats, obtaining any necessary permits from the USACE, RWQCB or the CCC;
    - Preparation of detailed plans for wetland mitigation construction that include excavation elevations, location of hydrologic connections, planting plans, and soil amendments, if necessary; preparation of maintenance and monitoring plans in consultation with a qualified habitat restoration specialist; monitoring of any mitigation wetlands for a period of 5 years, during which the site will achieve the target jurisdictional acreage by Year 5; and determination of specific performance criteria and monitoring for site success; provision of annual monitoring reports to the appropriate resource agencies.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

PWIMP operations are not expected to have significant impacts on any known wetlands and/or Waters of the U.S.

Long-Term Operational Mitigation Measures

PWIMP operations are not expected to have significant impacts to wetlands and/or Waters of the U.S. and no mitigation measures are required

Significance Determination: Less-than-Significant Impact

Impact 3.4-4: Implementation of the PWIMP and/or identified components/facilities could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

Habitat in the PWIMP Project Area is fragmented by industrial uses, commercial uses, residential developments, roads and adjacent agricultural fields. Construction activities are not expected to have any significant effect on fish and wildlife movement. However, the potential exists that some construction activities could affect migratory birds in the area. With the implementation of the **Mitigation Measure 3-4-1a** above, impacts would be considered less than significant.

Temporary Construction Mitigation Measures

With the implementation of the **Mitigation Measure 3-4-1a** above, impacts would be considered less than significant.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

PWIMP operations are not expected to have significant impacts on any fish and wildlife movement.

Long-Term Operational Mitigation Measures

PWIMP operations are not expected to have significant impacts fish and wildlife movement and no mitigation measures are required

Significance Determination: Less-than-Significant Impact

Impact 3.4-5: Implementation of the PWIMP and/or identified components/facilities could conflict with any local policies or ordinances protecting biological resources. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

Construction activities associated with the PWIMP facilities would not conflict with the City's 2030 General Plan, the Ventura County General Plan, and/or any other local plans or policies protecting biological species.

Temporary Construction Mitigation Measures

Construction activities associated with the PWIMP facilities would not conflict with the City's 2030 General Plan, the Ventura County General Plan, and/or any other local plans or policies protecting biological species. No Impacts are expected and no mitigation measures are required.

Significance Determination: No Impact

Long-Term Operational Impacts

Operational activities associated with the PWIMP facilities would not conflict with the City's 2030 General Plan, the Ventura County General Plan, and/or any other local plans or policies protecting biological species.

Long-Term Operational Mitigation Measures

Operational activities associated with the PWIMP facilities would not conflict with the City's 2030 General Plan, the Ventura County General Plan, and/or any other local plans or policies protecting biological species. No Impacts are expected and no mitigation measures are required.

Significance Determination: No Impact

Impact 3.4-6: Implementation of the PWIMP and/or identified components/facilities could conflict with an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

Construction activities associated with the PWIMP facilities would not conflict with an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Temporary Construction Mitigation Measures

Construction activities associated with the PWIMP facilities would not conflict an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. No Impacts are expected and no mitigation measures are required.

Significance Determination: No Impact

Long-Term Operational Impacts

Operational activities associated with the PWIMP facilities would not conflict with an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Long-Term Operational Mitigation Measures

Operational activities associated with the PWIMP facilities would not conflict with the City's 2030 General Plan, the Ventura County General Plan, and/or any other local plans or policies protecting biological species. No Impacts are expected and no mitigation measures are required.

Significance Determination: No Impact

3.4.5 Cumulative Effects

The proposed PWIMP will mostly take place within already-developed roadways and parcels in urbanized areas. Most of the project area has low biological sensitivity. The project is not likely to affect built environment resources, and little or no ground-disturbing activity in undeveloped areas will occur. Mitigation measures are detailed above that would reduce individual impacts to

less than significant. Given these factors, the PWIMP will not result in significant impacts to biological resources, and would not contribute to potential significant cumulative impacts. No mitigation measures for cumulative impacts are thus proposed.

3.5 Climate Change and Greenhouse Gases

This section describes how construction and operation of the components of the PWIMP would affect climate change and greenhouse gases. This evaluation was based on an initial review of existing reports and literature from the City of Oxnard and the Ventura County Air Pollution Control District.

3.3.1 Introduction

Gases that trap heat in the atmosphere are referred to as greenhouse gases (GHGs) because they capture heat radiated from the sun as it is reflected back into the atmosphere, similar to a greenhouse. The accumulation of GHGs has been implicated as a driving force for Global Climate Change. Definitions of climate change vary between and across regulatory authorities and the scientific community, but in general can be described as the changing of the earth's climate caused by natural fluctuations and the impact of human activities that alter the composition of the global atmosphere. Both natural processes and human activities emit GHGs. The major concern is that increases in GHGs are causing Global Climate Change. Global Climate Change is a change in the average weather on earth that can be measured by wind patterns, storms, precipitation and temperature. Although there is disagreement as to the speed of global warming and the extent of the impacts attributable to human activities, the vast majority of the scientific community now agrees that there is a direct link between increased emission of GHGs and long-term global temperature. Potential global warming impacts in California may include, but are not limited to, loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years (California Air Resources Board, 2006). Secondary effects are likely to include a global rise in sea level, impacts to agriculture, changes in disease vectors, and changes in habitat and biodiversity.

The accumulation of GHGs in the atmosphere regulates the earth's temperature; however, emissions from human activities such as electricity production and motor vehicles have elevated the concentration of GHGs in the atmosphere. This accumulation of GHGs has contributed to an increase in the temperature of the earth's atmosphere and contributed to Global Climate Change. The principal GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and water vapor (H_2O). Carbon dioxide is the reference gas for climate change because it gets the most attention and is considered the most important greenhouse gas. To account for the warming potential of GHGs, greenhouse gas emissions are often quantified and reported as CO_2 equivalents (CO_2e). The effects of GHG emission sources (i.e., individual projects) are reported in metric tons/year of CO_2e.

HISTORICAL CONTEXT

As noted in the Climate Action Team Report to Governor Schwarzenegger and the Legislature ("CAT Report") (Climate Action Team, 2006), the Earth's climate has always changed and evolved. This is most clearly exemplified in the 100,000-year ice-age cycles that have occurred. As described in the CAT Report, the last 10,000 years, and more specifically the last millennium, has been warm and one of the most stable climates observed (Climate Action Team, 2006). Yet

the CAT Report states that during the 20th century a rapid change in the climate and climate change pollutants has occurred and these changes are attributable to human activities. Climate change is described by the CAT Report as a "shift in the "average weather" that a given region experiences" (Climate Action Team, 2006), and that this can be measured by changes in temperature, wind patterns, precipitation, and storms.

According to the CAT Report, human activities including the burning of coal, oil, and natural gas, and the destruction of forests have contributed to an increase in CO2 in the atmosphere by approximately 30 percent since the late 1800s, and that the increase in CO2 and other greenhouse gases, and change in land surface has had a major influence on some of the "key factors that govern climate change…"

POTENTIAL EFFECTS OF HUMAN ACTIVITY ON CLIMATE CHANGE

Globally, climate change has the potential to impact numerous environmental resources through potential, though uncertain, impacts related to future air temperatures and precipitation patterns.

Scientific modeling predicts that continued GHG at or above current rates would induce more extreme climate changes during the 21st century than were observed during the 20th century. A warming of about 0.2°C (0.36°F) per decade is projected, and there are identifiable signs that global warming could be taking place, including substantial ice loss in the Arctic (Intergovernmental Panel on Climate Change, 2007). However, the understanding of GHG emissions, particulate matter, and aerosols on global climate trends remains uncertain. In addition to uncertainties about the extent to which human activity rather than solar or volcanic activity is responsible for increasing warming, there is also evidence that some human activity has cooling rather than warming effects (Intergovernmental Panel on Climate Change, 2001).

According to the California Air Resources Board (CARB), some of the potential impacts in California of global warming may include loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years. Several recent studies have attempted to explore the possible negative consequences that climate change, left unchecked, could have in California. These reports acknowledge that climate scientists' understanding of the complex global climate system, and the interplay of the various internal and external factors that affect climate change, remains too limited to yield scientifically valid conclusions on such a localized scale. Substantial work has been done at the international and national level to evaluate climatic impacts, but far less information is available on regional and local impacts. In addition, projecting regional impacts of climate change and variability relies on large-scale scenarios of changing climate parameters, using information that is typically at too coarse a scale to make accurate regional assessments. Below is a summary of some of the potential effects reported by an array of studies that could be affected by climate change.

Air Quality. Higher temperatures, conducive to air pollution formation, could worsen air quality in California. Climate change may increase the concentration of ground-level ozone, but the magnitude of the effect, and therefore its indirect effects, are uncertain. For other pollutants, the effects of climate change and/or weather are less well studied, and even less well understood. If higher temperatures are accompanied by drier conditions, the potential for large wildfires could increase, which, in turn, would further worsen air quality. However, if higher temperatures are accompanied by wetter, rather than drier conditions, the rains would tend to temporarily clear the air of particulate pollution and reduce the incidence of large wildfires, thus ameliorating the

pollution associated with wildfires. Additionally, severe heat accompanied by drier conditions and poor air quality could increase the number of heat-related deaths, illnesses, and asthma attacks throughout the state (CCCC, 2006).

Water Supply. Uncertainty remains with respect to the overall impact of global climate change on future water supplies in California. Various studies have found that a considerable amount of uncertainty regarding the precise impacts of climate change on California's hydrology and water resources will remain until more precise and consistent information about how precipitation patterns, timing, and intensity will change. For example, some studies identify little change in total annual precipitation as projected for California. Other studies show significantly more precipitation. Even assuming that climate change leads to long-term increases in precipitation, an analysis of these impacts related to climate change is further complicated by the fact that no studies have identified or quantified the runoff impacts associated with changes in precipitation would have on particular watersheds. Also, little is known about how groundwater recharge and water quality will be affected. Higher rainfall could lead to greater groundwater recharge, although reductions in spring runoff and higher evapotranspiration could reduce the amount of water available for recharge.

The California Department of Water Resources (DWR 2006) report on climate change and affects on the State Water Project (SWP), the Central Valley Project, and the Sacramento-San Joaquin Delta concludes that "[c]climate change will likely have a significant effect on California's future water resources . . . [and] future water demand." It also reports that "much uncertainty about future water demand [remains], especially [for] those aspects of future demand that will be directly affected by climate change and warming. While climate change is expected to continue through at least the end of this century, the magnitude and, in some cases, the nature of future changes is uncertain (DWR, 2006). This uncertainty serves to complicate the analysis of future water demand, especially where the relationship between climate change and its potential effect on water demand is not well understood (DWR, 2006). DWR adds that "[i]t is unlikely that this level of uncertainty will diminish significantly in the foreseeable future." Still, changes in water supply are expected to occur, and many regional studies have shown that large changes in the reliability of water yields from reservoirs could result from only small changes in inflows (Kiparsky 2003; DWR 2005; Cayan 2006, Cayan, D., et al, 2006).

Hydrology. As discussed above, climate changes could potentially affect: the amount of snowfall, rainfall and snow pack; the intensity and frequency of storms; flood hydrographs (flash floods, rain or snow events, coincidental high tide and high runoff events); sea level rise and coastal flooding; coastal erosion; and the potential for salt water intrusion. Sea level rise can be a product of global warming through two main processes: expansion of sea water as the oceans warm, and melting of ice over land. A rise in sea levels could result in coastal flooding and erosion and could jeopardize California's water supply. Increased storm intensity and frequency could affect the ability of flood-control facilities, including levees, to handle storm events. Sea level could rise as much as two feet along most of the U.S. coast.

Agriculture. California has a $30 billion agricultural industry that produces half the country's fruits and vegetables. Higher CO2 levels can stimulate plant production and increase plant water-use efficiency. However, if temperatures rise and drier conditions prevail, water demand could increase; crop-yield could be threatened by a less reliable water supply; and greater ozone pollution could render plants more susceptible to pest and disease outbreaks. In addition,

temperature increases could change the time of year certain crops, such as wine grapes, bloom or ripen, and thus affect their quality (CCCC, 2006).

Ecosystems and Wildlife. Increases in global temperatures and the potential resulting changes in weather patterns could have ecological effects on a global and local scale. Rising temperatures could have four major impacts on plants and animals: (1) timing of ecological events; (2) geographic range; (3) species' composition within communities; and (4) ecosystem processes such as carbon cycling and storage (Parmesan, 2004; Parmesan, C. and H. Galbraith 2004.)

CURRENT CONTEXT

On December 30, 2009, the Natural Resources Agency adopted Amendments to the State CEQA Guidelines for greenhouse gas (GHG) emissions, pursuant to SB 97 (Statutes of 2007). These amendments, which became effective on March 18, 2010, specifically require that an EIR include an analysis of the proposed project's GHG impacts.

Emissions of GHGs have the potential to adversely affect the environment because such emissions contribute, on a cumulative basis, to global climate change. The proper context for addressing this issue in an EIR is as a discussion of cumulative impacts, because although the emissions of one single project will not cause global climate change, GHG emissions from multiple projects throughout the world could result in a cumulative impact with respect to global climate change. In turn, global climate change has the potential to result in rising sea levels, which can inundate low-lying areas; to affect rainfall and snowfall, leading to changes in water supply; to affect habitat, leading to adverse effects on biological resources; and to result in other effects.

Therefore, the cumulative global climate change analysis presented in this section of the Draft Program EIR analyzes the GHG emissions associated with construction activities and operation of the PWIMP. The potential effects of global climate change on the project are also identified based on available scientific data.

Cumulative impacts are the collective impacts of one or more past, present, and future projects that, when combined, result in adverse changes to the environment. In determining the significance of a proposed project's contribution to anticipated adverse future conditions, a lead agency should generally undertake a two-step analysis. The first question is whether the *combined* effects from *both* the proposed project *and* other projects would be cumulatively significant. If the agency answers this inquiry in the affirmative, the second question is whether "the proposed project's *incremental* effects are cumulatively considerable" and thus significant in and of themselves. The cumulative project list for this issue (climate change) comprises anthropogenic (i.e., human- made) GHG emissions sources across the globe, and no project alone would reasonably be expected to contribute to a noticeable incremental change to the global climate. However, legislation and executive orders on the subject of climate change in California have established a statewide context for and a process for developing an enforceable statewide cap on GHG emissions. Given the nature of environmental consequences from GHGs and global climate change, CEQA requires that lead agencies consider evaluating the cumulative impacts of GHGs, even relatively small (on a global basis) additions. Small contributions to this cumulative impact (from which significant effects are occurring and are expected to worsen over time) may be potentially considerable and therefore significant.

The analysis is presented here, rather than the cumulative impacts section of this Draft Program EIR (Chapter 5), because this issue is presented here in greater detail. This discussion presents a

summary of applicable regulations, the current state of climate change science and GHG emissions sources in California, and a description of projected PWIMP generated GHG emissions and their contribution to global climate change.

3.4.2 Regulatory Context

Relevant Federal, State, and local guidelines specific to biological resource issues are discussed in this section.

3.4.2.1 Federal Regulations

The relevant federal regulations are discussed below.

SUPREME COURT RULING

The U.S. Environmental Protection Agency (EPA) is the federal agency responsible for implementing the federal Clean Air Act (CAA). The Supreme Court of the United States ruled on April 2, 2007, that carbon dioxide (CO_2) is an air pollutant as defined under the CAA, and that EPA has the authority to regulate emissions of GHGs. The ruling in this case resulted in EPA taking steps to regulate GHG emissions and lent support for state and local agencies' efforts to reduce GHG emissions.

EPA ACTIONS

In response to the mounting issue of climate change, EPA has taken actions to regulate, monitor, and potentially reduce GHG emissions.

GREENHOUSE GAS PERMITTING REQUIREMENTS

New major stationary emissions sources and major modifications at existing stationary sources are required by the CAA to obtain an air pollution permit before commencing construction. On May 13, 2010, EPA issued the Prevention of Significant Deterioration and Title V Greenhouse Gas Tailor Rule (EPA 2011). This final rule sets thresholds for GHG emissions that define when permits under the New Source Review Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs are required for new and existing industrial facilities.

PSD and Title V permitting requirements now cover new construction projects that emit GHG emissions of at least 100,000 tons carbon dioxide equivalent (CO_2e) (90,718 metric tons [MT]) per year even if they do not exceed the permitting thresholds for any other pollutant. Modifications at existing facilities that increase GHG emissions by at least 75,000 tons (68,039 MT) per year will be subject to permitting requirements, even if they do not significantly increase emissions of any other pollutant.

As part of the PSD and Title V rules, EPA undertook another rulemaking on June 29, 2012. This action issued a final rule that continues to focus permitting on the largest emitters. The EPA did not revise the GHG permitting thresholds that were established by the GHG Tailoring Rule. Therefore, at this time, PSD and Title V permitting requirements are not applicable to smaller sources of GHG emissions such as the proposed project (EPA 2012).

MANDATORY GREENHOUSE GAS REPORTING RULE

On September 22, 2009, EPA issued a final rule for mandatory reporting of GHGs from large

GHG emissions sources in the United States. In general, this national reporting requirement will provide EPA with accurate and timely GHG emissions data from facilities that emit 25,000 MT or more of CO_2 per year. This publicly available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost-effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial GHGs along with vehicle and engine manufacturers will report at the corporate level. An estimated 85% of the total U.S. GHG emissions, from approximately 10,000 facilities, are covered by this final rule.

NATIONAL PROGRAM TO CUT GREENHOUSE GAS EMISSIONS AND IMPROVE FUEL ECONOMY FOR CARS AND TRUCKS

On August 28, 2012 EPA and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) issued joint Final Rules for Corporate Average Fuel Economy (CAFE) standards for vehicle Model Years 2017 and beyond (NHTSA 2012). These first-ever national GHG emissions standards will increase fuel economy to the equivalent of 54.5 mpg for cars and light-duty trucks by Model Year 2025. EPA approved these standards under the CAA, and NHTSA approved them under the Energy Policy and Conservation Act.

3.4.2.2 State Regulations

The relevant state regulations are discussed below.

EXECUTIVE ORDER S-3-05

Executive Order S-3-05, which was signed by Governor Schwarzenegger in 2005, proclaims that California is vulnerable to the impacts of climate change. It declares that increased temperatures could reduce the Sierra Nevada snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea level. To combat those concerns, the Executive Order established total GHG emission reduction targets. Specifically, emissions are to be reduced to the 2000 level by 2010, the 1990 level by 2020, and to 80% below the 1990 level by 2050.

ASSEMBLY BILL 32, THE CALIFORNIA GLOBAL WARMING SOLUTIONS ACT OF 2006

In September 2006, Governor Arnold Schwarzenegger signed Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006. AB 32 establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and a cap on statewide GHG emissions. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction will be accomplished through an enforceable statewide cap on GHG emissions that will be phased in starting in 2012. To effectively implement the cap, AB 32 directs the California Air Resources Board (ARB) to develop and implement regulations to reduce statewide GHG emissions from stationary sources.

ASSEMBLY BILL 32 CLIMATE CHANGE SCOPING PLAN

In December 2008, ARB adopted its *Climate Change Scoping Plan*, which contains the main strategies California will implement to achieve reduction of approximately 118 million metric tons (MMT) CO_2e, or approximately 22% from the state's projected 2020 emission level of 545 MMT of CO_2e under a business-as-usual scenario (this is a reduction of 47 MMT CO_2e, or almost 10

percent, from 2008 emissions). ARB's original 2020 projection was 596 MMT CO_2e, but this revised 2020 projection takes into account the economic downturn that occurred in 2008 (ARB 2011). The Scoping Plan reapproved by ARB in August 2011 includes the Final Supplement to the Scoping Plan Functional Equivalent Document (FED), which further examined various alternatives to Scoping Plan measures. The Scoping Plan also includes ARB-recommended GHG reductions for each emissions sector of the state's GHG inventory. ARB estimates the largest reductions in GHG emissions to be achieved by implementing the following measures and standards (ARB 2011):

- Improved emissions standards for light-duty vehicles (26.1 MMT CO_2e);
- The Low-Carbon Fuel Standard (LCFS) (15.0 MMT CO_2e);
- Energy efficiency measures in buildings and appliances (11.9 MMT CO_2e); and
- A renewable portfolio and electricity standards for electricity production (23.4 MMT CO_2e).

In 2011, ARB adopted the cap-and-trade regulation. The cap-and-trade program covers major sources of GHG emissions in the state such as refineries, power plants, industrial facilities, and transportation fuels. The cap-and- trade program includes an enforceable emissions cap that will decline over time. The state will distribute allowances, which are tradable permits, equal to the emissions allowed under the cap. Sources under the cap will need to surrender allowances and offsets equal to their emissions at the end of each compliance period (ARB 2012).

With regard to land use planning, the Scoping Plan expects that reductions of approximately 3.0 MMT CO_2e will be achieved through implementation of Senate Bill (SB) 375, which is discussed further below (ARB 2011).

SENATE BILL 97

As directed by Senate Bill (SB) 97, the California Natural Resources Agency (CNRA) adopted Amendments to the CEQA Guidelines for GHG emissions on December 30, 2009. On February 16, 2010, the Office of Administrative Law approved the Amendments, and filed them with the Secretary of State for inclusion in the California Code of Regulations. The Amendments became effective on March 18, 2010. This EIR complies with these new guidelines, which includes new Appendix G checklist questions referenced in the impact analysis later in this chapter.

SENATE BILL 375

SB 375, signed in September 2008, aligns regional transportation planning efforts, regional GHG emission reduction targets, and land use and housing allocation. SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy (APS), which will prescribe land use allocation in that MPO's Regional Transportation Plan (RTP). ARB, in consultation with MPOs, will provide each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in the region for the years 2020 and 2035. These reduction targets will be updated every 8 years, but can be updated every 4 years if advancements in emissions technologies affect the reduction strategies to achieve the targets. ARB is also charged with reviewing each MPO's SCS or APS for consistency with its assigned targets. If MPOs do not meet the GHG emission reduction targets, transportation projects would not be eligible for funding programmed after January 1, 2012.

SENATE BILL X7-7

SB x7-7, enacted in November 2009, requires all water suppliers in California to increase water use efficiency. Specifically, the legislation sets an overall goal for the State of California to reduce per capita urban water use by 20% by December 31, 2020. An interim goal of a 10% per capita reduction was set for December 31, 2015.

The legislation set forth different requirements for urban water suppliers and agriculture water suppliers. All urban retail water suppliers were required to develop water use targets and an interim water use target by July 1, 2011. Urban retail water suppliers were also required to prepare a water management plan by July 2011, containing baseline per capita water use, water use targets, interim water use targets, and compliance with daily per capita water use. Agriculture water suppliers were required to adopt agriculture water management plans by December 31, 2010 and update those plans by December 31, 2015 and every 5 years thereafter (DWR 2010).

3.4.2.3 Local Regulations

The relevant local regulations are discussed below.

OXNARD 2030 GENERAL PLAN

The 2030 General Plan Goals and Policies discuss the issue of greenhouse gas emissions and climate change in Chapter 2 Sustainable Community. The General Plan discussion includes a review of key planning terms involved in sustainability concepts, many of which relate to greenhouse gas (GHG) emissions, their effect on global climate change, and the resulting environmental conditions that require planning and adaptation in coastal communities.

GHG emissions – mainly carbon dioxide from the burning of fossil fuels for energy production and for powering motor vehicles – are contributing toward global climate change. Among other effects, this climate change is expected to lead to a rise in sea level that will increase the potential for flooding in coastal areas. The State of California, through both Executive Orders by the Governor and through legislation, has adopted a number of policies and programs intended to reduce GHG emissions. These policies involve actions in a number of areas, including additional energy conservation through building design, increased fuel efficiency in motor vehicles, and measures to reduce the use of motor vehicles through land use and transportation strategies that promote alternative means of travel.

As of 2015, the City of Oxnard has adopted the 2030 General Plan, which includes a Sustainable Community chapter. The 2030 General Plan contains numerous statements of goals, policies, and implementation measures that relate to complying with the state direction to respond to the issue of GHG emissions and climate change. The policies are directed at improving energy conservation, and at reducing the consumption of energy for vehicle travel and other common urban purposes (the provision of water service, management of solid waste). In addition, the 2030 General Plan includes several policies to address the need for updated coastal planning in response to anticipated sea level rise (SLR).

Over the next few hundred years, global seal level is expected to rise because, at present, Earth's radiation budget is out of balance and Earth, especially the oceans, is still heating. Also, in the foreseeable future, projected increases in GHGs and associated increases in temperature are expected to further warm the oceans as well as increase the amount of ground---based ice melt.

Projections of global SLR range from approximately six to 32 centimeters above 1990 levels by 2035-2064, with an increase from 10 to 72 centimeters projected by 2070-2100 (Cayan 2008). As of 2017, Oxnard's Local Coastal Program (LCP) does not include a specific discussion of SLR, which is identified in the 2030 General Plan as a necessary update as of 2017 an LCP update is being undertaken. The current LCP identifies the coastal zone and coastal areas of the city and policies that impact the coastal zone identified. The policies relate to resources, such as agriculture, habitat areas, commercial fishing, visual resources, hazards, access and recreation, as well as development, that includes diking, dredging, filling, and shoreline structures, industrial and energy development, commercial visitor-serving facilities, as well as housing.

The 2030 General Plan EIR concluded that development of the Oxnard Planning Area consistent with the land uses and policies in the General Plan would have a significant and unavoidable impact relative to the issue of GHG emissions and climate change. The major reason for this conclusion is the current (2015) lack of specific criteria with which to judge the effects of GHG emissions and the evolving nature of plans and programs to address the issue, as well as the fact that the EIR was addressing the cumulative development of the City of Oxnard within its Planning Area. The impact statement is as follows:

Impact 5.7-6 The Project would potentially conflict with implementation of state goals for reducing greenhouse emissions.

For land use and transportation related projects, the degree of compliance with policies intended to minimize GHG emissions will remain an important element of assessing their impacts. The lists of related policies are long, but not all policies would apply to all projects. Many of the goals and policies related to reducing GHG emissions through energy conservation and minimizing vehicle use also relate to reducing air pollution in general. These policies are presented above and are not repeated here. The additional policies are identified in the 2030 General Plan EIR, which apply to the issue of GHG emissions and climate change.

3.5.3 Environmental Setting

The City of Oxnard lies entirely within the Oxnard Plain, which is in Ventura County. Ventura County's diverse topography, which affects the County's air quality, is characterized by mountains to the north, hills to the east between Ventura and Los Angeles Counties, two major river valleys (the Santa Clara River which flows east-west and the Ventura River which flows roughly north-south), and the Oxnard Plain to the south and west. The Santa Monica Mountains rise above the Oxnard Plain to the south and continue east into Los Angeles County. The mountainous topography surrounding the lower lying portions of Ventura County, where most pollutants are emitted, contributes to poor air quality by acting as a barrier, which prevents winds from blowing away polluted air.

3.5.3.1 Climate and Atmospheric Conditions

The air above the PWIMP Planning Area often exhibits weak vertical and horizontal dispersion characteristics. The region experiences temperature inversions, which limit atmosphere mixing and trap pollutants, resulting in high pollutant concentrations near ground level. Surface inversions (0 - 500 feet) are most frequent during winter; subsidence inversions (1,000 – 2,000 feet) are most frequent during summer. Generally, the lower the inversion base height and the greater the temperature increase from the top, the more pronounced the effect the inversion will

have on the inhibiting dispersion. The City's climate is characterized by cool winters and generally moderate summers. Marine air influences the climate throughout the year. According to the Western Regional Climate Center, average temperatures range from about 75 degrees F (24 degrees C) in summer to 65 degrees F (18 degrees C) in winter. Annual rainfall averages about 15 inches per year, with most rainfall occurring between November and April.

3.5.3.2 Existing Emission Sources and Emission Levels

Emissions are divided into two main categories: stationary and mobile. Stationary sources are those emission sources, such as industrial processes, burning crop residuals, and exposed soils/minerals (source of dust or Particulate Matter - PM_{10}) that are fixed in place. Within the City, stationary-source pollutants include ozone precursors associated with local industrial processes and PM_{10} emissions associated with road dust, burning, construction and demolition activities, and fuel combustion (at stationary locations, such as industry residences). Natural sources of PM_{10} emissions include those resulting from wildfires. The primary source of mobile emissions is vehicles (automobiles, passenger trucks, trucks, and buses). Vehicle emissions are also the primary source of ozone precursors.

The VCAPCD has established several monitoring stations in the South Central Coast Air Basin to measure air quality conditions. The nearest monitoring station to the City is located in El Rio, which is adjacent and to the north of the City of Oxnard. Monitoring data from the El Rio monitoring station is shown in Table 3.3-2.

PM_{10} and $PM_{2.5}$. The State 24-hour PM10 standard was exceeded between 0 and 5 times from 1999 to 2004 at the El Rio monitoring station. There is no State 24-hour PM2.5 standard. The Federal 24-hour $PM_{2.5}$ standard was exceeded one time in 2003 and at no other time from 1999 to 2004.

Ozone. The State 1-hour ozone standard was exceed once in 1999 and has not been exceeded since. The State 8-hour standard is not expected to become effective until early 2006. Initial 8-hour monitoring data indicates that the State 8-hour standard may occasional be exceeded at the El Rio monitoring station.

Table 3.3-2
Summary of PM10, PM2.5, and Ozone Air Quality Monitoring Data (1999-2004)

Pollutant Monitoring Station		Standard		Year					
	Parameter	Federal	California	1999	2000	2001	2002	2003	2004
PM10 ($\mu g/m^3$)									
El Rio	Annual geometric mean	NA	20	29	28	29	29	NA	29
	Annual arithmetic mean	50	NA	28	27	28	28	31	28
	24-hour maximum	150	50	50	52	53	100	127	59
	Days above State standards	-	-	0	1	3	2	5	1
$PM_{2.5}$									

Table 3.3-2
Summary of PM10, PM2.5, and Ozone Air Quality Monitoring Data (1999-2004)

Pollutant Monitoring Station		Standard		Year					
	Parameter	Federal	California	1999	2000	2001	2002	2003	2004
El Rio	Annual geometric mean	N/A	12	N/A	N/A	13	N/A	N/A	11
	Annual arithmetic mean	15	N/A	N/A	N/A	N/A	13	12	11
	24-hour maximum	65	N/A	37	46	41	29	82	29
	Days above State standards			0	0	0	0	1	0
Ozone (ppm)									
El Rio	1-hour maximum	NA	0.09	0.10	0.08	0.09	0.09	0.08	0.08
	Days above State Standards			1	0	0	0	0	0
	8-hour Maximum	0.08	0.076	0.08	0.07	0.07	0.07	0.07	0.08
	Days above State Standards			N/A	N/A	N/A	N/A	N/A	N/A

Notes: N/A = not available. Days above standard means days with one or more exceedance of the 1-hour ozone standards – The State 8-hour ozone standard was approved by the CARB on April 28, 2005 and is expected to become effective in early 2006.

Source: California Air Resources Board, 2005

As of 2015, the Ventura County air basin is in attainment with, or is unclassified with respect to, all federal and state ambient air quality standards except for ozone and PM_{10}.

3.5.3.3 Sensitive Receptors in the City

Sensitive receptors are typically defined as populations or uses that are more susceptible to the effects of air pollution than the general population. For the PWIMP Planning Area, sensitive receptors include the following populations or uses: long-term healthcare facilities, rehabilitation centers, convalescent centers, retirement homes, residences, schools, playgrounds, childcare centers, and athletic facilities.

3.5.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.5.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on would occur if the PWIMP would:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment;
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases or otherwise conflict with state goals for reducing GHG emissions in California; and/or
- Contribute or be subject to potential secondary effects of climate change (e.g., sea level rise, increase fire hazard).

3.5.4.2 Approach and Methodology

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

The methods used to assess the significance of the PWIMP's GHG emissions are based on a review of recent publications and actions from the Governor's Office of Planning and Research (OPR) and guidance from the VCAPCD. OPR published a technical advisory titled *CEQA and Climate Change: Addressing Climate Change through California Environmental Quality Act (CEQA) Review*. This advisory acknowledges the need for a set threshold for GHG emissions and notes that OPR has asked CARB to recommend a method for setting thresholds to encourage consistency and uniformity in GHG analyses in CEQA documents throughout the State. In the interim, OPR recommends that compliance with CEQA be evaluated using three steps: 1) identify and quantify the GHG emissions generated by a project; 2) assess the significance of the impact on climate change; and 3) identify alternatives and/or mitigation measures if the impacts are determined to be significant (OPR, 2008).

For this evaluation a stationary source significance threshold for operational emissions of 10,000 metric tons of CO_2e per year for stationary source projects will be used. Since the VCAPCD has not adopted a significance threshold for construction emissions, this analysis amortizes the total GHG construction emissions from the Project over the lifetime of the Project (assumed to be 30 years) and adds them to the Project's operational emissions. The total GHG emissions are compared to the 10,000 metric tons of CO_2e significance threshold. The Project is also assessed for significant impacts with conflicting with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs.

3.5.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts are discussed below.

Impact 3.5-1: Implementation of the PWIMP and/or identified components/facilities could generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

The construction of the new PWIMP facilities and the rehabilitation and/or replacement of existing facilities could generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment. This is a potentially significant impact.

The PWIMP would be located within the jurisdiction of VCAPCD, the regional agency empowered to regulate air pollutant emissions from stationary sources in the Ventura County. VCAPCD regulates air quality through its permit authority over most types of stationary emission sources and through its planning and review process. Construction activities generate Reactive Organic Compounds (ROC) and Nitrogen Oxides (NOx) which contribute to GHGs. Construction emissions are considered by VCAPCD to be temporary in nature and are not included in overall emissions when determining if project impacts are significant. However and pursuant to VCPACD policy, construction-related emissions should be mitigated if estimates of ROC and NOx emissions exceed 25 pounds per day. PWIMP construction activities would occur over many years, but any one individual project, or a collection of several projects being constructed at the same time have the potential to exceed theses estimates. VCAPCD's approach to analyses of construction impacts is to emphasize implementation of effective and comprehensive basic construction control measures in all aspects of construction. With implementation of the **Mitigation Measures 3.5-1a through 3.5-1c**[1] below, the PWIMP's construction-related impacts would be considered to be less than significant.

Construction Mitigation Measures

The following mitigation measures shall be implemented.

Mitigation Measure 3.5-1a: Calculate Air Emissions. For each individual PWIMP project(s), set of Projects, and/ or construction activity, the City shall calculate air quality emissions using an appropriate air emissions computer program, as appropriate. VCAPCD recommends using the URBEMIS computer program that was originally developed by the California Air Board. However, other models such as the Sacramento Metropolitan Air Quality Management District's (SMAQMD) Roadway Construction Emissions Model can be effective in assessing the emissions of linear construction projects. The model run(s) will establish estimated construction emissions, which will be used to establish a construction emissions control plan as described in Mitigation Measure 3.5-1b below.

Mitigation Measure 3.5-1b: Construction Emissions Control Plan. For each individual PWIMP project(s), set of Projects and/ or construction activity, the City shall prepare a Construction Emissions Control Plan that outlines an approach for phasing construction activities to ensure that daily construction emissions do not exceed the VCAPCD's significance thresholds

[1] These are consistent with and/or duplicative of the applicable mitigation measures in Section 3.3 Air Quality.

for construction activities. The plan shall be submitted to the VCAPCD for review and approval at least 30 days prior to the estimated start of construction activities. The City shall require the approved plan to be implemented during all construction activities by including the approved plan in construction contracts. The plan shall include, at a minimum, a detailed description of the construction equipment inventory and use requirements for each component of the project, including daily activity phasing. The plan shall include documentation that the equipment used to construct the project(s) is properly maintained and shall include the maintenance schedule of the equipment, consistent with manufacturers' specifications. To ensure that emissions remain below VCAPCD's daily significance threshold of 25 pounds per day of ROC and NOx, the plan shall be designed to achieve emission levels that are no higher than 22.5 pounds per day of ROC and NOx (i.e., 90 percent of the daily threshold). All aspects of construction activity, including but not limited to truck trips per day, miles per trip, miles of dirt road travel per day, daily equipment inventories, equipment hours, and amounts of total areas and volumes of material to be disturbed shall be clearly defined in the plan and implemented in the field so that it can be determined by a third party construction monitor that the agreed upon plan is adequately implemented.

Mitigation Measure 3.5-1c: ROC and NOx Construction Measures. For each individual PWIMP Project(s), set of Projects, and/ or construction activity, the City shall, to the extent applicable and possible, require its construction contractor(s) to implement ROC and NOx construction measures.

- Minimize equipment idling time.
- Maintain equipment engines in good condition and in proper tune as per manufacturers' specifications.
- Lengthen the construction period during smog season (May through October), to minimize the number of vehicles and equipment operating at the same time.
- Use alternatively fueled construction equipment, such as compressed natural gas (CNG), liquefied natural gas (LNG), or electric, if feasible.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

With regard to long-term operations, there would be no permanent stationary sources associated with the PWIMP, with the exception of emergency generators, and mobile sources would be limited to commuting workers to PWIMP facilities and limited truck trips to inspect the pipeline and conveyance facilities. However, operation of the new wells and expanded wastewater and advance recycled water treatment facilities will require additional electricity and would be the primary source of GHG emissions. If the annual operational emissions of these new or expanded PWIMP facilities exceed 10,000 metric tons of CO_2e per year above existing conditions, then the project would be considered to have a significant impact. However, with the Mitigation Measure 3.5-1a above and Mitigation Measure 3.5-1d below, then any impacts would be considered to be less than significant.

Long-Term Operational Mitigation Measures

The following mitigation measures shall be implemented.

Mitigation Measure 3.5-1d: Purchase of GHG Offset Credits. If it is determined that the Proposed new PWMIMP facilities would exceed 10,000 metric tons of CO_2e per year above existing conditions, then the City shall purchase GHG offset credits from a reputable purveyor of the GHG offset credits in compliance with CAPCOA's GHG Registry.

Significance after Mitigation: Less-than-Significant Impact

Impact 3.5-2: Implementation of the PWIMP and/or identified components/facilities could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases or otherwise conflict with state goals for reducing GHG emissions in California. The potential impacts due to temporary construction and long-term operations are discussed below.

As discussed above, the PWIMP would be located within the jurisdiction of VCAPCD, the regional agency empowered to regulate air pollutant emissions from stationary sources in the Ventura County. VCAPCD regulates air quality through its permit authority over most types of stationary emission sources and through its planning and review process. Construction activities generate Reactive Organic Compounds (ROC) and Nitrogen Oxides (NOx) which contribute to GHGs. Construction emissions are considered by VCAPCD to be temporary in nature and are not included in overall emissions when determining if project impacts are significant. However and pursuant to VCPACD policy, construction-related emissions should be mitigated if estimates of ROC and NOx emissions exceed 25 pounds per day. PWIMP construction activities would occur over many years, but any one individual project, or a collection of several projects being constructed at the same time have the potential to exceed theses estimates. VCAPCD's approach to analyses of construction impacts is to emphasize implementation of effective and comprehensive basic construction control measures in all aspects of construction. With implementation of the **Mitigation Measures 3.5-1a through 3.5-1c** above, the PWIMP's construction-related GHG impacts would be considered to be less than significant.

Significance after Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

As stated above and with regard to long-term operations, there would be no permanent stationary sources associated with the PWIMP, with the exception of emergency generators, and mobile sources would be limited to commuting workers to PWIMP facilities and limited truck trips to inspect the pipeline and conveyance facilities. However, operation of the new wells and expanded wastewater and advance recycled water treatment facilities will require additional electricity and would be the primary source of GHG emissions. If the annual operational emissions of these new or expanded PWIMP facilities exceed 10,000 metric tons of CO_2e per year above existing conditions, then the project would be considered to have a significant impact. However, with the implementation of **Mitigation Measures 3.5-1a and 3.5-1d** above, then any impacts would be considered to be less than significant.

Significance after Mitigation: Less-than-Significant Impact

Impact 3.5-3: Implementation of the PWIMP and/or identified components/facilities could contribute or be subject to potential secondary effects of climate change (e.g., sea level rise, increase fire hazard). The potential impacts due to temporary construction and long-term operations are discussed below.

As discussed above, the PWIMP would be located within the jurisdiction of VCAPCD, the regional agency empowered to regulate air pollutant emissions from stationary sources in the Ventura County. VCAPCD regulates air quality through its permit authority over most types of stationary emission sources and through its planning and review process. Construction activities generate Reactive Organic Compounds (ROC) and Nitrogen Oxides (NOx) which contribute to GHGs. Construction emissions are considered by VCAPCD to be temporary in nature and are not included in overall emissions when determining if project impacts are significant. However and pursuant to VCPACD policy, construction-related emissions should be mitigated if estimates of ROC and NOx emissions exceed 25 pounds per day. PWIMP construction activities would occur over many years, but any one individual project, or a collection of several projects being constructed at the same time have the potential to exceed theses estimates. VCAPCD's approach to analyses of construction impacts is to emphasize implementation of effective and comprehensive basic construction control measures in all aspects of construction. With implementation of the **Mitigation Measures 3.5-1a through 3.5-1c** above, the PWIMP's construction-related GHG impacts including any potential to contribute or be subject to potential secondary effects of climate change (e.g., sea level rise, increase fire hazard) would be considered to be less than significant.

Significance after Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

As stated above and with regard to long-term operations, there would be no permanent stationary sources associated with the PWIMP, with the exception of emergency generators, and mobile sources would be limited to commuting workers to PWIMP facilities and limited truck trips to inspect the pipeline and conveyance facilities. However, operation of the new wells and expanded wastewater and advance recycled water treatment facilities will require additional electricity and would be the primary source of GHG emissions. If the annual operational emissions of these new or expanded PWIMP facilities exceed 10,000 metric tons of CO_2e per year above existing conditions, then the project would be considered to have a significant impact. However, with the implementation of **Mitigation Measures 3.5-1a and 3.5-1d** above, then any operational GHG impacts including any potential to contribute or be subject to potential secondary effects of climate change (e.g., sea level rise, increase fire hazard) would be considered to be less than significant.

Significance after Mitigation: Less-than-Significant Impact

3.5.5 Cumulative Effects

As discussed above, the PWIMP would be located within the jurisdiction of VCAPCD, the regional agency empowered to regulate air pollutant emissions from stationary sources in the Ventura County. VCAPCD regulates air quality through its permit authority over most types of stationary emission sources and through its planning and review process. Construction activities generate Reactive Organic Compounds (ROC) and Nitrogen Oxides (NOx) which contribute to GHGs. Construction emissions are considered by VCAPCD to be temporary in nature and are not included in overall emissions when determining if project impacts are significant. However and pursuant to VCPACD policy, construction-related emissions should be mitigated if estimates of ROC and NOx emissions exceed 25 pounds per day. PWIMP construction activities would occur over many years, but any one individual project, or a collection of several projects being constructed at the same time have the potential to exceed theses estimates. VCAPCD's approach to analyses of construction impacts is to emphasize implementation of effective and comprehensive basic construction control measures in all aspects of construction. With implementation of the **Mitigation Measures 3.5-1a through 3.5-1c** above, the PWIMP's construction-related GHG impacts would be considered to be less than significant. As a result, the PWIMP construction activities are not expected to have any cumulative impacts to GHGs.

As stated above and with regard to long-term operations, there would be no permanent stationary sources associated with the PWIMP, with the exception of emergency generators, and mobile sources would be limited to commuting workers to PWIMP facilities and limited truck trips to inspect the pipeline and conveyance facilities. However, operation of the new wells and expanded wastewater and advance recycled water treatment facilities will require additional electricity and would be the primary source of GHG emissions. If the annual operational emissions of these new or expanded PWIMP facilities exceed 10,000 metric tons of CO_2e per year above existing conditions, then the project would be considered to have a significant impact. However, with the implementation of **Mitigation Measures 3.5-1a and 3.5-1d** above, then any impacts would be considered to be less than significant. As a result, the PWIMP operational activities are not expected to have any cumulative impacts to GHGs.

3.6 Cultural, Paleontological, and Tribal Resources

3.6.1 Introduction

This section describes the existing regulatory setting, cultural resources, and tribal cultural resources in the PWIMP Planning Area(s), and evaluates how construction and operation of the components of the PWIMP would impact identified and unanticipated cultural and tribal resources. A cultural resource is any physical evidence or specific location of past human activity, occupation, or use, identifiable through archaeological investigation, historical research, or oral history.

Cultural resources can be separated into three categories: archaeological resources (the physical traces of human activity), built environment resources (buildings and structures), and traditional cultural resources (places associated with cultural practices of a community).

- **Archaeological Resources.** Archeological resources are material remains of human life or activities that can provide information about past human behavior. Prehistoric archaeological resources include a variety of artifactual and non-artifactual remains of human activity. Typical prehistoric artifacts include flaked stone tools (arrowheads, scrapers), ground stone tools (mortars, pestles, milling slabs, net weights), bone tools (fishhooks, awls), and decorative or social items (bone flutes, bone gaming sticks, shell beads, shell or stone pendants, obsidian tinklers). Non-artifactual remains may include human remains; architectural remnants such as house pits; evidence of cooking such as fire-affected rock, ash, animal bone or shell; midden soil, which is dark brown to black with a high organic content and typically contains charcoal, animal bone; or shell middens, which are deposits of shell or shell mixed with midden soil and artifacts. Historic-era archaeological resources may include filled hollow features such as privies, trash pits, or wells; architectural features such as foundations, concrete pads, adobe brick, or fence posts; diffuse or concentrated trash scatters containing glass bottles, domestic ceramics, or metal; and trash dumps containing food debris such as animal bone, shellfish, seeds, or pits.
- **Built Environment Resources.** This term includes architectural evidence from the past, including buildings, building complexes (such as homesteads or farms), roads and trails, bridges, cemeteries, infrastructure (such as canals, dams, pipelines, power lines, or electrical stations), and other structures.
- **Traditional Cultural Resources.** Traditional cultural resources include sites of special importance to a living community. These may include gathering places, sacred sites, landscape features, or other locations that help to maintain the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community.

A Tribal Cultural Resource is a geographically-defined site, feature, place, object or cultural landscape that with cultural value to a California Native American tribe. It may include any of the above categories of cultural resource.

This evaluation of cultural and tribal cultural resources was based on an initial review of existing reports and literature from the City of Oxnard. In addition, information regarding known and recorded cultural resources within the Planning Area was identified through a records search of pertinent survey and site data at the South Central Coastal Information

Center, California State University, Fullerton, on May 3, 2018 (SCCIC #18900.4895). An inventory of properties listed in the National Register of Historic Places, the California Register of Historic Resources, the California Inventory of Historic Resources (2016), the California Historical Landmarks (1996), or the California Points of Historical Interest (2016) was also generated for the purposes of this report. Results of the historic properties listed by the Office of Historic Preservation were also obtained. However, due to the large number of surveys and archaeological sites in the project vicinity, as well as the confidential nature of cultural resource information, a comprehensive listing of the reports is not included in this Public Draft PEIR.

In addition, on April 10, 2018, a list of local Native American Tribes was obtained from the Native American Heritage Commission and on April 30, 2018 the City requested government-to-government consultation as required by AB 52. To date, none of the Native American Tribes have responded. Please see Appendix D.

Key terms and concepts include the following:

- **Archaeology.** The study of human activity in history or prehistory through study of artifacts, architecture, and other physical remains.
- **Ethnography.** The scientific study of contemporary human cultures.
- **Complex.** A patterned grouping of similar artifact assemblages from two or more sites, presumed to represent an archaeological culture.
- **Historic Preservation District.** An area of the City having historic, architectural, cultural or aesthetic significance and designated as a Historic Preservation District under the provisions of the City's Planning and Zoning Code.
- **Historic Resource.** A property, site, or district listed in, or determined to be eligible for listing in, the National Register of Historic Places, California Register of Historical Resources (CRHR), Ventura County Historical Landmarks, or City of Oxnard Points of Interest.
- **Isolate.** Archaeological artifacts or features found apart from recognized archaeological sites. Generally, isolates cannot provide enough information to make them eligible to be historic resources.
- **Landmark.** Any structure or natural feature designated as a Cultural or Historic Monument under the provisions of the City's Planning and Zoning Code or as listed in California Historical Landmarks.
- **Midden.** Soils produced by dumping of human domestic waste, which may contain artifacts, bone, shell fragments, charcoal, ash, rock, human remains, structural remnants, or other traces of human activity.
- **State Historical Landmark.** Historic structure or site of local or statewide interest.
- **State Point of Historical Interest.** Historic structure or site of local or countywide interest.

3.6.2 Regulatory Context

Cultural and tribal resources are subject to various Federal, State and local regulations. A brief overview of these regulations follows.

3.6.2.1 Federal Regulations

The relevant federal regulations are discussed below.

National Historic Preservation Act. The National Historic Preservation Act of 1966 (NHPA) established the National Register of Historic Places (NRHP) as the official list of the Nation's historic places deserving of preservation. Buildings, structures, districts, archaeological sites, or objects evaluated for listing on the NRHP should be at least 50 years old (barring exceptional circumstances), and should meet at least one of the following criteria:

A. Associated with events that have made a significant contribution to the broad patterns of our history;
B. Associated with the lives of persons significant in our past;
C. Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess high artistic values, represent a significant and distinguishable entity whose components may lack individual distinction;
D. Have yielded, or may be likely to yield, information important in prehistory or history. Criterion D is usually reserved for archaeological and paleontological resources.

To be eligible, a property must also retain sufficient integrity of location, design, setting, materials, workmanship, feeling, or association to convey its significance. Definitions and procedures for the NRHP are established at Title 36 Code of Federal Regulations (CFR) Parts 60 and 63.

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties. Local governments that receive grants or require permits from Federal Agencies may be required to determine whether a project has the potential to affect historic properties; if it does, the property must be evaluated for its eligibility to the NRHP. If a property is found eligible, and it is likely to be adversely affected by a Federal undertaking, mitigation measures are usually required. Section 106 procedures are outlined at Title 36 Code of Federal Regulations (CFR) Part 800.

American Indian Religious Freedom Act and Native American Graves and Repatriation Act. The American Indian Religious Freedom Act recognizes that Native American religious practices, sacred sites, and sacred objects have not been properly protected under other statutes. It establishes as national policy that traditional practices and beliefs, sites (including right of access), and the use of sacred objects shall be protected and preserved.

The Native American Graves and Repatriation Act of 1990 establishes procedures for the disposition of Native American burials and burial-associated artifacts that may be discovered during Federal undertakings or on Federal lands. The act provides for repatriation of human remains, funerary objects, or sacred objects to an appropriate tribal descendant.

3.6.2.2 State Regulations

The relevant state regulations are discussed below.

California Environmental Quality Act (CEQA). CEQA requires that lead agencies determine whether their projects may cause a substantial adverse change to a historical resource or unique archaeological resource, which is considered to be a significant effect on the environment (Public

Resources Code §21084.1). CEQA defines "historical resource" as a property determined eligible for the National Register of Historic Places (NRHP), the California Register of Historic Resources (CRHR), or local registers by a lead agency (14 Code of California Regulations §15064.5). The CRHR eligibility criteria are modeled on those for the NRHP and include:

1. Association with events that have made a significant contribution to the broad patterns of our history;
2. Association with the lives of persons significant in our past;
3. Embodiment of the distinctive characteristics of a type, period, or method of construction, represents the work of a master, possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
4. Has yielded, or is likely to yield, information important to prehistory or history.

Resources determined eligible for the NRHP are automatically listed on the CRHR. In addition, historic landmark designations by cities and counties are also presumptively eligible for the CRHR. A property that has been determined eligible to the CRHR or NRHP is considered a historical resource for the purposes of CEQA, whether or not it has been formally listed on the CRHR.

A "unique archaeological resource" is defined in CEQA statute §15064.5(g) as an archaeological artifact, object, or site that "without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2) Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3) Is directly associated with a scientifically recognized important prehistoric or historic event or person."

These eligibility criteria mirror that of the CRHR, so that practically speaking any resource meeting the definition of a unique archaeological resource will also meet the eligibility criteria of the CRHR.

A "substantial adverse change" under CEQA can include physical demolition, destruction, relocation, or alteration of a historical resource or its immediate surroundings in a way that "materially impairs" its significance in such a way as to make it ineligible for the CRHR.

CEQA emphasizes avoidance of archaeological and historical resources as the preferred means of reducing potential significant environmental effects resulting from projects. If avoidance is not feasible, an excavation program or some other form of mitigation must be developed to mitigate the impacts. In most cases, whenever a project adversely impacts historic resources, a mitigated Negative Declaration or EIR is required under CEQA. The following are steps typically taken to assess and mitigate potential impacts to cultural resources for the purposes of CEQA:

- Identify cultural resources,
- Evaluate the significance of the cultural resources found,
- Evaluate the effects of the project on cultural resources, and

- Develop and implement measures to mitigate the effects of the project on cultural resources that would be significantly affected.

California PRC Section 5097.5. California PRC Section 5097.5 prohibits excavation or removal of any "vertebrate paleontological site…or any other archaeological, paleontological or historical feature, situated on public lands, except with express permission of the public agency having jurisdiction over such lands." Public lands are defined to include lands owned by or under the jurisdiction of the state or any city, county, district, authority or public corporation, or any agency thereof. Section 5097.5 states that any unauthorized disturbance or removal of archaeological, historical, or paleontological materials or sites located on public lands is a misdemeanor.

State Laws Pertaining to Human Remains. Section 7050.5 of the California Health and Safety Code requires that construction or excavation be stopped in the vicinity of discovered human remains until the county coroner can determine whether the remains are those of a Native American. If the remains are determined to be Native American, the coroner must contact the California Native American Heritage Commission. CEQA Guidelines (Section 15064.5) specify the procedures to be followed in case of the discovery of human remains on non-Federal land. The disposition of Native American burials falls within the jurisdiction of the Native American Heritage Commission.

Native American Consultation. Prior to the adoption or amendment of a general plan, Government Code Sections 65352.3 and 65352.4 require a city or county to consult with local Native American tribes that are on the contact list maintained by the Native American Heritage Commission. The purpose is to preserve or mitigate impacts to places, features, and objects described in PRC Sections 5097.9 and 5097.993 (Native American sanctified cemetery, place of worship, religious or ceremonial site, or sacred shrine located on public property) that are located within a city or county's jurisdiction.

In addition, Assembly Bill 52 (e.g. 2014) (AB 52), as codified in PRC Sections 5097, 21073, 21074, 21080, 21082, 21083, and 21084, will:

- Establish a new classification of resources called Tribal Cultural Resources (TCRs) which considers the value of a resource to tribal cultural traditions, heritages, and identifies;
- Establish potential mitigation options for TCRs; and
- Recognize that California Native American tribes have expertise concerning their tribal history and practices.

AB 52 is intended to help identify impacts to TCRs as early as possible during the CEQA process so that appropriate mitigation measures may be developed. Under this legislation, when a project is initiated, the lead agency must formally notify interested tribes that have requested to be on the agency's consultation list. AB 52 consultation should inform the need for a ND, MND, or EIR and must be initiated prior to the release of an ND, MND, or EIR, so it is important to build AB 52 consultation into project schedules.

Tribes must be given written notification by the lead agency within 14 days of the decision by the lead agency themselves to undertake a project or the lead agency's determination that a project application is complete for a private project. If a tribe does not respond to a request within a 30-day timeframe, the agency may move forward with the project having made a good faith effort to open consultation.

However, if the tribe(s) responds after 30 days, the lead agency may elect to begin consultation with the tribe(s), despite the passing of the legal deadline. The lead agency can and should make follow-up calls after the consultation letters are sent to try to get responses as soon as possible. Note, however, that if the tribes do not respond to follow-up telephone calls, they must still be afforded the 30-day window to respond.

3.6.2.3 Local Regulations

The relevant local regulations are discussed below.

City of Oxnard Code. Chapter 16, Section 470 allows the Oxnard City Council to designate significant heritage features including physical objects, buildings or land. These features should exemplify a unique or significant style, be the site of a significant historical or cultural event, or be associated with people important in local history.

Oxnard Coastal Land Use Plan. The California Coastal Commission regulates all licensed, permitted, or assisted activities, wherever they may occur, if the activities affect coastal resources. The California Coastal Act (PRC Section 30244) states that: "Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required." These measures are defined by local coastal land use plans. The Oxnard Coastal Land Use Plan (1982) establishes Local Coastal Policy #48, which states that:

- Avoidance is the preferred mitigation in all cases where a proposed project would intrude on the known location of a cultural resource. Therefore, proposed project areas should be surveyed by a qualified archaeologist and resulting findings taken into account prior to issuing discretionary entitlements.
- Should any object of potential cultural significance be encountered during construction, a qualified cultural resources consultant shall be contacted to evaluate the find and recommend any further mitigation needed. All potential impacts shall be mitigated to the maximum extent feasible.
- Any unavoidable buried sites discovered during construction shall be excavated by a qualified archaeologist with an acceptable research design. During such site excavation, a qualified representative of the local descendants of the Chumash Indians shall be employed to assist in the study, to ensure the proper handling of cultural materials and the proper curation or reburial of finds of religious importance or sacred meaning.

This policy is incorporated into the City of Oxnard Code at Chapter 16, Section 17-37, and affects development taking place in the Oxnard Coastal Zone, which is generally the area 1,000 yards inland from the mean high tide line within the City of Oxnard.

City of Oxnard - Oxnard 2030 General Plan. The City of Oxnard's General Plan contains several goals and policies for the preservation of cultural resources:

- *Protection of Natural and Cultural Resources Goal CD-11* Aims to protected the historic and authentic qualities of Oxnard's traditional neighborhoods and historic districts through awareness, preservation, education, and incorporation of historic features into new development.

- *Environmental Resources Goal ER-1* Aims to ensure a "symbiotic, mutually-beneficial, sustainable relationship" between development activities and protection of natural and cultural resources, agriculture, and open spaces through avoidance and mitigation.
- *Cultural and Historic Resources Goal ER-11* is the most comprehensive goal, which requires identification, protection, and enhancement of the City's archaeological, historical, and paleontological resources. Proposed development projects should provide archaeological surveys, conduct research, and ensure mitigation of impacts, while the City should create a Historical Resource Inventory and encourage developers to preserve, protect and enhance the use of historical buildings, using the State Historic Building Code where possible.

3.6.3 Environmental Setting

The following section summarizes the Planning Area's prehistoric, ethnographic, and historic setting. Figure 3.6-1 provides a visual timeline of the Planning Area's historic setting.

Prehistoric Setting

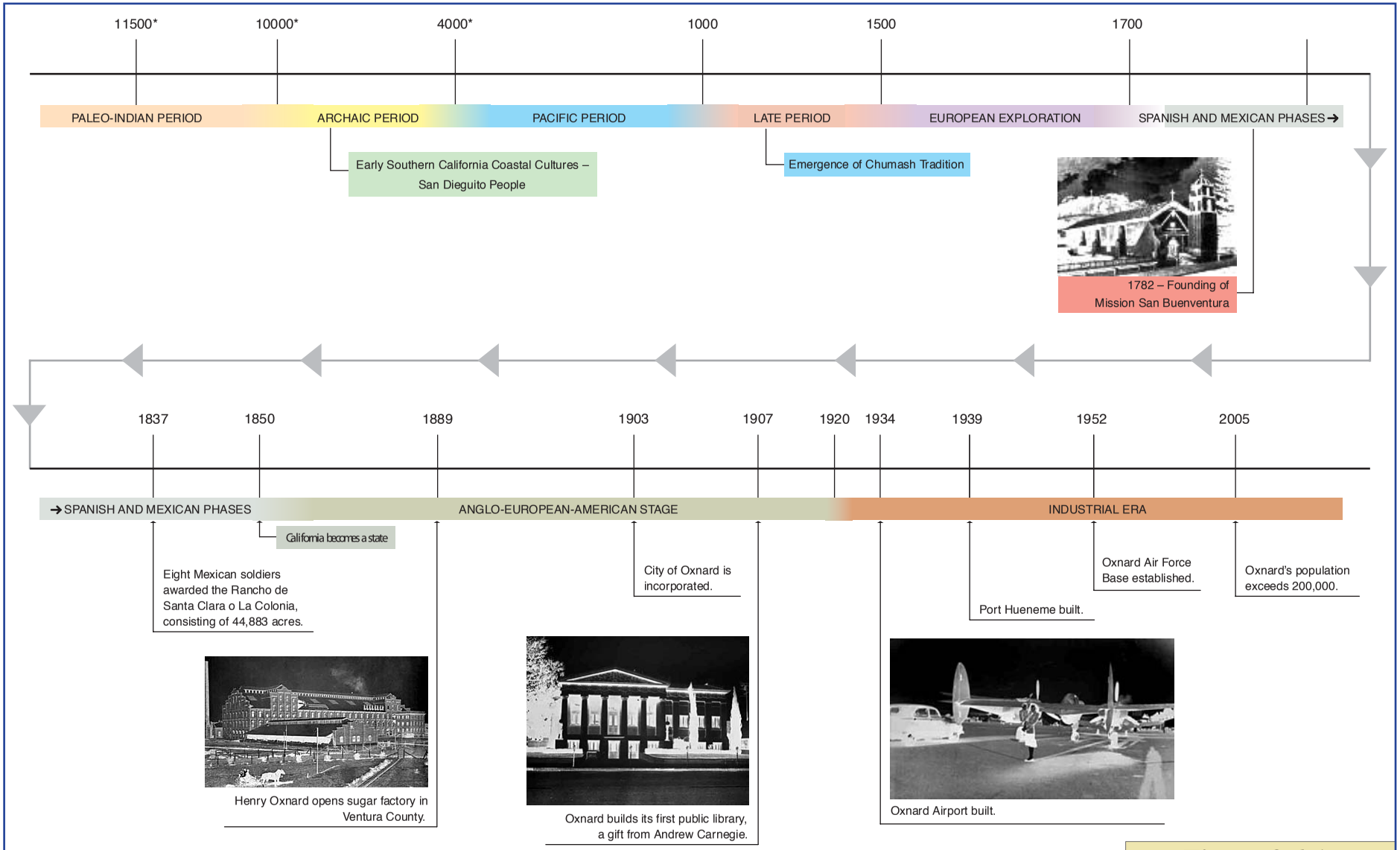
The ecologically rich landscape of the Santa Barbara channel has yielded some of the oldest evidence for human settlement in North America, with sites on the northern Channel Islands dated as far back as 11,000 BC. Extensive evidence for settlement on the mainland, however, reaches only back to 7000 BC, when the population of the Southern California Coast began developed a complex food processing technology marked by an abundance of manos and metates. The period from 7000-5000 BC, known as the Millingstone Period, saw a focus on shellfish as a main source of protein and the first production of shell beads. This period had small settlements and little evidence of social hierarchy.

In the Middle period, from 4500-2000 BC, more complex settlement systems emerged, with permanent villages and seasonal camps for specialized purposes. Mortar and pestle technology replaced milling slabs, and more projectile points were produced. This suggests a diversification of diet to include more land animals as well as tubers, seeds, and roots. In this period, grave goods and indications of personal wealth emerged, as well as the first evidence for marine mammal hunting and watercraft (Glassow et al. 2007).

The Middle/Late transition period (2000-1 BC) saw a further broadening of diet to include acorns, roots, shallow and deep-sea fish, sea mammals, small animals. Fishing became much a more important source of food than in previous periods before. This is reflected in a more diverse tool set, with new kinds of arrowheads, fishhooks, and fishing nets. Larger permanent settlements developed, with formal architecture, status differentiation, ritual behavior, and rock art. Some villages were continuously inhabited from 1200 BC to contact with the Spanish, suggesting that this period saw the development of a proto-Chumash culture, with parallels with ethnographically-attested Chumash practices.

From 1-1000 AD, known as the Late period, populations continued to grow and new technologies emerged, including the sewn-plank canoe, bow and arrow, and specialized craft items. Large cemeteries were established, and there is evidence for the special role of chiefs and shamans, with respective control over political and ritual aspects of society.

In the last seven centuries before Spanish contact (1000-1769 AD), Chumash society continued to



* Years Before Present
Photographs courtesy of the Oxnard Library

Figure 3.6-1
Historic Timeline for the Planning Area

Source: ESA, 2006

become more populous and complex. Some villages grew to contain 500-800 people, supported by complex regional exchange systems that connected the Channel Islands to the mainland and the far interior of California. Craft specialization is evident, with whole villages of microblade drill producers attested on Santa Cruz Island, and the development of *Olivella biplicata* shell beads as a regional currency (Gamble 2008:65).

Ethnographic Setting

At contact with the Spanish, 18,000-20,000 people lived in the Chumash region, which was likely the most complex society with the highest population density in western North America. The Chumash languages (Obispeño, Central Chumash, and Island Chumash) were spoken from Malibu to Morro Bay. The Ventureño language is local variant of Central Chumash, which formed a dialect continuum from Malibu to Santa Maria. The last native speaker of Central Chumash died in 1965, though language revival efforts are underway by the Santa Ynez Band (Golla 2011:198).

In the Ventura area, 2500-4000 people lived in settled villages, which were laid out with regular streets, and featured dance floors, cemeteries, playing fields, menstrual and puberty huts, storage structures, smokehouses, and sweatlodges. Chumash houses were hemispherical, made of poles and covered with woven grass thatch. Ranging from 12 to 20 feet in diameter, each house usually sheltered an extended family (Gamble 2008: 124; Grant 1978:512). Cemeteries were located near, but outside of, the village area (Gamble 2008:119).

Each village was headed by a hereditary chief (who were mostly male, but could be female), aided by shamans, healers, and ritual experts who formed the *'antap'* secret society. Chumash society was more hierarchical than most in California, including both hereditary chiefs and, in some periods, regional chiefs who controlled a group of villages. The Chumash used shell bead money as a medium of exchange and had many specialized industries, including basketry, bead-making, stone tool production, woodworking, and building wood-framed thatch houses. The most notable of the Chumash technologies was the seafaring plank canoe or *tomol* that allowed both deep-sea fishing and regular transportation of people and goods to and from the Channel Islands (Grant 1978:507).

Chumash people played games common throughout California, including shinny, the hoop and pole game, dice, and gaming sticks. Musical instruments including flutes, bows, whistles, and rattles often accompanied dance ceremonies. Tobacco was used both ritually and recreationally, and ceremonial feasting played an important role in creating connections between villages and in redistributing wealth (Gamble 2008:179). The annual festivals of *Hutash* (at the fall harvest) and *Kakunupmawa*, (at the winter solstice) attracted visitors as far away as the Channel Islands and San Joaquin Valley (Gamble 2008: 184).

Acorns were the staple food, supplemented by pinenuts, wild cherry, roasted soaproot, seeds, berries, mushrooms, and cress. Meat came from land animals (deer, coyote, fox), game birds (especially ducks and geese), marine mammals, shellfish, and many varieties of oceanic and freshwater fish (Grant 1978:515; Gamble 2008:151ff)

Historic Setting

Spanish, British and Russian explorers visited the California coast as early as the 16th century. Both Cabrillo (1542) and Vizcaíno (1601) visited the Chumash towns near Point Mugu, which included Muwu, Simo'mo, and Wixatset (Gamble 2008:105). Permanent European settlement, however, did not begin until the 1770s. Against an ongoing Russian advance down the Pacific Coast, Spanish expeditions by Gaspar de Portolá in 1769-70 and Juan Bautista de Anza in 1775-76 laid the groundwork for the establishment of a mission system by Franciscan priests in Alta California. The missions, supported with small military detachments at the Presidios of San Diego, Monterey, and San Francisco, aimed to convert local Native Americans and establish agricultural plantations using their labor.

Mission San Buenaventura was founded in 1782, supported by a new Presidio at Santa Barbara. Ventureño Chumash groups from the Santa Clara River watershed and Oxnard plain were gathered into the mission using a mix of persuasion and force. By 1804, 85% of the Chumash population was Missionized. Indian laborers at the mission grew grain and tree crops; managed herds of cattle, sheep, and horses; and practiced European crafts including tanning, milling, and blacksmithing (Jackson and Castillo 1985). However, disease, dietary deficiency, declining birth rate, and military conflict resulted in an almost 80% population decline among Chumash converts by the early 1830s.

After independence from Spain in 1822, competition for land grew among the *Californio* rancho class, leading to the secularization of church lands in 1834 and the grants of large Ranchos to individual citizens. Most of the PWIMP area lies on rancho El Rio de Santa Clara o la Colonia, granted in 1837 to seven former soldiers from the Presidio of Santa Barbara. Consisting of 44,883 acres, the ranch included almost all the present-day City of Oxnard as well as Point Mugu, Port Hueneme, and Colonia. Of the original grantees, only Rafael Gonzáles actively used the land for grazing cattle and sheep, and lived on Gonzales Road near the Santa Clara River. A small part of the PWIMP area north of US 101 lies on Rancho Santa Clara del Norte, granted to Juan Maria Sanchez in 1837.

Euro-American settlement in Ventura County began after the Gold Rush but accelerated in the 1860s. Thomas Bard bought a five-sevenths interest in Rancho Rio de Santa Clara in 1864 as agent for U.S. Secretary of War Thomas Scott; when Scott's plans to encourage the Southern Pacific Railroad to build its terminus on the property failed, he sold the land to Bard in 1869. By this time, however, squatters had assumed that the land was public and available for the taking, and had already occupied portions of the Rancho. After a protracted dispute over the land rights between Bard and the squatters, the courts decided in Bard's favor, with the condition that the squatters be given the opportunity to purchase the lands they occupied. Bard subdivided much of the rancho, sold plots to farmers of Irish and German descent, and established the town of Port Hueneme to allow farmers to ship their goods to San Francisco, then the major population center of the Pacific coast.

The fertility of the Oxnard floodplain and discovery of artesian water sources spurred the growth of agriculture in the area. Barley, wheat, and lima beans were major crops among the early farmers, with beets playing a subsidiary role as animal feed. In the mid-1890s, Albert Maulhardt and Ed Bouchard found that the Oxnard plain was ideal for sugar beets, a discovery that transformed the local economy (Hutchinson 1965:166). In 1897 they invited Henry Oxnard,

President of the American Beet Sugar Company, to construct a beet sugar factory on a 200-acre parcel near present-day Wooley Road and Saviers Boulevard. Oxnard, a native of Louisiana, had opened a beet sugar factory with his three brothers in Chino and invested over $2 million in the new plant (Osborn 1972).

In 1898, as the plant was being built, a new townsite was planned near the factory by the Colonia Improvement Company and named after the Oxnard brothers (Heil 1978:19). A new railroad line over the Santa Clara River was constructed to connect the new town and factory with the Southern Pacific mainline (Maguire 1961). When the American Beet Sugar Factory opened in August 1899, the influx of workers led to the rapid construction of hotels, homes, schools, and public facilities. The City of Oxnard was incorporated in 1903, and by 1920 had 4,400 residents.

The beet sugar factory spurred demand for labor, both in the factory and in the fields producing beets and other crops. While the early agriculturalists were predominantly German and Irish in origin, with some French Jews working as agricultural brokers, most farm laborers were of Chinese, Japanese, and Mexican origin. A small Chinatown opened along 7th and 8th Streets in Oxnard by 1912, with businesses serving Chinese and Euro-American clientele (Chan 1991). Over 1000 Japanese workers were brought to Oxnard in 1900 to work in the sugar beet fields (Fukuyama 1994). Large groups of Mexican workers arrived the same year. Poor working conditions led to the formation of Oxnard's first major labor union, the Japanese-Mexican Farm Labor Association, was the first in California composed of minority workers, and the first to win a major agricultural strike in 1903 (Almaguer 1984).

The economy of Oxnard remained dominated by agriculture and sugar production through the 1920s and 1930s, though population growth slowed during the Great Depression. A new harbor was built at Port Hueneme in 1940, but was soon appropriated by the US Navy as a logistics hub and training center for the Naval Construction Battalions (or Seabees). New military facilities were sited at Point Mugu in 1946 (the Pacific Missile Test Center), Camarillo in 1952 (Oxnard Air Force Base). These military bases, along with facilities built by contractors such as Raytheon and Bendix, brought over 20,000 military personnel and 10,000 civilian workers to the Oxnard area, propelling the population from 8,500 in 1940 to 21,600 in 1950, making it Ventura County's largest city (Trien 1985:134).

After the closure of the American Beet Sugar refinery in 1958, urban renewal efforts transformed downtown Oxnard, while the development of suburban tracts moved the commercial center of gravity of City to the north with the development of the Esplanade Shopping Center in 1969-1971. Rapid population growth continued, reaching 71,225 by 1970.

Summary of Existing Resources

This section summarizes known cultural resources in the PWIMP planning area. It includes information from the Native American Heritage Commission, California Historical Resources Information System (CHRIS), and Ventura County. No tribal cultural resources are known, but there are numerous archaeological resources and built environment resources within the project area. Tables 3.6-1, 3.6-2, and 3.6-3 below present summaries of the most important resources.

Tribal Cultural Resources. On April 1, 2018 the Native American Heritage Commission (NAHC) in Sacramento, California was contacted to determine whether its Sacred Lands File lists any Tribal Cultural Resources within the PWIMP area. The NAHC responded on April 10, 2018 stating that a search of its Sacred Lands File failed to indicate the presence of Native American cultural resources in the PWIMP area. Included with the response was a list of 5 Native American representatives who may have further knowledge of Native American resources in the project area. In accordance with AB 52 regulations, the City sent each of tribe a formal letter on April 30, 2017 requesting government-to-government consultation with each of tribes and inviting them to participate in the process. No response was received within the statutory 30-day consultation period. In sum, no Tribal Cultural Resources were identified within the PWIMP area. Please see Appendix D.

Prehistoric Resources. In May 2018, a records search was completed at the South Central Coastal Information Center (SCCIC #4895), California State University, Fullerton. The record search identified 31 archaeological resources within the planning area and the ½ mile buffer zone around it. 26 of these are prehistoric archaeological resources (four of which have minor historic components), one is a historic resource, three are landscape features, and one is an ethnographic location.

Known Archaeological Sites

Sixteen prehistoric archaeological sites, ten isolates, and one possible ethnographic site are known in the PWIMP and the ½-mile search radius (see Table 3.6-1 below). Most of these are concentrated on the east side of Oxnard, near Rice Avenue between US 101 and Highway 1. Only three of the sites have subsurface components: two are habitation sites with midden, artifacts, and burials, and the other is a midden representing a seasonal shellfish-gathering camp. Other resources include an isolated burial (CA-VEN-1304), ten surface scatters of prehistoric artifacts without known subsurface elements, and one possible ethnographic site related to plant collecting. Among the isolates are five scatters of marine shell that may not be archaeological in nature, though they were found in an area sensitive for prehistoric archaeological resources. The most significant sites include:

- CA-VEN-506 is a prehistoric archaeological site near East Fifth Street and Rice Avenue containing a Late Period Chumash cemetery. It was discovered in 1977 during grading in a lemon orchard, when workers uncovered parts of six burials, a stone bowl, pestles, abalone shells, and fire-affected rock. Test excavations in 1985 revealed that the site was large but extensively disturbed by agricultural activities and bioturbation; though it covered 6 surface acres, much of this extent is likely due to the redeposition of artifacts (Wlodarski and Romani 1988).
- CA-VEN-662, located mostly in Port Hueneme near Hueneme Road, may be the site of the village of We'nemu (Hueneme), the main Chumash settlement on the Oxnard plain. First recorded in 1933, many pestles, hopper mortars, stone bowls, and other artifacts were collected. Surface survey and recording in 1979 and 2004 noted burned rock, a chert core, flakes, hammerstones, deer bone, and shellfish. Five burials were recovered during pipeline monitoring in 2012, and investigators at that time believed that more burials might be located under Hueneme Road. The site has been determined eligible for the National Register of Historic Places.

- CA-VEN-667 is located on Harbor Boulevard near the Southern California Edison Mandalay generating station. The site consists of several small lenses of shell midden embedded in Aeolian sand dunes. Recorded in 1979 and revisited in 1997, it was interpreted as a shellfish-gathering and processing camp. An unconfirmed report claims that a burial was excavated in the vicinity of the site at some point before 1979.
- CA-VEN-789 is a prehistoric site located in a field east of Oxnard, near Rose Avenue and East Avenue. 1984 recording efforts identified a large surface scatter of shale, chert, and basalt flakes and flaked tools, along with a wide variety of shellfish. Extensive subsurface testing in 1985, however, found that the site had been disturbed in the 1970s and that there was no evidence of a subsurface deposit (Wlodarski and Romani 1988). A note on the site record indicates that UCSB held human remains supposed to be from this site in the late 1990s.

Table 3.6-1
Known Prehistoric Archaeological Sites in PWIMP Area and ½-mile buffer

Primary #	Trinomial	Type	Description	Location*
P-56-000013	VEN-13	Site	Lithic Scatter	US 101 nr Beardsley Wash
P-56-000506	VEN-506	Site	Lithic Scatter, Burials, Habitation Debris	E Fifth St near Rice Ave
P-56-000545	VEN-545	Site	Lithic Scatter	Santa Clara River Bluff
P-56-000555	VEN-555	Site	Habitation Debris	Arnold Rd
P-56-000662	VEN-662	Site	Lithic Scatter, Burials, Hearths, Habitation Debris	Hueneme Road
P-56-000665	VEN-665	Site	Lithic Scatter, Habitation Debris	Rice Ave nr Wooley Rd
P-56-000666	VEN-666	Site	Lithic Scatter, Habitation Debris	E Fifth St nr Rice Ave
P-56-000667	VEN-667	Site	Burials, Hearths, Habitation Debris	Harbor Blvd
P-56-000726	VEN-726/H	Site	Privies/dumps, Lithic Scatter	Rice Ave nr Channel Islands Blvd
P-56-000789	VEN-789	Site	Lithic Scatter, Burials, Habitation Debris	E Fifth St nr Rice Ave
P-56-000918	VEN-918	Site	Habitation Debris	E Fifth St nr Rice Ave
P-56-001234	VEN-1234H	Ethnographic	Plant Collection Site	Harbor Blvd
P-56-001304	VEN-1304	Site	Burials	Vineyard Ave nr US 101
P-56-001514	VEN-1514	Site	Lithic Scatter, Habitation Debris	Rice Ave nr E Fifth St
P-56-001807	VEN-1807/H	Site	Lithic Scatter, Historic Artifacts	Harbor Blvd
P-56-100059		Isolate	Lithic Scatter	Rice Ave nr US 101
P-56-100060		Isolate	Lithic Scatter	Rice Ave nr Pleasant Vly Rd
P-56-100061		Isolate	Basket Hopper Mortar	Pleasant Valley Rd
P-56-100121		Isolate	Mortar	Vineyard Ave nr US 101
P-56-100156		Isolate	Lithic Scatter	Arnold Rd

Table 3.6-1
Known Prehistoric Archaeological Sites in PWIMP Area and ½-mile buffer

Primary #	Trinomial	Type	Description	Location*
P-56-100192		Site	Lithic Scatter	Fiske Place
P-56-100398		Isolate	Marine Shell	E Fifth St nr Rice Ave
P-56-100399		Isolate	Marine Shell	E Fifth St nr Rice Ave
P-56-100400		Isolate	Marine Shell	E Fifth St nr Rice Ave
P-56-100401		Isolate	Marine Shell	E Fifth St nr Rice Ave
P-56-100402		Isolate	Marine Shell	Rice Ave nr E Fifth St
P-56-120002		Site	Lithic Scatter, Habitation Debris	Rice Ave

***General indication. Resource locations protected by law.**

Prehistoric Archaeological Sensitivity

As noted above, the Oxnard plain has few known archaeological sites because it was a relatively resource-poor environment in prehistory. The northern part of the PWIMP area near the Santa Clara River can be considered generally low in sensitivity because of the extensive cycles of alluviation and erosion that have taken place along the river course. The exposed coast south of the river is also low in sensitivity for prehistoric settlement, except where natural lagoons provided access to fresh water and abundant marine resources, as at Port Hueneme and Mugu Lagoon. Many artifact scatters and isolates have been found in the area east of Oxnard along Rice Avenue and East Fifth Street, including artifacts typical of residential sites. However, no sites with well-developed stratigraphy have yet been identified. It is possible that an as-yet unknown village site exists in this area, though the area is one to two miles from historically attested watercourses or springs (SFEI 2011).

Generally speaking, archaeological sensitivity can be considered high near low-energy perennial watercourses and sheltered coastal lagoons, and near known prehistoric archaeological sites. Although some geographic areas experience greater sensitivity than other areas for the presence of prehistoric or historic archaeological resources, it is possible for a variety of archaeological deposits to be encountered during ground-disturbing activities in almost any location, including areas considered having low sensitivity. Evidence from previous survey work and site investigations in the PWIMP area suggests that the types of prehistoric sites that might be discovered in the future include:

- Surface scatters of lithic artifacts associated with or without midden accumulations, resulting from short-term occupation, and/or specialized economic activities, or long-term occupation.
- Isolated finds of cultural origin, such as lithic flakes and projectile points or millingstone fragments.
- Floral and faunal remains or deposits.

Historic Archaeological Resources

The evidence from previous survey work and site investigations in the Planning Area indicates that known historic archaeological resources include:

- **CA-VEN-664H:** This is an historic archaeological site, located near the Oxnard wastewater treatment plant. When recorded in 1979, the site included remains of several 20th-century farm buildings, with a cistern, irrigation pipe, and brick courses. Artifacts noted included domestic ceramics, glass (some dating to 1903), cut cow bone, and marine shell (Horne and Craig 1979). Later development of an industrial building and adjacent parking lot appears to have destroyed the site completely.
- **CA-VEN-726/H**: This prehistoric site located near Rice Road also contains bottle glass dating from circa 1890-1912.
- **CA-VEN-1807/H:** This is a prehistoric archaeological site with a historic component, located near a transmission tower on Harbor Boulevard. Prehistoric material includes a surface scatter of isolated artifacts including one fragment of flaked stone, a groundstone fragment, and an unrefined earthenware fragment with slip. Historic artifacts consist of aqua glass insulator fragments.
- **P-56-100156** is an isolated prehistoric artifact found with a shard of historic purple glass, located near Arnold Rd.
- **P-56-100460** is a scatter of historic glass bottles measuring 10 feet by 75 feet, located near Olds Road.

None of these resources have been determined eligible for the California Register or National Register.

Historic-Period Archaeological Sensitivity

A number of factors can be used to infer an area's sensitivity for buried historic archaeological resources (Caltrans 2007). These include surface scatters of artifacts, documentary sources (historic maps, deeds, or photographs), standing buildings or structures that suggest patterns of land use (homes, barns, ponds, fences, industrial facilities), and ecological or landscape features (steep hills, bodies of water, wetlands).

In American cities, it was typical to burn or bury domestic trash through the 1920s. Before the introduction of indoor plumbing, household trash was often disposed of in outdoor privy pits as well. Both of these activities typically took place in rear yards, meaning that the rear yards of houses dating to before 1920 are more sensitive for buried historic archaeological deposits. A wider variety of activity took place on rural properties. While domestic trash was still disposed of behind dwellings, it is also possible to find archaeological materials associated with farming, ranching, or animal care in different locations, often in association with buried architectural remains of fences, corrals, or barns.

Almost all work proposed in the scope of the PWIMP will take place in public right-of-way including roads and sidewalks. While many historic artifacts are deposited along historic road courses, they are mostly single items that were lost or thrown away by travelers. Such incidental deposits typically have little information potential, meaning that they are unlikely to be eligible for NRHP or CRHR. Since the PWIMP area includes mostly sidewalks and roadways, it generally has low sensitivity for buried historic archaeological resources.

However, it is possible that project activities will take place off-road, or will cross historic archaeological features (particularly earthworks or other architectural features). The types of resources that might be found include:

- Historic artifact scatters and buried deposits of historic debris and artifacts;
- Building foundations and associated deposits;
- Levees and roads;
- Remains of farms and ranches.

Built Environment Resources

The PWIMP Planning Area contains numerous historic buildings and structures that are listed on, or eligible for the NRHP and CRHR. The County of Ventura also maintains a list of local historic landmarks and points of interest that are historic resources under CEQA.

National Register Properties

Henry T. Oxnard Historic District. The Henry T. Oxnard National Historic is a residential neighborhood located west of the City's central business and commercial center along North F and North G Streets between Palm and 5th Streets (see Figure 3.6-2). It was inscribed on the National Register of Historic Places in 1999 (National Register #99000109). Containing 137 contributing properties, the district is primarily comprised of Bungalow and Craftsman style homes along with Mediterranean/Spanish Revival styles. It qualified for the National Register because most of the homes and the setting appear as they did during the period between 1909 and 1940.

Leonard Ranch Historic District. The Leonard Ranch Historic District at 3779 W. Gonzales Road (Primary Number 56-152763), was found eligible for NRHP and is listed in the California Register (OHP 2006). The property covers 3.45 acres of the ranch's original 1,000 acres and includes a ranch house, main residence, a cook's cabin, and various landscaping features including a pair of Moreton Bay fig trees.

California Register Properties

A recent Historic Resources Survey of downtown Oxnard (San Buenaventura Research Associates 2005) identified a potential NRHP or CRHR district at 703-705 South Oxnard Boulevard for their association with Oxnard's Chinatown. Three other districts potentially eligible as local historic districts were also identified: the 300-400 blocks of A Street; the 100 block of East Fifth Street and Enterprise Street; and Heritage Square.

Ventura County Landmarks

Ventura County established a Cultural Heritage Board in 1966 to advise the county on historical landmark designation and preservation. The Cultural Heritage Board recommends County Historical Landmark and Point of Interest designations to the County Board of Supervisors for approval. The City of Oxnard has declined to establish its own historic preservation program, and thus does not have a separate registry of historic properties (Ventura County 2016).

Figure 3.6-2
Henry T. Oxnard Historic Area

Source: City of Oxnard, 2016

NOT TO SCALE

County Historical Landmarks are defined as "a structure, natural feature, site or area having historical, archeological, cultural, or aesthetic significance". These Landmarks are historical resources for the purposes of CEQA. A Point of Interest includes "the site of a historical event, the site of a historical resource or structure that no longer exists, or a natural feature or area having historical significance." Because Points of Interest are usually intangible, they are not CEQA historical resources.

Twenty-four County Historical Landmarks and three Points of Interest are located within the PWIMP area and are summarized in Tables 3.6-2 and 3.6-3.

Table 3.6-2
Ventura County Landmarks in PWIMP Area

#	Name	Location	Year Built	NRHP or CRHR Status
13	Oxnard Carnegie Library	424 South C Street	1907	NR # 71000210
15	Naumann Giant Gum Tree / Eucalyptus Rows	Pleasant Valley & Etting	c. 1900	Ineligible for listing
16	Sugar Beet Factory	Wooley & Oxnard Blvds	1898	No information
17	Oxnard Plaza Park Pagoda	5th & C Streets	1910-11	No information
18	Japanese Cemetery	Pleasant Valley & Etting	1908	Locally listed
56	Bank of A. Levy	143 W. Fifth Street	1926	Appears eligible for NR
70	First Church of Christ Scientist	Heritage Square, 731 South A Street	1906-08	Locally listed
73	Murphy House	205 S. F Street	1911	Contrib to NR district
74	Henry Levy House	155 S. G Street	1914	Contrib to NR District, indiv eligible for NR
75	Achille Levy House	201 S. D Street	1912	Appears eligible for NR
100	Justin Petit Ranch House	Heritage Square, 730 South B Street	1896	Locally listed
141	Ventura County Railway	250 E. Fifth Street	1905	Eligible for NR
144	Scarlett/McGrath Ranch House	5011 W. Gonzales	1889	Locally listed
145	Perkins/Clabeth House	Heritage Square, 721 South A Street	1887	Locally listed
146	Wineman/Lehmann/Miller House	101 South D Street	1903	Contributor to NR district
147	Staire/Diener House	235 S. D Street	1911	Contributor to NR district
148	Palm Trees along C Street	Magnolia to Wooley Rd	1904	No information to date
149	Japanese Nisei Methodist Episcopal Church	630-632 S. A Street	1908, 1940	Appears eligible for NR
158	Swift House and Lying-in Hospital	838-840 W Fifth Street	1926-28	Ineligible for NR
161	Henry T. Oxnard Historic District & Landmark Area	Between Fifth, Magnolia, F & G Streets	1911-1950	NR #99000109
165	Gottfried Maulhardt/Albert Pfeiler Farm Site	NW Corner Pinata Dr. and Cesar Chavez Dr.	1873	No information to date
171	Bon Ton Court	531 South F Street	1926	Contrib to local district

Table 3.6-2
Ventura County Landmarks in PWIMP Area

#	Name	Location	Year Built	NRHP or CRHR Status
173	McColm Manor Apartments	534-542 South F Street	1950	Contributor to local district
175	J.A. Swartz Residence	636 West Fifth Street	1929	Contributor to local district

Notes: *N/A = not available*
Source: *County of Ventura, 2016 and California OHP, 2012*

Table 3.6-3
Ventura County Points of Interest in PWIMP Area

#	Name	Location	NRHP or CRHR Status
8	Santa Clara Chapel Site	301 Esplanade Drive	N/A
9	Cesar Chavez Childhood Home Site	452 N. Garfield Avenue	N/A
10	Colonial House Restaurant	701-747 N. Oxnard Blvd	N/A

Notes: *N/A = not available*
Source: *County of Ventura, 2016 and California OHP, 2012*

3.6.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.6.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on cultural or tribal cultural resources would occur if the PWIMP should:

- Cause a substantial adverse change in the significance of an historical resource as defined in State CEQA Guidelines §15064.5;
- Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to State CEQA Guidelines §15064.5;
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature;
- Disturb any human remains, including those interred outside of formal cemeteries; and/or
- Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code §21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe.

As noted above, a "historical resource" under CEQA is a property, site, or district listed in, or determined to be eligible for listing in, the National Register of Historic Places, California Register of Historical Resources (CRHR), Ventura County Historical Landmarks, or City of

Oxnard Points of Interest. A "unique archaeological resource" is one that meets the criteria in CEQA Guidelines §15064.5(g), which are substantively similar to those of the CRHR. CEQA Guidelines section 15064.5 defines "substantial adverse change" as:

- Physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired.
- Demolition or material alteration in an adverse manner of those physical characteristics of an historical resource which convey its historical significance and justify its inclusion in or eligibility for inclusion in the CRHR inclusion in a local register, or identification in a historical resources survey.

3.6.4.2 Approach and Methodology

This section provides an overview of the approach and methodology used in evaluations of historic properties, identifies potential impacts, and proposes mitigation measures to mitigate potential impacts to a less-than-significant level.

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2.

CEQA Guidelines §15168 notes that the level of detail required in a Program EIR is dictated by the "ripeness" of the project. That is, the level of detail in environmental analysis should match the level of detail developed for the project to date. Thus, although this section addresses the full range of potential environmental effects associated with implementation of the PWIMP, it provides only a qualitative, programmatic level of detail because many details remain unknown. Instead, the analysis focuses on potential significant impacts and provides broad mitigation measures that should be implemented as appropriate at the project level.

The analysis in the following sections has been developed based on record search information and archaeological sensitivity analysis. The above identified cultural resources in the PWIMP area can and will be avoided during construction. However, all project components requiring ground disturbance (such as grading, trenching, and filling) have the potential to discover previously unknown cultural resources during project construction.

3.6.4.3 Potential Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts to cultural resources are discussed below.

Impact 3.6-1: Implementation of the PWIMP and/or identified components/facilities could cause a substantial adverse change in the significance of an historical resource or a unique archaeological resource as defined in State CEQA Guidelines §15064.5. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

The PWIMP Study area is located in a highly urbanized area and has a low potential to cause a substantial adverse change in the significance of an historical resource. Built environment resources (buildings and structures) are unlikely to be affected because work under the PWIMP will generally take place in City streets. However, if buildings or structures over 50 years old (including infrastructural facilities such as wastewater plant buildings) are affected by the project, they may require evaluation by a qualified architectural historian. Most of the PWIMP area is of low archaeological sensitivity, since most known resources are either located outside of public rights-of-way, or are isolated finds of artifacts without stratigraphy. However, several sensitive areas exist near rights-of-way, and there is always the potential for discovery of previously unknown archaeological resources. Since ground disturbance associated with all PWIMP physical project components could inadvertently and adversely impact historic resources or unique archaeological resources, this impact is potentially significant. However, it can be mitigated to less-than-significant levels with implementation of Mitigation Measures 3.6-1a through 3.6-1e as applicable.

Temporary Construction Mitigation Measures

The following mitigation measures shall be applied to all physical project components requiring ground disturbance and construction activities. The City will ensure that the City and/or the selected construction contractor implement the following measures.

Mitigation Measure 3.6-1a: Pre-Construction Cultural Resources Survey(s). The City shall perform pre-construction archaeological surveys for all PWIMP project components that require ground-disturbing activities including, but not limited to facility footprints, construction right-of-way corridors, staging areas, and access roads. Where proposed project areas are composed entirely of impervious surfaces, a historic archaeological and geo-archaeological sensitivity analysis may be substituted for surface survey. If resources or highly sensitive areas are identified during survey, **Mitigation Measure 3.6-1b** shall be implemented wherever possible.

Mitigation Measure 3.6-1b: Avoidance. The City will seek to avoid cultural resources as the preferred mitigation measure. Avoidance of cultural resources would result in less-than-significant levels of impacts to identified cultural resources. All design-level engineering and construction drawings will be prepared in consultation with a cultural resource specialist. Facilities, staging areas, and any activity involving ground disturbance shall be located to avoid resources. To ensure that no inadvertent damage occurs to avoided cultural resources, exclusion zones covering the resource and a 100-foot buffer around it will be marked both on the ground and on construction maps.

Mitigation Measure 3.6-1c: Evaluation for CRHR. If avoidance is determined to be infeasible, The City shall retain a qualified archaeologist (for archaeological resources) or architectural historian (for built environment resources) to evaluate the resources for eligibility to the CRHR. In the case of historic or prehistoric archaeological sites, evaluation may be completed by examining existing records and reports, by detailed recording, and/or by excavation to determine data potential of the sites. Resources found to be ineligible for CRHR would require no further management. If a CEQA historic resource or unique archaeological resource is determined to exist, then Mitigation Measure 3.6-1d will be used to reduce impacts to less-than-significant levels.

Mitigation Measure 3.6-1d: Develop a Cultural Resources Treatment Plan (CRTP). The City shall develop a Cultural Resources Treatment Plan (CRTP) for all known and newly discovered CEQA historic resources or unique archaeological resources within areas of direct impact of project activities. The plan will include, at minimum:

- Procedures for protection and avoidance of environmentally sensitive areas (ESAs), including archaeological monitoring protocols;
- Procedures for evaluating inadvertent discoveries of archaeological resources, including research, recording, or test excavations;
- Procedures for mitigating impacts to CEQA archaeological resources (including Native American burials) through data recovery excavations;
- Provisions and procedures for Native American consultation;
- Training for construction personnel on their responsibilities to identify and protect cultural resources;
- Curation of any cultural materials collected during the project; and
- Specification that archaeologists and other disciplinary specialists hired for the project meet the appropriate Professional Qualifications Standards mandated by the California Office of Historic Preservation (OHP).

Mitigation Measure 3.6-1e: Halt Work if Cultural Resources are Discovered. If prehistoric or historic subsurface cultural resources are discovered during ground-disturbing activities, all work within 100 feet of the resources shall be halted and after notification, the City shall consult with a qualified archaeologist to assess the significance of the find. If any find is determined to be significant historical resource (CEQA Guidelines §15064.5(a)(3) and/or unique archaeological resource (PRC §21083.2), representatives of the City and a qualified archaeologist shall meet to determine the appropriate course of action. In considering any suggested mitigation proposed by the consulting archaeologist in order to mitigate impacts to historical resources or unique archaeological resources, the lead agency shall determine whether avoidance is necessary and feasible in light of factors such as the nature of the find, project design, costs, and other considerations. If avoidance is infeasible, other appropriate measures (e.g., data recovery) shall be instituted. Work may proceed on other parts of the project site while mitigation for historical resources or unique archaeological resources is carried out.

With the implementation of the above mitigation measures, the PWIMP would not result in impacts to historical archeological and tribal resources.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

PWIMP operations are not anticipated to impact historical resources. Most proposed facilities will be placed underground, and therefore will not increase access to sensitive cultural sites, or impair the continued use of historic structures or sites. Facility operations would therefore not result in impacts to cultural resources.

Long-Term Operational Mitigation Measures

PWIMP operations are not expected to have significant impacts on cultural and tribal resources. However, future routine maintenance and repair of the systems and facilities (i.e. excavation and repair of pipe or other facilities) could inadvertently discover buried and previously unknown historical archeological and/or tribal resources. As such, the City shall implement **Mitigation Measures 3.6-1a through 3.6-1e** to the extent possible. With the incorporation of these measures, any PWIMP operational impacts to historical resources would be considered less than significant.

Significance After Mitigation: Less-than-Significant Impact

Impact 3.6-2: Implementation of the PWIMP and/or identified components/facilities could cause a substantial adverse change in the significance of a unique archaeological resource pursuant to State CEQA Guidelines Section 15064.5. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

As discussed above, ground disturbance activities with all PWIMP project facilities/components could adversely impact potentially important archeological and/or tribal resources that are not known to exist, even on previously disturbed sites – including at existing wastewater treatment plants, roadways and other disturbed areas. As ground disturbance associated with all PWIMP physical project components could inadvertently and adversely impact potentially important archaeological and tribal resources, this impact is potentially significant, but can be mitigated to less-than-significant levels with implementation of **Mitigation Measures 3.6-1a through 3.6-1e** as applicable.

Temporary Construction Mitigation Measures

The potential impact of the construction of PWIMP facilities on archeological resources would be less than significant with implementation of **Mitigation Measures 3.6-1a through 3.6-1e**.

Significance after Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

PWIMP operations of are not anticipated to impact archeological resources. It will not increase access to sensitive cultural sites, or impair the continued use of historic structures or sites. Facility operations would not result in impacts to archeological resources. However, future routine maintenance and repair of the system (i.e., excavation and repair of pipe or other facilities) should take into consideration and avoid any archeological resources in the immediate vicinity.

Long-Term Operational Mitigation Measures

The potential impact of the operations of PWIMP facilities on archeological resources would be less than significant with implementation of **Mitigation Measures 3.6-1a through 3.6-1e**.

Significance: Less-than-Significant Impact

Impact 3.6-3: Implementation of the PWIMP and/or identified components/facilities could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

Paleontological resources are the fossilized evidence of past life found in the geologic record. Despite the tremendous volume of sedimentary rock deposits preserved worldwide, and the enormous number of organisms that have lived through time, preservation of plant or animal remains as fossils is an extremely rare occurrence. Because of the infrequency of fossil preservation, fossils – particularly vertebrate fossils – are considered nonrenewable resources. Because of their rarity, and the scientific information they can provide, fossils are highly significant records of ancient life.

Paleontologic resources, including an undetermined number of fossil remains and unrecorded fossil sites, associated specimen data and corresponding geologic and geographic site data, and the fossil-bearing strata, could be adversely affected by (i.e., would be sensitive to) the direct and indirect environmental impacts resulting from construction related earth-moving activities (particularly trenching for pipelines) associated with PWIMP.

Direct impacts would result mostly from earth-moving activities (particularly trenching for pipelines) in previously undisturbed strata, making the strata and their paleontologic resources unavailable for future scientific investigation. Although earth-moving activities would be comparatively short term and limited to relatively narrow trenches, the possible accompanying loss of some fossil remains, unrecorded fossil sites, associated specimen data and corresponding geologic and geographic site data, and the fossil-bearing strata is a potentially significant long-term environmental impact.

Easier access to fresh exposures of fossiliferous strata and the accompanying potential for unauthorized fossil collecting could result in the loss of some additional fossil remains, unrecorded fossil sites, and associated specimen data and corresponding geologic and geographic site data. This loss of paleontologic resources would be a potentially significant long-term environmental impact.

Although the accompanying loss of any fossil remains and site would be a highly significant impact paleontologically, the impact of grading would be considered only moderately significant because of the moderate potential for the loss of paleontologic resources. Also, because the PWIMP construction activities would result in minimal excavation in bedrock conditions, significant paleontologic discovery would be unlikely. However, fossil discoveries can be made even in areas of supposed low sensitivity. In the event a paleontologic resource is encountered during project activities, implementation of the following mitigation measure would reduce potential impacts to less-than-significant.

Temporary Construction Mitigation Measure

Mitigation Measure 3.6-3: Stop Work if Paleontological Remains are Discovered. If paleontological resources, such as fossilized bone, teeth, shell, tracks, trails, casts, molds, or impressions are discovered during ground-disturbing activities, work will stop in that area and within 100-feet of the find until a qualified paleontologist can assess the significance of the find and, if necessary, develop appropriate treatment measures in consultation with the City.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

PWIMP operations are not expected to have significant impacts on any known paleontological resources. However, routine maintenance and repairs that involve excavation could inadvertently discover paleontological resources.

Long-Term Operational Mitigation Measures

With the implementation of **Mitigation Measure 3.6-3** above, any impacts would be considered less than significant.

Significance After Mitigation: Less-than-Significant Impact

Impact 3.6-4: Implementation of the PWIMP and/or identified components/facilities could disturb human remains, including those interred outside of formal cemeteries. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

Ground disturbing activities have the potential to uncover both historic-era and prehistoric human remains. For prehistoric resources, shellmounds often contain human remains. For the historic era, there is potential to discover human remains outside of the boundary of an established cemetery. California law provides measures for the treatment of both historic-era and prehistoric human remains in Public Resources Code 5097 and in California Health and Safety Code 7050.5 and 7052. With the implementation of the Mitigation Measure 3.6-4 below, impacts would be considered less than significant.

Temporary Construction Mitigation Measures

The following mitigation measure shall be applied to all physical project components requiring ground disturbance and construction activities. The Project Applicant will ensure that the following measures are implemented by the selected construction contractor.

Mitigation Measure 3.6-4: Halt Work if Human Remains are Discovered. If buried human remains are encountered during construction, work shall be *immediately* halted, and the City and the Ventura County Coroner shall be *immediately* notified. If the remains are determined to be Native American, then the Native American Heritage Commission (NAHC) will be notified within 24 hours as required by Public Resources Code 5097. The NAHC shall designate a Most Likely Descendant, who will be responsible for providing recommendations for the treatment of the remains within 48 hours of being granted access to the find.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

PWIMP operations are not expected to have significant impacts on any known human remains. However, routine maintenance and repairs that involve excavation could inadvertently discover human remains.

Long-Term Operational Mitigation Measures

With the implementation of **Mitigation Measure 3.6-4** above, any impacts would be considered less than significant.

Significance After Mitigation: Less-than-Significant Impact

Impact 3.6-5: Implementation of the PWIMP and/or identified components/facilities could cause a substantial adverse change in the significance of a tribal cultural resource. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction Impacts

Tribal cultural resources are defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is either; (1) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k); and/or (2) is a resource determined by the City or its archeological consultant, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1.

As noted above, consultation with the NAHC and with local tribes under AB52 did not identify any Tribal Cultural Resources within the Project area. Therefore, the Proposed Project/Action is not likely to cause a substantial adverse change in the significance of tribal cultural resources. Nevertheless, there is a slight chance that construction activities of the Proposed Project could result in accidentally discovering unique tribal cultural resources. To further reduce this less-than-significant impact, the following mitigation measures shall be implemented.

Temporary Construction Mitigation Measures

Mitigation Measure 3.6-5: Halt Work if Tribal Cultural Resources are Discovered. In the event that any tribal cultural resources are discovered during ground disturbing activities, all work within 100-feet of the resources shall be halted and after notification, the City shall consult with a qualified archaeologist and local tribes to assess the significance of the find. If any find is determined to be significant as a unique tribal cultural resource, the City shall treat the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including to, but not limited to, the following:

- Protecting the cultural character and integrity of the resource;
- Protecting the traditional use of the resource; and
- Protecting the confidentiality of the resource.

In considering any suggested mitigation proposed by the consulting archaeologist and/or the appropriate tribe in order to mitigate impacts to any tribal cultural resources find, the City shall determine whether avoidance is feasible in light of factors such as the nature of the find, project design, costs, and other considerations. If avoidance is infeasible, other appropriate measures (e.g., data recovery) shall be instituted and coordinated with the appropriate tribe(s). Work may proceed on other parts of the project site while mitigation measures for tribal cultural resources or other unique archaeological resources are carried out.

Significance After Mitigation: Less-than-Significant Impact

Long-Term Operational Impacts

PWIMP operations are not expected to have significant impacts on any known tribal resources. However, routine maintenance and repairs that involve excavation could inadvertently discover human remains.

Long-Term Operational Mitigation Measures

With the implementation of **Mitigation Measure 3.6-5** above, any impacts would be considered less than significant.

Significance After Mitigation: Less-than-Significant Impact

3.6.5 Cumulative Effects

The Proposed PWIMP will mostly take place within already-developed roadways and parcels in urbanized areas. Most of the project area has low archaeological sensitivity. Mitigation measures are detailed above that would reduce individual impacts to less than significant. Given these factors, the PWIMP will not result in significant impacts to cultural resources, and would not contribute to potential significant cumulative impacts. No mitigation measures for cumulative impacts are thus proposed.

3.7 Geologic, Seismic, and Soil Hazards

This section describes the existing regulatory setting, the geologic, seismic, and soil hazards in the PWIMP Planning Area(s), and evaluates how construction and operation of the components of the PWIMP would result in potential adverse impacts related to existing soil conditions or seismicity. Background information specific to the PWIMP Planning Area's soil conditions is addressed in Section 3.2 - Agricultural and Soil Resources. Mineral resource issues are discussed in 3.11 - Mineral Resources.

3.7.1 Introduction

This evaluation of geologic and seismic hazard conditions was based on information from the City of Oxnard's 2030 General Plan and was completed using information collected from the United States Geological Survey and the California Department of Conservation – Division of Mines and Geology (CDMG).

Key Terms and concepts include the following:

- **Alquist-Priolo Fault Zone.** The Alquist-Priolo Earthquake Fault Zoning Act, passed in 1972, requires the State Geologist to identify zones of special study around active faults.
- **Fault.** A fault is a fracture in the Earth's crust that is accompanied by displacement between the two sides of the fault. An active fault is defined as a fault that has moved in the last 10,000 to 12,000 years (Holocene time). A potentially active fault is one that has been active in the past 1.6 million years (Quaternary period). A sufficiently active fault is one that shows evidence that Holocene displacement occurred on one or more of its segments or branches (Hart, 1997).
- **Landslide.** Downslope movement of soil and/or rock, which typically occurs during an earthquake or following heavy rainfall.
- **Liquefaction.** Liquefaction in soils and sediments occurs during some earthquake events, when material is transformed from a solid state into a liquid state because of increases in pressure in the pores (the spaces between soil particles). Earthquake-induced liquefaction most often occurs in low-lying areas with soils or sediments composed of unconsolidated, saturated, clay-free sands and silts, but it can also occur in dry, granular soils or saturated soils with some clay content.
- **Magnitude.** Earthquake magnitude is measured by the Richter scale, indicated as a series of Arabic numbers with no theoretical maximum magnitude. The greater the energy released from the fault rupture, the higher the magnitude of the earthquake. Magnitude increases logarithmically in the Richter scale; thus, an earthquake of magnitude 7.0 is thirty times stronger than one of magnitude 6.0. Earthquake energy is most intense at the point of fault slippage, which is called the epicenter because the energy radiates from that point in a circular wave pattern; the farther an area is from an earthquake's epicenter, the less likely that area is to be affected by groundshaking.

3.7.2 Regulatory Context

Relevant federal, state, and local guidelines specific to geologic and seismic hazards are discussed in this section.

3.7.2.1 Federal Regulations

There are no current federal regulations relevant to geologic and seismicity issues in the state.

3.7.2.2 State Regulations

The relevant state regulations are discussed below.

Alquist-Priolo Earthquake Fault Zoning Act. The Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act), signed into law December 1972, requires the delineation of zones along active faults in California. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazards associated with fault rupture and to prohibit the location of most structures for human occupancy across these traces. Cities and counties must regulate certain development projects within these zones, which include withholding development permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement (Hart, 1997). Surface fault rupture is not necessarily restricted to the area within an Alquist-Priolo Zone.

Seismic Hazards Mapping Act. The Seismic Hazards Mapping Act was developed to protect the public from the effects of strong groundshaking, liquefaction, landslides, or other ground failure, and from other hazards caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation of the site has to be conducted and appropriate mitigation measures incorporated into the project design.

California Building Code. The California Building Code is another name for the body of regulations known as the California Code of Regulations (C.C.R.), Title 24, Part 2, which is a portion of the California Building Standards Code. Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable (Bolt, 1988). Published by the International Conference of Building Officials, the Uniform Building Code is a widely adopted model building code in the United States. The California Building Code incorporates by reference the Uniform Building Code with necessary California amendments. About one-third of the text within the California Building Code has been tailored for California earthquake conditions.

California Department of Transportation – Highway Design Manual. The California Department of Transportation (Caltrans) has developed roadway design standards including those for seismic safety. Consideration of earthquake hazards in roadway design is detailed in the Highway Design Manual published by Caltrans (1995). Modifications to local highways and roads would be required to adhere to Caltrans engineering standards.

3.7.2.3 Local Regulations

The relevant local regulations are discussed below.

City of Oxnard - Oxnard 2030 General Plan. The Safety Element of the City's existing General Plan contains an objective and several policies pertinent to geologic and seismic hazard conditions.

3.7.3 Environmental Setting

The PWIMP Study Area is situated on the Oxnard Plain, which is located near the western edge of the Transverse Range Province. The Coastal Mountains and the Sierra Nevada Range are located to the north and the peninsular ranges to the south. Local geologic conditions of the Study Area consist of coastal lowland areas that range in elevation from sea level to about 115-feet above sea level. These areas are comprised of alluvial deposits of silt, sands and gravel, which extend to a depth of approximately 500- feet beneath the Study Area. The history of alluviation is related to the Santa Clara River and its flood patterns. Beneath the alluvium lies the San Pedro formation (approximately 4,000- feet thick beneath the City), which consists of moderately indurated sandstones and conglomerates.

Seismic Activity. The potential earthquake-induced hazards that may affect the City of Oxnard consist of fault rupture and strong ground motions, and the secondary effects of ground motion, such as liquefaction and tsunamis. Each of these is discussed below.

Seismicity and Regional Faults. The Study Area is located within Seismic Risk Zone 4. Earthquakes occurring in Seismic Risk Zone 4 have the potential to create the greatest impacts compared to the other risk zones. Areas within Seismic Zone 4, have a one in ten chance that an earthquake with an active peak acceleration level of 0.04g (4/10 the acceleration of gravity) will occur within the next 50 years.

The CDMG has determined the probability of earthquake occurrences and their associated peak ground accelerations throughout the State of California. According to the CDMG's probabilistic seismic hazard map for California, peak ground accelerations in the Study Area could range from 0.50 g to 0.80 g (California Geological Survey, 1998).

The City will probably experience ground shaking from earthquake activity that is most likely associated with the historically active faults in the surrounding area (see Figure 3.7-1). The resultant ground shaking could be severe with an earthquake of maximum credible or probable magnitude in one of the nearby faults. The estimated maximum (moment) magnitudes (Mw) represent characteristic earthquakes on particular faults. The maximum credible earthquake for a particular fault is the largest magnitude event that appears capable of occurring under the presently known tectonic framework. The maximum probable earthquake is the maximum earthquake likely to occur during a 100-year interval. It is regarded as a probable occurrence, not as an assured event that will occur at a specific time. Table 3.7-1 provides a listing of faults in the proximity of the Study Area and the maximum magnitude of some of these nearby faults that may cause future ground shaking activity. As shown in Figure 3.7-1, several active and/or potentially active faults are located in the vicinity of the Study Area. The most regionally active faults are the Oak Ridge, Pitas Point-Ventura, Red Mountain, Acacapa, and Malibu Coast faults, all within 5- to 10-miles of the PWIMP Study Area. Although the

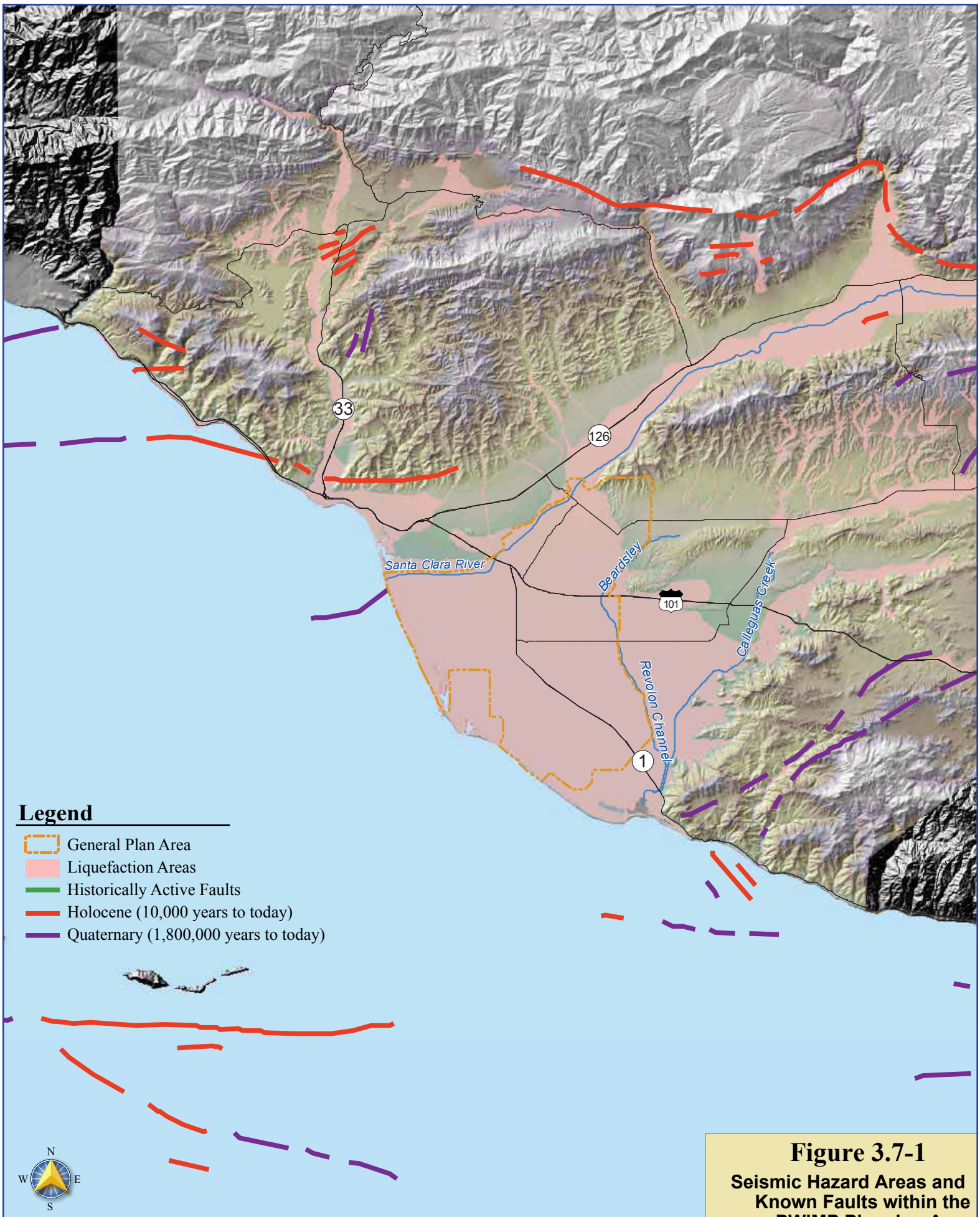


Figure 3.7-1

Seismic Hazard Areas and Known Faults within the PWIMP Planning Area

Source: USGS, 1993; California Department of Conservation, 2005; City of Oxnard; and ESA, 2006

Study Area is not located within an Alquist-Priolo zone or no large-magnitude earthquakes greater than 6.0 have occurred historically along other major regional faults, the Study Area is situated within a seismically active region and is susceptible to several types of earthquake-related risks, including surface rupture, ground shaking, liquefaction and tsunamis.

Table 3.7-1
Fault Systems in the Vicinity of the Oxnard Planning Area

Fault Zone	Location Relative to Oxnard	Historical Seismicity and Recency of Faulting	Slip Rate (mm/Year)	Maximum Credible Magnitude	Maximum Probable Magnitude
Oak Ridge	1 mile northwest	Holocene, in part; mainly Late Quaternary	3.5 to 6.0	7.5	6.7
Springville	1.5 miles northeast	N/A	N/A	N/A	N/A
Camarillo	3.5 miles northeast	N/A	N/A	N/A	N/A
Pitas Point-Ventura	6 miles northwest	Holocene, probably within the last 1500 years	0.5 to 1.5	6.1	6.6
Simi	7 miles northwest	Holocene	N/A	6.6	6.6
Red Mountain	10 miles northwest	Holocene to Late Quaternary	0.4 to 1.5	N/A	6.6
Anacapa	12 miles south	N/A	N/A	N/A	6.7
Orcutt Canyon	14 miles north	N/A	N/A	N/A	N/A
Javon	14 miles northwest	N/A	1.1	N/A	N/A
Carpenteria	14 miles northwest	N/A	N/A	N/A	N/A
Lion Canyon	14 miles north	Late Quaternary	N/A	N/A	N/A
Oakview	14 miles north	Late Quaternary	N/A	N/A	N/A
San Cayetano	15 miles north	Less than 5,000 years ago	1.3 to 9.0	6.75	6.7
Malibu Coast	15 miles southeast	Holocene, in part; otherwise Late Quaternary	0.3	7.5	6.6
Mission Ridge Arroyo Parida	16 miles northwest	30,000 years ago	about 0.37	N/A	6.6
Stepard Mesa-Rincon Creek	18 miles northwest	Late Quaternary	about 0.3	N/A	N/A
Santa Ynez	20 miles north	Late Quaternary; except for a short	0.1 to 0.7	7.5	6.7

Table 3.7-1
Fault Systems in the Vicinity of the Oxnard Planning Area

Fault Zone	Location Relative to Oxnard	Historical Seismicity and Recency of Faulting	Slip Rate (mm/Year)	Maximum Credible Magnitude	Maximum Probable Magnitude
		segment near the intersection with the Baseline fault, which is Holocene in age			
Santa Susana	24 miles northeast	Late Quaternary Short segment ruptured during the 1971 San Fernando earthquake	5.0 to 7.0	6.6	6.6
Santa Cruz Island	24 miles southwest	Holocene, offshore; Late Quaternary on Santa Cruz Island	0.9	N/A	6.7
San Pedro Basin	24 miles southeast	N/A	N/A	N/A	6.6
Holser	25 miles northeast	Late Quaternary	0.4	N/A	6.0
Palos Verdes Hills	29 miles southeast	Holocene, offshore; Late Quaternary on shore.	0.1 to 3.0	7	6.6
Northridge	32 miles northeast	Late Quaternary; 1994 Northridge Earthquake.	N/A	6.5	6.2
San Jose	33 miles northwest	Late Quaternary Last significant quake: 2/28/90; No surface rupture found.	0.2 to 2.0	N/A	6.4
San Gabriel	34 miles northeast	Late Quaternary west of intersection with the Sierra Madre fault zone; Quaternary east of that intersection; Holocene only between Saugus and Castaic.	1.0 to 5.0	N/A	6.7
More Ranch	34 miles northwest	N/A	N/A	7.25	6.6
Santa Monica	35 miles southeast	Late Quaternary	0.27 to 0.39	7.5	6.6

Table 3.7-1
Fault Systems in the Vicinity of the Oxnard Planning Area

Fault Zone	Location Relative to Oxnard	Historical Seismicity and Recency of Faulting	Slip Rate (mm/Year)	Maximum Credible Magnitude	Maximum Probable Magnitude
San Fernando	38 miles northeast	Last occurrence: February 9, 1971	5	6.5	6.4
San Andreas	42 miles northeast	January 9, 1857 (Mojave Segment); April 18, 1906 (Northern Segment)	20 to 35	8.25	8.1

Source: *Hart, Fault Rupture Hazard Zones in California, 1997*

Other Geologic Hazards in the Study Area. Detailed below are other geologic hazards in the PWIMP Study Area.

- **Surface Fault Rupture.** A surface rupture is a break in the ground's surface and the associated deformation resulting from the movement of a fault. Fault activity is classified as active or potentially active. An active fault is one that has had surface displacement within the last 10,000 to 12,000 years (Holocene time) and a potentially active fault is one that has experienced surface displacement during the last 1.6 million years (Quaternary period).

  Fault systems in the immediate vicinity of the Study Area are identified in Figure 3.7-1. Information specific to these local faults along with other regional faults not identified in the figure is provided in Table 3.7-1. As shown in Figure 3.7-1, no known active faults are present within the City's Study Area. However, active and/or potentially active faults are present in the surrounding region, and some of these may extend into the subsurface beneath the Study Area.
- **Liquefaction.** Liquefaction is an unstable ground condition in which water-saturated soils change from a solid to semi-liquid state because of a sudden shock or strain. Liquefaction may occur in water-saturated sediment during moderate to great earthquakes. As shown in Figure 3.7-1, the potential for liquefaction occurs throughout most of the Study Area. Liquefaction conditions occur within the Study Area for several reasons, including underlying sections of thick alluvial deposits, high groundwater levels (0 feet near the coastline to approximately 40 feet at the northeastern corner of the City), and the potential for strong regional ground shaking. The combination of these factors constitutes a significant seismic hazard in the southern California region, including the Study Area.
- **Subsidence and Uplift.** Subsidence may be defined as the downward movement of a relatively large amount of land caused by the withdrawal of subsurface water and/or petroleum. Conversely, uplift is the upward movement of a relatively large amount of land caused by the injection of water or petroleum and/or by tectonic forces.

  Portions of the City are subject to subsidence. Historic records show that the amount of much of this subsidence is at least one foot. In the area near Hueneme Road and

Rice Avenue, which is adjacent to the southeast corner of the Study Area, the amount of subsidence has been up to 12- feet.

- **Landslides (Slope Failure).** Landslides (or slope failure) refer to the dislodging and falling of a mass of soil or rocks along a sloped surface. Although the potential for small-scale slope failure may exist locally, particularly along stream banks, margins of drainage channels, and similar settings where steep banks or slopes occur, the relatively flat terrain of the Study Area minimizes this potential geologic hazard.
- **Tsunamis.** A tsunami is an ocean wave produced by offshore seismic activity. As a coastal city, there is always the potential for tsunami damage; development along the coast-line has increased the risk. While most coasts along the Pacific Basin have a long history of tsunami damage, such damage to California has been relatively slight in recent historical times. The most recent tsunami to cause appreciable damage to California occurred with the great Alaskan earthquake on March 27, 1964.

3.7.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.7.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on cultural and tribal resources would occur if the PWIMP would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
    - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist or based on other substantial evidence of a known fault;
    - Strong seismic groundshaking that cannot be addressed through compliance with standard Code requirements.
- Be located on a geologic unit or soil that is unstable or that could become unstable as a result of the project and potentially result in an on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse that cannot be addressed through compliance with standard Code requirements;
- Be located on expansive soil, creating substantial risks to life or property that cannot be addressed through compliance with standard Code requirements;
- Expose people or structures to inundation by seiche or tsunami;
- Rely on dredging or other maintenance activity by another agency that is not guaranteed to continue.

3.7.4.2 Approach and Methodology

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

Due to the nature of the PWIMP and individual project facilities and actions, geologic, seismic, and soil discussions will vary negligibly between project components as well as between construction and operations. The potential for an earthquake would be the same for all PWIMP project elements and would consist of fault rupture and strong ground motions, and the secondary effects of ground motion, including, liquefaction, and tsunamis. In most cases, the impact of geologic, seismic, and soil hazards would be reduced to acceptable levels by implementing appropriate design and construction techniques based on site-specific geotechnical investigations; and further mitigation would not be required. As a result, this impact assessment addresses all geologic, seismic, and soils hazards under one impact statement and includes both construction and operations.

3.7.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts to agricultural resources are discussed below.

Impact 3.7-1: Implementation of the PWIMP and/or identified components/facilities could expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving earthquakes, landslides, liquefaction, and/or subsidence. The potential impacts due to temporary construction and long-term operations are discussed below.

Temporary Construction and Long-Term Operational Impacts

As described above in the Environmental Setting, the potential exists for a large magnitude earthquake to result in high intensity ground shaking, landslides, liquefaction, and subsidence. The intensity of such an event would depend on the causative fault and the distance to the epicenter, the moment magnitude, and the duration of shaking. Intense ground shaking and high ground accelerations would affect the entire area around the proposed facilities and associated

pipelines. The primary and secondary effects of ground shaking could damage structural foundations, distort pipelines and other water conveyance structures, and cause failure of concrete. Damage to these features would cause temporary service disruption and possibly loss of water due to leakage and pipe rupture. Pumps could be rendered inoperable. In comparison to above-ground structures, underground pipelines and buried structures are generally less susceptible to damage from strong ground shaking because they are imbedded in compacted backfill that can tolerate more seismic wave motion. Broken pipelines could result in soil washout and sinkholes.

Locating and repairing damaged pipelines and the pumps could require a temporary cessation of operation of the facilities for a significant period of time. The 1989 Loma Prieta earthquake reportedly caused more than 60 water pipeline breaks in Santa Cruz, the nearest urbanized area to the epicenter (CDMG, 1990). However, modern standard engineering and construction practices include design criteria to mitigate potential damage from an earthquake, and any potential interruption of service would likely be temporary in nature. While these practices would not completely eliminate the potential for damage to the facilities, they would ensure that the resultant improvements will have the structural fortitude to withstand anticipated groundshaking without significant damage. With implementation of **Mitigation Measure 3.7-1a**, this impact would be reduced to a less-than-significant level.

Temporary Construction and Long-Term Operational Mitigation Measure

Mitigation Measure 3.7-1a: Conduct Appropriate Geotechnical Engineering Studies. A California licensed geotechnical engineer or engineering geologist will conduct geotechnical investigations of all PWIMP facilities prior to the final design and prepare recommendations applicable to foundation design, earthwork, backfill and site preparation prior to or during the project design phase. The investigations will specify seismic and geologic hazards including potential ground movements and co-seismic effects (including liquefaction). The recommendations of the geotechnical engineer will be incorporated into the design and specifications in accordance with California Geological Survey Special Publication 117 and shall be implemented by the construction contractor. The construction manager will conduct inspections and certify that all design criteria have been met in accordance with the California Building Code as well as applicable City and County ordinances.

All PWIMP elements and pipeline facilities will comply with applicable policies and appropriate engineering investigation practices necessary to reduce the potential detrimental effects of expansive soils, and corrosivity. Appropriate geotechnical studies will be conducted by California licensed geotechnical engineers or engineering geologists using generally accepted and appropriate engineering techniques for determining the susceptibility of the sites to unstable, weak or corrosive soils in accordance with the most recent version of the California Building Code. A licensed geotechnical engineer or engineering geologist will prepare recommendations applicable to foundation design, earthwork, and site preparation prior to or during the project design phase. Recommendations will address mitigation of site-specific, adverse soil and bedrock conditions that could hinder development. Project engineers will implement the recommendations and incorporate them into project specifications. Geotechnical design and design criteria will comply with the most recent version of the California Building Code and applicable local construction and grading ordinances. Once appropriately designed and subsequently constructed, in accordance with local and state building code requirements, the resultant improvements will have the structural fortitude to withstand the potential hazards of expansive soils or corrosivity without significant damage.

During the design phase for all PWIMP components that require ground-breaking activities, the project applicant will perform site-specific design- level geotechnical evaluations which will include slope stability conditions and provide recommendations to reduce and eliminate any potential slope hazards, if any, in the final design and if necessary, throughout construction. For all pipelines located in landslide hazard areas, appropriate piping material with the ability to deform without rupture (e.g. ductile steel) will be used. For all other facilities, a geotechnical evaluation will be conducted and the geotechnical evaluations will include detailed slope stability evaluations, which could include a review of aerial photographs, field reconnaissance, soil testing, and slope stability modeling. Facilities design and construction will incorporate the slope stability recommendations contained in the geotechnical analysis conducted by California licensed geotechnical engineers or engineering geologists. Final slope stabilization measures, determined by the licensed geotechnical engineer or engineering geologist in accordance with California Building Code requirements, may include, without limitation, one or more of the following:

- Appropriate slope inclination (not steeper than 2 horizontal to 1 vertical)
- Slope terracing
- Fill compaction
- Soil reinforcement
- Surface and subsurface drainage facilities
- Engineered retaining walls
- Buttresses
- Erosion control measures

Mitigation measures included in the geotechnical report will be incorporated into the project construction specifications and become part of the project.

Significance After Mitigation: Less-than-Significant Impact

3.7.5 Cumulative Effects

Due to the nature of the PWIMP and individual project facilities and actions, geologic, seismic, and soil discussions will vary negligibly between project components as well as between construction and operations. The potential for an earthquake would be the same for all PWIMP project elements and would consist of fault rupture and strong ground motions, and the secondary effects of ground motion, including, liquefaction, and tsunamis. In most cases, the impact of geologic, seismic, and soil hazards would be reduced to acceptable levels by implementing appropriate design and construction techniques based on site-specific geotechnical investigations; and further mitigation would not be required. The PWIMP would not have any cumulative impacts to geology, seismicity, and soils hazards and no further mitigation is required.

3.8 Hazards and Hazardous Materials

This section focuses on those human-made hazards associated with the potential exposure to hazardous materials. To provide a better understanding of the extent of existing human-made hazard concerns within the PWIMP Planning Area, topics covered in this section include federal, state, and local regulations; and existing human-made hazards in the PWIMP Planning Area.

3.8.1 Introduction

This evaluation of geologic and seismic hazard conditions was based on information from the City of Oxnard's 2030 General Plan and was obtained from various State agencies (e.g., California Department of Toxic Substances Control, etc.) that monitor or compile information related to the locations of hazardous waste generators, hazardous materials treatment, storage and disposal facilities, and underground storage tank locations. Key Terms and concepts include the following:

- **Hazardous Materials.** A hazardous material is defined by the California Code of Regulations (CCR) as a substance that, because of physical or chemical properties, quantity, concentration, or other characteristics, may either (1) cause an increase in mortality or an increase in serious, irreversible, or incapacitating, illness; or (2) pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported or disposed of (CCR, Title 22, Division 4.5, Chapter 10, Article 2, Section 66260.10).
- **Hazardous Wastes.** Similarly, hazardous wastes are defined as materials that no longer have practical use, such as substances that have been discarded, discharged, spilled, contaminated, or are being stored prior to proper disposal. According to Title 22 of the CCR, hazardous materials and hazardous wastes are classified according to four properties: toxic, ignitable, corrosive, and reactive (CCR, Title 22, Chapter 11, Article 3).

3.8.2 Regulatory Context

The storage, use, and handling of hazardous materials by industries and businesses are subject to various Federal, State and local regulations. A brief overview of these regulations follows.

3.8.2.1 Federal Regulations

Detailed below are the relevant federal regulations.

Resource Conservation and Recovery Act (RCRA). The principal Federal legislation is RCRA, which are administered by the United States Environmental Protection Agency (EPA). RCRA imposes reporting, permitting, and operational control requirements on those who generate, treat, store, or dispose of hazardous waste. The Federal Hazardous Materials Transport Act, administered by the U.S. Department of Transportation, requires detailed manifesting and reporting of hazardous materials shipped on the U.S. highway system; it also

contains packaging requirements for shipped materials. The Clean Water Act, also administered by the EPA, controls the discharge of hazardous materials or hazardous waste to waters of the U.S. or to local wastewater treatment plants.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLA, commonly referred to as Superfund, was enacted on December 11, 1980. The purpose of CERCLA was to provide authorities the ability to respond to uncontrolled releases of hazardous substances from inactive hazardous waste sites that endanger public health and the environment. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites, provided for liability of persons responsible for releases of hazardous waste at such sites, and established a trust fund to provide for cleanup when no responsible party could be identified. Additionally, CERCLA provided for the revision and republishing of the National Contingency Plan (NCP) that provides the guidelines and procedures needed to respond to releases and threatened releases of hazardous substances, pollutants, or contaminants. The NCP also provides for the National Priorities List, a list of national priorities among releases or threatened releases throughout the United States for the purpose of taking remedial action.

The Superfund Amendments and Reauthorization Act (SARA). SARA amended CERCLA on October 17, 1986. This amendment increased the size of the Hazardous Response Trust Fund to $8.5 billion, expanded EPA's response authority, strengthened enforcement activities at Superfund sites; and broadened the application of the law to include Federal facilities. In addition, new provisions were added to the law that dealt with emergency planning and community right to know. SARA also required EPA to revise the Hazard Ranking System to ensure that it accurately assesses the relative degree of risk to human health and the environment posed by sites and facilities subject to review for listing on the National Priorities List.

Resource Conservation and Recovery Act of 1976 (RCRA). RCRA is the nation's hazardous waste control law. It defines hazardous waste, provides for a cradle-to-grave tracking system and imposes stringent requirements on treatment, storage and disposal facilities. RCRA requires environmentally sound closure of hazardous waste management units at treatment, storage, and disposal facilities. The EPA is the principal agency responsible for the administration of RCRA, SARA, and CERCLA.

Occupational Safety and Health Administration (OSHA). Through the enactment of the Occupational Safety and Health Act, OSHA was obligated to prepare and enforce occupational health and safety regulations with the goal of providing employees a safe working environment. OSHA regulations apply to the work place and cover activities ranging from confined space entry to toxic chemical exposure. OSHA regulates workplace exposure to hazardous chemicals and activities through the specification of work place procedures and equipment.

U.S. Department of Transportation (DOT). The DOT regulates the interstate transport of hazardous materials and wastes through implementation of the Hazardous Materials Transportation Act. This act specifies driver-training requirements, load labeling procedures, and container design and safety specifications. Transporters of hazardous wastes must also meet the requirements of additional statutes such as RCRA, discussed previously

3.8.2.2 State Regulations

At the State level, State agencies accept delegation of Federal responsibility for the administration of hazardous materials and hazardous waste management. The Porter-Cologne Water Quality Control Act allows the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB) to accept implementation responsibility for the Clean Water Act. The Hazardous Waste Control Act of 1977, and recent amendments to its implementation regulations, has given the Department of Health Services (DHS) the lead role in administering the RCRA (RCRA) program. The Hazardous Substances Highway Spill Containment Act gives the California Highway Patrol (CHP) the authority to respond to spills of hazardous materials on the State's highway system. Detailed below are the other relevant state regulations.

Hazardous Substance Account Act (1984), California Health and Safety Code Section 25300 ET SEQ (HSAA). This act, known as the California Superfund, has three purposes: 1) to respond to releases of hazardous substances; 2) to compensate for damages caused by such releases; and 3) to pay the State's 10% share in CERCLA cleanups. Contaminated sites that fail to score above a certain threshold level in the EPA's ranking system may be placed on the California Superfund list of hazardous wastes requiring cleanup.

California Environmental Protection Agency (CAL/EPA). The Cal/EPA was created in 1991 to coordinate State environmental programs, reduce administrative duplication, and address the greatest environmental and health risks. Cal/EPA unifies the State's environmental authority under a single accountable, cabinet-level agency. The Secretary for Environmental Protection oversees the following agencies: Air Resources Board, Integrated Waste Management Board, Department of Pesticide Regulation, State Water Resources Control Board, Department of Toxic Substances Control, and the Office of Environmental Health Hazard Assessment.

Department of Toxic Substance Control (DTSC). Cal/EPA has regulatory responsibility under Title 22 of the California Code of Regulations (CCR) for administration of the State and Federal Superfund programs for the management and cleanup of hazardous materials. The DTSC is responsible for regulating hazardous waste facilities and overseeing the cleanup of hazardous waste sites in California. The Hazardous Waste Management Program (HWMP) regulates hazardous waste through its permitting, enforcement and Unified Program activities. HWMP maintains the EPA authorization to implement the RCRA program in California, and develops regulations, policies, guidance and technical assistance/training to assure the safe storage, treatment, transportation and disposal of hazardous wastes. The State Regulatory Programs Division of DTSC oversees the technical implementation of the State's Unified Program, which is a consolidation of six environmental programs at the local level, and conducts triennial reviews of Unified Program agencies to ensure their programs are consistent statewide and conform to standards.

State Water Resources Control Board (SWRCB). Acting through the RWQCB, the SWRCB regulates surface and groundwater quality pursuant to the Porter-Cologne Water Quality Act, the Federal Clean Water Act, and the Underground Tank Law. Under these laws, RWQCB is authorized to supervise the cleanup of hazardous waste sites referred to it by local agencies in those situations where water quality may be affected.

Depending on the nature of contamination, the lead agency responsible for the regulation of hazardous materials at the site can be the DTSC, RWQCB, or both. DTSC evaluates contaminated sites to ascertain risks to human health and the environment. Sites can be ranked by DTSC or referred for evaluation by the RWQCB. In general, contamination affecting soil and groundwater is handled by RWQCB and contamination of soils is handled by DTSC.

California Occupational Safety and Health Administration (Cal/OSHA). Cal/OSHA and the Federal OSHA are the agencies responsible for assuring worker safety in the handling and use of chemicals in the workplace. Pursuant to the Occupational Safety and Health Act of 1970, Federal OSHA has adopted numerous regulations pertaining to worker safety, contained in the Code of Federal Regulations Title 29 (29 CFR). These regulations set standards for safe workplaces and work practices, including standards relating to hazardous material handling. Cal/OSHA assumes primary responsibility for developing and enforcing State workplace safety regulations. Because California has a federally approved OSHA program, it is required to adopt regulations that are at least as stringent as those found in 29 CFR. Cal/OSHA standards are generally more stringent than Federal regulations.

Cal/OSHA regulations concerning the use of hazardous materials in the workplace, as detailed in Title 8 of the CCR, include requirements for safety training, availability of safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation. Cal/OSHA enforces hazard communication program regulations that contain training and information requirements, including procedures for identifying and labeling hazardous substances, communicating hazard information related to hazardous substances and their handling, and preparation of health and safety plans to protect workers and employees at hazardous waste sites. The hazard communication program requires that Material Safety Data Sheets (MSDSs) be available to employees and that employee information and training programs be documented.

Hazardous Materials Transport. California law requires that Hazardous Waste (as defined in California Health and Safety Code Division 20, Chapter 6.5) be transported by a California registered hazardous waste transporter that meets specific registration requirements. The requirements include possession of a valid Hazardous Waste Transporter Registration, proof of public liability insurance, which includes coverage for environmental restoration, and compliance with California Vehicle Code registration regulations required for vehicle and driver licensing. Additional requirements can be found in Title 22 CCR, Chapter 13.

State agencies with primary responsibility for enforcing Federal and State regulations and responding to hazardous materials transportation emergencies are the CHP and Caltrans. Together, these agencies determine container types used and license hazardous waste haulers for hazardous waste transportation on public roads. The CHP designates State and Federal roadways as hazardous materials truck routes. The CHP classifies hazardous materials into three categories: explosives, poisons that can be inhaled, and radioactive material. U.S. Route 101 and Hueneme Road from Port Hueneme to Las Posas Road in Ventura County are the only locally designated truck routes for hazardous materials.

3.8.2.3 Local Regulations

The relevant local regulations are discussed below.

Ventura County – Hazardous Waste Management Plan. Assembly Bill 2948 (Tanner, 1986) established procedures for the preparation of a County Hazardous Waste Management Plan (CHWMP). The CHWMP is intended to serve as the primary planning document for hazardous waste management within a County, and contains goals, policies and recommended programs for the management, recycling and disposal of hazardous wastes. The CHWMP principally governs the coordination and planning of hazardous waste disposal capacity between the County and State. The California Department of Health Services must give its approval to the plan before the document becomes effective.

A Hazardous Waste Management Plan (HWMP) was developed in 1988 and adopted in 1989 by Ventura County in response to the Tanner Act (AB 2948). In accordance with Tanner Act requirements, the HWMP includes information on current and projected hazardous waste generation in the County, including household hazardous waste, an inventory of contaminated sites and hazardous waste treatment, storage, and disposal facilities. The HWMP contains descriptive background information and policy guidance for: current hazardous waste generation; hazardous waste treatment, storage, or disposal facilities; and hazardous waste reduction. The HWMP also identifies a comprehensive set of siting criteria for hazardous waste facilities and proposes designated routes for the transportation of hazardous wastes and materials through the County.

City of Oxnard - Oxnard 2030 General Plan. The Safety Element of the City's existing General Plan contains two objectives and several policies pertinent to human-made hazards.

City of Oxnard – Fire Department. The Oxnard Fire Department administers the City's Environmental Health Hazardous Materials Program and is a Certified Unified Program Agency (CUPA). A CUPA is a single local agency designated by the California Environmental Protection Agency as having regulatory authority for six environmental programs. These programs are Hazardous Waste, Hazardous Waste On-site Treatment, Spill Prevention Countermeasure Plan (aboveground tanks), Underground Storage Tanks, Hazardous Materials Business Plan and Inventory, and Risk Management Plan. As the City's CUPA, the Oxnard Fire Department implements the Hazardous Materials Ordinance and monitors the use of hazardous materials throughout the Planning Area.

3.8.3 Environmental Setting

Hazardous wastes generated by both residents and businesses within the Planning Area contribute to environmental and human health hazards that have become an increasing public concern. However, proper waste management and disposal practices can minimize public concern over toxicity and the contamination of soils, water, and the air. This section provides information on several locations known to generate hazardous materials or other hazardous conditions within the PWIMP Planning Area. This information is based on existing information from a variety of Federal and State agency databases including those maintained by the SWRCB and DTSC.

Flooding and Sea Level Rise. Due to its low land profile, the City of Oxnard became a member of the National Flood Insurance Program (NFIP). The City also adopted a Master Plan of Drainage (1979) and a Floodplain Management Ordinance (Chapter 35 of the Oxnard City Code) to protect its residents and businesses. The City of Oxnard falls within the Santa

Clara River's 1,600 square mile watershed. Areas along the northern border of the City fall within the river's 100-year floodplain with a larger portion of Oxnard's core falling within the 500-year floodplain. The Multi-Jurisdictional Hazard Mitigation Plan for Ventura County identifies one critical facility and 279 commercial and residential buildings as susceptible to coastal and riverine flooding.

Riverine flooding can occur as a result of heavy rains and melting snow. Heavy water volume can cause breaches of stream channels, river channels, or the structures designed to contain water (e.g., levees). The latter was the case in 1969 when 50- and 100-year peak discharge levels were reached in many channels of the Santa Clara and Ventura watersheds. During this episode, the City of Oxnard was threatened by a break in the Santa Clara River levee along the City's north border.

Flooding in Oxnard caused by rainwater is most likely to occur in the winter months when Ventura County receives most of it precipitation. In 2005, the majority of Oxnard's rain fell between late January and mid- March. On average, however, rainfall in the Oxnard area increases sharply in early November and does not decrease until mid/late-March

High winds or tides can cause seawater surges resulting in coastal flooding beyond the high tide line. Wave action can directly impact seaside homes and infrastructure. Indirectly, wave action can cause beach and bluff erosion resulting in damage to seaside homes and infrastructure.

Several dams are located at least 35 miles to the east and northeast of the City of Oxnard within Ventura and Los Angeles Counties. These include the Santa Felicia Dam at Lake Piru, the Castaic Lake Dam and the Pyramid Lake Dam. The major threat to Oxnard is upstream along the Santa Clara River corridor. Although the potential for a dam failure is considered low, should one or more of these dams fail, the entire city is located within the Dam Inundation Zone, also called Dam Failure Hazard Area. Damage to the city could be in the form of a wall of fast-moving water, mud, and debris. As identified in the *Multi-Jurisdictional Hazard Mitigation Plan for Ventura County*, 36,179 residential and commercial buildings and 99 critical facilities could be impacted by a dam failure.

Tsunami and Tidal Marine Hazards. A tsunami is a rapidly moving wave or series of waves caused by earthquakes or undersea landslides. Given its location along the Pacific Ocean coastline, the City of Oxnard could potentially be struck or impacted by a tsunami; however, the 2005 Multi-Jurisdictional Hazard Mitigation Plan for Ventura County, California considers this hazard to pose a remote threat to life and property in Ventura County due to the low likelihood of occurrence. Since 1946, only five major tsunamis have impacted the California coast, the most recent in 1964. Areas that are affected by flooding are also at risk for tsunamis. Oxnard's projected tsunami impact area extends inland from the shoreline approximately one mile.

The City's Channel Islands Harbor and Mandalay Bay could potentially be impacted by seiches. Seiches are oscillating waves in enclosed or partially enclosed bodies of water (e.g., lakes, bays, or gulfs) for varying lengths of time as a result of seismic or atmospheric disturbances.

Coastal Wave and Beach Erosion. Development and shoreline use from Point Mugu to Point Conception have been attributed to the loss of natural sand beaches and resulting beach erosion problems. Manmade structures such as breakwalls, piers, and oil platforms interrupt

the natural cycle of sand being eroded and deposited along the shoreline. In response to the widespread impacts of beach erosion along the entire length of Southern California, the Beach Erosion Authority for Clean Oceans and Nourishment (BEACON) was formed. BEACON is a California Joint Powers agency established to deal with coastal erosion and beach problems on the Central Coast of California. Member agencies include the Cities of Carpinteria, Goleta, Oxnard, Port Hueneme, San Buenaventura, Santa Barbara, and the Counties of Santa Barbara and Ventura.

BEACON is currently working on a comprehensive sand management and opportunistic beach replenishment program called South Central Coast Beach Enhancement Program (SCCBEP). Also, at the direction of the member agencies, BEACON has recently expanded its scope to include the problems of ocean water quality. It plans to coordinate activities by member agencies involving beach and ocean pollution.

Damage to Oxnard Shores, Oxnard's beachfront homes, flooding, as well as loss of beach sand and formation of extensive dunes due to blowing sand are some of the problems associated with the City of Oxnard's beach erosion.

Wildfires. Dense urban areas do not contain large amounts of continuous surface fuels to feed a wildfire. Therefore, these areas are generally more resistant to the spread of wildfires than other areas. The City of Oxnard is Ventura County's largest urban community and has limited exposed to the wildfire hazard. The Multi-Jurisdictional Hazard Mitigation Plan for Ventura County, California notes that no commercial buildings and only five residential building have potential exposure to high and very high wildfire hazards.

Underground Storage Tanks. As previously described, the Oxnard Fire Department administers the CUPA/Hazardous Materials Ordinance and has regulatory authority over the local Underground Storage Tank Program. The Leaking Underground Storage Tank Incident Report (LUST) contains an inventory of reported leaking underground tank incidents and is compiled from data provided by the SWRCB Leaking Underground Storage Tank Information System. A review of the current list indicates that there are currently 340 LUST sites within the Planning Area. These sites are predominately clustered around the City's primary transportation corridors including Oxnard Boulevard and Hueneme Road and are predominately associated with retail and commercial uses (e.g., gas stations, convenience stores, car washes, etc.). However, additional sites are associated with local industrial and agricultural uses. A summary of these sites by roadway is provided in Table 3.8-1.

Table 3.8-1
Leaking Underground Storage Tank Listings in the Planning Area

Roadway	Number of Sites
2nd Street	1 site - Ventura County Fire Protection
5th Street	11 sites - Various
23rd Street	1 site - Naval Construction Battalion
A Street	1 site - A Street Arco
Arcturus Avenue	5 sites - Various
Arnold Road	1 site - Del Norte Foods
Auto Center Drive	2 sites – Various
Azahar Street	1 site – Newton Building Materials

Table 3.8-1
Leaking Underground Storage Tank Listings in the Planning Area

Roadway	Number of Sites
Balboa Street	1 site – Navarro Property
Beardsley Road	1 site – Rancho Del Tio
Beedy Street	2 sites – Various
Bernoulli Circle	1 site – Wilma Pacific, Inc.
Bevra Avenue	1 site – Strathmore Homes
Bristol Road	1 site – Saticoy Lemon Association #1
Buena Vista Avenue	2 sites – Various
C Street	5 sites – Various
Calle Rocas	1 site – Herb Brisco Residence
Camino Avenue	1 site – Power Machinery
Central Avenue	4 sites – Various
Channel Islands Boulevard	6 sites – Various
Colonia Road	2 sites – Various
Commercial Avenue	6 sites – Various
Cooper Road	2 sites – Various
Cortez Street	1 site – Laidlaw Transit, Inc & bus yard
Country Club	1 site – Saticoy Country Club
Cypress	1 site – Miguel Ramos
Darling Road	1 site – Paramount Citrus
Date Street	1 site – Celso Cerri
Del Norte	3 sites – Various
Diaz Avenue	2 sites – Various
Dodge Road	1 site – Golden Coast Nursery
Doris Avenue	3 sites – Various
Dufau Road	1 site – Pleasant Valley Vegetable Coop
Edison Drive	3 sites – Various
El Rio Drive	2 sites – Various
Etting Road	4 sites – Various
Frazier	2 sites – Various
Gonzales Road	6 sites – Various
Hailes Road	1 site – Reiter Brothers, Inc.
Hueneme Road	10 sites – Various
Industrial Avenue	3 sites – Various
J Street	1 site – Wooley Gas Service
K Street	1 site – Oxnard Fire Station #1
La Vista	1 site – Seacoast Associates
Lambert Street	4 sites – Various
Leland Street	4 sites – Various
Lirio Avenue	6 sites – Various
Los Altos Street	1 site – Berdan Holding LLC
Los Angeles Avenue	4 sites – Various
Lockwood Street	3 sites – Various
Magnolia Street	1 site – Oxnard Roofing Company
Mallard Way	1 site – Ven Oaks Plumbing
Marquita	1 site – City of Oxnard
Maulhardt Avenue	9 sites – Various
Mercantile Street	2 sites – Various
Mesa School Road	1 site – Mesa Elementary School
Meta Street	1 site – Tri-County Yellow Cab
Montgomery	1 site – Tri-County Truck Company
Mountain View Avenue	6 sites – Various
Nardo Street	3 sites – Various

Table 3.8-1
Leaking Underground Storage Tank Listings in the Planning Area

Roadway	Number of Sites
Naval Air Road	1 site – San Miguel Produce
Nyland Avenue	2 sites – Various
Olivas Park Drive	2 sites – Various
Oxnard Boulevard	33 sites – Various
Pacific Avenue	3 sites – Various
Paseo Mercado	1 site – Federal Express
Pelican Way	1 site – ARCO Fuel Docks
Peninsula Road	1 site – City of Oxnard Firehouse #6
Perkins Road	3 sites – Various
Pine Street	3 sites – Various
Pleasant Valley Road	5 sites – Various
Ramona Drive	2 sites – Various
Raytheon Road	1 site - Raytheon Company
Rice Avenue	2 sites – Various
Rice Road	1 site – Manabi Farms
Richmond Avenue	1 site – Western Technical
Roosevelt Boulevard.	1 site – Stark Realty Inc
Rose Avenue	11 sites – Various
Sandy Circle	1 site – Tri County Truck
Santa Clara Avenue	4 sites – Various
Saviers Road	18 sites – Various
Sherwin Avenue	2 sites – Various
Solar Drive	1 site – GTE California Inc.
Spinnaker Drive	1 site – Ventura Port District
Statham Boulevard	3 sites – Various
Strickland Drive	1 site – Estate of Lucille Borden
Sturgis Road	2 sites – Various
Sunkist Circle	1 site - Morse Signal Devices
Teal Club Road	2 sites – Various
Ventura Boulevard	10 sites – Various
Ventura Road	16 sites – Various
Victoria Avenue	8 sites – Various
Vineyards Avenue	17 sites – Various
Violeta Street	3 sites – Various
Walnut Avenue	1 site – Oro Del Norte Ranch
Wagon Wheel Road	3 sites – Various
Wells Road	1 site – Westerdale Trust
Winchester	2 sites – Various
Wolff Road	1 site – Hailwood, Inc.
Wooley Road	9 sites – Various
Wright Road	1 site – Ventura School

Source: Environmental Data Resources, Inc. 2016

Aboveground Storage Tanks. Similarly, the Oxnard Fire Department has regulatory authority over the Spill Prevention Countermeasure Plan for aboveground storage tanks. The Aboveground Storage Tank database provides a list of registered aboveground storage tanks. This information comes from the SWRCB's Hazardous Substance Storage Container Database. A review of the current list indicates that there are currently 28 aboveground storage tanks in the Planning Area, with many associated with industrial and agricultural uses. A summary of these locations by address is provided in Table 3.8-2.

Table 3.8-2 Aboveground Storage Tanks in the Planning Area	
Address	**Site**
1230 E 5th Street	Silvas Oil Company
1000 23rd Avenue	Naval Construction Battalion
1631 Auto Center Drive	Toyota of Oxnard
5900 Arctures Road	BMW Engineering and Emissions
5901 Arctures Road	Spare Parts Warehouse
501 Del Norte Boulevard	PTI Technologies Inc.
801 Del Norte Boulevard	Quinn Company
3803 Dufau Road	Mission Produce, Inc.
5601 Edison Drive	Wallenius Lines
251 S. Hayes Avenue	Water Division
201 N. Harbor Boulevard	Mandalay Onshore Facility
393 N. Harbor Boulevard	Mandalay Generating Station
2001 Lockwood Street	Former Autonation USA
666 Pacific Avenue	Oxnard Pest Control
1060 South Pacific Avenue	City of Oxnard Equipment Yard
5936 Perkins Road	Hueneme Mill
6001 South Perkins Road	Oxnard Wastewater Treatment Facility
6200 Perkins Road	Halaco Engineering Company
800 N. Rice Avenue	Procter & Gamble Paper Products
635 S. Rose Avenue	Helena Chemical Company
4000 S. Rose Avenue	Oxnard College
2934 Teal Club Road	Tri-County Builders Supply
2800 Sturgis Road	HAAS Automation
1500 E. Ventura Boulevard	Honda of Oxnard
3555 E. Vineyard Avenue	Hanson Aggregates
6029 Vineyard Avenue	Saticoy Facility
1015 E. Wooley Road	Oxnard Facility
1757 E. Wooley Road	Silvas Oil Company
Source: Environmental Data Resources, Inc. 2016	

Landfill and Recycling Site Locations. The California Integrated Waste Management Board (CIWMB) is responsible for managing California's solid waste stream. The CIWMB works in partnership with local government, industry, and the public to reduce waste disposal and ensure environmentally safe landfills are maintained. The CIWMB maintains a Solid Waste Information System database that contains information on solid waste facilities, operations, and disposal sites throughout the State. The types of facilities found in this database include landfills, transfer stations, material recovery facilities, composting sites, transformation facilities, waste tire sites, and closed disposal facilities. Table 3.8-3 provides a list of solid waste facilities or landfills (including closed facilities) identified by the CIWMB as occurring in the Planning Area. A list of recycling facilities is also provided in Table 3.8-4.

Table 3.8-3 Solid Waste and Landfill Sites in the Planning Area	
Address	**Site**
6352 Beardsley Road	Rancho Del Tio
Del Norte Boulevard & Sturgis Road	Oxnard MRF Joint Powers
111 South Del Norte Boulevard	Del Norte Regional Recycling
4105 Gonzales Road	Bailard Landfill (closed facility)
6200 Perkins	Halaco Engineering Company

Table 3.8-3 **Solid Waste and Landfill Sites in the Planning Area**	
Address	**Site**
1234 South Rice Road	Earth Care Compost
800 South Victoria Avenue	Oxnard Dump/Mandalay Bay Development
2401 West Vineyard Avenue	Santa Clara and Coastal Landfill (closed facility)
Source: Environmental Data Resources, Inc. 2016	

3.8-4 **Recycling Facilities in the Planning Area**	
Address	**Site**
111 South Del Norte Boulevard	Del Norte Regional Recycling
1111 E. Channel Islands Boulevard	Oxnard Recycling
1905 Lirio Avenue	Standard Industries Metal Recycling
1441 Mountain View	Oxnard Metals Inc.
11032 Nardo Street	Walker Brothers Recycling
1610 Pine Street	Eddies Recycling
521 N. Rice Avenue	California Public Recycling
2101 N. Rose Avenue	Vons Companies #436
2401 Saviers Road	Sav On Drug #3709
4220 Saviers Road	California Recycling Services
872 N. Ventura Road	California Recycling Services
920 N. Ventura Road	Tomra Pacific Inc./Albertsons
440 S. Ventura Road	California Recycling Services
3380 E. Vineyard Avenue	California Recycling Services
818 W. Wooley Road	California Recycling Services
Source: Environmental Data Resources, Inc. 2016	

3.8.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.8.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on cultural and tribal resources would occur if the PWIMP would:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- Be located on a site, which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment;
- Be located within an area covered by an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and would result in a safety hazard for people residing or working in the project area;

- Be located within the vicinity of a private airstrip and would result in a safety hazard for people residing or working in the project area;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

3.8.4.2 Approach and Methodology

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

According to the City's CEQA Guidelines, a "Substantial" hazard related to chronic health risks (e.g., exposure to ongoing emissions of toxic air contaminants) will normally include, but not necessarily be limited to, the exceedance of VCAPCD health risk public notification thresholds (Ten excess cancer cases in one million for cancer risk and a Hazard Index of more than 1.0 for non-cancer risk). In addition, a "Substantial" risk of upset hazards (e.g., a chemical spill) is defined by the criteria described in Tables 3.8-5 through 3.8-7. Tables 3.8-5 and 3.8-6 describe the criticality and frequency of potential upsets, while Table 3.8-7 uses these factors to determine whether a particular upset risk is significant. As indicated in Table 3.8-7, a substantial risk would depend upon both the criticality and frequency of a potential event. The potential for minor events may not pose a substantial risk even if the potential frequency is relatively high, while the potential for more severe events may pose a substantial risk even if the potential for such events is rare.

Table 3.8-5
Criticality Classifications of Upset Hazards

Classification	Description of Public Safety Hazard
Negligible	No significant risk to the public, with no minor injuries
Minor	At most a few minor injuries
Major	Up to 10 severe injuries
Serious	Up to 100 severe injuries or up to 10 fatalities
Disastrous	More than 100 severe injuries or more than 10 fatalities

Table 3.8-5
Criticality Classifications of Upset Hazards

Classification	Description of Public Safety Hazard
Source: City of Oxnard, *CEQA Guidelines*, May 2017	

Table 3.8-6
Frequency Classifications of Upset Hazards

Classification	Frequency	Description of Event
Extraordinary	Greater than once in 1,000,000 years	Has never occurred but could occur
Rare	Between once in 10,000 and once in 1,000,000 years	Occurred on a worldwide basis, but only a few times
Unlikely	Between once in 100 and once in 10,000 years	Is not expected to occur during the project lifetime
Likely	Between once per year and once in 100 years	Would probably occur during the project lifetime
Frequent	Greater than once in a year	Would occur once in a year on average
Source: City of Oxnard, *CEQA Guidelines*, May 2017		

Table 3.8-7
Significance Risk of Upset Hazards

	Probability (Frequency Per Year)				
Consequences	**Extraordinary (>1,000,000 years)**	**Extraordinary (>1,000,000 Years and < 1,000,000 years)**	**Unlikely (< 100 and > 10,000 years)**	**Likely (> 1 and < 100 years**	**Frequent (> 1 per year**
Disastrous (> 100 severe injuries or 10 fatalities)					
Severe (Up to 100 severe injuries or 10 fatalities)					
Major (up to 10 severe injuries)					
Minor (A few minor injuries)					
Negligible (No Minor Injuries)					

Source: City of Oxnard, *CEQA Guidelines*, May 2017
Note: Incidents that fall in the shaded area of the risk matrix would be classified as significant

This section reviews the description of the PWIMP as described in Section 2 – Project Description and then determines whether operation or construction would involve the use, generation, disposal, transport, or management of potentially hazardous or explosive substances (including, but not limited to, oil, pesticides, chemicals, or radiation) in sufficient quantities to cause a potential hazard. If so, determine whether a quantified health risk assessment (HRA) or risk of upset evaluation is warranted. Emergency response and evacuation plans are required for businesses that

use hazardous materials or involve a potential threatened release of acutely hazardous materials during operation or construction.

The following factors should be considered in developing a determination of significance:

- The probable frequency and severity of consequences to people or property as a result of a potential accidental release or explosion of a hazardous substance
- The degree to which the project may require a new, or interfere with an existing, emergency response or evacuation plan, and the severity of the consequences
- The degree to which project design would reduce the frequency or severity of a potential accidental release or explosion of a hazardous substance
- The probable frequency and severity of consequences to people from exposure to the health hazard

This impact analysis focuses on potential effects of hazards and hazardous materials associated with the PWIMP. The evaluation was made in light of current conditions at the various PWIMP project site(s), the environmental database searches, applicable regulations and guidelines, and Proposed PWIMP Project operations.

The following impacts were considered in this section, but were found to be absent from or not applicable to the proposed project; therefore, no further discussion of these impacts is provided.

- Although operation of the PWIMP faculties would require truck trips to deliver water and/or wastewater treatment chemicals and dispose of waste, and indirectly result in an incremental increase in the potential for accidents during the routine transport of hazardous materials, the transportation of hazardous materials and wastes is regulated by the California Department of Transportation and the California Highway Patrol. These agencies regulate container types and packaging requirements as well as licensing and training for truck operators, chemical handlers, and hazardous waste haulers. Because all service providers would be required to comply with existing and future hazardous materials laws and regulations for the transport of hazardous materials, the risk of accidental releases of hazardous materials during normal transport operations does not constitute a significant hazard.

- Some PWIMP Project components are situated within two-miles of the Oxnard Airport as well as near private agricultural airstrips on the outskirts of the City. However, these components mainly consist of water, wastewater, recycled water, and stormwater pipelines/conveyance facilities that once constructed would be situated below the ground surface, and therefore and would not pose a safety hazard with respect to airport operations. The proposed water and recycled water storage tanks would not be tall enough to interfere with any airport take-off or landing operations. Similarly, construction activities would not affect airport operations. The proposed TMDL storage pond is an open water storage facility that could attract birds and waterfowl, which could be dangerous to airport operations. However, the location would be would be located outside of the two-mile radius that could affect airport operations. In addition, the TMDL Storage facility would not pose a significant increase in potential bird strikes than what currently exists due to other open water features in the area as the

Santa Clara River, agricultural storage ponds, and the Pacific Ocean that can attract birds and waterfowl.

- Although construction activities could impede access for emergency response vehicles and therefore interfere with an emergency response plan or emergency evacuation plan, measures to avoid interference with emergency access are addressed in Section 3.15, Traffic and Circulation.

3.8.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts are discussed below.

Impact 3.8-1: Excavation and grading for the project could expose construction workers, the public, or the environment to hazardous materials that may be present in excavated soil or groundwater.

The PWIMP involves excavation, trenching, tunneling and grading for the construction of water, wastewater, recycled water and stormwater conveyance pipelines, building footings and utilities. A number of properties with soil and/or groundwater contamination are located within ¼-mile of project facilities and may have impacted subsurface conditions at project locations. The typical contaminants anticipated to be encountered during project construction activities are related to releases from gasoline service stations, dry cleaners, and agricultural uses such as petroleum hydrocarbons, VOCs, metals, and pesticides. Of particular concern, construction could result in exposure to various organic substances, metals, and petroleum products.

Soil disturbance during construction could further disperse existing contamination into the environment and expose construction workers or the public to contaminants. If significant levels of hazardous materials are present in excavated soils, health and safety risks to workers and the public could occur. The dewatering of contaminated groundwater could also present risks to public health and safety, and the environment, if the contaminated groundwater is not handled properly. The potential for contaminated soil and groundwater to be released into the environment during Project construction is a potentially significant impact.

Because regulatory agency lists are continually updated as new environmental concerns are identified or existing environmental release sites are cleaned up, the agency list and file review would need to be updated to evaluate these concerns closer to the time of excavation for the PWIMP project facilities. Implementation of **Mitigation Measure 3.8-1a through 3.8-1d**, as well as compliance with hazardous materials laws and regulations, would reduce the potential for exposure to hazardous materials during construction to a less-than-significant level.

Temporary Construction Mitigation Measures

Mitigation Measure 3.8-1a: Conduct Phase I Environmental Site Assessment(s). Within one year prior to construction of facilities requiring excavation of more than 50-cubic yards of soil, the contractor shall retain a qualified environmental professional to conduct a Phase I Environmental Site Assessment in conformance with ASTM Standard 1527-13 to evaluate subsurface conditions that could be expected during construction. For all pipeline/conveyance facility alignments, the contractor shall retain a qualified environmental professional to update the environmental database review to identify environmental cases, permitted hazardous materials uses, and spill sites within one- quarter mile of the pipeline/conveyance facility alignment. Regulatory agency files shall be

reviewed for those sites that could potentially affect soil and groundwater quality within the project alignment.

If these preliminary environmental reviews indicate that a release of hazardous materials could have affected soil or groundwater quality at a project site, the contractor shall retain a qualified environmental professional to conduct a Phase II environmental site assessment to evaluate the presence and extent of contamination at the site, in conformance with state and local guidelines and regulations. If the results of the subsurface investigation(s) indicate the presence of hazardous materials, additional site remediation may be required by the applicable state or local regulatory agencies, and the contractors shall be required to comply with all regulatory requirements for facility design or site remediation.

Mitigation Measure 3.8-1b: Prepare Project-Specific Health and Safety Plan(s). Based on the findings of the environmental review required by Mitigation Measure 3.8-1a, the City or its contractor shall prepare a project-specific Health and Safety Plan (HSP) in accordance with 29 CFR 1910 to protect construction workers and the public during all excavation, grading and construction services. The HSP shall identify the following, but not be limited to:

- A summary of all potential risks to construction workers and maximum exposure limits for all known and reasonably foreseeable site chemicals;
- Specified personal protective equipment and decontamination procedures, if needed Safety procedures to be followed in the event suspected hazardous materials are encountered;
- Emergency procedures, including route to the nearest hospital;
- The identification of a site health and safety officer and responsibilities of the site health and safety officer

Mitigation Measure 3.8-1c: Environmental Construction Monitor(s). Based on the findings of the environmental review required by Mitigation Measure 3.8-1a, the City or its contractor shall have a site health and safety supervisor fully trained pursuant to the HAZWOPER standard (29 CFR 1910.120) be present during excavation, grading, trenching, or cut and fill operations to monitor for evidence of potential soil contamination, including soil staining, noxious odors, debris or buried storage containers. The site health and safety supervisor must be capable of evaluating whether hazardous materials encountered constitute an incidental release [1] of a hazardous substance or an emergency spill. The site health and safety supervisor shall direct procedures to be followed in the event that a hazardous materials release with the potential to impact worker health and safety is encountered. These procedures shall be in accordance with hazardous waste operations regulations and specifically include, but are not limited to, the following:

- Immediately stopping work in the vicinity of the unknown hazardous materials release, and notifying MCDEH, and
- Retaining a qualified environmental firm to perform sampling and remediation.

Mitigation Measure 3.8-1d: Develop a Materials Disposal Plan(s). For each individual PWIMP project (as applicable), the City or its contractor shall develop a materials disposal plan specifying how the applicant or its contractor would remove, handle, transport, and dispose of all excavated

[1] An incidental release is a release of a hazardous substance, which does not pose a significant safety or health hazard to employees in the immediate vicinity or to the employee cleaning it up, nor does it have the potential to become an emergency within a short time frame. Incidental releases are limited in quantity, exposure potential, or toxicity and present minor safety and health hazards to employees in the immediate work area or those assigned to clean them up.

material in a safe, appropriate, and lawful manner. The plan must identify the disposal method for soil and the approved disposal site, and include written documentation that the disposal site would accept the waste.

The applicant or its contractor shall develop a groundwater dewatering control and disposal plan specifying how the applicant or its contractor would remove, handle, and dispose of groundwater impacted by hazardous substances in a safe, appropriate and lawful manner. The plan must identify the locations at which potential groundwater impacts are likely to be encountered (based on the results of Mitigation Measure 3.8-1a), the method to analyze groundwater for hazardous materials, and the appropriate treatment and/or disposal methods.

Significance after Mitigation: Less than Significant.

Impact 3.8-2: Potential for accidental release of hazardous materials from construction activities.

Petroleum products, such as gasoline, diesel fuel, lubricants and cleaning solvents would be utilized to fuel and maintain construction vehicles and equipment. Inadvertent release of large quantities of these materials into the environment could adversely impact soil, surface waters, or groundwater quality. As a result the following mitigation measures are proposed:

Mitigation Measure 3.8-2a: Store, Handle, Use Hazardous Materials in Accordance with Applicable Laws. The City shall ensure that all construction-related and operational hazardous materials and hazardous wastes shall be stored, handled, and used in a manner consistent with relevant and applicable federal, state, and local laws. In addition, construction-related and operational hazardous materials and hazardous wastes shall be staged and stored away from stream channels and steep banks to keep these materials a safe distance from near-by residents and prevent them from entering surface waters in the event of an accidental release.

Mitigation Measure 3.8-2b: Properly Dispose of Contaminated Soil and/or Groundwater. If contaminated soil and/or groundwater is encountered or if suspected contamination is encountered during project construction, work shall be halted in the area, and the type and extent of the contamination shall be identified. A contingency plan to dispose of any contaminated soil or groundwater will be developed through consultation with appropriate regulatory agencies.

Mitigation Measure 3.8-2c: Properly Dispose of Hydrostatic Test Water. Dewatering of the pipeline during hydrostatic testing during construction, as well as any dewatering as a result of operations and maintenance activities, shall be discharged to land or the sanitary sewer system and not into any creeks, drainages, or waterways and shall require prior approval from the Los Angeles Regional Water Quality Control Board.

Significance After Mitigation: Less-than-Significant Impact.

Impact 3.8-3: Handling and Use of Hazardous Materials within ¼-mile of a school during construction.

The potential impact from the handling and use of hazardous materials within ¼-mile of a school during construction could be a significant impact. As discussed above, construction activities may result in the inadvertent release of small quantities of fuels, solvents, or lubricants. Construction would occur within ¼-mile of schools. However, with the implementation of

Mitigation Measures 3.8-1a through 3.8-1d and 3.8-2a through 3.8-2c, the potential for a hazardous materials release during construction to result in exposures at the nearby schools is remote, therefore, this impact is less than significant.

Significance After Mitigation: Less than Significant.

Impact 3.8-4: Increased risk of wildland fires during construction in high fire hazard areas.

Construction of the PWIMP would be located within an urban setting and is not generally located in an area where there is the risk of wildland fire. Specifically, a records search of the California Department of Forestry and Fire Protection Fire Severity mapping system does not regard the Proposed Project/Action Area to be in an area of moderate or high risk to wildfires. As a result, there is little potential to expose people or structures to a significant risk of loss, injury or death involving wildland fires. However, the potential exists that construction activities could cause a fire, especially in a drought situation or in the dry season. With the incorporation of the following mitigation measure, any potential impacts are considered to be less than significant.

Mitigation Measure 3.8-4a: Fire Prevention and Control. The City shall comply with all federal, state, county and local fire regulations pertaining to burning permits and the prevention of uncontrolled fires. The following measures shall be implemented to prevent fire hazards and control of fires:

- A list of relevant fire authorities and their designated representative to contact shall be maintained on site by construction personnel.
- Adequate firefighting equipment shall be available on site in accordance with the applicable regulatory requirements.
- The level of fire hazard shall be posted at the construction office (where visible for workers) and workers shall be made aware of the hazard level and related implications.
- The City or its contractor shall provide equipment to handle any possible fire emergency. This shall include, although not be limited to, water trucks; portable water pumps; chemical fire extinguishers; hand tools such as shovels, axes, and chain saws; and heavy equipment adequate for the construction of fire breaks when needed. Specifically, the City or its contractor shall supply and maintain in working order an adequate supply of fire extinguishers for each crew engaged in potentially combustible work such as welding, cutting, and grinding.
- All equipment shall be equipped with spark arrestors.
- In the event of a fire, the City or its contractor shall immediately use resources necessary to contain the fire. The City or contractor shall then notify local emergency response personnel.
- Any and all tree-clearing activities (if any) are to be carried out in accordance with local rules and regulations for the prevention of forest fires.

- Burning shall be prohibited.
- Flammable wastes shall be removed from the construction site on a regular basis.
- Flammable materials kept on the construction site must be stored in approved containers away from ignition sources.

Significance After Mitigation: Less-than-Significant Impact

3.8.5 Cumulative Effects

The PWIMP involves excavation, trenching, tunneling and grading for the construction of water, wastewater, recycled water and stormwater conveyance pipelines, building footings and utilities. A number of properties with soil and/or groundwater contamination are located within ¼-mile of project facilities and may have impacted subsurface conditions at project locations. The typical contaminants anticipated to be encountered during project construction activities are related to releases from gasoline service stations, dry cleaners, and agricultural uses such as petroleum hydrocarbons, VOCs, metals, and pesticides. Of particular concern, construction could result in exposure to various organic substances, metals, and petroleum products.

Soil disturbance during construction could further disperse existing contamination into the environment and expose construction workers or the public to contaminants. If significant levels of hazardous materials are present in excavated soils, health and safety risks to workers and the public could occur. The dewatering of contaminated groundwater could also present risks to public health and safety, and the environment, if the contaminated groundwater is not handled properly. The potential for contaminated soil and groundwater to be released into the environment during Project construction is a potentially significant impact.

Because regulatory agency lists are updated as new environmental concerns are identified or existing environmental release sites are cleaned up, the agency list and file review would need to be updated to evaluate these concerns closer to the time of excavation for the PWIMP project facilities. Implementation of **Mitigation Measures 3.8.1a through 3.8-1d**, as well as compliance with hazardous materials laws and regulations, would reduce the potential for exposure to hazardous materials during construction to a less-than-significant level. As a result, the PWIMP would not result in any significant cumulative hazardous materials impacts.

3.9 Hydrology, Water Quality, and Water Utilities

This section evaluates the potential hydrologic and water quality impacts that would result from the proposed PWIMP.

3.9.1 Introduction

This evaluation of hydrology and water quality was based on information from the City of Oxnard's 2030 General Plan. Key Terms and concepts include the following:

- **Acre Feet Per Year (AFY).** A quantity measure of water. The amount of water covering an acre of land with one foot of water.
- **Aquifer.** A deposit of rock, such as sandstone, containing water that can be used to supply wells.
- **Drainage.** The control and removal of excess rainfall runoff or groundwater by the use of surface or subsurface features or drains.
- **Drainage Channel.** An open channel such as swale, constructed channel, or natural drainage course that may convey, store, and treat runoff.
- **Groundwater.** Water beneath the surface that can be collected with wells, tunnels, or drainage galleries.
- **NPDES.** National Pollutant Discharge Elimination System, a permitting program administered by the State. The NPDES permit granted to Oxnard establishes standards and requirements for the control of pollutants in stormwater.
- **Service Area.** The area for which a purveyor is responsible for disturbing water supplies.
- **Stormwater Management.** Public policies and activities undertaken to regulate the rate, volume, and quality of runoff.
- **Wastewater.** Sewage (either treated or untreated) from residential, commercial, industrial, and institutional sources.
- **Wastewater Collection System.** The totality of the pipes, pump stations, manholes, and other facilities that convey untreated wastewater from the various sources around the City to the Oxnard Wastewater Treatment Plant.
- **Water Demand.** The volume of water requested by users to satisfy their needs.
- **Watershed.** An area of land that drains water, sediment, and dissolved material to a common outlet.
- **Water Supply.** Water supplied from surface water tanks, direct diversions from a water body (e.g., river, lake, or delta) or groundwater conveyed (e.g., via pipes) for use as a City water source.

3.9.2 Regulatory Context

Hydrology and water quality is subject to various Federal, State and local regulations. A brief overview of these regulations follows.

3.9.2.1 Federal Regulations

A brief overview of the federal regulations follows.

Clean Water Act. The CWA, enacted by the federal government in 1972 and amended in 1987, was designed to restore and maintain the chemical, physical, and biological integrity of the waters of the nation.

- **National Pollution Discharge Elimination System.** Section 301(a) of the CWA requires that point source discharges of pollutants to a water of the United States must be done in conformance with an NPDES permit. NPDES permits establish effluent limitations that incorporate various requirements of the CWA designed to protect water quality. CWA Section 402 authorizes the EPA or states with an approved NPDES program to issue permits. The State of California has an approved NPDES Program. The state NPDES Program is described below. In addition, communities greater than 100,000 in populations are required to apply for a municipal permit under the NPDES program. In Ventura County, the County and numerous co-permittees applied for a joint permit under this program; co-permittees included numerous cities throughout Ventura County, including Oxnard, Camarillo, and Ventura. The Countywide NPDES Municipal Stormwater Permit is also described below.
- **Total Maximum Daily Loads.** Section 303(d) of the CWA requires that states make a list of waters that are not attaining standards after technology-based limits. This is done to maintain a minimum level of pollutant management, using the best available technology, be put into place. States are to develop total maximum daily loads (TMDLs) for waters on this list (and where the EPA administrator deems they are appropriate). A TMDL must account for all sources of the pollutants that caused the water to be listed, including contributions from point sources (federally permitted discharges) and contributions from nonpoint sources. EPA is required to review and approve the list of impaired waters and each TMDL. The Santa Clara and Calleguas Creek watersheds have been listed as being impaired. The State of California is currently in the process of developing TMDLs for these and the other waters that have been listed as being impaired pursuant to Section 303(d) of the CWA, as described below.
- **Underground Injection Control Program.** The Safe Drinking Water Act established the Underground Injection Control (UIC) Program to provide safeguards so that injection wells do not endanger current and future underground sources of drinking water (USDW). The UIC Program defines an injection well as any bored, drilled, or a driven shaft or a dug hole, where the depth is greater than the largest surface dimension that is used to discharge fluids underground. EPA groups underground injection into five classes for regulatory control purposes. Wells used for injection of potable or recycled water into a potable groundwater aquifer would fall under Class V, which includes injection of nonhazardous fluids into or above a USDW. The State of California shares primary enforcement responsibility for the UIC Program with EPA. The UIC Program is authorized by rule, and no permit is necessary.

However, current federal requirements prohibit any injection activity that may endanger underground sources of drinking water (40 CFR Part 144). Therefore, owners and operators of Class V wells are required to provide inventory information (location, legal contact, nature of the injection activity, etc.) to their state UIC authority.

- **National Toxics Rule and California Toxics Rule.** In 1992, pursuant to the CWA, EPA promulgated the National Toxics Rule (NTR) criteria to establish numeric criteria for priority toxic pollutants for California. The NTR established water quality standards for 42 pollutants not covered at that time under California's statewide water quality regulations. As a result of a September 1994 court order that revoked California's statewide water quality control plan for priority pollutants, EPA initiated efforts to promulgate additional numeric water quality criteria for California. In May 2000, EPA issued the California Toxics Rule (CTR), which promulgated numeric criteria for priority pollutants. The CTR documentation (Volume 65, pages 31682–31719 of the *Federal Register* [65 FR 31682–31719], May 18, 2000, along with amendments in February 2001) "carried forward" the previously promulgated standards of the NTR, thereby providing a single document listing California's fully adopted and applicable water quality criteria for 126 priority pollutants.
- **Section 303(D) Impaired Waters List.** Section 303(d) of the CWA requires states to develop lists of water bodies (or sections of water bodies) that do not meet water quality standards after implementation of minimum required levels of treatment by point- source dischargers (i.e., municipalities and industries). The intent of the Section 303(d) list is to identify water bodies that require future development of a Total Maximum Daily Load (TMDL) and associated implementation program to maintain water quality. Section 303(d) requires states to develop a TMDL for each of the listed pollutants and water bodies.
- **Federal Anti-degradation Policy**. Section 303 of the Clean Water Act (CWA) (33 U.S.C. § 1313) requires that states adopt water quality standards for waters of the United States within their applicable jurisdiction. Such water quality standards must include, at a minimum, (1) designated uses for all waterbodies within their jurisdiction, (2) water quality criteria necessary to protect the most sensitive of the uses, and (3) anti-degradation provisions. Anti-degradation policies and implementing procedures must be consistent with the regulations in 40 C.F.R. § 131.12. Anti-degradation is an important tool that states use in meeting the CWA requirement that water quality standards protect public health and welfare, enhance water quality, and meet the objective of the Act to "restore and maintain the chemical, physical and biological integrity" of the nation's waters. The CWA requires that states adopt anti-degradation policies and identify implementation methods to provide three levels of water quality protection to maintain and protect (1) existing water uses and the level of water quality, (2) high quality waters, and (3) outstanding national resource waters.
- **Executive Order 11988: Floodplain Management.** Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, Executive Order 11988 states that "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values

served by flood plains in carrying out its responsibilities."

The Federal Emergency Management Agency (FEMA) oversees floodplains and administers the National Flood Insurance Program (NFIP) adopted under the National Flood Insurance Act of 1968. The program makes federally subsidized flood insurance available to property owners within communities that participate in the program. Areas of special flood hazard (those subject to inundation by a 100-year flood) are identified by FEMA through regulatory flood maps titled Flood Insurance Rate Maps. The NFIP mandates that development cannot occur within the regulatory floodplain (typically the 100-year floodplain) if that development results in an increase of more than one foot in flood elevation. In addition, development is not allowed in delineated floodways within the regulatory floodplain.

3.9.2.2 State Regulations

A brief overview of the state regulations follows.

State Water Resources Control Board. EPA has delegated responsibility for implementation of portions of the CWA to the California State Water Resources Control Board (State Board) and nine Regional Water Quality Control Boards (RWQCBs), including water quality planning and control programs such as the NPDES. The Code of Federal Regulations (Title 40, CFR) and EPA guidance documents provide direction for implementation of the CWA. The State Board sets statewide policies and develops regulations for the implementation of water quality control programs mandated by state and federal water quality statutes and regulations. The RWQCBs develop and implement Water Quality Control Plans (Basin Plans) that consider regional beneficial uses, water quality characteristics, and water quality problems. The State Board has adopted several statewide Water Quality Control Plans that are part of the Basin Plans. In addition, both the State and Regional Boards have adopted policies, separate from these plans, that provide detailed direction on the implementation of certain plan provisions. In the event that inconsistencies exist among the various plans and policies, the more stringent provisions apply. Applicable acts, policies, and water quality control plans are as follows:

- **The Porter-Cologne Water Quality Control Act.** The Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) provides the basis for water quality regulation within California and defines water quality objectives as the limits or levels of water constituents established for the reasonable protection of beneficial uses. The SWRCB administers water rights, water pollution control, and water quality functions throughout California, while the Central Coast RWQCB (CCRWQCB) conducts planning, permitting, and enforcement activities. The Porter-Cologne Act requires the RWQCB to establish a regional Basin Plan with water quality objectives, while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses. Beneficial uses, together with the corresponding water quality objectives, are defined as standards, per federal regulations. Therefore, the regional Basin Plans form the regulatory references for meeting state and federal requirements for water quality control. Changes in water quality are allowed if the change is consistent with the maximum beneficial use of the State waters, it does not unreasonably affect the present or anticipated beneficial uses, and it does not result in water quality less than that prescribed in the water quality control plans. The Basin Plan regulations also apply to groundwater. The Basin Plan for this location is discussed below in the local regulations subsection. This

Act would apply to the recharge wells because they would have the potential to affect water quality and beneficial uses in the Basin through injection of purified water. Thus, the Project would be required to comply with the Basin Plan water quality objectives established by the LARWQCB to protect the beneficial uses of the groundwater.

- **"Anti-degradation Policy."** In 1968, the SWRCB adopted an anti-degradation policy (policy) aimed at maintaining the high quality of waters in California through the issuance of Resolution No. 68-16 ("Statement of Policy with Respect to Maintaining High Quality Waters in California"). They apply to both surface waters and groundwaters (and thus groundwater replenishment projects), protect both existing and potential beneficial uses of surface water and groundwater, and are incorporated into Regional Water Quality Control Board (RWQCB) Water Quality Control Plans (e.g., Basin Plans).

  The policy requires that existing high water quality be maintained to the maximum extent possible, but allows lowering of water quality if the change is "consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated use of such water (including drinking), and will not result in water quality less than prescribed in policies." The policy also stipulates that any discharge to existing high quality waters will be required to "meet waste discharge requirements which will result in the best practicable treatment or control of the discharge to ensure that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

  The policy prohibits actions that tend to degrade the quality of surface and groundwater. The RWQCBs oversee this policy (SWRCB, 1968). The anti-degradation policy states that:

  - Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies.
  - Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters must meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

  SWRCB has interpreted Resolution No. 68-16 to incorporate the federal anti-degradation policy, which applies if a discharge that began after November 28, 1975 would lower existing surface and groundwater quality. This policy would apply to the treated water to be recharged into the Project wells because this element would be required to comply with the state resolution maintaining the existing water quality.

  One of the requirements for a recycled water project is that it must be compatible with State Board Resolution 68-16 and the Recycled Water Policy (see below, under the header 'Recycled Water Policy'). This can be evaluated on a project-specific localized

impacts basis or can be evaluated in terms of the utilization of basin-wide groundwater assimilative capacity. Utilization of more than 10% of basin-wide assimilative capacity for compliance with anti-degradation policy has typically required a Salt and Nutrient Management Plan for the basin or a similar level of evaluation (Brown and Caldwell, 2018).

- **Recycled Water Policy**. The Recycled Water Policy was adopted by the SWRCB in February 2009 and was subsequently amended in 2013 to include monitoring for CECs (discussed below) for groundwater replenishment projects. The Recycled Water Policy was a critical step in creating uniformity in how RWQCBs were individually interpreting and implementing the Anti-degradation Policy in Resolution 68-16 for water recycling projects, including groundwater replenishment projects such as the Project. The critical provisions in the Policy related to groundwater replenishment projects are discussed in the following subsections.
    - ***Constituents of Emerging Concern.*** As defined in the SWRCB Recycled Water Policy, CECs are chemicals in personal care products, pharmaceuticals including antibiotics, antimicrobials, agricultural and household chemicals, hormones, food additives, transformation products and inorganic constituents. These chemicals have been detected throughout the nation in trace amounts in surface water, wastewater, recycled water, and groundwater. The Recycled Water Policy includes monitoring requirements for six CECs for subsurface application groundwater replenishment projects using recycled water, four of which are used as health-based indicators and others serving as performance-based indicators. In addition to the Recycled Water Policy, the SWRCB regulations for groundwater replenishment projects with recycled water requires a project sponsor in the project's Engineering Report to recommend CECs for monitoring in the recycled water and potentially in the groundwater. For recharge projects using recycled water that has been treated using RO and an advanced oxidation process (AOP), the monitoring requirements in the Recycled Water Policy only apply to recycled water prior to and after RO/AOP treatment (i.e., no groundwater sampling). None of the CECs currently have regulatory limits. The Recycled Water Policy includes monitoring trigger levels (MTLs) for the four health-based CEC indicators and response actions to be taken by groundwater replenishment project sponsors based on monitoring results compared to the MTLs. The MTLs were based on Drinking Water Equivalent Levels. A Drinking Water Equivalent Level represents the amount of a CEC in drinking water that can be ingested daily over a lifetime without appreciable risk. The following CECs from the Recycled Water Policy are those with health-based indicators, treatment/performance-based indicators, or both as indicated below in parentheses.
        - 17-β-estradiol – steroid hormone (health-based indicator);
        - Caffeine – stimulant (health-based and performance-based indicator);
        - N-nitrosodimethylamine (NDMA) – disinfection byproduct (health-based and performance- based indicator) [Note: NDMA's current California Notification Level (NL) is 0.01µg/L];

- Triclosan – antimicrobial (health-based indicator); and
- N, N-diethyl-metatoluamide (DEET) – ingredient in personal care products (performance- based indicator); and Sucralose – food additive (performance-based indicator).

- ***Salt and Nutrient Management Plans.*** In recognition that some groundwater basins in the state contain salts and nutrients that exceed or threaten to exceed Basin Plan groundwater objectives, and that some Basin Plans do not have adequate implementation measures to achieve compliance, the Recycled Water Policy includes provisions for managing salts and nutrients on a regional or watershed basis through development of Salt and Nutrient Management Plans (SNMP) rather than imposing requirements on individual recycled water projects (which had been the practice prior to adoption of the Recycled Water Policy). SNMPs were to be developed for every groundwater basin/sub-basin with high salts and nutrients by May 2014 (May 2016 with a RWQCB-approved extension).
- ***Anti-degradation and Assimilative Capacity.*** Assimilative capacity is the ability for groundwater to receive contaminants without detrimental effects to human health or other beneficial uses. It is typically derived by comparing background ambient chemical concentrations in groundwater to the concentrations of the applicable Basin Plan groundwater quality objectives. The difference between the ambient concentration and groundwater quality objective is the available assimilative capacity. The Recycled Water Policy establishes two assimilative capacity thresholds in the absence of an adopted SNMP. A groundwater replenishment project that utilizes less than 10% of the available assimilative capacity in a groundwater basin/sub-basin (or multiple projects utilizing less than 20% of the available assimilative capacity in a groundwater basin/subbasin) are only required to conduct an anti-degradation analysis verifying the use of the assimilative capacity. In the event a project or multiple projects utilize more than the designated fraction of the assimilative capacity (e.g., 10% for a single project or 20% for multiple projects), the project proponent must conduct a RWQCB-deemed acceptable (and more elaborate) anti-degradation analysis.

  The RWQCB has the discretionary authority to allocate assimilative capacity to groundwater replenishment projects. There is a presumed assumption that allocations greater than the Recycled Water Policy thresholds would not be granted without concomitant mitigation or an amendment to the Basin Plan groundwater quality objective to create more assimilative capacity for allocation. Groundwater replenishment projects that utilize advanced treated recycled water will use very little to essentially none of the available assimilative capacity because of the high quality of the water. The Reverse Osmosis (RO) treatment component proposed for the PWIMP provides very high removal percentages for salts and nutrients, eliminating the need to utilize significant basin-wide assimilative capacities. Therefore, the PWIMP carries a low risk of adverse salt and nutrient impacts to groundwater.

- ***Regional Water Quality Control Board Groundwater Requirements.*** The Recycled Water Policy does not limit the authority of a RWQCB to impose more stringent requirements for groundwater replenishment projects to protect designated beneficial uses of groundwater, provided that any proposed limitations for the protection of public health may only be imposed following regular consultation with the California SWRCB DDW. The Recycled Water Policy also does not limit the authority of a RWQCB to impose additional requirements for a proposed groundwater replenishment project that has a substantial adverse effect on the fate and transport of a contaminant plume (for example those caused by industrial contamination or gas stations), or changes the geochemistry of an aquifer thereby causing the dissolution of naturally occurring constituents, such as arsenic, from the geologic formation into groundwater. These provisions require additional assessment of the impacts of a groundwater replenishment project on areas of contamination in a basin and/or if the quality of the water used for replenishment causes constituents, such as naturally occurring arsenic, to become mobile and impact groundwater.

- **Ocean Plan.** On November 16, 2000, the SWRCB adopted and revised a *Water Quality Control Plan for the Ocean Waters of California* (Ocean Plan). The revised plan was approved by the State of California Office of Administrative Law (OAL) on July 9, 2001, and approved by EPA on December 3, 2001. The revised plan contains water quality objectives for coastal waters of California meant to ensure the reasonable protection of beneficial uses and the prevention of nuisance. By complying with these water quality objectives, it is expected that receiving waters are protected for marine aquatic life (including shellfish), water contact recreation, and other human health issues.
- **Policies Related to Groundwater Sources of Drinking Water Policy.** The Sources of Drinking Water Policy (adopted as Resolution 88-63) designates the municipal and domestic supply (MUN) beneficial use for all surface waters and groundwater except for those waters: (1) with total dissolved solids exceeding 3,000 mg/L, (2) with contamination that cannot reasonably be treated for domestic use, (3) where there is insufficient water supply, (4) in systems designed for wastewater collection or conveying or holding agricultural drainage, or (5) regulated as a geothermal energy producing source. Resolution 88-63 addresses only designation of water as drinking water source; it does not establish objectives for constituents that threaten source waters designated as MUN.

RWQCB, Los Angeles Region (4) – Water Quality Control Plan. The Oxnard Plain and Pleasant Valley areas are located within the LARWQCB. The LARWQCB adopted a revised *Water Quality Control Plan for the Los Angeles Region: Basin Plan for Coastal Watersheds of Los Angeles and Ventura Counties* (Basin Plan) on June 13, 1994, and amended this plan on January 27, 1997 by LARWQCB Resolution No. 97-02. This updated and consolidated plan represents the master quality control planning document and regulations of the LARWQCB. The SWRCB and the OAL approved the revised Basin Plan on November 17, 1994, and February 23, 1995, respectively. On May 26, 2000, EPA approved the revised Basin Plan except for the implementation plan for potential municipal and domestic supply (MUN)-designated water bodies, which is not pertinent to this discharge.

The Basin Plan is designed to preserve and enhance water quality and protect the beneficial uses

of all regional waters. Specifically, the Basin Plan: (1) designates beneficial uses for surface and groundwaters, (2) sets beneficial uses for specific surface and groundwaters, (3) sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the anti-degradation policy of the state, and (4) describes implementation programs to protect all waters in the region. In addition, the Basin Plain incorporates (by reference) all applicable state and regional board plans and policies and other pertinent water quality policies and regulations.

The Los Angeles Region encompasses all coastal drainages flowing into the Pacific Ocean between Rincon Point (on the coast of western Ventura County) and the eastern Los Angles County line, as well as the drainages of five offshore islands. In addition, the region includes all coastal waters within 3 miles of the continental and island coastlines. For planning purposes, the Regional Board uses the classification system developed by the California Department of Water Resources, which divides surface waters into hydrologic units, areas, and subareas; and groundwaters into major groundwater basins. The proposed project is located within the Oxnard and Pleasant Valley Subareas of the Oxnard Plain Area of the Santa Clara-Calleguas Hydrologic Unit of the Basin Plan.

Beneficial Uses form the cornerstone of water quality protection under the Basin Plan. Once Beneficial Uses are designated, appropriate water quality objectives can be established that maintain or enhance water quality; and programs can be implemented to ensure the protection of beneficial uses. The designated beneficial uses, together with water quality objectives, form water quality standards mandated under the California Water Code and the CWA. Beneficial uses and water quality objectives are specified for the following water bodies: inland surface waters (rivers, streams, lakes, and inland wetlands); groundwater; wetlands (freshwater, estuarine and saltwater marshes); swamps, mudflats, and riparian areas; and coastal waters (bays, estuaries, lagoons, harbors, beaches, and ocean water).

The Basin Plan provides an implementation plan for enhancing or maintaining water quality. This plan includes WDRs, Water Reclamation Requirements (WRRs), and the NPDES Program as described below. Effluent limits for ocean discharges are based the statewide Water Quality Control Plans that are made part of the Basin Plans, which include the Ocean Plan described above. In addition, as described below, TMDLs are currently being developed but have not yet been finalized for the Santa Clara and Calleguas Creek watersheds, which are listed as being impaired. Once finalized, these TMDLs will be incorporated into the Basin Plan as an amendment and will include implementation provisions.

- **Waste Discharge Requirements.** All wastewater discharges in the region, whether to surface or groundwaters, are subject to the California Water Code (Section 13263) and will require WDRs to be issued by the RWQCB. All reuses of treated wastewaters are subject to WRRs as described below. In addition, WDRs for discharges to surface waters also serve as NPDES permits because EPA has delegated responsibility of implementing this program to the state and regional boards. It is illegal to discharge wastes of any waters of the state and to reuse treated wastewaters without obtaining appropriate WDRs, WRRs, or NPDES permits. Any facility or person who discharges, or proposes to discharge, wastes or makes a material change to the character, location, or volume of waste discharges to waters in the region must describe the quality and nature of the proposed discharge in a report of waste discharge (ROWD) or an NPDES application. Upon review of the ROWD or NPDES application and

all other pertinent information (including comments received at a public hears), the regional board will consider the issuance of requirements that incorporate appropriate measures and limitations to protect the public health and water quality. The basis components of the requirements include:

  - Discharge limitations (including, if required, effluent and receiving water limits) Standard requirements and provisions outlining the dischargers general discharge requirements and monitoring and report responsibilities
  - A monitoring program in which the discharger is required to collocate and analyze samples and submit monitoring reports to the regional board on a prescribed schedule.
  - Dischargers are categorized according to their threat to water quality and operational complexity. In addition, discharges to surface waters are categorized as major or minor discharges. NPDES permits are adopted for a 5-year period.

- **Reclamation Requirements.** Projects that reuse treated wastewater and thereby lessen the demand for higher quality fresh waters are subject to WRRs, which are used to regulate groundwater recharge with treated wastewaters in lieu of WDRs. Title 22, California Code of Regulations, Division 4, Chapter 3 describes the applicable reclamation criteria. Requirements from the California DHS are incorporated into WRRs. The state and regional boards recognize the shortage of fresh water in the region and the need to conserve water for beneficial uses. Accordingly, reclaimed wastewaters are considered to be an increasingly important local resource. The RWQCB supports reclamation projects (i.e., those projects that reuse treated wastewaters, thereby offsetting the use of fresh waters) through the WRRs program. Under this program, treated wastewaters are reused for groundwater recharge, recreational impoundments, industrial processing and supply, and landscape irrigation.
- **National Pollution Discharge Elimination System Program.** The CWA authorizes EPA to regulate point source pollutants to the waters of the United States under the NDPES permitting program. California became a "delegated state" for issuing NDES Permits in 1974. As noted above, the state issues NPDES permits as WDRs in accordance with a Memorandum of Agreement (MOA) between EPA and the state board, and as codified in the California Water Code. A standard NPDES permit generally includes the following components: findings, effluent limitations, receiving water limitations, provisions, compliance/task schedules, pretreatment requirements, sludge requirements, and a monitoring program.
- **General WDRs and NPDES Permit for Discharges of Groundwater.** The Basin Plan allows discharges, in some cases, to be regulated under general requirements, which simplifies the permit process for certain types of discharges. These general requirements are issued administratively after an NPDES application has been filed and it has been determined that the discharge meets the conditions specified in the general requirements. A General WDR and NPDES Permit is available for construction dewatering and well test waters, which would be covered by the General NPDES Permit and WDRs for Groundwater Discharges from Construction and Project Dewatering to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties.
- **General NPDES Permit for Discharges of Stormwater.** The Basin Plan requires a statewide general NPDES stormwater permit for all construction projects impacting 5 acres

or more, or smaller areas that are part of a larger common plan, including excavation, demolition, grading, and clearing. For construction activities, landowners are required to develop and implement an SWPPP and assess the effectiveness of their pollution prevention measures (control practices). The NPDES permit establishes requirements for the Notice of Intent (NOI) and the schedule for submittal and compliance. In addition, as described above for the Clean Water Act under Federal Standards, the State of California is currently in the process of developing TMDLs for waters that have been listed as being impaired pursuant to Section 303(d) of the CWA. TMDLs are to be established at the level necessary to implement the applicable water quality standards, which require that all sources of pollution and all aspects of a watershed drainage system be reviewed. Section 303(d), 303(e), and their implementing regulations of the CWA, require that approved TMDLs be incorporated into water quality control plans. EPA has established regulations (40 CFR 122) requiring that NPDES permits be revised to be consistent with any approved TMDL. Federal regulation requires that implementation plans be developed along with the TMDLs. The SWRCB has interpreted state law (Porter-Cologne Water Quality Control Act) to require that implementation be addressed when TMDLs are incorporated into Basin Plans (water quality control plans). TMDLs developed by RWQCBs are to be designed as Basin Plan amendments and will include implementation provisions. TMDLs are in development but have not yet been finalized for the Santa Clara and Calleguas Creek watersheds, are listed as being impaired.

RWQCB, Los Angeles Region (4) – Section 401 Certification. Section 401 of the CWA grants each state the right to ensure that the interests of the state are protected on any federally permitted activity occurring in or adjacent to Waters of the State. In California, the RWQCB are the agencies mandated to ensure protection of the waters of the state. Anyone proposing to conduct a project that requires a federal permit or involves dredge or fill activities that may result in a discharge to U.S. surface waters and/or "Waters of the State" are required to obtain a CWA Section 401 Water Quality Certification and/or Waste Discharge Requirements (Dredge/Fill Projects) from the LARWQCB, verifying that the project activities will comply with state water quality standards. The most common federal permit for dredge and fill activities is a CWA Section 404 permit issued by the U.S. Army Corps of Engineers (USACE).

Sustainable Groundwater Management Act. The Sustainable Groundwater Management Act (SGMA) was signed into California State law by Governor Jerry Brown on September 16, 2014 and became effective January 1, 2015. SGMA gives local agencies the authority to customize groundwater sustainability plans to their regional economic and environmental needs and manage groundwater in a sustainable manner to protect groundwater resources. SGMA provides a definition of sustainable groundwater management and has established a framework for local agencies to develop plans and implement sustainable management strategies to manage groundwater resources, prioritizes basins (ranked as high- and medium-priority) with the greatest problems (i.e., the undesirable results as discussed below), and sets a 20-year timeline for implementation.

The DWR and the SWRCB are the lead state agencies responsible for developing regulations and reporting requirements necessary to carry out SGMA. DWR sets basin prioritization, basin boundaries, and develops regulations for groundwater sustainability plans. The SWRCB is responsible for fee schedules, data reporting, probationary designations and interim sustainability plans (DWR, 2016).

SGMA requires the creation of a Groundwater Sustainability Agency for medium- and high-priority groundwater basins in accordance with Water Code §10723 et seq. Each Groundwater Sustainability Agency is to develop and implement a Groundwater Sustainability Plan (GSP) in accordance with Water Code §10727 et seq. The GSP would describe how users of groundwater within the Basin would manage and use groundwater in a manner that can be sustainably maintained during the planning and implementation horizon without causing undesirable results. SGMA defines undesirable results as follows:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply;
- Significant and unreasonable reduction of groundwater storage;
- Significant and unreasonable seawater intrusion;
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies;
- Significant and unreasonable land subsidence that substantially interferes with surface land uses; and
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

The PWIMP would affect groundwater management in the Basin because it would be replenishing the aquifers with purified water and altering pumping distribution among the City's groundwater supply wells. As one of the objectives of the PWIMP is to replenish groundwater and raise groundwater levels, the PWIMP may have a positive contribution to the sustainable management of groundwater.

Department of Drinking Water, Domestic Water Supply System for Potable Use. California's drinking water program was originally created in 1915, when the California State Board of Health established the Bureau of Sanitary Engineering. In 1976, two years after the Safe Drinking Water Act was passed, California adopted its own safe drinking water act (contained in the Health and Safety Code) and adopted implementing regulations (contained in Title 22 California Code of Regulation). The state's act had two main goals: (1) to continue the state's drinking water program, and (2) to be the delegated authority (referred to as the "primacy") by the EPA for enforcement of the federal Safe Drinking Water Act. As required by the federal act, California's program must set drinking water standards that are at least as stringent as the EPA's standards. In addition, each community water system must monitor for a specified list of contaminants, and the findings must be reported to the state.

The DDW regulates public water systems, oversees water recycling projects, permits water treatment devices, supports and promotes water system security, and performs a number of other functions. DDW has adopted enforceable primary and secondary maximum contaminant levels (MCLs). The MCLs are either based on the federal MCLs or as part of DDW's own regulatory process. For example, California has an MCL for perchlorate while there is no federal MCL. The MCLs account for not only chemicals' health risks, but also factors such as their detectability and treatability, as well as costs of treatment. Health and Safety Code Section 116365(a) requires a contaminant's MCL to be established at a level as close to its Public Health

Goal (PHG) as is technologically and economically feasible, placing primary emphasis on the protection of public health. The Office of Environmental Health Hazard Assessment (OEHHA) established PHGs.

They are concentrations of drinking water contaminants that pose no significant health risk if consumed for a lifetime, based on current risk assessment principles, practices, and methods. OEHHA establishes PHGs pursuant to Health and Safety Code Section 116365(c) for contaminants with MCLs, and for those for which MCLs will be adopted.

Public water systems use PHGs to provide information about drinking water contaminants in their annual Consumer Confidence Reports. Certain public water systems must provide a report to their customers about health risks from a contaminant that exceeds its PHG and about the cost of treatment to meet the PHG and hold a public hearing on the report. There are also a variety of chemicals of health concern whose occurrence is too infrequent in conventional drinking water sources to justify the establishment of national standards; these are addressed using advisory levels. The DDW, with the assistance of OEHHA, has established notification levels (NLs) and Response Levels for that purpose. If a chemical concentration is greater than its NL in drinking water, the utility that distributes the water must inform its customers and consumers about the presence of the chemical, and about health concerns associated with exposure to it. If a chemical is present in drinking water that is provided to consumers at concentrations greater than the Response Levels (10 to 100 times greater than the NL depending on the toxicological endpoint of the constituent), DDW recommends that the source be taken out of service.

Final Groundwater Replenishment with Recycled Water Regulations hereafter, referred to as "Groundwater Replenishment Regulations," went into effect June 18, 2014 (SWRCB, 2015). The overarching principles taken into consideration by DDW in developing the Groundwater Replenishment Regulations were:

- Groundwater replenishment projects are replenishing groundwater basins that are used as sources of drinking water

Control of pathogenic microorganisms should be based on a low tolerable risk that was defined as an annual risk of infection[1] from pathogen microorganisms in drinking water of one in 10,000 (10-4). This risk level is the same as that used for the federal Surface Water Treatment Rule for drinking water.

- Compliance with drinking water standards for regulated chemicals.
- Controls for unregulated chemicals.
- No degradation of an existing groundwater basin used as a drinking water source.
- Use of multiple barriers to protect water quality and human health.
- Projects should be designed to identify and respond to a treatment failure. A component of this design acknowledges that groundwater replenishment projects inherently will

[1] There is a difference between infection and disease. Infection, often the first step, occurs when a pathogen enters a body and begins to multiply. Disease occurs when the cells in the body are damaged as a result of the infection and signs and symptoms of an illness appear. Infection necessarily precedes disease, but infection typically only leads to disease in a fraction of cases. Many factors influence the infection-to-disease ratio.

include storage in a groundwater aquifer and include some natural treatment

The key provisions of the Groundwater Replenishment Regulations that apply to subsurface application (e.g., the use of injection or vadose zone wells) that use 100% recycled water for application are summarized in Table 4.9-1.

Table 4.9-1
Summary of Groundwater Replenishment Regulations

Control Mechanism	Requirements
Source Control	Entities that supply recycled water to a groundwater replenishment project must administer a comprehensive source control program to prevent undesirable chemicals from entering wastewater. The source control program must include: (1) an assessment of the fate of DDW and RWQCB- specified contaminants through the wastewater and recycled water treatment systems; (2) provisions for contaminant source investigations and contaminant monitoring that focus on DDW and RWQCB- specified contaminants; (3) an outreach program to industrial, commercial, and residential communities; and (4) an up-to-date inventory of contaminants.
Pathogen Control	To meet the low tolerable risk level (a basic principle of the regulations), pathogen reduction requirements have been established for treatment of recycled water similar to the approach used for drinking regulations. The Groundwater Replenishment Regulations require a project to achieve a 12- log enteric virus reduction, a 10-log *Giardia* cyst reduction, and a 10-log *Cryptosporidium* oocyst reduction using at least 3 treatment barriers. To ensure that a barrier is significant, each barrier must achieve at least 1.0-log reduction. No treatment process can be credited with more than a 6-log reduction. The log reductions must be verified using a procedure approved by DDW. Log reduction refers to the reduction of pathogenic microorganism concentrations on a log-scale (e.g., 3 logs is 99.9% removal). Failure to meet the specified reductions requires notification to DDW and RWQB, investigation, and/or discontinuation of recycled water use until a problem is corrected. Trussell et al. (2013) conducted an extensive review of the proposed pathogen reduction requirements in the Groundwater Replenishment Regulations and concluded that the assumptions used to derive the log reductions were conservative and provide a large factor of safety that likely reduces the actual risk of infection below the 10^{-4} level, particularly for control of the amount of a particular disease present in a community.
Nitrogen Control	To ensure protection of groundwater, the concentration of total nitrogen in recycled water must meet 10 mg/L before or after recharge. Failure to meet this value requires follow-up sampling, notification to DDW and RWQCB, and/or discontinuation of recycled water use until a problem is corrected.
Regulated Chemicals Control	The recycled water must meet drinking water MCLs as specified by the Groundwater Replenishment Regulations. Failure to meet MCLs requires follow-up sampling, notification to DDW and RWQCB, and/or discontinuation of recycled water use until the problem is corrected.
Unregulated Chemicals Control	Monitoring the concentrations and toxicities of thousands of potential organic compounds in any water supply would be an infeasible task. Control of unregulated chemicals for all groundwater replenishment projects using 100% recycled water is accomplished through criteria for full advanced treatment of the recycled water, limits for Total Organic Carbon (TOC) and performance of treatment for CECs. TOC is used as a surrogate for unregulated and unknown organic chemicals. For subsurface application projects (injection and vadose wells), the entire recycled water flow must be treated using RO and AOP. After treatment, the TOC in the recycled water cannot exceed an average of 0.5 mg/L. Specific performance criteria for RO and AOP processes have been included in the Groundwater Replenishment Regulations. Failure to meet the requirements

Table 4.9-1
Summary of Groundwater Replenishment Regulations

Control Mechanism	Requirements
	established for a groundwater replenishment project results in notifications to DDW and RWQCB, response actions, and in some cases cessation of the use of recycled water.
Response Retention Time (RRT)	The intent of the RRT is to provide time to retain recycled water underground to identify any treatment failure so that inadequately treated recycled water does not enter a potable water system. Sufficient time must elapse to allow for: a response that will protect the public from exposure to inadequately treated water; and provide an alternative source of water or remedial treatment at the wellhead if necessary. The RRT is the aggregate period of time between treatment verification samples or measurements; time to make the measurement or analyze the sample; time to evaluate the results; time to make a decision regarding the appropriate response; time to activate the response; and time for the response to work. The minimum RRT is 2 months but must be justified by the groundwater replenishment project sponsor.
Monitoring Program	Comprehensive monitoring programs are established for recycled water and groundwater for regulated and unregulated constituents.
Operation and Optimization Plan	The intent of the plan is to assure that the facilities are operated to achieve compliance with the Groundwater Replenishment Regulations, to achieve optimal reduction of contaminants, and to identify how the project will be operated and monitored.
Boundaries Restricting Locations of Drinking Water Wells	Project sponsors must establish a "zone of controlled well construction," which represents the greatest of the horizontal and vertical distances reflecting the underground retention times required for pathogen control or for the RRT. Drinking water wells cannot be located in this zone. Project sponsors must also create a "secondary boundary" representing a zone of potential controlled well construction that may be beyond the zone of controlled well construction, thereby requiring additional study before a drinking water well is drilled.
Adequate Managerial and Technical Capability	A project sponsor must demonstrate that it possess adequate managerial and technical capability to comply with the regulations.
Engineering Report	The project sponsor must submit an Engineering Report to DDW and RWQCB that indicates how a groundwater replenishment project will comply with all regulations and includes a contingency plan to insure that no untreated or inadequately treated water will be used. The report must be approved by DDW.
Reporting	Annual reports must be submitted to DDW, RWQCB, and groundwater providers downgradient of injection wells; the Engineering Report must be updated every 5 years.
Alternatives	Alternatives to any of the provisions are allowed if: the project sponsor demonstrates that the alternative provides the same level of public health protection; the alternative has been approved by DDW; and an expert panel has reviewed the alternative unless otherwise specified by DDW.
Public Hearing	The project sponsor must hold a public hearing for a groundwater replenishment project after DDW approves the Engineering Report; based on the Engineering Report, the hearing, and public comments, DDW issues a conditional approval letter to the RWQCB for inclusion in the Waste Discharge Requirements and/or Water Reclamation Requirements issued by the RWQCB. Thus, including the hearing for the RWQCB permit, there are two public hearings for a groundwater replenishment project. Should DDW obtain primacy for issuing groundwater replenishment permits, the RWQCB would provide recommendations and conditions for inclusion in the Waste Discharge Requirements and/or Water Reclamation Requirements and the SWRCB would hold the permit hearing.

Statewide NPDES General Permit for Drinking Water System Discharges. Since February 2016, the District has coverage under the Statewide National Pollutant Discharge Elimination System (NPDES) Permit for Drinking Water System Discharges to Waters of the United States (WQ 2014-0194-DWQ General Order No. CAG140001). The SWRCB is responsible for issuance of NPDES permits for discharges from drinking water systems with 1,000 connections or greater that are regulated by the State Board Division of Drinking Water or a local county department of public health. The Order provides regulatory coverage for short-term or seasonal planned and emergency (unplanned) discharges resulting from a water purveyor's essential operations and maintenance activities undertaken to comply with the federal Safe Drinking Water Act, the California Health and Safety Code, and the State Water Board's Division of Drinking Water permitting requirements for providing reliable delivery of safe drinking water. Such discharges include, but are not limited to, discharges from supply wells, transmission systems, water treatment facilities, water distribution systems, and storage facilities. Planned and emergency discharges are required to be regulated by an NPDES permit if the discharges flow into a water of the U.S. Discharges authorized under the Order are determined to not adversely affect or impact beneficial uses of the receiving waters when properly managed through BMPs. For the purposes of the groundwater resources analysis, the NPDES Statewide General permit applies to planned discharges of groundwater during the drilling, construction, and development of groundwater monitoring and/or recharge wells.

Water Well Standards. Under California Water Code Section 231, enacted in 1949, DWR is responsible for developing standards for the protection of well water quality. Authority for enforcing the standards as they apply to the construction, destruction, and modification of water wells rests with the Santa Cruz County Environmental Health Services. The California Water Code requires contractors that construct or destruct water wells to have a C-57 Water Well Contractor's License, follow DWR well standards, and file a completion report with DWR (Water Code Sections 13750.5 et seq.). The City would obtain the appropriate permits for installation of any new water supply wells and abandonment and destruction of any wells.

Well Completion Reports. DWR is responsible for maintaining a file of well completion reports (DWR Form 188), which must be submitted whenever a driller works on a water well. Well completion reports must be filed with DWR within 60 days from the date of the work. Well completion reports may be used by public agencies conducting groundwater studies, provided that the information is kept confidential and is used only for the purpose of conducting the study (Water Code Sections 13751 and 13752).

Groundwater Rights. In California, water rights involve the right to use water, not the right to own water. While the Water Code implies the existence of groundwater rights, their doctrinal bases and characteristics are essentially the product of the decisions of the courts. There are three types of groundwater rights:

- ***Overlying Rights.*** Subject to certain limitations, property owners above a common aquifer possess a right to the reasonable and beneficial use of a groundwater resource on their own lands overlying the aquifer from which the water is taken. Overlying rights are correlative (related to each other) and overlying users of a common water source are allowed to share the resource on a pro rata basis in times of shortage.
- ***Appropriative Rights.*** Non-overlying uses and public uses, such as municipal uses, are called appropriative uses. Among groundwater appropriators, the "first in time, first in

right" priority system applies. Appropriative users are entitled to use the surplus water available after the overlying user's rights are satisfied.

- ***Prescriptive Rights.*** Prescriptive rights are gained by trespass or unauthorized taking that can yield a title because it was allowed to continue longer than the five-year statute of limitations. Claim of a prescriptive water right to non-surplus water by an appropriator must be supported by many specific conditions, including a showing that the pumpage occurred in an open manner, was continuous and uninterrupted for five years, and was under a claim of right. From a water law standpoint, the City possesses appropriate water rights and as a public agency, it has the right to store recharge and to recapture water in the Groundwater Basin can be summarized by the following general rules:
    - The City has the right to recapture water that has been added to the groundwater supply as a result of recharge;
    - The City has the right to prevent other groundwater producers from extracting the replenished supply, although this could require litigation, and in some cases, adjudication of all rights to the groundwater basin may be necessary to determine rights to the total supply; and
    - The underground storage and recovery of the groundwater basin cannot substantially interfere with the basin's native or natural groundwater supply.

- ***Material Injury.*** Groundwater case law has generally adopted the threshold that "…material injury… turns on the existence of an appreciable diminution in the quantity or quality of water…" A reasonable definition of "appreciable" in the context of this EIR is if the project would render a nearby well incapable of meeting its:
    - Historically measured maximum daily production level;
    - Historically measured dry-season production levels; or
    - Historically measured annual production levels under drought conditions.

3.9.2.3 Local Regulations

California Government Code Section 53091 (d) and (e) provides that facilities for the production, generation, storage, treatment, or transmission of water supplies are exempt from local (i.e. city and county) building and zoning ordinances. Some of the proposed facilities evaluated in this EIR relate to the production, generation, treatment, and transmission of water and are, therefore, legally exempt from local building and zoning ordinances. However, they would not be exempt from the requirements of Local Coastal Programs, if applicable. With that said, the relevant local regulations related to the PWIMP are discussed below.

Coastal Zone Management Act Federal Consistency Review. The federal consistency requirement set forth in Section 307 of the Coastal Zone Management Act (CZMA) requires that activities approved or funded by the federal government (e.g., the federally-funded California Clean Water State Revolving Fund Program) that affect any land or water use or natural resource of a state's coastal zone, must be consistent with the enforceable policies of the state's federally approved coastal management program.

California's federally approved coastal management program consists of the California Coastal Act, the McAteer-Petris Act, and the Suisun Marsh Protection Act. The California Coastal Commission implements the California Coastal Act and the federal consistency provisions of the

CZMA for activities affecting coastal resources outside of San Francisco Bay. Subparts D and F of the federal consistency regulations govern consistency review for activities involving a federal permit and federal funding, respectively. These sections generally require the applicant to provide the subject state agency (e.g., the Coastal Commission) with a brief assessment of potential coastal resources impact and project conformity with the enforceable policies of the management program.

The Coastal Commission considers an application for a coastal development permit to satisfy the Subpart D and F conformity assessment requirements. Typically, the Coastal Commission will provide its response (concurrence, conditional concurrence, or objection) in its staff report for the coastal development permit. In cases where the coastal development permit is issued by a local government with a certified local coastal program (LCP), the Coastal Commission will typically provide its response in a letter, following the permit issuance and the completion of any appeals process.

California Coastal Act. The California Coastal Act (Public Resources Code Section 30000 et seq.) provides for the long- term management of lands within California's coastal zone boundary. The Coastal Act includes specific policies for management of natural resources and public access within the coastal zone. Of primary relevance to groundwater hydrology and water quality are Coastal Act policies concerning protection of the biological productivity and quality of coastal waters. For example, Article 4 of the Act details policies related to the marine environment, such as biological productivity and water quality. Specifically, and relevant to groundwater hydrology and water quality, the Act requires the quality of coastal waters, streams, wetlands, estuaries appropriate to maintain optimum populations of marine organisms and for the protection of human health, to be maintained and, where feasible, restored through, among other means, preventing depletion of groundwater supplies (Cal. Pub. Res. Code §§ 30231).

Fox Canyon Groundwater Management Agency. The FCGMA was created in 1982 to preserve groundwater resources for water users in all areas overlying the Fox Canyon aquifer zone and has jurisdiction over all of the land that overlies the Fox Canyon Aquifer, which encompasses approximately 185 square miles. The Oxnard Plain and Pleasant Valley are included in this area. The FCGMA manages groundwater resources through ordinances and does not own any capital facilities. The first, Ordinance No 1, was adopted in 1983 and required that all well owners with extraction facilities within register their wells with the FCGMA, report annual extractions, and pay an annual groundwater extraction charge. The most significant, Ordinance No 5, addresses groundwater overdraft by requiring reductions in groundwater extractions via scheduled 5 percent reductions beginning in 1990 every 5 years that total 25 percent with the objective of reducing extractions to a "safe yield" level. Ordinance No. 8 (the "Ordinance Code"), adopted in 2002, combines the previous active ordinances (1.3, 3.2, 4.3, and 5.9) to reduce confusion, eliminate redundant text, and to shorten the laws into a more manageable format.

Applicable Ordinance No. 8 is reviewed once every 5 years and, if necessary, amended to ensure that the goals of the FCGMA are met. Ordinance No. 8 covers the following items:

- Registration of wells, reporting extraction, and levying of charges
- Installation and use of metering equipment for groundwater extraction facilities
- Protection of the South, East, and West Las Posas Basins
- Reduction of groundwater extractions to eliminate overdraft of the aquifer system

The following provisions of Ordinance No. 8 will be utilized in implementation of the PWIMP.

- Section 5.3, Adjustments to Extraction Allocations, recognizes that adjustments to "extraction allocation" may be necessary to provide some flexibility while still maintaining the goal of reaching a safe yield condition. The PWIMP will utilize Section 5.3.2.4, Transfer of Allocation, to transfer groundwater that is not pumped, in lieu of recycled water deliveries to agricultural users, to the City and/or UWCD for groundwater extraction for potable supplies. A request for transfer of allocation is required to be submitted jointly by the parties involved, including specific details of the requested transfer. If approved, the adjustment of allocation is effective for the remainder of the calendar year and for all subsequent calendar years until modification by a subsequent FCGMA-approved adjustment.
- Section 5.7, Credits, allows operators to obtain credits that are not considered as extraction allocations or adjustments to extraction allocations. Credits are to be accounted for through the normal reporting and accounting procedure and are carried forward from year to year. Upon request, the FCGMA Board may transfer credits provided there is a net benefit to the aquifer within the FCGMA. The PWIMP will utilize Section 5.7.1.2, Storage Credits, to obtain storage credits for "foreign water" injected or spread and percolated in a FCGMA Board-approved injection/storage facility. The FCGMA will determine the amount of storage credits based upon documentation of expected losses provided by the operator seeking the storage credit. A written application for approval of an injection/storage facilities is required that provides the details of the requested injection/storage program. If approved, an operator will obtain credits as determined by the FCGMA.

County Well Permit. Ventura County Well Ordinance No. 4814 requires that a permit application be filed with the Ventura County Water Resources Division. This ordinance states that the well construction standards of the County are those as listed in the State of California's Department of Water Resources Bulletin No. 74-9, Chapter IV, entitled "Water Well Standards - Ventura County" and Bulletin No. 74-81, Bulletin No. 74-90, Chapter II, entitled "Water Well Standards – State of California." A detailed well log must be submitted to the Water Resources Department within 30 days upon completion of the monitoring wells.

County Watercourse Encroachment Permit. The Ventura County Public Work Agency, Flood Control Department, requires that a Watercourse Encroachment Permit be obtained prior to construction.

Countywide NPDES Municipal Stormwater Permit. Local stormwater permitting requirements by the Ventura County Public Work Agency, Flood Control Department, for construction are covered by the stormwater permitting requirements in the RWQCB Water Quality Control Plan for the Los Angeles Region (Basin Plan), which are described above. In addition, communities greater than 100,000 in population are required to apply for a municipal permit under the NPDES program. In Ventura County, the County and numerous co-permittees applied for a joint permit under this program; co-permittees included numerous cities throughout Ventura County, including Oxnard, Camarillo, and Ventura. The Countywide NPDES Municipal Stormwater Permit was adopted by the RWQCB in 2000, pursuant to Division 7 of the California Water Code. Board Order No. 00-108 represents the permit under NPDES for stormwater discharges and urban runoff within Ventura County.

The Order requires the Ventura County Flood Control District other co-permittees to implement the requirements of NPDES Permit No. CAS004002, including the Monitoring and Reporting Program, Ventura Countywide Stormwater Quality Urban Impact Mitigation Plan (SQUIMP), and Ventura Countywide Stormwater Quality Management Plan (SQMP).

The requirements include programs to ensure that best management practices (BMPs) and other stormwater quality protection measures are incorporated into grading and building permits, and that regulatory and site inspection programs are developed. Individual water quality protection measures, including BMPs, were developed at the County level; and the County and Cities become jointly responsible for ensuring compliance.

The Santa Clara River is the primary surface water feature in the City and the longest free-flowing river in Southern California. The river is also one of the few remaining rivers in the area that remains in a relatively natural state. The total river length is approximately 70 miles, extending from its headwaters at Mount Pinos to the Santa Clara River Estuary adjacent to McGrath State Beach.

The Oxnard Plain groundwater Hydrographic sub-unit includes the Oxnard and Pleasant Valley Hydrographic Sub areas, each of which receives natural recharge from a system of nine groundwater basins along the Santa Clara River Basin. The Oxnard Hydrographic Sub area is located in the southwest corner of the Santa Clara River Basin and consists of the Montalvo, Mound, and Oxnard Plain Basins.

The Oxnard Plain Basin is the most important to the City of Oxnard and is composed of two aquifer systems known as the Upper Aquifer System (UAS) and the Lower Aquifer System (LAS). The UAS consists of the Oxnard Aquifer, and the Mugu Aquifer. The LAS is comprised of the Hueneme, Fox Canyon, and Grimes Canyon Aquifers.

Due to its low land profile, the City of Oxnard became a member of the National Flood Insurance Program (NFIP). The City also adopted a Master Plan of Drainage and a Floodplain Management Ordinance (Chapter 35 of the Oxnard City Code) to protect its residents and businesses. The City of Oxnard falls within the Santa Clara River's 1,600 square mile watershed. Flooding in Oxnard caused by rainwater is most likely to occur in the winter months when Ventura County receives most of it precipitation. The majority of Oxnard's rain falls between late January and mid-March. On average, however, rainfall in the Oxnard area increases sharply in early November and does not decrease until mid/late-March. High winds or tides can cause seawater surges resulting in coastal flooding beyond the high tide line. Wave action can directly impact seaside homes and infrastructure. Indirectly, wave action can cause beach and bluff erosion resulting in damage to seaside homes and infrastructure.

Several dams are located at least 35 miles to the east and northeast of Oxnard within Ventura and Los Angeles counties. These include the Santa Felicia Dam at Lake Piru, the Castaic Lake Dam and the Pyramid Lake Dam. The major threat to Oxnard is upstream along the Santa Clara River corridor. Although the potential for a dam failure is considered low, should one or more of these dams fail, the entire city is located within the Dam Inundation Zone, also called Dam Failure Hazard Area. Damage to the city could be in the form of a wall of fast---moving water, mud, and debris. Residential and commercial buildings as well as critical facilities could be impacted by a dam failure.

The City of Oxnard is a participant with other local governments in the Ventura Countywide Stormwater Quality Management Plan. This is a comprehensive regional effort to implement federal and state requirements for reducing water pollution from uncontrolled stormwater runoff. This program defines the Best Management Practices applicable to management of stormwater runoff, and the prevention of dry weather runoff. It also establishes the design requirements for Low Impact Development to minimize the volume of stormwater discharge and pollutant levels that originate from newly developed areas.

Compliance with these principles by construction and land development projects that may affect stormwater quality in the City stormwater drainage system is a requirement of the National Pollutant Discharge Elimination System (NPDES) Permit No. CAS004002, issued by the California Regional Water Quality Control Board, Los Angeles Region in 2010.

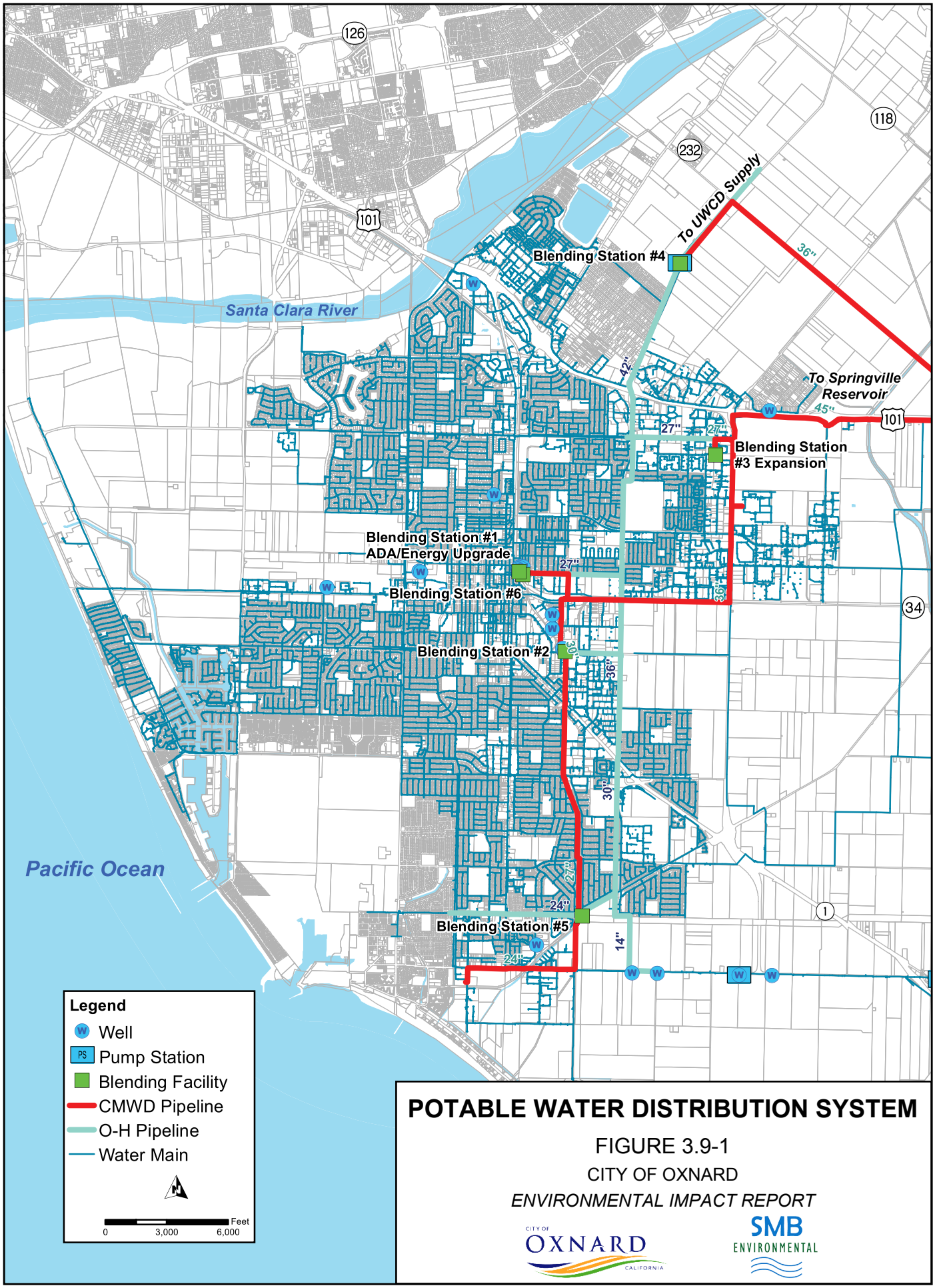
Discussions and background information related to Hydrology and Water Quality are found in two chapters of the 2030 General Plan EIR (Infrastructure and Community Services and Safety and Hazards). The first chapter addresses water quality issues that may be associated with wastewater treatment discharges or other discharges that may involve water pollution, including the management of stormwater discharges. The Safety and Hazards chapter addresses hydrology issues associated with flooding, affecting the 100-year flood plain, and potential development in these areas. For all of the issues within this topic, it was determined that the application of existing statutory and regulatory requirements and compliance with existing City and agency programs would address potential significant impacts.

3.9.3 Environmental Setting

As discussed in Chapter 2 – Project Description, the City owns and operates its own water supply, recycled water supply, wastewater collection and treatment, and stormwater facilities. Each is summarized below.

Existing Water Supply and Distribution Facilities. The City of Oxnard owns and operates its own municipal water supply system and is fortunate to have both local and imported water supplies available. The City's water supply sources consist of a blend of local groundwater produced through the City's own groundwater wells, local groundwater the City purchases from the United Water Conservation District (UWCD), imported surface water purchased from the Calleguas Municipal Water District (CMWD), and recycled water supplies from the City's Advanced Water Purification facility (APWF) from the Oxnard Wastewater Treatment Plant (OWTP) effluent. There are six (6) Blending Stations (BS) throughout the City. Figure 3.9-1 presents the City's water supply and distribution system.

Existing Wastewater Facilities. The City of Oxnard currently provides wastewater collection and treatment services through the Public Works Wastewater Division. The Oxnard Wastewater Treatment Plant (OWTP) services the cities of Oxnard and Port Hueneme, and the U.S. Navy Construction Battalion Station, the Point Mugu Naval Air Station, and some adjacent unincorporated areas. The City owns, operates, and maintains over 300 miles of sewer pipeline and 16 wastewater pumping stations as shown on Figure 3.9-2. Three additional pumping stations owned and operated by other entities also discharge to the City's system. The collection systems convey flow to the OWTP located at the southwest portion of the City. The collection system includes gravity sewers ranging from 6- to 48-inches in diameter. The majority



POTABLE WATER DISTRIBUTION SYSTEM

FIGURE 3.9-1

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

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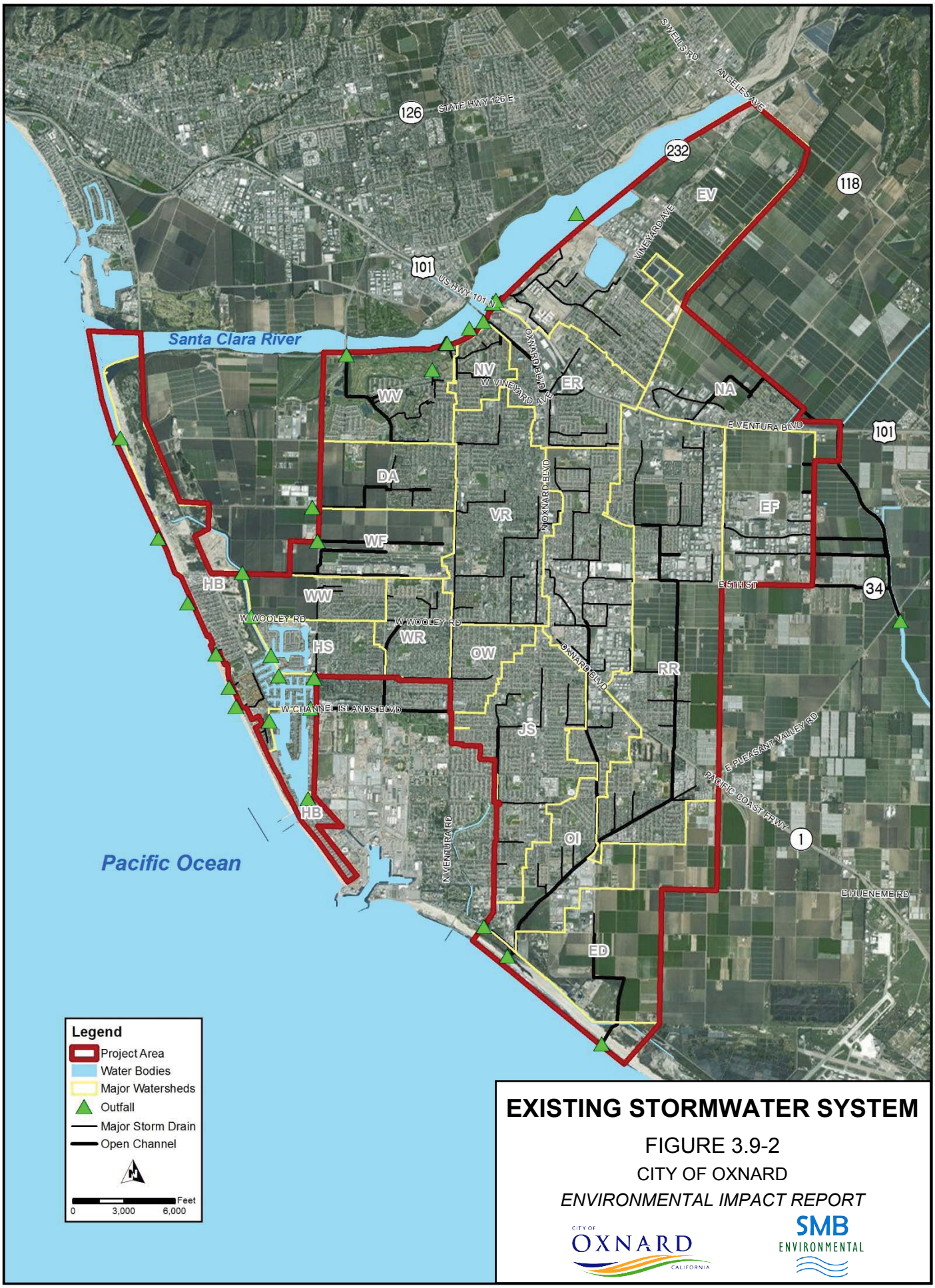


EXISTING STORMWATER SYSTEM

FIGURE 3.9-2

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

CITY OF OXNARD CALIFORNIA

SMB ENVIRONMENTAL

ox0917rf23-9587-CEQA(EIR-Fig2-21).ai

of flow in the system is conveyed to the treatment facility through the Ventura Road, Rose Avenue, Redwood, Western, Central, and Eastern trunk sewers.

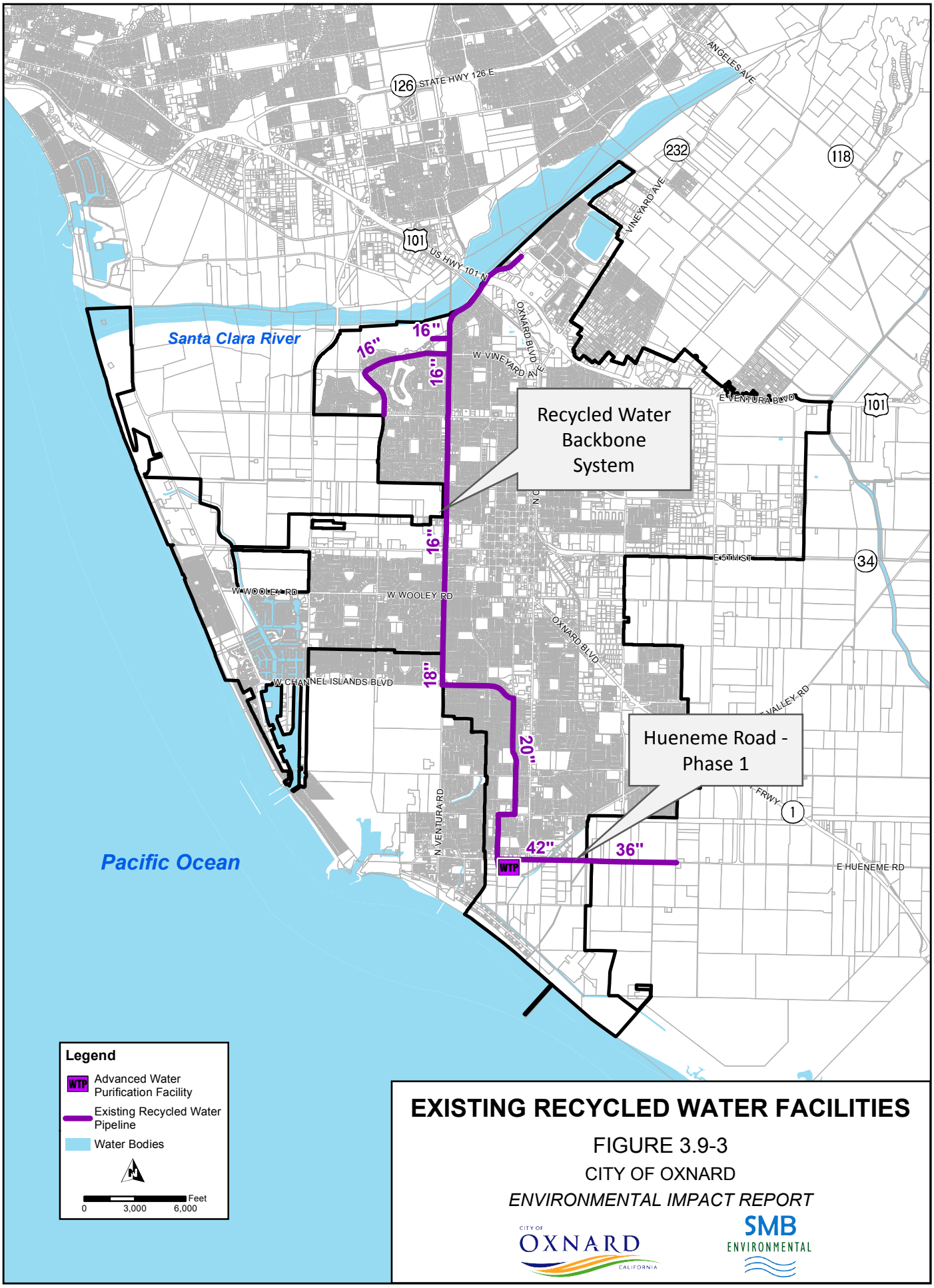
The OWTP has a current design capacity of 39.6 million gallons per day, Average Dry Weather Flow (ADWF) and 75.4 million gallons per day Peak Wet Weather Flow (PWWF). The OWTP has an ocean outfall pipe consisting of three sections. The first section, beginning at the effluent pumping station which consists of 868 feet of 48-inch diameter reinforced concrete pipe. This is followed by 1,600 feet of 30-inch diameter cast iron pipe. There is a 5,200- foot section of 48-inch diameter reinforced concrete pipe of which the terminal 1,016-foot portion is comprised of a diffuser section, designed for rapid dispersion of the effluent to meet ambient ocean water salinity conditions and not to have concentrations settle on the ocean floor. The final section of the pipe limits the actual capacity of the system to 50 million gallons per day and therefore the plant incorporates a flow equalization facility to limit maximum plant outfall capacity to an average of 50 MGD. There are presently some lines in the sewer collection system that is at capacity.

Existing Recycled Water System. Wastewater from the Oxnard Wastewater Treatment Plant (OWTP) provides secondary treated wastewater to the advanced water purification facility (AWPF) for recycled water treatment and distribution. Figure 3.9-3 provides an overview of the existing recycled water facilities. The existing 6.25 mgd facility was constructed to allow for modular expansion of the MF, RO, and UV/AOP treatment trains up to 25 mgd without adding ancillary equipment (i.e., cleaning and support systems). However, it is necessary to assess whether enough OWTP effluent exists to increase the AWPF's capacity. In general, the AWPF's capacity cannot be expanded beyond what the OWTP can supply. The City's AWPF is now in operation, producing high quality water for non-potable reuse. Detailed water quality and performance testing has been completed and is documented in Appendix D. In short, the City's advanced treated recycled water has shown consistent contaminant removal throughout the MF/RO/UVAOP process and meets all health goals, including Maximum Contaminant Levels (MCLs), secondary MCLs, and Notification Levels (NLs). In addition, Constituents of Emerging Concern (CEC) concentrations were either Non-Detect (ND) or below the recommended health levels according to literature sources.

Existing Stormwater Drainage Infrastructure. Oxnard's relatively flat topography has a major bearing on the drainage needs of the area. Elevations in the City range from sea level to 80 feet above sea level. The City is in Ventura County Watershed Protection District (VCWPD) Flood Zone 2. The drainage area includes the City and surrounding area that drains into the City. In addition to natural factors, the type and intensity of land use are significant factors affecting storm runoff. Open areas allow for percolation into soils and minimizes runoff. Developed areas have increased portions of impervious surfaces and generate increased surface runoff.

The City of Oxnard currently uses storm drain facilities maintained by the Public Works Department Operations Division and County of Ventura flood control channels to handle storm water runoff as shown on Figure 3.9-2, above. In addition, it is a common practice for agricultural operations to use private underground tile lines to drain perched water from shallow soil zones. These tile lines empty into city storm drains or natural drainage courses. Funding for storm drain maintenance is provided by the City's general fund.

The PWIMP planning boundary for the drainage area encompasses the urbanized core of the



EXISTING RECYCLED WATER FACILITIES

FIGURE 3.9-3

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

ox0917rf11-9587-CEQA(EIR-Fig2-9).ai

City and a portion of the area within the Sphere of Influence, a total of approximately 35 square miles. The plan divides the City into 17 watershed areas each approximately 500 acres or larger in size.

The drainage system of Oxnard discharges to the sea, either directly or indirectly via VCFCD facilities. The City is a co-permittee, along with nine other cities, Ventura County and the Watershed Protection District for the NPDES permit issued by the California Regional Water Quality Control Board. The City is required to comply with the Countywide Storm Water Quality Management Program and the Federal Clean Water Act that regulates discharge of pollutants into waters of the U.S.

The City has three existing flood planning policies. These policies are (1) a storm drain fund fee aimed at new development, (2) a requirement that all new development convey water generated by their project and all upstream water to the nearest adequate storm drain facility, and (3) drainage standards defining the appropriate hydrology method and roughness factors for use in all storm drainage conveyance system designs.

3.9.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.9.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on cultural and tribal resources would occur if the PWIMP would:

- Cause a violation of any adopted water quality standards or waste discharge or treatment requirements;
- Substantially deplete groundwater supplies or interfere with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted);
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in on- or off-site flooding or exceed the capacity of existing or planned stormwater drainage systems;
- Place new structures within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
- Impede or redirect flood flows such that it would increase on- or off-site flood potential;
- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; and/or
- Be exposed to a substantial risk related to inundation by seiche, tsunami, or mudflow.

3.9.4.2 Approach and Methodology

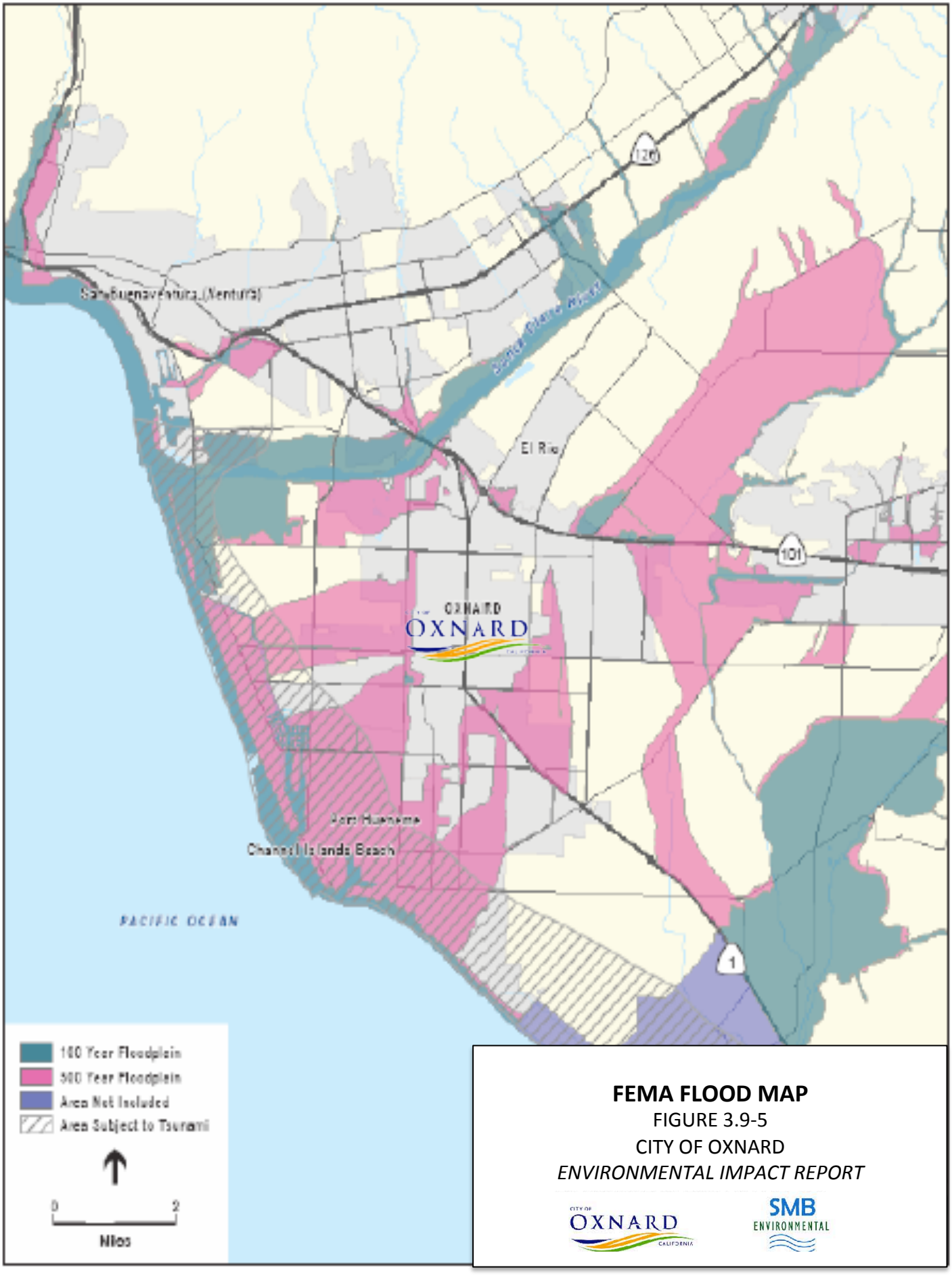
As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

According to the City's CEQA Guidelines, the key evaluation of potential water quality impacts will relate to how a project complies with applicable stormwater Best Management Practices (BMPs) and Low Impact Development (LID) principles. Guidance from the Countywide Stormwater Quality Management Program identifies measures and requirements that apply to different kinds of projects (Ventura County Stormwater Quality Management Program 2015). Applicable federal, state, and local standards will typically be described and information demonstrating compliance with standards will be provided.

Compliance with applicable National Pollutant Discharge Elimination System (NPDES) and associated local standards and requirements will normally suffice to reduce water quality impacts to below a level of significance.

Impacts to hydrological and storm drain systems will also consider NPDES and associated local requirements pertaining to limiting increases in surface runoff. Again, compliance with applicable requirements needs to be demonstrated. For smaller infill projects that would not substantially increase impervious surface area, citing of requirements may suffice. For larger projects involving substantial changes in surface runoff and the need for onsite detention/retention, a preliminary hydrological study will normally be needed in support of the CEQA document.

The potential for flooding may be evaluated with relevant FEMA FIRMs. In addition, Figure 3.9-4 shows the approximate extent of the 100-year flood level in the beach and coastal areas, and how that level may change with rising sea level. Projects within the 100-year flood zone typically require flood insurance unless a Letter of Map Revision (LOMR) is approved by FEMA.



FEMA FLOOD MAP

FIGURE 3.9-5

CITY OF OXNARD

ENVIRONMENTAL IMPACT REPORT

3.9.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts are discussed below.

Impact 3.9-1: Construction and operation of the PWIMP could cause a violation of any adopted water quality standards or waste discharge or treatment requirements. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction Impacts

Excavation, grading, and construction activities associated with the PWIMP facilities could violate water quality as those activities would expose and disturb soils, resulting in potential increases in erosion and siltation in the Project area. Construction during the rainy season could result in increases in erosion, station, and water quality issues. Generally, excavation, grading, paving, and other construction activities would expose disturbed and loosened soils to erosion by wind and runoff. Construction activities could therefore result in increased erosion and siltation, including nutrient loading and increasing the total suspended solids concentration. Erosion and siltation from construction have the potential to impact the creeks, drainage crossings, and the ocean, therefore posing a potentially significant impact to water quality. With the incorporation of the following mitigation, any potential impacts to water quality as a result of construction are reduced to less-than-significant levels.

Temporary Construction Mitigation Measures

Mitigation Measure 3.9-1a: Implement Construction Best Management Practices. To reduce potentially significant erosion and siltation, the City and/or its selected contractor(s) shall obtain a Stormwater Pollution Prevention Permit(s) (SWPPP) and implement Best Management Practices and erosion control measures as required by the Los Angeles RWQCB. Best Management Practices to reduce erosion and siltation shall include the following measures: Avoidance of construction activities during inclement weather; limitation of construction access routes and stabilization of access points; stabilization of cleared, excavated areas by providing vegetative buffer strips, providing plastic coverings, and applying ground base on areas to be paved; protection of adjacent properties by installing sediment barriers or filters, or vegetative buffer strips; stabilization and prevention of sediments from surface runoff from discharging into storm drain outlets; use of sediment controls and filtration to remove sediment from water generated by dewatering; and returning all drainage patterns to pre-existing conditions.

Significance after Mitigation: Less than Significant.

Long-Term Operational Impacts

The PWIMP would treat secondary effluent through advanced water purification processes and either inject it into the groundwater basin through IPR/ASR recharge wells for either: 1) indirect potable reuse (IPR); 2) provide it directly for non-potable reuse (NPR) (i.e. irrigation); and/or 3) eventually provide it directly for direct potable reuse (DPR). The potential for each of these options to violate any adopted water quality standards or waste discharge or treatment requirements are discussed below. In addition, the injection of water into the groundwater basin has the potential to cause leaching of soils and constituents within the soils. Further, the

expansion of the PWIMP's Reuse Program has the potential to affect the discharges to the ocean and potentially ocean water quality. Each of these are discussed below.

Indirect Potable Recharge

The operation of the PWIMP could involve the injection of up to approximately 18.75 mgd (i.e. 21,000 afy)[2] of treated wastewater into the groundwater basin through the proposed IPR/ASR wells. IPR/ASR wells have the potential to make a significant contribution to the City's water resources needs. However, a significant impact would occur if the injected purified water contained residual chemicals, pathogens, or other contaminants at high enough concentrations leading to degradation of the ambient groundwater quality and violation of groundwater quality standards.

The advanced water purification process removes chemical constituents, pathogens, and CECs from the source water. As further defined in the Regulatory Framework, above, CEC is a broad term that may include a wide range of trace level pollutants that are common to modern wastewater streams, such as; potential endocrine disrupting compounds, pharmaceutically active compounds, and personal care products. The DDW requires that potable reuse projects produce a high-quality water that meets state and federal potable water standards, removes pathogens using multiple barriers of treatment, utilizes RO for removal of total organic carbon and salts, is low in conventional disinfection byproducts (DPBs), and provides for an advanced oxidation process (AOP) that is capable of further reduction of trace level organic pollutants, should they pass through the RO process.

Further, recharging groundwater aquifers with purified water has been implemented successfully in California. For example, the Orange County Water District, currently purifies secondary effluent to near distilled water quality and recharges 100 million gallons per day into their groundwater basin. The State of California supports this type of potable reuse, repeatedly documenting the high-quality water and the protection of public health. Final regulations for groundwater recharge are adopted by the State through the DDW, as discussed in the Regulatory Framework, above, and these regulations are key to the impact assessment of the Project.

California regulations (see Regulatory Context, above) require a comprehensive monitoring program to ensure that the quality of the treated water remains high. The monitoring program requires the operator to test, on a quarterly basis, a minimum of two monitoring wells between the point(s) of recharge/injection and extraction for drinking water. In addition, other real time monitoring systems must be in place to identify failures in the system to avoid recharging the groundwater with non-purified water. Online sensor technology is available that provides water managers with the ability to control the treatment process in real time to ensure the process is working as intended. There are specific monitoring technologies for each process in the Project treatment sequence (MF/UF, RO, and UV-AOP). For example, in some systems, if the required UV dose is not provided for pathogen disinfection, the plant automatically shuts down. Facilities can be designed, engineered, and operated to limit opportunities for failure and ensure proper system operation.

The City's AWPF is now in operation, producing high quality water for non-potable reuse. Detailed water quality and performance testing has been completed and is documented in

[2] Based on the ultimate capacity of the APWF.

Appendix D. In short, the City's advanced treated recycled water has shown consistent contaminant removal throughout the MF/RO/UVAOP process and meets all health goals, including Maximum Contaminant Levels (MCLs), secondary MCLs, and Notification Levels (NLs). In addition, Constituents of Emerging Concern (CEC) concentrations were either Non Detect (ND) or below the recommended health levels according to literature sources.

Based on the proposed water treatment sequence, recharge locations, and estimated residence time, the proposed PWIMP IDP/ASR wells would comply with state groundwater regulations and would adequately treat and remove the chemicals of concern and the CEC's present in the wastewater stream generated by the Oxnard WWTF. Advanced water purification processes would greatly reduce or eliminate the concentrations of trace CEC's or other chemicals of concern to far below limits considered safe for human consumption. As the injection of advanced treated wastewater would be adequately treated, the potential for degradation of the ambient potable groundwater would negligible and would not violate any adopted water quality standards or waste discharge or treatment requirements. This potential impact is considered less than significant.

Direct Non-Potable Reuse

The operation of the PWIMP could also include the application of up to approximately 18.75 mgd (i.e. 21,000 afy) of recycled water for irrigation or other non-potable purposes. The advanced purified water would provide the non-potable users with a much higher quality of water than tertiary treated water and thus this water would have no detection or much lower concentration of constituents of concern including total dissolved solids (TDS). As a result, this would be a beneficial impact over existing tertiary water supplies. Any other impacts would be considered less than significant.

Direct Potable Recharge

The operation of the PWIMP could also include the use of up to approximately 18.75 mgd (i.e. 21,000 afy) of advanced purified water being used for direct potable use. However, this has not yet been approved by the State of California and the DDW. Therefore, and until such time that DPR is approved in the State and for this particular PWIMP Project, the City will continue to use the advanced purified water for direct non-potable reuse and for indirect potable reuse, consistent with federal, state, and local requirements and prior approvals. As a result, any impacts are considered to be less than significant.

Soil Leaching

Managed active recharge of purified water into an aquifer can cause chemical reactions between the purified water and the aquifer material such that mineral dissolution[3], oxidation[4], and/or desorption[5] can occur. These processes can lead to the release of metals (from iron or manganese oxide minerals) or other inorganic constituents (sulfides through oxidation). Changes in water quality caused by these processes can lead to treatment operations issues and could potentially degrade groundwater quality of an aquifer.

Detailed geochemical characterization on the characteristics of aquifer sediments has not yet been

[3] Mineral dissolution is the process by which a rock or mineral completely dissolves in water.
[4] Oxidation refers to any chemical reaction in which a material gives up electrons, as when the material combines with oxygen. Burning is an example of rapid oxidation; rusting is an example of slow oxidation.
[5] Desorption refers to the process where a substance is released from or through a surface; the opposite of absorption.

performed. However, and based on a cursory review, there is potential for some regulated metals (arsenic, cadmium, nickel, and manganese) and other inorganic constituents (fluoride, sulfate) to be released to the aquifer through leaching due to the injection of purified water. If these constituents, especially the regulated metals, were to be released to the groundwater in the groundwater basin in concentrations that exceed California MCLs, it would be considered a significant impact. However, under SWRCB DDW regulations and the state Anti-Degradation Policy, the District would not be permitted to implement the Project and recharge the aquifer with purified water that could induce leaching of metals or other inorganic constituents to the groundwater.

It is possible that the treated water could need conditioning to minimize the potential for leaching of other constituents that may be susceptible to mobilization under low salinity and/or oxidized conditions. Therefore, proper conditioning to prevent geochemical mobilization in excess of MCLs would occur and the Project would conform to the Anti-degradation Policy. As part of this Project and in accordance with the SWRCB DDW regulations and the state Anti-Degradation Policy, adherence to which is mandatory for water recharge projects, the City would conduct the appropriate studies and testing to develop adequate post-treatment stabilization measures that would ensure chemical leaching does not occur to an extent that groundwater quality standards would be violated. Given that the City proposes post-treatment stabilization prior to injection of the purified water and would comply with California's water quality standards, this impact is considered less than significant.

Ocean Water Quality

The PWIMP's Reuse Program operational activities have the potential to affect ocean water quality in terms of the following:

- Change in Flows to Ocean Outfall from Recycled Water Reuse and IPR, NPR, and DPR
- Change in Concentrate Flows to Wastewater Treatment Plant Influent

The PWIMP would treat a portion of the effluent from the existing OWTP to meet regulatory standards for direct non-potable reuse (primarily irrigation) and IPR/DPR. The diversion of secondary effluent for tertiary and advanced water treatment prior to reuse would result in a reduction of flow to the ocean outfall. The magnitude of this reduction would vary seasonally. The recycled water and IPR/DPR reuse program involves the expansion of the existing 6.25 mgd AWPF by an additional 6.25 mgd to 12.5 mgd and then by another 6.25 mgd to a final capacity of 18.75 mgd. In short, this would reduce the flows to the ocean outfall by 12.5 mgd. This reduction, in and of itself, would be considered a less-than-significant impact to potentially a beneficial impact to the ocean receiving waters. Further, changes in discharges to the ocean via the City's existing ocean outfall would only be allowed in accordance with applicable standards and the City's existing Waste Discharge Requirements (WDR), and NPDES permit.

This potential benefit would also be offset (or reduced) by the expansion of the existing 7.5 mgd desalter plant by an additional 7.5 mgd for a total capacity of 15 mgd, which would increase the concentrate loads of salts going to the ocean. Specifically, the net effect would an approximate 15 to 20 percent reduction in flows going to the ocean and an approximate 10 to 15 percent increase in TDS in the ocean effluent. However, these relatively small changes are within the natural variability of the current discharge and are within the permitted outfall capacity. Further the City's existing outfall would not need to be expanded and the diffuser system would disperse

the concentrate and it would be come ambient to the ocean salinity, upon discharge. This would be considered a less-than-significant impact the ocean receiving waters. Further, any changes to the discharges to the ocean via the City's existing ocean outfall would only be allowed in accordance with applicable standards and the City's existing Waste Discharge Requirements (WDR), and NPDES permit. Because project discharges would fall within existing WDR requirements, this impact would be less than significant. Therefore, no mitigation measures would be required.

Significance: Less-than-Significant Impact.

Impact 3.9-2: Construction and operation of the PWIMP could substantially deplete groundwater supplies or interfere with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted). The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction Impacts

Construction the PWIMP facilities would not deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. Construction of most of the PWIMP facilities would be done primarily within existing roadways and existing disturbed areas. In addition, subsurface excavation would be limited to several feet below surface elevation and would not interfere with the groundwater basin(s) and/or groundwater supplies. The PWIMP involves the construction and operation of six (6) new groundwater wells and ten (10) new IPR/ASR wells.

A significant impact would occur if construction activity associated with the drilling, construction and development of the proposed recharge wells or monitoring wells were to permanently lower groundwater levels, hinder the ability of nearby District and non-District production wells to pump groundwater, or degrade local groundwater quality to such a degree that water supplies in neighboring wells is no longer useable.

Drilling deep, large diameter wells is a common occurrence and is conducted using proven, industry standard methods. Boreholes for proposed recharge wells and monitoring wells would be drilled by a truck-mounted drill rig using one of the standard drilling methods for large diameter deep wells; an example of this would be dual-wall, reverse-circulation rotary.[6] Some drilling projects require large volumes of water during well drilling to reduce friction in the drill casing and to help flush rock fragments and pulverized cuttings generated from drilling out of the borehole. For these operations, clean well drilling water is typically brought onto the site via support trucks or obtained from the municipal supply (e.g. temporary hook-up or hydrant). The water used during drilling is cycled

[6] Dual-wall, reverse-circulation rotary drilling uses a drilling rig with two rotary drives. One drive rotates the outer drilling casing into the subsurface with a hardened drive or cutting shoe, while the other drive rotates an inner drill pipe and cutting bit. In reverse circulation, air or water is pumped under pressure down between the outer drill casing and inner drill pipe, and air, water, and cuttings are returned to the surface in the inner drill pipe. Upon reaching the desired depth, the inner drill string is removed, and the well casing, filter pack, and surface seal is built inside the outer casing, allowing the well to be built while holding the native formation materials back from the borehole. Upon completion, the outer casing is withdrawn, leaving the finished well in place.

through the well boring, flushed or ejected out of the hole, contained on site to settle sediment, and then transported off-site. As drilling water is typically brought on site or is provided by a municipal water purveyor (in the case of the Project, the City), its use has a less-than-significant effect on groundwater resource sources.

After a monitoring or recharge well is constructed, it is developed. Well development is a standard procedure that is typically performed to maximize the well efficiency by removing fine-grained material that would clog the slots in the well screen and pore spaces of the gravel or sand filter pack and the surrounding aquifer formation. Clogging in the screen or filter pack would reduce the flow of water into the well. The procedure is conducted in general accordance with the American Society for Testing and Materials (ASTM) D5521-02: *Standard Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers.* The two steps in a well development program are mechanical development and pumping development.

Mechanical development can require three (3) to five (5) 24-hour days to complete and involves swabbing the inside of the screen and casing and airlifting or bailing out the water. A pump is used to pump and surge water through the well to remove remaining sediment from within the well. Mechanical development pumps can extract water at 200 gallons per minute (gpm) requiring up to 500,000 gallons of water. Monitoring well development uses compressed air and produces much less water (about 50,000 to 100,000 gallons). The pumping development continues until the well is free of sediment and the well water turbidity is low.

Pumping development can require one (1) to four (4) days depending on the depth and size of the well and the conditions of the aquifer formation material. The groundwater volumes extracted during development of a large production or recharge well could range between 500,000 to 1.5 million gallons, depending on the planned rate of extraction from the well; development of monitoring wells would require considerably less water because they are smaller wells.

Continued extraction of water causes the groundwater levels to decline in a circular pattern surrounding the well, forming what is referred to as a cone of depression. The development pumping would maintain the cone of depression until the development pumping ceases and levels recover as groundwater flows back into the aquifer materials.[7] The groundwater level drawdown created from well development is typically minimal and localized around the well due to the extraction rate (approximately 200 gpm over 6-10 days).

Well development is a temporary operation that could depress groundwater levels locally around the well for up to an estimated 24 to 48-hours. However, given the location of the proposed recharge and monitoring well sites, the short-term duration of the well development process is not anticipated or expected to form a cone of depression that would adversely impact the operation of nearby City or non-City, private production wells. Therefore, the changes in water levels caused by well-head development during the construction of the monitoring and recharge wells is considered less than significant.

Construction of the recharge and monitoring wells would require the use of drilling fluids in the drilling process, primarily to help keep the borehole from caving in during drilling. These fluids

[7] The cone of depression expands as pumping continues until the discharge from the well equals the recharge to the aquifer. When this equilibrium is reached, in what is referred to as the steady state conditions, the cone of depression ceases to expand.

are typically water-based and contain small amounts of inert additives. The chemicals in the fluids could degrade the groundwater quality in the aquifer and constitute a significant impact if not used properly and within the manufacturer's guideline and professional standards. Examples of the products currently used throughout the water well drilling industry include liquid polymer emulsion used to stabilize the borehole by preventing reactive shale and clay from swelling and sloughing, or a concentrated detergent containing non-corrosive, non-contaminating, and slowly biodegradable wetting agents, dispersants, and emulsifiers. Sometimes a mud mixture is used that contains the expansive clay bentonite. However, polymers are widely used because they are more easily removed from the well during development. Often surfactants and dispersants are also used during well development. These and all drilling fluids that are added during drilling and development are removed through the downhole fluid circulation and well development. As the fluids are typically confined to the interior part of the borehole or may migrate a minimal distance from the well boring, there is a low potential for significant quantities of residual drilling fluids to remain in the aquifer after the fluids are removed through drilling circulation and well development and thus would have negligible effect on groundwater. Therefore, degradation of groundwater quality during drilling operations is considered less than significant and no mitigation is required.

Significance: Less-than-Significant Impact.

Long-Term Operational Impacts

The PWIMP involves the construction and operation of six (6) new groundwater wells that would each have a 2,000 gpm capacity that could result in the extraction of up to approximately 2.9 mgd or approximately 19,350 afy of groundwater. As a result, these new groundwater wells could substantially deplete groundwater supplies or interfere with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. However, and in contrast, the PWIMP also involves the construction and operation of ten (10) new IPR/ASR wells and standby wells – each with 3 monitoring wells that could involve the injection of up to approximately 18.75 mgd (i.e. 21,000 afy) of advanced treated wastewater into the groundwater basin that could help offset those extractions from the new groundwater water supply wells. In addition, the use of recycled water in lieu of additional groundwater pumping would also help preserve groundwater supplies.

This impact analysis evaluates whether the pumping distribution and aquifer recharge of purified water would alter hydrogeologic conditions to the extent that unfavorable groundwater conditions would occur in the groundwater basin. For the purposes of this analysis, unfavorable groundwater conditions are those that result in an appreciable decrease in the quantity of available groundwater. In practice, this could result from the PWIMP Reuse Program conditions causing physical damage and a loss of yield in nearby wells by lowering static groundwater levels below the top of the well screen. As the PWIMP would recharge the groundwater basin through the use of the ten (10) IPR/ASR wells, unfavorable conditions could also be characterized as an increase in groundwater elevations that result in groundwater mounding (higher than normal groundwater elevations surrounding a recharge well, somewhat like a reversed cone of depression) that raises groundwater levels above the ground surface.

A significant environmental impact on groundwater resources would occur if the proposed pumping distribution and managed active recharge would cause permanently depressed groundwater levels, damaged or reduced yield in City and non-City wells or caused groundwater levels to increase to the ground surface. To date, the City has not performed any groundwater modeling to either prove or disprove the potential to adversely affect existing groundwater conditions. As a result, potentially significant impacts could occur. However, with the implementation of the following mitigation measure, any impacts would be considered less than significant.

Long-Term Operational Mitigation Measures

Mitigation Measure 3.9-2a: Prepare Groundwater/Hydrogeologic Plan and/or Monitoring/Modeling. The City shall, in conjunction with the requirements of SGMA and other local requirements, prepare an implementation plan for the groundwater that is extracted and recharged from this Project in the PWIMP planning area and including on the southern Oxnard Plain and Pleasant Valley areas. This plan will provide the details of how groundwater will be recovered and the best management practices that will be implemented, including, but not limited to:

- The City shall continue to contribute to the UWCD ongoing basin-wide groundwater monitoring program for the Oxnard Plain and Pleasant Valley areas program to assist with the collection of data that are necessary to monitor and evaluate the effects from groundwater that is extracted and recharged by the PWIMP facilities. It is assumed that the City will have full access to the UWCD groundwater monitoring database to assist the City with performing the routine annual evaluation described below.

- The City shall perform annual groundwater/hydrogeologic evaluations and prepare annual evaluation reports to document the groundwater/hydrogeologic conditions and effects from implementation of the PWIMP facilities including but not limited to surface and groundwater interactions, seawater intrusion, and water quality impacts such as turbidity, taste, odor, nutrients, and TDS. These reports will be submitted to UWCD, FCGMA, and other interested stakeholders involved with water resources management in the Oxnard Plain and Pleasant Valley areas.

- As necessary, the City shall adjust the groundwater that is extracted and/or recharged on the southern Oxnard Plain and Pleasant Valley areas to reduce potential significant impacts to groundwater resources. These adjustments, in part, will be based on comments received by UWCD, FCGMA, and other interested stakeholders involved with water resources management in the Oxnard Plain and Pleasant Valley areas.

Significance after Mitigation: Less than Significant.

Impact 3.9-3: Construction and operation of the PWIMP could substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in on- or off-site flooding or exceed the capacity of existing or planned stormwater drainage systems. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction and Long-Term Operational Impacts

The construction and/or operation of the PWIMP facilities would not result in any new significant impervious surfaces and would not create new areas of low permeability. The new and/or rehabilitated PWIMP facilities would be located primarily within existing developed areas and/or within existing roadways. The new and/or rehabilitated PWIMP facilities or areas would be returned to pre-construction conditions and would not increase the impervious surfaces and therefore would not create new areas of low permeability. In addition, the construction of the filtration upgrades would not create a new impervious layer that would significantly affect permeability. As a result, no significant additional runoff is expected to be generated by the construction and/or operation of the PWIMP. Therefore, PWIMP would not result in exceeding the capacity of existing or planned stormwater drainage systems. In fact, many of the stormwater improvements would actually help with stormwater drainage in the PWIMP planning area. Any impacts are considered to be less than significant to beneficial and no mitigation is necessary.

Significance Determination: Less-than-Significant to Beneficial Impacts.

Impact 3.9-4: Construction and/or Operation of the PWIMP could: 1) Place new structures within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map; 2) Impede or redirect flood flows such that it would increase on- or off-site flood potential; 3) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; and/or 4) Be exposed to a substantial risk related to inundation by seiche, tsunami, or mudflow. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction and Long-term Operational Impacts

As shown in Figure 3.9-4 above and other recent FEMA flood maps identify some areas within the PWIMP Planning Area as being within designated 100-year floodplains. These areas are primarily located along the Santa Clara River in the northern portion of the Planning Area and the flooding potential is largely due to a substandard levee along the western end of the Santa Clara River. The coastline is also designated as being located within a 100-year floodplain area. Development of the Project within or adjacent to these flood prone areas could expose project facilities to flooding hazards. However, most of these facilities are pipelines and conveyance facilities that once constructed would be in the 500-year flood zone, underground, and not be affected by flooding. Further, the stormwater improvements would also help drain the areas in the PWIMP Planning area in the event of storm and flooding events. In addition, the new above ground facilities would be required to be designed and developed to City and/or Ventura County design codes and regulations for flood control. As a result, any impacts associated with placing facilities within the 100-year flood zone(s) are considered to be less than significant.

In addition to flood hazards associated with 100-year flood zones, flood inundation resulting from dam failure due to a variety of factors is a potential hazard for the City. Failure of the Santa Felicia Dam at Lake Piru, Castaic Lake Dam, and Pyramid Lake Dam east and northeast of the Planning Area has the potential to inundate portions of the Planning Area. Inundation flooding would extend along the Santa Clara River and spread throughout the Planning Area. New

developments or improvements under the Project (located nearest the Santa Clara River) could be subject to flood hazards associated with failure of any one of these dams. However, it is assumed that all dams have been constructed to the specifications set forth by State and federal agencies.

Additionally, regular inspections are conducted to identify any weaknesses or problems with the dams that could cause structural damage or overtopping of the dam. Although dam failure can result in major catastrophes, the safeguards in place mentioned above reduce the threat of dam failure and it is considered low and any impacts are considered to be less than significant.

The generation of a tsunami or seiche resulting from a seismic event could potentially inundate portions of the Planning Area nearest the coast (see Figure 3.9-4). As identified in the figure, the City's projected tsunami impact area extends inland from the coastline approximately one mile. Additionally, the City's Channel Islands Harbor and Mandalay Bay could potentially be affected by seiches. Although there are no existing methods to predict the events (i.e., seismic events, etc.) that generate these types of natural hazards, there are several methods to minimize their impacts. These methods include: 1) avoidance of the tsunami hazard zone; or 2) rely on early detection of an arriving tsunami hazard and appropriately evacuate tsunami impact zones. These impacts are considered to be less than significant.

Significance Determination: Less-than-Significant Impact

3.9.5 Cumulative Effects

Construction and operation of the PWIMP has the potential to have potentially significant impacts to hydrology and water quality. However, with the identified mitigation measures above, any impacts, including cumulative impacts would be reduced to less-than-significant levels.

3.10 Land Use Planning

This section evaluates the potential land use planning impacts that would result from the proposed PWIMP.

3.10.1 Introduction

This evaluation of land use planning was based on information from the City of Oxnard's 2030 General Plan and the City's May 2017 *CEQA Guidelines*.

Key Terms and concepts include the following:

- ***Density (Net and Gross).*** Density is calculated by taking the number dwelling units in an area and dividing it by the acreage in the area. Gross density is calculated using the total acreage for the area. Net density is calculated by dividing units by the net acreage, generally, exclusive of roadways
- ***Floor Area Ratio (FAR).*** The ratio of gross floor area of structures on a particular parcel to the area of the parcel on which the structures are located.
- ***Gross Acreage.*** This term refers to the total area of a site.
- ***Gross Floor Area.*** The floor area actually occupied or used by a tenant or other user, including hallways, lobbies, utilities, and other common areas.
- ***Lot Coverage.*** This term refers to the amount of a lot that is allowed to be covered by the footprint of structures on that lot.
- ***Net Acreage.*** Net acreage is calculated by taking the gross acreage of a site and subtracting portions of the site dedicated to public improvements, such as streets.
- ***Planned Development (PD).*** Land use zoning which allows the adoption of a set of development standards that are specific to a particular project. PUD zones usually do not contain detailed development standards; those are established during the process of considering proposals and adopted upon project approval. Also known as a Planned Residential Group (PRD) or Planned Unit Development (PUD).
- ***Zoning.*** Zoning is the principal land use tool for implementing the general plan; it translates general plan land use recommendations and standards directly into enforceable regulations. A zoning ordinance divides a community into districts and specifies the land uses allowed and the development standards that apply for each district. Standards generally include minimum lot size, density, building height, lot coverage, and setbacks.

3.10.2 Regulatory Context

Land use planning is not subject to federal and state regulations, so this discussion only focuses on the local context. A brief overview of these regulations follows.

Zoning. The City of Oxnard Zoning Ordinance and Coastal Zoning Ordinance set forth the zoning regulations for the incorporated areas of the Planning Area. These ordinances regulate building height, land uses, setbacks, provisions of open space, density, and other factors related to development on individual properties. Under California State law, cities and counties have latitude in establishing zoning standards and procedures. The Oxnard Zoning Ordinance provides for a total of 39 districts.

General Plan 2030 and Zoning Consistency. In California, regulations contained within the zoning ordinance are required by law to be consistent with the policies established in the general plan (Government Code §658960). Consistency is achieved when each land use category has one or more corresponding zoning districts. While the 2030 General Plan provides general descriptions of permitted land uses and development intensities, the zoning ordinance must provide the specific regulations upon which property can be developed.

Other City, County, and Regional Plans and Policies. Intergovernmental relationships influence and affect the City of Oxnard. A brief summary of the impact of these agencies and their respective policies are described below.

- **Ventura County Local Agency Formation Commission.** Formed under provisions of State law, the Ventura County Local Agency Formation Commission (LAFCO) is charged with managing the implementation of State requirements and policies relating to boundary changes within the County. Boundary alterations include spheres of influence, incorporations, annexations, and reorganizations. As with all LAFCO's within the state, the organizations goals and objectives include: encouragement of the orderly formation and expansion of local government agencies; preservation of agricultural land resources; and discouragement of urban sprawl.
- **Ventura County Council of Governments (VCOG).** The Ventura County Council of Governments (VCOG) is a voluntary joint powers authority established to promote regional cooperation within the County. VCOG's goal is to facilitate cooperation on issues of mutual concern within the County or sub-region of the County. Services provided by the organization include: oversight of the Countywide Integrated Waste Management Plan (CIWMP); review of transportation and planning related regional governance models and documents; coordination with agencies and organization outside of Ventura County; provision of a forum for informal information exchange; and county-wide emergency management coordination.
- **Southern California Association of Governments (SCAG).** The Southern California Association of Governments (SCAG) serves as the designated Metropolitan Planning Organization (MPO) for the six-county area including Los Angeles, Orange, San Bernardino, Riverside, Ventura, and Imperial Counties. Mandated at the Federal level, SCAG is responsible for researching and preparing region-wide plans for transportation, growth management, hazardous waste management, and air quality.
- **Oxnard Harbor District.** As in independent special district, the Oxnard Harbor District operates the commercial activities of the Port of Hueneme. Created in 1937, the Harbor District is managed by a five-member Board of Harbor Commissioners elected at-large by the residents of the Harbor District. The boundary of the Harbor District includes the cities of Oxnard and Port Hueneme. The Harbor District is empowered

to acquire, construct, own, operate, control, and develop any project or activity necessary to accomplish its mission and goals for operation of the harbor. With the exception of the Port of Hueneme, land use decisions remain the responsibility of the jurisdiction within which the property is located. However, activities occurring in the Port of Hueneme can dramatically impact surrounding land uses. As such, cooperation between the City of Oxnard and the Harbor District is necessary to ensure all impacts are considered.

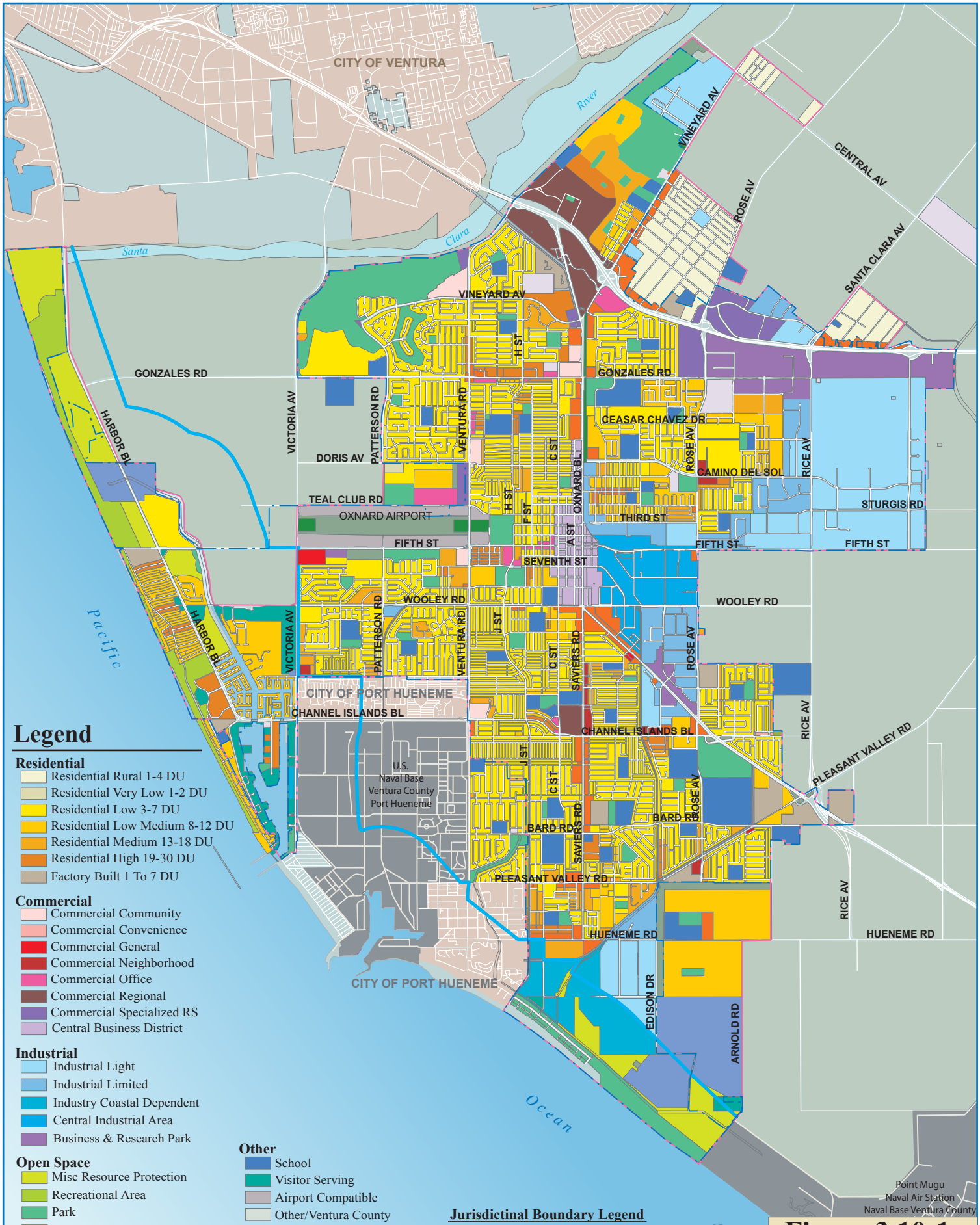
- **California Coastal Commission.** The mission of the California Coastal Commission is to protect, conserve, restore, and enhance California's coastal assets to ensure environmental sustainability and stewardship for future generations. The Coastal Commission, in partnership with coastal cities and counties, plans and regulates the use of land within the designated coastal zone. Issues of concern to the commission include: shoreline public access; recreation; habitat protection; landform alteration; development; and other land altering activities.
- **Adjacent Jurisdictions.** The land use intentions of neighboring jurisdictions influence and impact the overall pattern of land use within the City of Oxnard. Neighboring jurisdictions include the City of Ventura to the northwest, the City of Camarillo to the northeast, the City of Port Hueneme to the southwest, and the County of Ventura. As previously mentioned, mechanisms exist for the regional coordination of land use and other activities impacting the health and welfare of the community.

3.10.3 Environmental Setting

This section discusses the environmental setting for land use planning in the PWIMP planning area. Figure 3.10-1 provides and overview of the existing land uses within the PWIMP Planning Area, Figure 3.10-2 provides an overview of the current zoning in the PWIMP Planning Area, and Figure 3.10-3 provides an overview of the vacant lands within the PWIMP Planning Area.

Oxnard Historic Land Use. Oxnard's historic land use pattern reflects the City's central location in the Oxnard plain with surrounding agriculture, as Oxnard grew in all directions from the original small town. Land within the City limits is currently classified into one of five broad categories: residential, commercial, industrial, open space, and other. Each of these categories is further subdivided into uses correlated with specific standards. With the exception of several high-rise buildings in north Oxnard, one or two story residential and commercial buildings and several industrial areas characterize the City. Most of the City's higher intensity development lies adjacent to primary thoroughfares such as Highway 101, Gonzales Road, Rose Avenue, Rice Avenue, Oxnard Boulevard, Hueneme Road, Ventura Road, Victoria Avenue, Saviers Road, and in the Central Business District.

With the exception of several high-rise buildings in northern Oxnard, the City is characterized by low rise buildings (one or two stories), low density residential, and a large industrial base surrounded by agricultural and natural resources. Most of the City's higher intensity development lies adjacent to primary thoroughfares such as Oxnard Boulevard, Highway 101, Saviers Road, and Hueneme Road. The following descriptions characterize the existing development within the City based on the land use categories adopted in the 2030 General Plan.



Legend

Residential
- Residential Rural 1-4 DU
- Residential Very Low 1-2 DU
- Residential Low 3-7 DU
- Residential Low Medium 8-12 DU
- Residential Medium 13-18 DU
- Residential High 19-30 DU
- Factory Built 1 To 7 DU

Commercial
- Commercial Community
- Commercial Convenience
- Commercial General
- Commercial Neighborhood
- Commercial Office
- Commercial Regional
- Commercial Specialized RS
- Central Business District

Industrial
- Industrial Light
- Industrial Limited
- Industry Coastal Dependent
- Central Industrial Area
- Business & Research Park

Open Space
- Misc Resource Protection
- Recreational Area
- Park
- Misc Ag/Planning Reserve
- Misc Open Space
- Open Space Buffer
- Misc Agriculture

Other
- School
- Visitor Serving
- Airport Compatible
- Other/Ventura County
- Military Base
- Public Utility/Energy Facility
- Public/Semi Public
- Easement

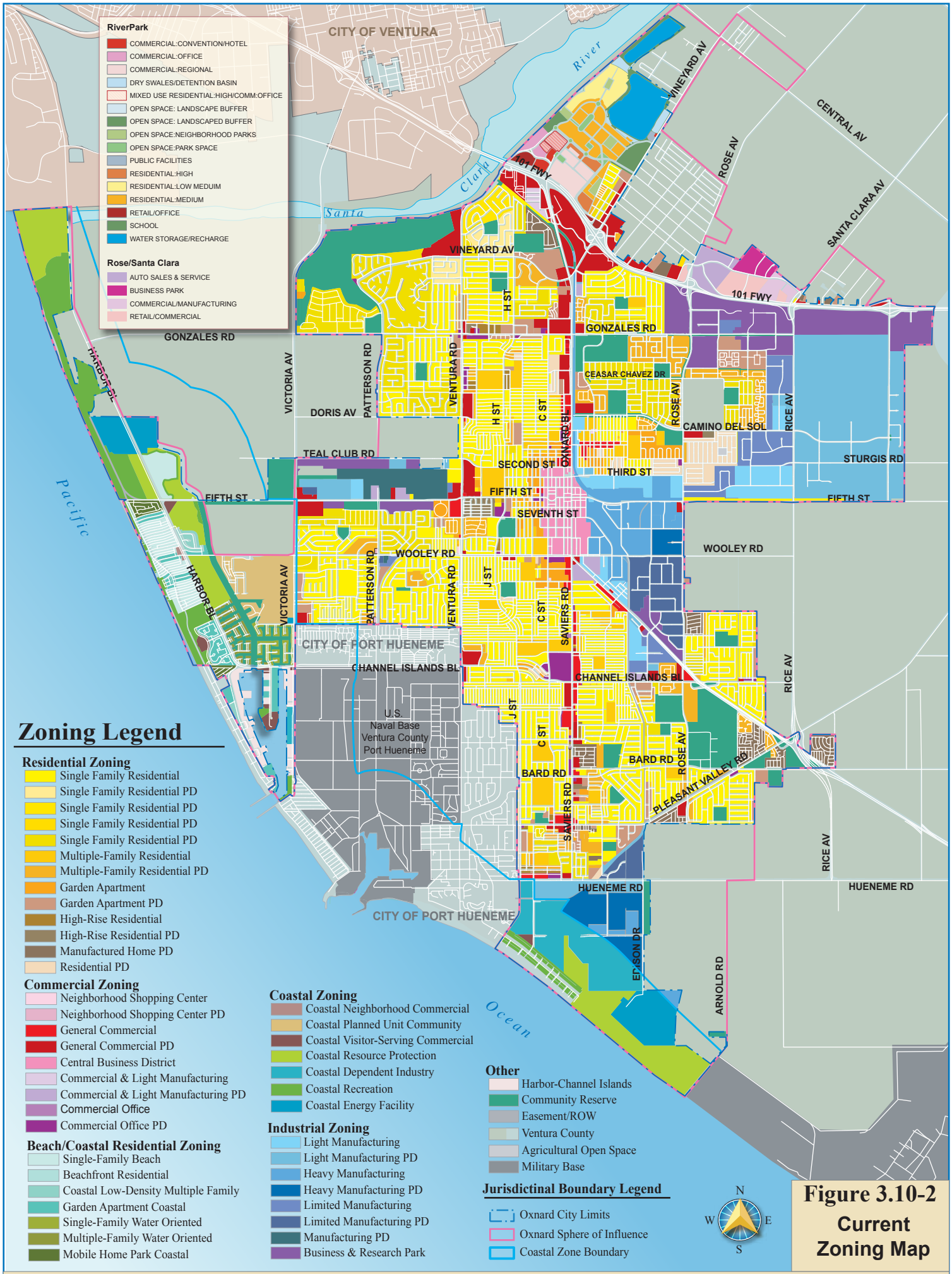
Jurisdictinal Boundary Legend
- Oxnard City Limits
- Oxnard Sphere of Influence
- Coastal Zone Boundary

N W E S

Figure 3.10-1
2030 General Plan Map

Source: City of Oxnard GIS
Created By: City of Oxnard Planning & Environmental Services, 11-2005

0 1 2 3 4 Miles


RiverPark
COMMERCIAL:CONVENTION/HOTEL
COMMERCIAL:OFFICE
COMMERCIAL:REGIONAL
DRY SWALES/DETENTION BASIN
MIXED USE RESIDENTIAL:HIGH/COMM:OFFICE
OPEN SPACE: LANDSCAPE BUFFER
OPEN SPACE: LANDSCAPED BUFFER
OPEN SPACE:NEIGHBORHOOD PARKS
OPEN SPACE:PARK SPACE
PUBLIC FACILITIES
RESIDENTIAL:HIGH
RESIDENTIAL:LOW MEDUIM
RESIDENTIAL:MEDIUM
RETAIL/OFFICE
SCHOOL
WATER STORAGE/RECHARGE
Rose/Santa Clara
AUTO SALES & SERVICE
BUSINESS PARK
COMMERCIAL/MANUFACTURING
RETAIL/COMMERCIAL
CITY OF VENTURA
River
Santa Clara
Pacific
Ocean
VINEYARD AV
CENTRAL AV
ROSE AV
SANTA CLARA AV
101 FWY
GONZALES RD
HARBOR BL
VICTORIA AV
DORIS AV
PATTERSON RD
VENTURA RD
H ST
C ST
CHANNEL BL
CEASAR CHAVEZ DR
CAMINO DEL SOL
RICE AV
TEAL CLUB RD
SECOND ST
THIRD ST
FIFTH ST
STURGIS RD
SEVENTH ST
WOOLEY RD
J ST
SAVIERS RD
CITY OF PORT HUENEME
CHANNEL ISLANDS BL
U.S. Naval Base Ventura County Port Hueneme
BARD RD
PLEASANT VALLEY RD
HUENEME RD
EDISON DR
ARNOLD RD
Zoning Legend
Residential Zoning
Single Family Residential
Single Family Residential PD
Single Family Residential PD
Single Family Residential PD
Single Family Residential PD
Multiple-Family Residential
Multiple-Family Residential PD
Garden Apartment
Garden Apartment PD
High-Rise Residential
High-Rise Residential PD
Manufactured Home PD
Residential PD
Commercial Zoning
Neighborhood Shopping Center
Neighborhood Shopping Center PD
General Commercial
General Commercial PD
Central Business District
Commercial & Light Manufacturing
Commercial & Light Manufacturing PD
Commercial Office
Commercial Office PD
Beach/Coastal Residential Zoning
Single-Family Beach
Beachfront Residential
Coastal Low-Density Multiple Family
Garden Apartment Coastal
Single-Family Water Oriented
Multiple-Family Water Oriented
Mobile Home Park Coastal
Coastal Zoning
Coastal Neighborhood Commercial
Coastal Planned Unit Community
Coastal Visitor-Serving Commercial
Coastal Resource Protection
Coastal Dependent Industry
Coastal Recreation
Coastal Energy Facility
Industrial Zoning
Light Manufacturing
Light Manufacturing PD
Heavy Manufacturing
Heavy Manufacturing PD
Limited Manufacturing
Limited Manufacturing PD
Manufacturing PD
Business & Research Park
Other
Harbor-Channel Islands
Community Reserve
Easement/ROW
Ventura County
Agricultural Open Space
Military Base
Jurisdictinal Boundary Legend
Oxnard City Limits
Oxnard Sphere of Influence
Coastal Zone Boundary
N
W
E
S
Figure 3.10-2
Current Zoning Map
Source: City of Oxnard GIS
Created By: City of Oxnard Planning & Environmental Services, 05-2006
0
1
2
Miles

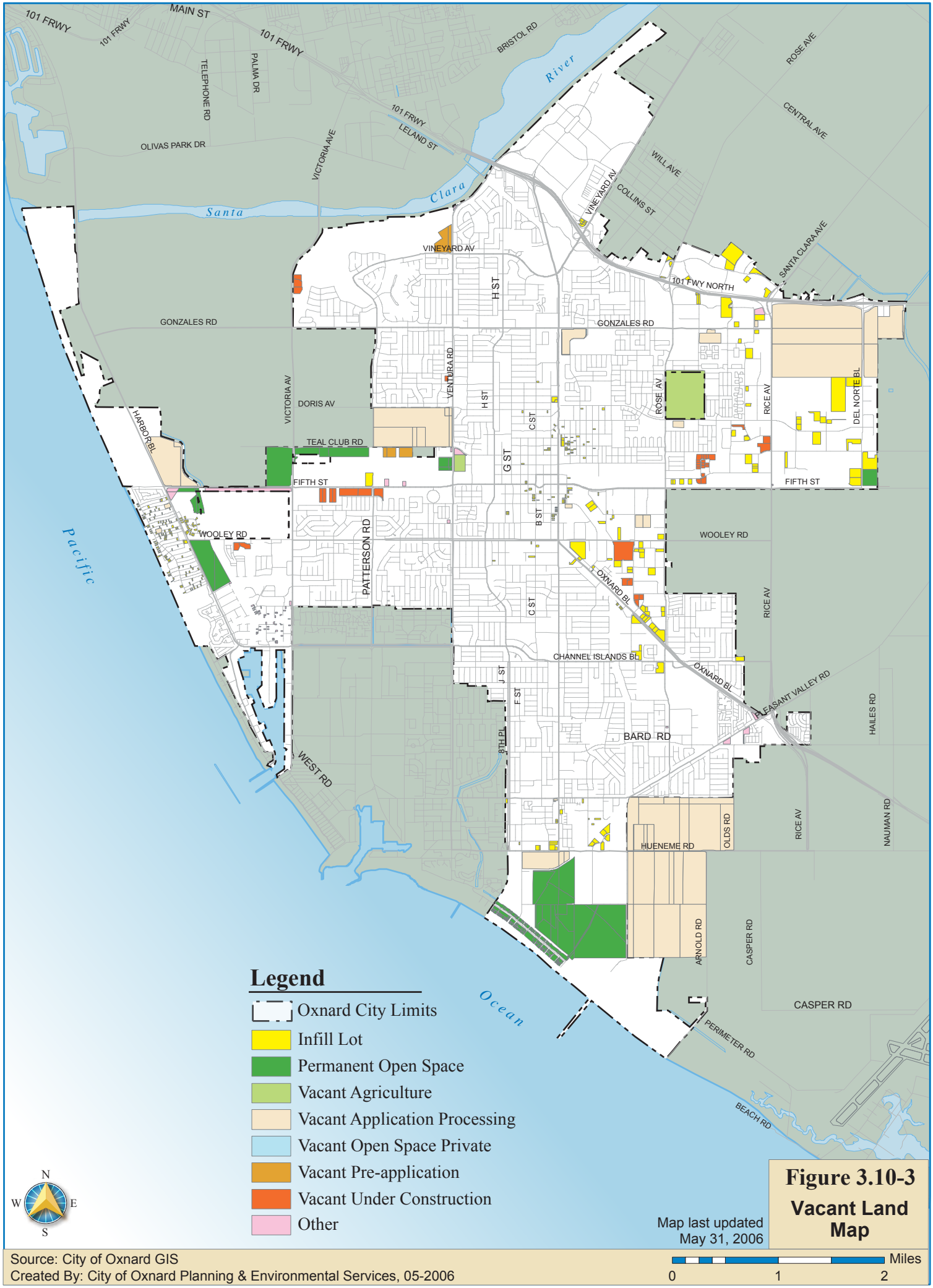

101 FRWY
MAIN ST
TELEPHONE RD
PALMA DR
BRISTOL RD
River
ROSE AVE
CENTRAL AVE
OLIVAS PARK DR
VICTORIA AVE
LELAND ST
WILL AVE
COLLINS ST
VINEYARD AV
Santa Clara
SANTA CLARA AVE
101 FWY NORTH
GONZALES RD
H ST
VENTURA RD
ROSE AV
RICE AV
DEL NORTE BL
VICTORIA AV
DORIS AV
HARBOR BL
TEAL CLUB RD
G ST
C ST
FIFTH ST
B ST
WOOLEY RD
PATTERSON RD
OXNARD BL
CHANNEL ISLANDS BL
J ST
F ST
8TH PL
PLEASANT VALLEY RD
HAILES RD
BARD RD
WEST RD
OLDS RD
HUENEME RD
NAUMAN RD
ARNOLD RD
CASPER RD
PERIMETER RD
BEACH RD
Pacific
Ocean
Legend
Oxnard City Limits
Infill Lot
Permanent Open Space
Vacant Agriculture
Vacant Application Processing
Vacant Open Space Private
Vacant Pre-application
Vacant Under Construction
Other
N
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Figure 3.10-3
Vacant Land Map
Map last updated May 31, 2006
Source: City of Oxnard GIS
Created By: City of Oxnard Planning & Environmental Services, 05-2006
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- **Residential.** As the predominant urban land use, residential uses comprise over 15 percent of the acreage within the Planning Area. Sixty percent of the residential units fall into the Low-Density category. Limitations with available property for additional development will present planning challenges for the City if this ratio is to be maintained. Although higher density developments have been increasing in recent years, additional considerations must be given to increasing the residential density of future development proposals.
- **Commercial.** Commercial uses comprise 1,398.2 acres, or 3.1 percent of the land use within the Planning Area. Commercial development includes regional and community retail, neighborhood uses, and administrative offices. This land is dispersed throughout the City and ranges from small, single parcel retail stores, to large retail and office developments. Several regional retail centers within the City provide a variety of opportunities for City residents and visitors. Brief profiles of the most significant areas are provided.
- **Downtown Oxnard:** Also referred to as the Central Business District (CBD), is bounded by 2nd Street on the north, the Ventura County railroad and Factory Lane on the eat, Wooley Road on the south, and C and D Streets on the west. This area contains a variety of commercial and retail uses including a new theater complex, restaurants, farmer's market, and other various opportunities.
- **Heritage Square:** Occupying the block bound by 7th, "A", 8th, and "C" Streets, this complex of relocated historic buildings contains professional offices, visitor serving uses, a community theatre, restaurant, and facilities for weddings, meetings, and other special events.
- **Centerpoint Mall:** This center is approximately two miles south of Downtown Oxnard at the intersection of Saviers Road and Channel Islands Boulevard.
- **Oxnard Factory Outlet/Oxnard Home and Lifestyle Center:** South of Highway 101 between Rice and Rose Avenues, this discount center features a variety of restaurants, housewares, home furnishings, luggage, and electronics retailers. This facility is currently being renovated as "The Palms."
- **Plaza del Norte Marketplace/Oxnard Auto Center:** North of Highway 101 between Rice and Rose Avenues, this shopping area includes Costco, Marshall's, Wickes Furniture, Sports Chalet, Frye's Electronics, a variety of restaurants, and additional retail stores and the Oxnard Auto Center.
- **The Esplanade:** This "Power Center" is located approximately 2.5 miles north of Downtown Oxnard off Highway 101 at Vineyard and Oxnard Boulevards. Its major tenants include Cost Plus, Borders Books, Staples, Home Depot, and Nordstrom Rack.
- **Shopping at the Rose:** Located on Highway 101 at Rose Avenue in Oxnard, this center includes retail businesses such as Sam's Club, Wal-Mart, CompUSA, and Vons.
- **Channel Islands Harbor.** In addition to these existing regional centers, there are two significant areas already planned for development within the City. These areas include

RiverPark and Wagon Wheel.

- **RiverPark:** This mixed-use community is located immediately north of Highway 101 between Vineyard Avenue and the Santa Clara River. In addition to a variety of residential uses, it will include a significant retail and office component. The RiverPark specific plan calls for 244 acres of residential uses, 147 acres of commercial (2.5 million square feet), 44 acres of public facilities (including schools and community playfields), and 265 acres of open space (water storage facilities and passive parks). Commercial uses are expected to include retail and entertainment uses, office space, a hotel and convention center, and ground floor retail in residential buildings in selected locations.
- **Wagon Wheel:** Located south of Highway 101, just west of the Esplanade development, is an 80-acre redevelopment project, which is expected to combine commercial and residential uses into a mixed-use, transit-oriented development.

Industrial. Industrial lands constitute over eight percent of the total planning area. Within the industrial category, light industrial land uses, primarily located in the eastern part of the City between Rice Avenue and Del Norte Boulevard and in southern Oxnard south of Hueneme Road, are the predominate industrial type (almost 41 percent). Major industrial areas within the City include:

- **Oxnard Pacific Commerce Center.** Located south of Highway 101 (Ventura Freeway), between Rose Avenue and Del Norte Boulevard, the Pacific Commerce Center provides industrial and business and research park opportunities.
- **Channel Island Business Center.** The Channel Islands Business Center consists of 211 acres of industrial uses surrounding the Channel Islands Harbor.
- **Northeast Industrial Area.** The Northeast Industrial Area includes 1,389 acres of light industrial, limited industrial, and business and research park uses.
- **Oxnard Town Center (Business and Research Park).** The Oxnard Town Center is a multiple use master planned business and commercial development located near the interchange of Highway 101 (Ventura Freeway) and State Route 1 (Oxnard Boulevard).
- **Hueneme Road Industrial Area.** Located north and south of Hueneme Road between Edison Drive and the Pacific Ocean, the Hueneme Road Industrial Area includes 185 acres of heavy industrial uses, including the City's Wastewater Treatment Facility.
- **Sakioka Farms/Powers.** This project, located south of Highway 101 (Ventura Freeway), proposes light industrial, office, and retail uses on a 430-acre mixed used site.
- **Ormond Beach.** The Southern Subarea of the Ormond Beach Specific Plan areas consists of approximately 595 acres south of Hueneme Road. Approximately 420 acres of this area would be developed, primarily with light industrial (265 acres) and business/research park (62 acres) uses; the remaining developed areas would include detention/biofiltration areas and a greenbelt area.
- **Power Generating Stations.** There are currently two power-generating stations located

within Oxnard's coastal areas. One station is located within Mandalay Beach and the other, in Ormond Beach.

Open Space. There are approximately 26,800 acres of open space and recreational areas within the planning area, most under agricultural production (91 percent) and located outside the incorporated city limits. The abundance of open space creates a unique urban pattern as these resources delineate the City's boundaries. The western and southern edges are framed by the Pacific Ocean, the northwestern edge by the Santa Clara River, and the northeastern and eastern sides by the area associated with the Oxnard-Camarillo Greenbelt Agreement.

Bounded on the south and west by the Pacific Ocean, beaches are plentiful and provide significant contributions to open space within the City. Developed beaches include the McGrath State Beach and Oxnard Beach, with undeveloped sites including Mandalay State Beach and Ormond Beach. Significant natural features within these beaches include dunes, wetlands, and animal habitats. The beaches along the City's coastline are recognized as Oxnard's primary natural resources providing unique recreational opportunities and scenic views. In addition to these coastal resources, the Santa Clara River and its floodplain form a strong natural boundary to the northern portion of the City.

The City of Oxnard, along with the Cities of Camarillo and Ventura and the County of Ventura, is party to the Oxnard-Camarillo and Oxnard-Ventura Greenbelt Agreements. These agreements contribute to the preservation of a large agricultural area extending outside the planning area (approximately 29,460 acres). These areas provide a buffer between Oxnard and Camarillo to the east and Oxnard and Ventura to the northwest.

Other. Approximately 15 percent of land within the City is specified as other uses, which do not fit into one of the previous land use classifications. Examples of uses in this description include public facilities, schools, and airport compatible land uses such as low intensity commercial and some limited manufacturing uses.

Public and quasi-public uses have a major presence throughout the Downtown area of the City. Facilities within this area include City Hall, City Hall Annex, Main Library, Ventura County Human Services Agency, Oxnard School District Education Service Center, Clincas del Camino Real, and the Oxnard Boys and Girls Club. Additional facilities, such as schools, fire stations, and parks are dispersed through the community providing more direct access to the neighborhoods they serve.

3.10.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.10.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on cultural and tribal resources would occur if the PWIMP would:

- Conflict with an applicable land use plan, policy or regulation of the City or other agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating a significant environmental effect;

- Involve land uses that are not allowed under an applicable airport land use compatibility plan;
- Conflict with an applicable habitat conservation plan or natural community conservation plan; and/or
- Physically divide an established community.

3.10.4.2 Approach and Methodology

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

3.10.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts are discussed below.

Impact 3.10-1: Construction and operation of the PWIMP could conflict with an applicable land use plan, policy or regulation of the City or other agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating a significant environmental effect. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction and Long-Term Operational Impacts

In general, the construction and operation of the PWIMP and individual facilities would be consistent with existing and appropriate land use plans or regulations with the City and/or other jurisdictions. For instance, the rehabilitation of existing water, recycled water and stormwater pipelines and conveyance facilities would be located in existing roadways and rights-of-ways and would not conflict or change any existing land use or compatibility. Any impacts would be limited to the temporary construction period and temporary vehicle access to adjacent properties would be maintained during construction. These pipelines would be compatible with applicable land use policies because all construction would occur within or adjacent to existing road rights-of-way, and appropriate construction easements would be obtained by the City of Oxnard. Similarly, the rehabilitation of the existing blending stations, desalter and AWPF would be on existing lands with appropriate land use compatibility and thus would not conflict with existing land use plans or regulations. Further, the new IDP/ASR wells considered are consistent with

applicable Ventura County policies concerning agricultural lands and are not considered urban development by the City of Oxnard and are consistent with applicable City policies concerning permanent agricultural lands in the Oxnard Planning Area.

New facilities such as the water and recycled water storage tanks, the brine line, new recycled and water pipelines, and/or the TMDL Basin could be located in areas where they could conflict with existing land use compatibility and would require easements or authorizations from various agencies, including, but not limited to the City, Ventura County, Ventura County Flood Control District, SCAG, Oxnard Harbor District, and/or the California Coastal Commission. However, with the following mitigation measures, any impacts from the construction and/or operation of the PWIMP would be considered to be less than significant.

Temporary Construction and Long-Term Operational Mitigation Measures

Mitigation Measure 3.10-1a: Land Use Compatibility Review. For each PWIMP project to be constructed and/or operated, the City shall review the land use compatibility on a project-level basis through a subsequent environmental document to ensure that the proposed individual project does not conflict with an existing land use compatibility or cause a significant environmental impact that cannot be reduced to a less than significant level(s). In addition, the City shall obtain all necessary easements for any and all temporary construction activities.

Mitigation Measure 3.10-1b: New Pipeline Locations. Any new PWIMP pipelines and/or conveyance facilities that cross any agricultural fields or private property shall be located in an area or buried at a depth that would not interfere with the use of the land, such as agricultural tilling, grading, planting, etc.

Mitigation Measure 3.10-1c-: Return to Existing Conditions. For all PWIMP pipeline or conveyance facility construction activities, soil shall be stockpiled and replaced once installed, unless soil contamination is expected. If soil contamination is detected, then mitigation measures in 3.8 Hazards and Hazardous Wastes. The construction area shall be returned to preconstruction conditions and grade.

Significance after Mitigation: Less than Significant.

Impact 3.10-2: Construction and operation of the PWIMP could involve land uses that are not allowed under an applicable airport land use compatibility plan. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction and Long-term Operational Impacts

Some PWIMP Project components are situated within two-miles of the Oxnard Airport as well as near private agricultural airstrips on the outskirts of the City. However, these components mainly consist of water, wastewater, recycled water, and stormwater pipelines/conveyance facilities that once constructed would be situated below the ground surface, and therefore and would not pose a safety hazard with respect to airport operations. The proposed water and recycled water storage tanks would not be tall enough to interfere with any airport take-off or landing operations. Similarly, construction activities would not affect airport operations. The proposed TMDL storage pond is an open water storage facility that could attract birds and waterfowl, which could be dangerous to airport operations. However, the location would be located outside of the two-mile radius that could affect airport operations. In addition, the

TMDL Storage facility would not pose a significant increase in potential bird strikes than what currently exists due to other open water features in the area as the Santa Clara River, agricultural storage ponds, and the Pacific Ocean that can attract birds and waterfowl. As a result, construction and operation of the PWIMP would not involve land uses that are not allowed under an applicable airport land use compatibility plan and any impacts are considered less than significant.

Significance Determination: Less-than-Significant Impact.

Impact 3.10-3: Construction and operation of the PWIMP could conflict with an applicable habitat conservation plan or natural community conservation plan. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction and Long-Term Operational Impacts

Neither an HCP nor an NCCP has been prepared for a jurisdiction that would apply to the PWIMP Planning Area. As such, no conflict between the policies and goals of the PWIMP and the policies of an adopted HCP or NCCP exist. Consequently, there is no impact.

Significance Determination: No Impact.

Impact 3.10-4: Construction and/or Operation of the PWIMP could physically divide an established community. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction and Long-term Operational Impacts

None of the PWIMP project facilities would physically divide and established community and no impacts are anticipated.

Significance Determination: No Impact.

3.10.5 Cumulative Effects

Construction and operation of the PWIMP has the potential to have potentially significant impacts to land use planning. However, with the identified mitigation measures above, any impacts, including cumulative impacts would be reduced to less-than-significant levels.

3.11 Mineral Resources

This section evaluates the potential impacts to mineral resources that could result from the proposed PWIMP.

3.11.1 Introduction

This evaluation of local mineral and energy resources was completed using information collected from the California Department of Conservation's Division of Oil, Gas, and Geothermal Resources. Information from the California Geological Survey, the City's existing Oxnard 2030 General Plan, and the City's May 2017 *CEQA Guidelines* were also reviewed. Key Terms and concepts include the following:

- **Minerals.** Any naturally occurring chemical element or compound, or groups of elements and compounds, formed from inorganic processes and organic substances, including, but not limited to, coal, peat, and bituminous rock, but excluding geothermal resources, natural gas, and petroleum. Gold, sand, gravel, clay, crushed stone, limestone, diatomite, salt, borate, potash, etc. are examples of minerals.
- **Mineral Resource Zone.** An area or land where deposits of commercially viable mineral or aggregated deposits are known to exist. This designation is applied to sites determined by the State Division of Mines and Geology as being a resource of regional significance, and is intended to help maintain the quarrying operations and protect them from encroachment of incompatible land uses.
- **Mining.** The act or process of extracting resources, such as coal, oil, or minerals from the earth. The term also includes quarrying; well operation; milling, such as crushing, screening, washing and floatation; and other preparation customarily done at the mine site or as part of a mining activity

3.11.2 Regulatory Context

Relevant State and local guidelines specific to mineral and energy resource issues are discussed in this section.

3.11.2.1 State Regulations

California Surface Mining and Reclamation Act of 1975 (SMARA). The loss of regionally significant mineral resource deposits to land uses that preclude mining activities is one of the main emphases that SMARA was designed to address. The law specifically mandates a two-phased process, commonly referred to as classification-designation, for mineral resources. The California Geological Survey (previously called the California Division of Mines and Geology) is responsible under SMARA for carrying out the classification phase of the process.

The California Mining and Geology Board is responsible for implementing the second phase. The second phase allows the designation of areas within a production-consumption (P-C) region that contain significant deposits of Portland cement concrete (PCC)-grade aggregate (valued for its versatility and its importance in construction) that may be needed to meet the region's

future demand (California Department of Conservation, 1986).

Regulations provided under SMARA require the State Geologist to classify lands into Mineral Resource Zones (MRZ) based on the known or estimated mineral resource potential of that land. The classification process is based solely on geology, without regard to land use or land ownership. The primary goal of mineral land classification is to help ensure that the mineral resource potential of lands is recognized and considered in the land use planning process. The MRZ categories are as follows:

- MRZ-1. Areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence.
- MRZ-2. Areas where adequate information indicates significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence.
- MRZ-3. Areas containing mineral deposits the significance of which cannot be evaluated from available data.
- MRZ-4. Areas where available information is inadequate for assignment to any other MRZ.

In addition to mineral resource conservation, the SMARA regulates surface mining operations within California. The California Mining and Geology Board have established reclamation regulations that fulfill the reclamation requirements of SMARA. These regulations are summarized below.

Annual Mining Report. SMARA requires that a mining report be submitted annually and include such information as the amount of land disturbed during the previous year, acreage reclaimed during the previous year, and amendments to local reclamation plans.

Reclamation Plan. Before a mining project is approved by a local jurisdiction, a reclamation plan must be prepared and approved. In general, the reclamation plan must include and satisfy the following requirements:

- Maximum anticipated depth of extraction;
- A description of the reclamation land use;
- A description of the manner in which reclamation will be accomplished;
- A description of the manner in which affected streambed channels and streambanks will be rehabilitated to a condition that minimizes erosion;
- Final slope stability as determined by a registered geotechnical engineer;
- Compaction of areas sited for roads, buildings, or other improvements; and
- Location of planned temporary stream or watershed diversions. Reclamation plans are also required to include performance standards for:
    - Revegetation;
    - Drainage and erosion controls;
    - Reclamation of prime agricultural land and other agricultural land;

- Stream protection, including protection of surface water and groundwater; and
- Topsoil salvage.

3.11.2.2 Local Regulations

Detailed below is a summary of the local regulations.

Ventura County - Mineral Resource Management Plan. The County of Ventura has adopted a Mineral Resource Management Plan with the following policies requiring:

- Establishment of land use categories to allow timely mineral extraction in areas classified as MRZ-2 or designated to be of regional or statewide significance and the designation of land use zones to preserve mineral extraction access.
- Establishment of buffer zones around MRZ-2 Zones to allow the continued extraction of minerals and to avoid land use incompatibilities between mining activities and land uses surrounding the MRZ-2 Zones.

According to the plan, compatible land uses include the following:

- Very Low Density Residential (0.1 units/acre)
- Extensive Industrial
- Recreation/Open Space
- Agriculture

City of Oxnard - Oxnard 2030 General Plan. The combined Open Space/Conservation Element's of the City's existing 2030 General Plan contains an objective and several policies pertinent to mineral resources.

3.11.3 Environmental Setting

Important mineral/sand/gravel deposits are primarily located along the Santa Clara River channel, along Route 101 (Ventura Freeway) corridor and along the eastern edge of the City extending as far west as Oxnard Boulevard in several areas. These local resources are described in greater detail below. The location of these important sand/gravel deposits and existing oil wells within the Planning Area is identified in Figure 3.11-1.

Sand and Gravel Resources. Areas of significant mineral deposits within the City's Planning Area are identified as MRZ-2 and MRZ-3 areas. The City's MRZ-2 area encompasses the course of the Santa Clara River through the City and also a corridor of land along U.S. Route 101 (Ventura Freeway) from the Santa Clara River eastward to approximately Del Norte Avenue. MRZ-3 areas are located south of the Santa Clara River (west of Ventura Freeway) and a large area bordering State Route 1 through the center of the Planning Area.

Oil and Gas Resources. Four oil and gas fields are located within the City's current Planning Area: West Montalvo, El Rio, Santa Clara Avenue and Oxnard. The West Montalvo Field includes the area along the coastline and upstream from the mouth of the Santa Clara River and currently contains 29 active wells and 24 inactive or shut-in wells. The West Montalvo Field is the only local field to increase the number of active wells in recent years. The Santa Clara Avenue

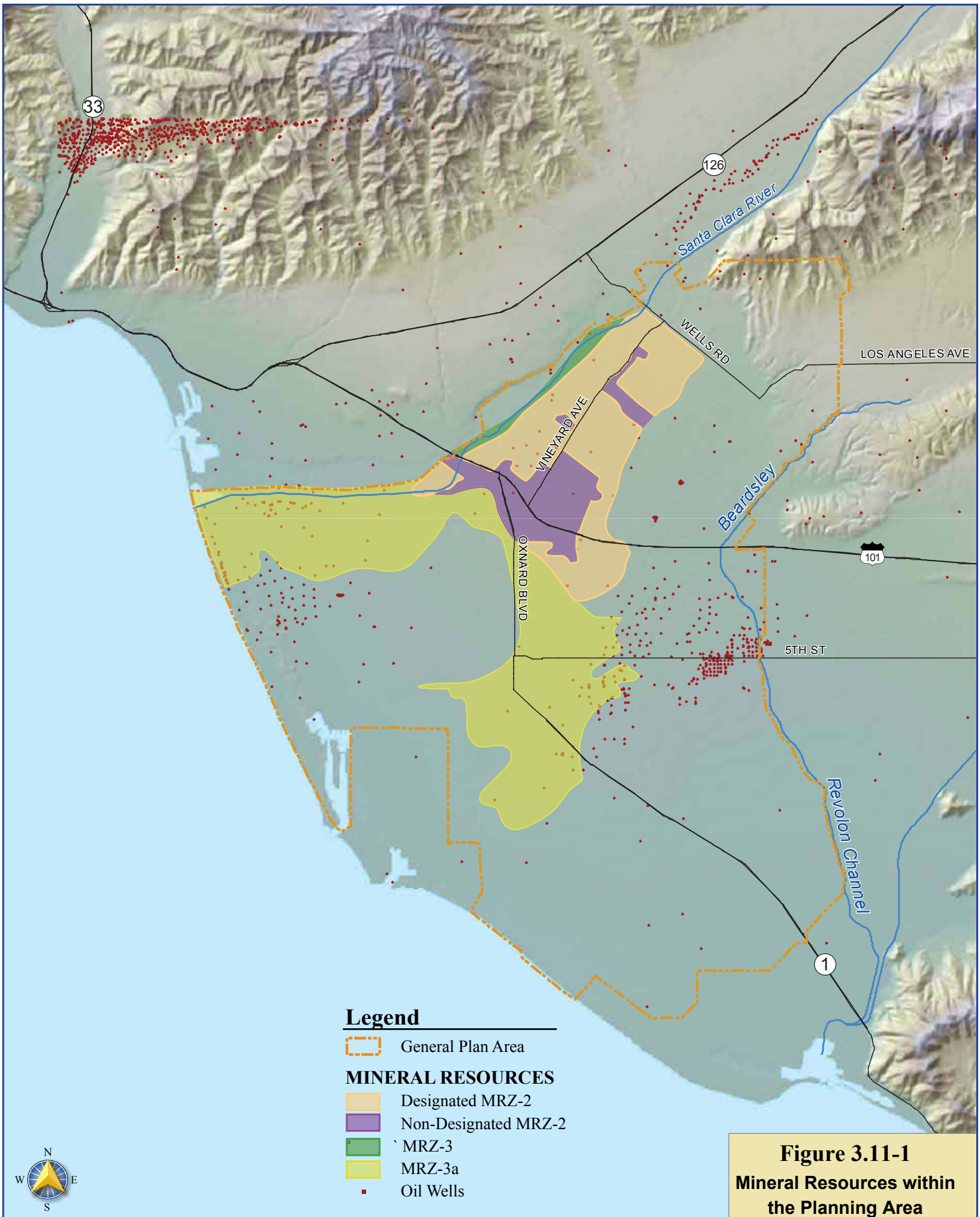

Figure 3.11-1
Mineral Resources within the Planning Area

Source: USGS, 1993; City of Oxnard, 2005; and ESA, 2006

Field, located near Nyeland Acres, contains approximately 18 active oil and gas wells and 12 inactive wells. The Oxnard Field contains 38 active oil and gas wells and 59 inactive wells. The El Rio Field is located at the crossing of Ventura Freeway and the Santa Clara River. However, no recent production data is available for this field.

An additional 50 abandoned oil well sites are located around the City's Planning Area but not within the identified oil fields shown discussed above. Major petroleum companies with leases in the Planning Area include Chevron, Shell, Texaco, Mobil, and Western LNG. The remainder of the leases is with smaller independent companies. (City of Oxnard 2030 General Plan).

3.11.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.11.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on cultural and tribal resources would occur if the PWIMP would:

- Result in the loss of availability of a known mineral resource of value to the region or state; and/or
- Result in the loss of availability of a locally important mineral resource recovery site delineated in the 2030 General Plan or other adopted land use plan.

3.11.4.2 Approach and Methodology

As described in Chapter 2, Project description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

In considering how the above significance criteria apply to the PWIMP, this analysis shows the location of identified mineral resources in the PWIMP Planning Area as shown above on Figure 3.11-1. If a PWIMP project would occur within, or block access to, an area designated as MRZ-2, or other known mineral resources, then a significant impact could occur.

Due to the nature of the proposed project, geology, soil, and mineral resource discussions will vary negligibly between project construction and operation. Therefore, the impact assessment discussion for this resource area is applicable to both construction and operation of PWIMP elements.

3.11.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts are discussed below.

Impact 3.11-1: Construction and operation of the PWIMP could result in the loss of availability of a known mineral resource of value to the region or state. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction and Long-Term Operational Impacts

The construction and operation of the PWIMP and individual facilities would not be located in areas that have known mineral resources of value, including MRZ-2 and any oil and gas fields. Most of the PWIMP facilities would be located in existing disturbed areas where there are no known minerals or would not interfere with mineral and/or oil and gas extraction. Further, the new proposed facilities would not be located in areas that have known mineral resources of value, including MRZ-2 and any oil and gas fields. As a result, the construction and/or operation of the PWIMP facilities and activities would have no impact to mineral resources of value and/or oil and gas reserves.

Significance Determination: No Impact.

Impact 3.11-2: Construction and operation of the PWIMP could result in the loss of availability of a locally important mineral resource recovery site delineated in the 2030 General Plan or other adopted land use plan. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction and Long-term Operational Impacts

The construction and operation of the PWIMP and individual facilities would not be located in areas that have known mineral resources of value, including MRZ-2 and any oil and gas fields that are delineated in the 2030 General Plan and/or other adopted land use plans. Most of the PWIMP facilities would be located in existing disturbed areas where there are no known minerals or would not interfere with mineral and/or oil and gas extraction. Further, the new proposed facilities would not be located in areas that have known mineral resources of value, including MRZ-2 and any oil and gas fields. As a result, the construction and/or operation of the PWIMP facilities and activities would have no impact to mineral resources of value and/or oil and gas reserves.

Significance Determination: No Impact.

3.11.5 Cumulative Effects

The construction and operation of the PWIMP and individual facilities would not be located in areas that have known mineral resources of value, including MRZ-2 and any oil and gas fields. Most of the PWIMP facilities would be located in existing disturbed areas where there are no known minerals or would not interfere with mineral and/or oil and gas extraction. Further, the new proposed facilities would not be located in areas that have known mineral resources of value, including MRZ-2 and any oil and gas fields. As a result, the construction and/or operation of the PWIMP facilities and activities would have no impact, including cumulative impacts, to mineral resources of value and/or oil and gas reserves.

3.12 Noise

This section evaluates the potential noise impacts that could result from the construction and/or operation of the proposed PWIMP.

3.12.1 Introduction

This evaluation of noise was completed using information collected from the City's existing Oxnard General Plan 2030 and the City's May 2017 *CEQA Guidelines* were also reviewed. Key Terms and concepts include the following:

- **Ambient Noise.** The total noise associated with a given environment and usually comprising sounds from many sources, both near and far.
- **Attenuation.** Reduction in the level of sound resulting from absorption by the topography, the atmosphere, distance, barriers, and other factors.
- **A-weighted decibel (dBA).** A unit of measurement for noise having a logarithmic scale and measured using the A-weighted sensory network on a noise-measuring device. An increase or decrease of 10 decibels (dB) corresponds to a tenfold increase or decrease in sound energy. A doubling or halving of sound energy corresponds to a 3-dBA increase or decrease.
- **Community Noise Equivalent Level (CNEL).** Used to characterize average sound levels over a 24-hour period, with weighting factors included for evening and nighttime sound levels. Leq values (equivalent sound levels measured over a 1-hour period - see below) for the evening period (7:00 p.m. to 10:00 p.m.) are increased by 5 dB, while Leq values for the nighttime period (10:00 p.m. to 7:00 a.m.) are increased by 10 dB. For a given set of sound measurements, the CNEL value will usually be about 1 dB higher than the Ldn value (average sound exposure over a 24- hour period – see below). In practice, CNEL and Ldn are often used interchangeably.
- **Day-Night Average Sound Level (Ldn).** Ldn refers to average sound exposure over a 24-hour period. Ldn values are calculated from hourly Leq values, with the Leq values for the nighttime period (10:00 p.m. to 7:00 a.m.) increased by 10 dB to reflect the greater disturbance potential from nighttime noises.
- **Equivalent Sound Level (Leq).** The level of a steady-state sound that, in a stated time period and at a stated location, has the same sound energy as the time-varying sound (approximately equal to the average sound level). The equivalent sound level measured over a 1-hour period is called the hourly Leq or Leq (h).
- **Lmax and Lmin.** The maximum and minimum sound levels, respectively, measured during the measurement period with a sound meter. When a sound meter is set to the "slow" response setting, as is typical for most community noise measurements, the Lmax and Lmin values are the maximum and minimum levels measured over a 1-second period.
- **Percentile-Exceeded Sound Level (Lx).** The sound level exceeded during a given

percentage of a measurement period. Examples include L10, L50, and L90. L10 is the A-weighted sound level that is exceeded 10% of the measurement period, and so on. L50 is the median sound level measured during the measurement period. L90, the sound level exceeded 90% of the time, excludes high localized sound levels produced by nearby sources such as single car passages or bird chirps. L90 is often used to represent the background sound level. L50 is also used to provide a less conservative assessment of the background sound level.

- **Sensitive Receptors.** Sensitive receptors are defined to include residential areas, hospitals, convalescent homes and facilities, schools, and other similar land uses.

3.12.2 Regulatory Context

Noise issues are subject to various Federal, State and local regulations. This section begins with a brief introduction to the characteristics of sound and follows with a brief overview of key regulations.

Characteristics of Sound. Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise can be defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude) of a particular sound. The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. The decibel or dB scale is used to quantify sound intensity. Because sound pressure can vary by over one trillion times within the range of human hearing, a logarithmic loudness scale (i.e., dB scale) is used to keep sound intensity numbers at a convenient and manageable level.

Since the human ear is not equally sensitive to all frequencies within the entire spectrum, noise measurements are weighted more heavily within those frequencies of maximum human sensitivity in a process called "A- weighting" written as dBA. The human ear can detect changes in sound levels of approximately 3 dBA under normal conditions. Changes of 1- to 3-dBA are typically noticeable under controlled conditions, while changes of less than 1- dBA are only discernable under controlled, extremely quiet conditions. A change of 5-dBA is typically noticeable to the general public in an outdoor environment.

Environment noise fluctuates over time. While some noise fluctuations are minor, others can be substantial. Some noise levels occur in regular patterns, others are random. Some noise levels fluctuate rapidly, others slowly. Some noise levels vary widely, others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels, and are listed above under the "Key Terms" section.

Calculating Attenuation. Noise may be generated from a point source, such as a piece of construction equipment, or from a line source, such as a road containing moving vehicles. Because of spreading losses, noise attenuates (decreases) with distance. The typical atmospheric attenuation rate for point source noise is 6-dBA per doubling of the distance as predicted by the equation:

dBA Reduction = 20 Log [measured distance] (Lower bracket to include both reference distance quantities)

Noise from a line source will also attenuate with distance, but the rate of attenuation is a function of both distance and the type of terrain over which the noise passes. Hard sites, such as developed areas with paving, attenuate noise at a rate of 3-dBA per doubling of the distance as predicted by the following equation:

$$\text{dBA Reduction} = 10 \text{ Log } [\text{measured distance}] \text{ (reference distance)}$$

Soft sites, such as undeveloped areas, open space, and vegetated areas attenuate line-source noise at a rate of 4.5 dBA per doubling of the distance, as predicted by the following equation:

$$\text{Attenuated dBA} = 15 \text{ Log } [\text{measured distance}] \text{ reference distance}$$

True hard sites are fairly rare, particularly in rural areas. Accordingly, soft site attenuation is typically assumed for planning level analyses in rural areas.

Objects such as walls, topography, and buildings which block the line-of-sight between a source and a receptor will attenuate the noise source. If a receptor is located behind the object, but has a view of the source, the wall will do little to attenuate the noise. Additionally, a receptor located on the same side of the object as the noise source may experience an increase in the perceived noise level as the object may reflect noise back to the receptor, possibly increasing the noise.

Noise Contours. The interpretation of noise contours is a generalization, not an exact science. The measurements by sophisticated instruments are affected by many variables in a particular area. However, these individual effects are generalized so that noise contours describe the impact that can generally be expected. Noise contour lines themselves are not specific boundaries of noise tolerance. A contour line denoting a 65-dBA limit, for example, does not imply that residents on one side of the line are seriously affected, while on the other side of the line tolerable conditions exist. Rather, the area between 75- dBA and 65-dBA indicates that residents within this vicinity may experience a high level of noise and potential interference with daily functions.

Effects of Noise. High noise levels can interfere with a broad range of human activities in a way, which degrades public health and welfare. Such activities may include:

- Speech communication in conversation and teaching;
- Telephone communication;
- Listening to television and radio;
- Listening to music;
- Concentration during mental and physical activities;
- Relaxation; and
- Sleep.

Interference with listening situations can be determined in terms of the level of the environmental noise and its characteristics. The amount of interference in non-listening situations is often dependent upon factors other than the physical characteristics of the noise. These may include attitude toward the source of an identifiable noise, familiarity with the noise, characteristics of the exposed individual, and the intrusiveness of the noise.

Hearing loss, total or partial, and either permanent or temporary, is a well-established effect of noise on human health. The primary measure of hearing loss is the hearing threshold level - the level of a tone that can just be detected by an individual. As a person is exposed to increased noise levels, that person may experience a shift in the threshold at which sound can be detected. Exposure to very high noise levels for lengthy periods of time can generate threshold shifts, which can be temporary or permanent. In general, A-weighted sound levels must exceed 60-80 decibels before a person will experience temporary threshold shifts. The greater the intensity level above 60-80 decibels and the longer the exposure, the greater length of the temporary threshold shift.

3.12.2.1 Federal Regulations

The following federal regulations apply to noise.

Federal Highway Administration (FHWA). The Federal Highway Administration (FHWA) has developed noise abatement criteria that are used for federally funded roadway projects or projects that require Federal review. These criteria are discussed in detail in Title 23 Part 772 of the Federal Code of Regulations (23CFR772). The second phase allows the designation of areas within a production-consumption (P-C) region that contain significant deposits of Portland cement concrete (PCC)-grade aggregate (valued for its versatility and its importance in construction) that may be needed to meet the region's future demand (California Department of Conservation, 1986).

Environmental Protection Agency (EPA). The EPA has identified the relationship between noise levels and human response. The EPA has determined that over a 24-hour period, an Leq of 70- dBA will result in some hearing loss. Interference with activity and annoyance will not occur if exterior levels are maintained at an Leq of 55-dBA and interior levels at or below 45 dBA. Although these levels are relevant for planning and design and useful for informational purposes, they are not land use planning criteria because they do not consider economic cost, technical feasibility, or other needs of the community.

The EPA has set 55-dBA Ldn as the basic goal for residential environments. However, other Federal agencies, in consideration of their own program requirements and goals, as well as the difficulty of actually achieving a goal of 55- dBA Ldn, have generally agreed on the 65-dBA Ldn level as being appropriate for residential uses. At 65-dBA Ldn activity interference is kept to a minimum, and annoyance levels are still low. It is also a level that can realistically be achieved.

Department of Housing and Urban Development (HUD). HUD was established in response to the Urban Development Act of 1965 (Public Law 90-448) and was tasked by the Housing and Urban Development Act of 1965 (Public Law 89-117) "to determine feasible methods of reducing the economic loss and hardships suffered by homeowners as a result of the depreciation in the value of their properties following the construction of airports in the vicinity of their homes."

HUD first issued formal requirements related specifically to noise in 1971 (HUD Circular 1390.2). These requirements contained standards for exterior noise levels along with policies for approving HUD-supported or assisted housing projects in high noise areas. In general, these requirements established the following three zones:

- 65-dBA Ldn or less - an acceptable zone where all projects could be approved.
- Exceeding 65-dBA Ldn but not exceeding 75-dBA Ldn - a normally unacceptable zone where mitigation measures would be required and each project would have to be individually evaluated for approval or denial. These measures must provide 5-dBA of attenuation above the attenuation provided by standard construction required in a 65- to 70-dBA Ldn area and 10-dBA of attenuation in a 70- to 75-dBA Ldn area.
- Exceeding 75-dBA Ldn - an unacceptable zone in which projects would not, as a rule, be approved.

HUD's regulations do not include interior noise standards. Rather a goal of 45-dBA Ldn is set forth and attenuation requirements are geared towards achieving that goal. HUD assumes that using standard construction practices, any building will provide sufficient attenuation so that if the exterior level is 65-dBA Ldn or less, the interior level will be 45-dBA Ldn or less. Thus, structural attenuation is assumed at 20, dBA. However, HUD regulations were promulgated solely for residential development requiring government funding and are not related to the operation of schools or churches.

The Federal government regulates occupational noise exposure common in the workplace through the Occupational Health and Safety Administration (OSHA) under the USEPA. Noise exposure of this type is dependent on work conditions and is addressed through a facility's or construction contractor's health and safety plan. With the exception of construction workers involved in facility construction, occupational noise is irrelevant to this study and is not addressed further in this document.

3.12.2.2 State Regulations

The following state regulations apply to noise.

California Department of Transportation (Caltrans). Caltrans has adopted policy and guidelines relating to traffic noise as outlined in the Traffic Noise Analysis Protocol (Caltrans 1998b). The noise abatement criteria specified in the protocol are the same as those specified by FHWA.

California Department of Health Services. The Office of Noise Control in the State Department of Health Services has developed criteria and guidelines for local governments to use when setting standards for human exposure to noise and preparing noise elements for General Plans (Office of Planning and Research, 2003). These guidelines include noise exposure levels for both exterior and interior environments. In addition, the California Code of Regulations sets forth requirements for the insulation of multiple-family residential dwelling units from excessive and potentially harmful noise. The State indicates that locating units in areas where exterior ambient noise levels exceed 65-dBA is undesirable. Whenever such units are to be located in such areas, the developer must incorporate into building design various construction features which reduce interior noise levels to 45-dBA CNEL.

3.12.2.2 Local Regulations

The following local noise regulations apply.

City of Oxnard - Oxnard 2030 General Plan. The Noise Element of the City's existing General Plan contains several goals, objectives, and policies pertinent to noise issues.

City of Oxnard Noise Ordinance. Article XI (Sound Regulation) of Chapter 7 in the Oxnard Municipal Code is designed to, "protect classes of land use from excessive sound because the city council has determined that such excessive sound is detrimental to the public health, safety and welfare and contrary to the public interest." The adopted Noise Ordinance sets standards for noise levels and provides the means to enforce the reduction of obnoxious or offensive noises. The Noise Ordinance sets interior and exterior noise levels for all properties within designated noise zones, unless exempted. The Noise Ordinance standards are identified in Table 3.12-1.

Table 3.12-1
City of Oxnard Exterior and Interior Noise Ordinance

Sound Zone	Type of Land Use	Allowable Exterior Sound Level	
		7 am to 10 pm	10pm to 7am
I	Residential	55-dBA	50-dBA
II	Commercial	65-dBA	60-dBA
III	Industrial	70-dBA	70-dBA
IV	As identified in Figure IX-2 of the 2030 General Plan		
Sound Zone	**Type of Land Use**	**Allowable Interior Sound Level**	
All	**Residential**	**50-dBA**	**45-dBA**

Source: City of Oxnard Municipal Code, Article X (Sound Regulation) of Chapter 7

3.12.3 Environmental Setting

The main noise generators within the City consist of vehicular traffic along the Ventura Freeway, other major roadways, the Oxnard Airport, the Union Pacific Railroad line, and a variety of stationary noise sources. Each of these noise sources is described in greater detail below.

Traffic Noise. As in most typical urbanized areas, the most pervasive noise sources in the City are motor vehicles, including automobiles, trucks, buses, and motorcycles. The noise generated from vehicles using roads within the Planning Area is governed primarily by the number of vehicles, type of vehicles (mix of automobiles, trucks, and other large vehicles), and their speed.

The highest noise levels are adjacent to the Ventura Freeway. Noise levels that would affect noise sensitive land uses such as residences, schools, and hospitals also occur along major arterials including Victoria Avenue, Channel Islands Boulevard, Ventura Road, and Oxnard Boulevard.

Airport Noise. The greatest potential for noise intrusion occurs when aircraft land, take off, or run their engines while on the ground. There are three primary sources of noise in a jet engine: the exhaust, the turbomachinery, and the fan. The noise associated with general aviation propeller aircraft (piston and turbo-prop) is produced primarily by the propellers and secondarily from the engine and exhaust.

Aircraft noise affecting the City is primarily generated by the Oxnard Airport and the Point Mugu Naval Air Station. The Oxnard Airport is situated upon 216 acres of land located in the southwest corner of the City. The Oxnard Airport is served primarily by general aviation and commuter aircraft. In 2000, the last year for which figures are available, the Airport was base to approximately 150 aircraft and 88,277 annual operations.

The Point Mugu Naval Air Station is located within the jurisdictional boundaries of the County of Ventura, which designates the site as "Institutional Use." The property is also within the City of Oxnard's Planning Area. While no major established flight patterns pass over the City, infrequently used patterns do pass over residential areas of the City.

The Camarillo Airport is also located within Ventura County. According to the Ventura County, the Camarillo Airport does not have any flight paths over the City of Oxnard. However, the northeast portion of the City may experience noise generated by Camarillo Airport operations.

Railroad Noise. The Union Pacific Railroad line running across the Planning Area is the only railroad line utilized on a regular basis. The line enters the Planning Area at its eastern boundary, runs west along East Fifth Street to the Transportation Center where it turns north and runs adjacent to Oxnard Boulevard, and eventually crosses the northern City boundary at the Ventura Freeway.

Several factors combine to produce railroad noises, including length of train, speed, grade, type of track, number of engines, and number of trips. The Union Pacific Railroad line operates approximately eight trains in the Planning Area within a 24-hour period. Four trains are scheduled Amtrak passenger trains, and the other four are nonscheduled freight trains that could pass through the City anytime during a 24-hour period. The older residential neighborhoods within the central portion of the City are subject to the greatest noise effects from local railroad activity, particularly the nighttime freight trains.

Existing Noise Conditions and Stationary Noise Sources. A series of short- and long-term noise measurements were completed to help describe existing noise levels within the City. The short-term Leq noise measurements were completed to characterize typical noise levels at various locations within the City. Noise measurements were taken along heavily traveled roadway corridors and in downtown Oxnard, residential neighborhoods, and City parks. Ambient noise levels ranged from 50.7- to 74.2-dBA Leq. The lowest noise level, 50.7-dBA, occurred in a residential neighborhood. The highest noise level, 74.2-dBA, occurred along Victoria Avenue, which is a heavily trafficked City roadway.

Industrial land uses have the potential to generate high noise levels within their immediate operating environments. The scope and degree of noise generated by industrial uses is dependent upon various factors, including type of industrial activity, hours of operation, and their location relative to sensitive land uses. Most of the industrial stationary noise sources within the Planning Area are located within two industrial areas known as the Hueneme Road Industrial Area and the Central Industrial Area.

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their location relative to sensitive land uses. Most of the industrial stationary noise sources within the Planning Area are located within two industrial areas known as the Hueneme Road Industrial Area and the Central Industrial Area.

3.12.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.12.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant noise impact on would occur if the PWIMP would:

- Generate or expose persons to noise levels exceeding standards established in the Oxnard 2030 General Plan or Noise Ordinance, or applicable standards of other agencies;
- Generate or expose persons to excessive groundborne vibration or groundborne noise levels;
- Generate a substantial temporary or periodic increase in ambient noise in the project vicinity above levels existing without the project;
- Generate a substantial permanent increase in ambient noise in the project vicinity above levels existing without the project;
- For a project located within the airport land use plan for Oxnard Airport or within two miles of Naval Base, Ventura County at Point Mugu, would the project expose people residing or working in the project area to excessive noise levels?
- Would the project expose non-human species to excessive noise

3.12.4.2 Approach and Methodology

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

For the purposes of this PEIR, temporary impacts during construction are considered significant if they would substantially interfere with affected land uses. Substantial interference could result from a combination of factors, including: exposing sensitive receptors to noise levels in excess of

regulatory standards or codes, which could result in a considerable nuisance; the generation of substantial noise levels at sensitive receptor locations lasting long periods of time at any one location (i.e., more than one week); and/or construction activities that would affect noise-sensitive uses during the nighttime. The City's 2030 General Plan Noise Element prohibits construction activities within 500 feet of sensitive receptors during the evening hours that exceed noise levels of 60-dBA L_{dn} at residential land uses and 65-dBA L_{dn} at multi-family residences and hotels. For the purposes of this analysis, nighttime construction would be significant if it generated exterior noise levels exceeding 60-dBA L_{eq} in any one-hour period at sensitive land uses where people sleep (residences and hotels).

The PWIMP's long-term operational impacts on the ambient noise environment would be considered substantial if it would expose sensitive receptors or other identified land uses to noise levels in excess of regulatory standards or codes. In addition to concerns regarding the absolute noise level that might occur when a new source is introduced into an area, it is also important to consider the existing ambient noise environment. If the ambient noise environment is quiet and the new noise source greatly increases the noise exposure, even though a criterion level might not be exceeded, an impact may occur.

A numerical threshold to identify the point at which a vibration impact occurs has not been identified by local jurisdictions in the applicable standards or municipal codes. In the absence of local regulatory significance thresholds for vibration from construction equipment, this analysis uses California Department of Transportation (Caltrans) identified PPV thresholds for adverse human reaction (strongly perceptible) and risk of architectural damage to buildings, which are 0.1 in/sec 0.2 in/sec, respectively (Caltrans, 2004).

Regarding the last two significance criteria, because the PWIMP would not involve the development of noise-sensitive land uses that would be exposed to excessive aircraft noise, there would be no impacts associated with these criteria. Therefore, impacts associated with aviation noise are not addressed further in this PEIR.

3.12.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts are discussed below.

Impact 3.12-1: Construction and operation of the PWIMP could generate or expose persons to noise levels exceeding standards established in the Oxnard 2030 General Plan or Noise Ordinance, or applicable standards of other agencies. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction Impacts

Construction activities would occur at numerous locations throughout the City and portions of Ventura County for approximately twenty years. Such activities would result in the generation of noise associated with site preparation and building of each component of the PWIMP. The noise levels generated during construction of the PWIMP facilities would vary during the construction period(s), depending upon the construction phase and the types of construction equipment used.

High noise levels would be created by the operation of heavy-duty trucks, backhoes, bulldozers, excavators, front-end loaders, compactors, scrapers, and other heavy-duty construction equipment. Operating cycles for these types of construction equipment may involve one or two minutes of full

power operation followed by three to four minutes at lower power settings, compared to other equipment such as drill rigs, which tend to operate at a continuous level.

The maximum combined noise levels adjacent to the construction sites could be as high as 84 to 89-dBA. However, it should be noted that average noise levels adjacent to the construction activities would be at least 10- to 20-dBA less than the combined noise levels presented in the table, due to the fact that most of the machinery would not operate at maximum power levels throughout the day and all of the equipment would not operate simultaneously throughout the day. Other primary sources of acoustical disturbance would be random incidents, which would last less than one minute, such as dropping large pieces of equipment or the hydraulic movement of machinery lifts.

In addition to onsite construction noise at the various Project component sites, construction activities would also cause increased sporadic noise levels between 60-dBA and 88-dBA at 50-feet along access routes to the Project sites due to movement of materials, equipment, and workers to and from on the various sites. Truck trips generated by Project construction would be dispersed throughout the day and over the local road network, and commute trips by construction workers would primarily occur before and after Project truck trips occur. Daily transportation of materials and construction workers would not be a substantial source of daily noise levels.

The potential for construction of the Project to violate noise standards and/or adversely affect nearby sensitive receptors could be significant. However, the impact of each individual project component varies and the following mitigation measures would help reduce any potential temporary construction related impacts to less than significant levels.

Temporary Construction Mitigation Measures

Mitigation Measure 3.12-1a: **Limit Construction Hours.** To the extent possible, construction activities will be limited to the least noise-sensitive times and will comply with the City's noise ordinances. Construction, alteration, and other related activities shall be allowed on weekdays between the hours of 8 a.m. and 5 p.m., and on Saturdays between the hours of 10 a.m. and 6 p.m. Construction activities shall not exceed the outdoor ambient sound level (dBA) of 86 dBA. Nighttime construction would require specific and special approval from the City. Temporary hotel accommodations shall be provided to all residents located within 100-feet of a designated construction area where construction activity would occur on a 24-hour continuous basis. The accommodations shall be provided for the duration of the 24-hour construction activities.

Mitigation Measure 3.12-1b: Locate Staging Areas away from Sensitive Receptors. The City's construction specifications shall require that the contractor select staging areas as far as feasibly possible from sensitive receptors. Currently, planned staging areas are at the City's existing WWTP, water, and stormwater yards/facilities.

Mitigation Measure 3.12-1c: Maintain Mufflers on Equipment. The City's construction specifications shall require the contractor to maintain all construction equipment with manufacturer's specified noise-muffling devices. The City shall ensure that the contractor(s) construction equipment with internal combustion engines have sound control devices at least as effective as those provided by the original equipment manufacturer. No equipment shall be permitted to have an un-muffled exhaust.

Mitigation Measure 3.12-1d: Idling Prohibition and Enforcement. The City shall prohibit and enforce unnecessary idling of internal combustion engines. In practice, this would mean turning off equipment if it will not be used for five or more minutes.

Mitigation Measure 3.12-1e: Equipment Location and Shielding. Locate all stationary noise-

generating construction equipment such as air compressors and standby power generators as far as possible from homes and businesses. Contractor specifications shall include a requirement that construction equipment located within 500-feet of noise-sensitive receptors shall be equipped with noise reducing engine housings or other noise reducing technology such that equipment noise levels are no more 85-dBA at 50-feet. The line of sight between construction within 500-feet of sensitive receptors and nearby sensitive receptors shall be blocked by portable acoustic barriers and/or shields to reduce noise levels by at least an additional 10-dBA.

Mitigation Measure 3.12-1f: Notify Residents and Sensitive Receptors. Residences and other sensitive receptors within 500-feet of a construction area shall be notified of the construction schedule in writing, at least two weeks prior to the commencement of construction activities. The City or the contractor(s) shall designate a noise disturbance coordinator who would be responsible for responding to complaints regarding construction noise. The coordinator shall determine the cause of the complaint and ensure that reasonable measures are implemented to correct the problem. A contact number for the noise disturbance coordinator shall be conspicuously placed on construction site fences and included in the construction schedule notification sent to nearby residences. The notice to be distributed to residences and sensitive receptors shall first be submitted to the City for review and approval.

Significance After Mitigation: Less-Than-Significant Impact.

Long-Term Operational Impacts

PWIMP facilities would generate a nominal amount of operational noise resulting from mobile sources as a result of employee commute trips. In addition, facility(s) operations and maintenance activities would require several truck trips per day for routine maintenance and inspection. Noise that would be associated with plant, pipeline, and other facility maintenance would be short-term and random and would not result in measureable increases of ambient noise levels in the surrounding area. Impacts related to PWIMP maintenance would less than significant.

The PWIMP facilities such as the expanded desalter and APWF, the new water supply and IPR/ASR wells, and pumping stations associated with the water supply and recycled water storage tanks would include long-term onsite stationary noise sources. The potential impact of individual PWIMP facility components would vary and need to be designed to avoid potential noise impacts to sensitive receptors. With the implementation of the following mitigation measure, any impacts would be considered to be less than significant.

Long-Term Operational Mitigation Measures

Mitigation Measure 3.12-1g: Enclosed Noise Structures. All stationary noise sources (e.g., pump stations, permanent and emergency power generators, electrical gear, motors, etc.) shall be located within enclosed structures with adequate setback and screening, as necessary, to achieve acceptable regulatory noise standards for industrial uses as well as to achieve acceptable levels at the property lines of nearby residences and commercial uses, as determine by the City or Ventura County, as appropriate. Noise enclosures shall be designed to reduce equipment noise levels by at least 20-dBA. Once the stationary noise sources have been installed, noise levels shall be monitored to ensure compliance with local noise standards. If PWIMP facility(s) stationary noise sources exceed the applicable noise standards, an acoustical engineer shall be retained to install additional noise attenuation measures in order to meet the applicable noise standards.

Significance After Mitigation: Less-Than-Significant Impact.

Impact 3.12-2: Construction of the PWIMP could generate or expose persons to excessive groundborne vibration or groundborne noise levels. The operations of the PWIMP facilities would not cause groundborne vibrations or groundborne noises and is not discussed further. The potential temporary construction impacts are discussed below.

Temporary Construction Impacts

Some types of construction equipment can produce vibration levels that can cause architectural damage to structures and be annoying to nearby sensitive receptors. Vibration levels generated during construction of the PWIMP facilities would vary by the type of facility, the construction period duration, the construction timing or phase, and the types of construction equipment used.

A numerical threshold to identify the point at which a vibration impact occurs has not been identified by local jurisdiction standards or municipal codes. Therefore, Peak Particle Velocity (PPV) thresholds identified by Caltrans are used in this analysis to determine the significance of vibration impacts related to adverse human reaction (strongly perceptible) and risk of architectural damage to normal buildings, which are 0.1 in/sec and 0.2 in/sec, respectively (Caltrans, 2004). At distances greater than 25-feet, construction equipment would produce vibration levels under the strongly perceptible level and would not result in architectural damage to normal buildings. Construction of the PWIMP facilities would be greater than 25-feet from structures, with exception of the pipelines/conveyance facilities through the City, which could be as close as 10-feet from some structures. Construction within 10-feet of buildings could cause annoyance impacts, and use of vibratory rollers, caisson drills, and loaded trucks within 10-feet of structures could result in a significant impact related to building damage. Implementation of the following mitigation measure would reduce these impacts to a less-than-significant level.

Temporary Construction Impacts

Mitigation Measures 3.12-2a: Vibration Monitoring. Vibration monitoring shall be conducted for any and all PWIMP construction activities within 10-feet of buildings to confirm vibration levels do not exceed 0.1 in/sec PPV. If vibration levels exceed the limits of this mitigation measure, then construction practices shall be modified to use smaller types of construction equipment, operate the equipment in a manner to reduce vibration, or use alternate construction methods, and monitoring shall continue for an additional 200-feet for until construction practices meet the required vibration levels. The monitoring in this mitigation measure shall be repeated if the construction methods change in a manner that would increase vibration levels, or when structures are closer to the limits of construction than previous vibration monitoring have confirmed is below the vibration thresholds. Smaller vibratory rollers shall be used to minimize vibration levels during repaving activities where needed to meet vibration limits.

Significance After Mitigation: Less-Than-Significant Impact.

3.12.5 Cumulative Effects

Construction and operation of the PWIMP has the potential to have significant noise impacts on sensitive receptors in the area. However, with the implementation of the identified mitigation measures above would reduce these impacts to less-than-significant levels. As for cumulative impacts, the City would need to further analyze the construction of each of these PWIMP facilities on a project-level basis at the appropriate time with a full understanding of other projects being constructed in the area at the same time to be able to further assess the potential for the PWIMP to have cumulative noise impacts.

3.13 Traffic and Transportation

This section evaluates the potential impacts to traffic and transportation that could result from the construction and/or operation of the proposed PWIMP.

3.13.1 Introduction

A community is both defined and constrained by the network of highways, roads, streets, waterways, and railways that move its residents and goods through and also in and out of the area. The historical emphasis of transportation planning efforts in the City of Oxnard has been on the development of a street and highway network that would meet the demands of private automobile users and industry. Alternative transportation modes, including public transportation, bicycling, and passenger rail facilities, are becoming more important as the City of Oxnard focuses on reducing the dependency on private automobiles for transportation. This evaluation of noise was completed using information collected from the City's existing 2030 General Plan and the City's May 2017 *CEQA Guidelines* were also reviewed. Key Terms and concepts include the following:

- **Average Daily Traffic (ADT).** The total traffic volume during a given period of time divided by the number of days in the period. Current ADT volumes can be determined by continuous traffic counts or periodic counts. Where only periodic traffic counts are taken, ADT volume can be established by applying correction factors such as for the season or day of the week.
- **Capacity.** Maximum rate of flow that can be accommodated on a facility segment under prevailing conditions.
- **Congestion.** The resulting reduction of flow that occurs when demand exceeds the capacity of a roadway.
- **Level of Service (LOS).** A descriptive indicator of operating conditions on a lane or roadway. LOS is a qualitative measure of the effect of traffic flow factors, such as speed and travel time, interruption, freedom to maneuver, driver comfort, and convenience.
- **Volume to Capacity Ratio (V/C).** The V/C ratio is a comparison of traffic volume on a roadway to the traffic capacity of the roadway, based on the number of lanes available.

3.13.2 Regulatory Context

Standards applicable to traffic and transportation are summarized below.

3.13.2.1 Federal

Federal laws that apply to the PWIMP include the following:

Title 49, Code of Federal Regulations (CFR), Sections 171-177 (49 CFR 171-177). Title 49, Code of Federal Regulations (CFR), Sections 171-177 (49 CFR 171-177) governs the transportation of hazardous materials, the types of materials defined as hazardous, and the marking of the transportation vehicles.

49 CFR 350-399, and Appendixes A-G, Federal Motor Carrier Safety Regulations. 49 CFR 350-399, and Appendixes A-G, Federal Motor Carrier Safety Regulations address safety considerations for the transport of goods, materials, and substances over public highways.

49 CFR 397.9, the Hazardous Materials Transportation Act of 1974. 49 CFR 397.9, the Hazardous Materials Transportation Act of 1974, directs the U.S. Department of Transportation to establish criteria and regulations for the safe transportation of hazardous materials.

3.13.2.2 State

State laws that apply to this project include the following sections of this California Vehicle Code (CVC), unless specified otherwise:

California Streets and Highways Code (S&HC). California Streets and Highways Code (S&HC), Sections 660, 670, 1450, 1460 et seq., 1470, and 1480, regulates right-of-way encroachment and granting of permits for encroachments on state and county roads.

Sections 13369, 15275, and 15278. Sections 13369, 15275, and 15278 address the licensing of drivers and classifications of licenses required to operate particular types of vehicles. In addition, certificates permitting the operation of vehicles transporting hazardous materials are addressed.

Sections 25160. Sections 25160 et seq. addresses the safe transport of hazardous materials.

Sections 2500-2505. Sections 2500-2505 authorize the issuance of licenses by the Commissioner of the CHP to transport hazardous materials, including explosives.

Sections 31303-31309. Sections 31303-31309 regulate the highway transportation of hazardous materials, routes used, and restrictions. CVC Section 31303 requires hazardous materials to be transported on state or interstate highways that offer the shortest overall transit time possible.

Sections 31600-31620. Sections 31600-31620 regulate the transportation of explosive materials.

Sections 32000-32053. Sections 32000-32053 regulate the licensing of carriers of hazardous materials and include noticing requirements.

Sections 32100-32109. Sections 32100-32109 establish special requirements for the transportation of substances presenting inhalation hazards and poisonous gases. CVC Section 32105 requires shippers of inhalation or explosive materials to contact the CHP and apply for a Hazardous Material Transportation License. Upon receiving this license, the shipper will obtain a handbook specifying approved routes.

Sections 34000-34121. Sections 34000-34121 establish special requirements for transporting flammable and combustible liquids over public roads and highways.

Sections 34500, 34501, 34501.2, 34501.3, 34501.4, 34501.10, 34505.5-7, 34506, 34507.5, and 34510-11. Sections 34500, 34501, 34501.2, 34501.3, 34501.4, 34501.10, 34505.5-7, 34506, 34507.5, and 34510-11 regulate the safe operation of vehicles, including those used to transport hazardous materials.

S&HC, Sections 117 and 660-72, and CVC, Sections 35780 et seq. S&HC, Sections 117 and 660-72, and CVC, Sections 35780 et seq., require permits to transport oversized loads on county roads. California S&HC Sections 117 and 660 to 711 require permits for any construction, maintenance, or repair involving encroachment on state highway rights-of-way. CVC Section 35780 requires approval for a permit to transport oversized or excessive loads over state

highways

California State Planning Law, Government Code Section 65302. California State Planning Law, Government Code Section 65302, requires each city and county to adopt a General Plan, consisting of seven mandatory elements, to guide its physical development. Section 65302(b) requires that a circulation element be one of the mandatory elements.

- All construction in the public right-of-way will need to comply with the "Manual of Traffic Controls for Construction and Maintenance of Work Zones" (Caltrans, 1996).
- The Caltrans weight and load limitations for state highways apply to all state and local roadways. The weight and load limitations are specified in the CVC Sections 35550 to 35559. The following provisions, from the CVC, apply to all roadways and are therefore applicable to this project.
- General Provisions:
  - The gross weight imposed upon the highway by the wheels on any axle of a vehicle shall not exceed 20,000 pounds; and the gross weight upon any one wheel, or wheels, supporting one end of an axle, and resting upon the roadway, shall not exceed 10,500 pounds.
  - The maximum wheel load is the lesser of the following: (a) the load limit established by the tire manufacturer or (b) a load of 620 pounds per lateral inch of tire width, as determined by the manufacturer's rated tire width.
- Vehicles with Trailers or Semitrailers:
  - The gross weight imposed upon the highway by the wheels on any one axle of a vehicle shall not exceed 18,000 pounds; and the gross weight upon any one wheel, or wheels, supporting one end of an axle and resting upon the roadway, shall not exceed 9,500 pounds. The exception is that the gross weight imposed upon the highway by the wheels on any front steering axle of a motor vehicle shall not exceed 12,500 pounds.

3.13.2.3 Local

The local laws that apply are as follows:

City of Oxnard 2030 General Plan. The City of Oxnard 2030 General Plan (transportation and circulation element) sets forth policies that are applicable to the GREAT project. They are as follows:

- The City LOS standards for the state highway system and specific routes of regional significance shall be those standards adopted in the Comprehensive 2030 General Plan and Environmental Impact Report (EIR). (City of Oxnard, 1990)
- The City shall require the managers of all new development projects to analyze their contribution to increased traffic and to implement improvements necessary to address the increase.

Ventura County General Plan. The Transportation and Circulation Element of the Ventura County General Plan identifies the goals, policies, and implementation measures that ensure compatibility between land use, infrastructure, and transportation modes (motorized and non-

motorized). The plan describes the circulation diagram and functional roadway classification system of the County. The element establishes standards that guide the development of the transportation system and management of access to the highway system by new development, throughout the unincorporated areas of the County. (Ventura County, 1988)

Ventura County Transportation Commission (VCTC). The VCTC is a planning partnership among the local, county, regional, nonattainment area, and state planning agencies that creates processes to facilitate coordination and cooperation and to provide a synergistic environment where optimum transportation decisions can be made.

Regional Transportation Plan. The RTP represents the blueprint for major transportation investments in the region. The plan provides a vision for the regional transportation system, now and in the future, and is designed to achieve specific goals defined by the Ventura County community.

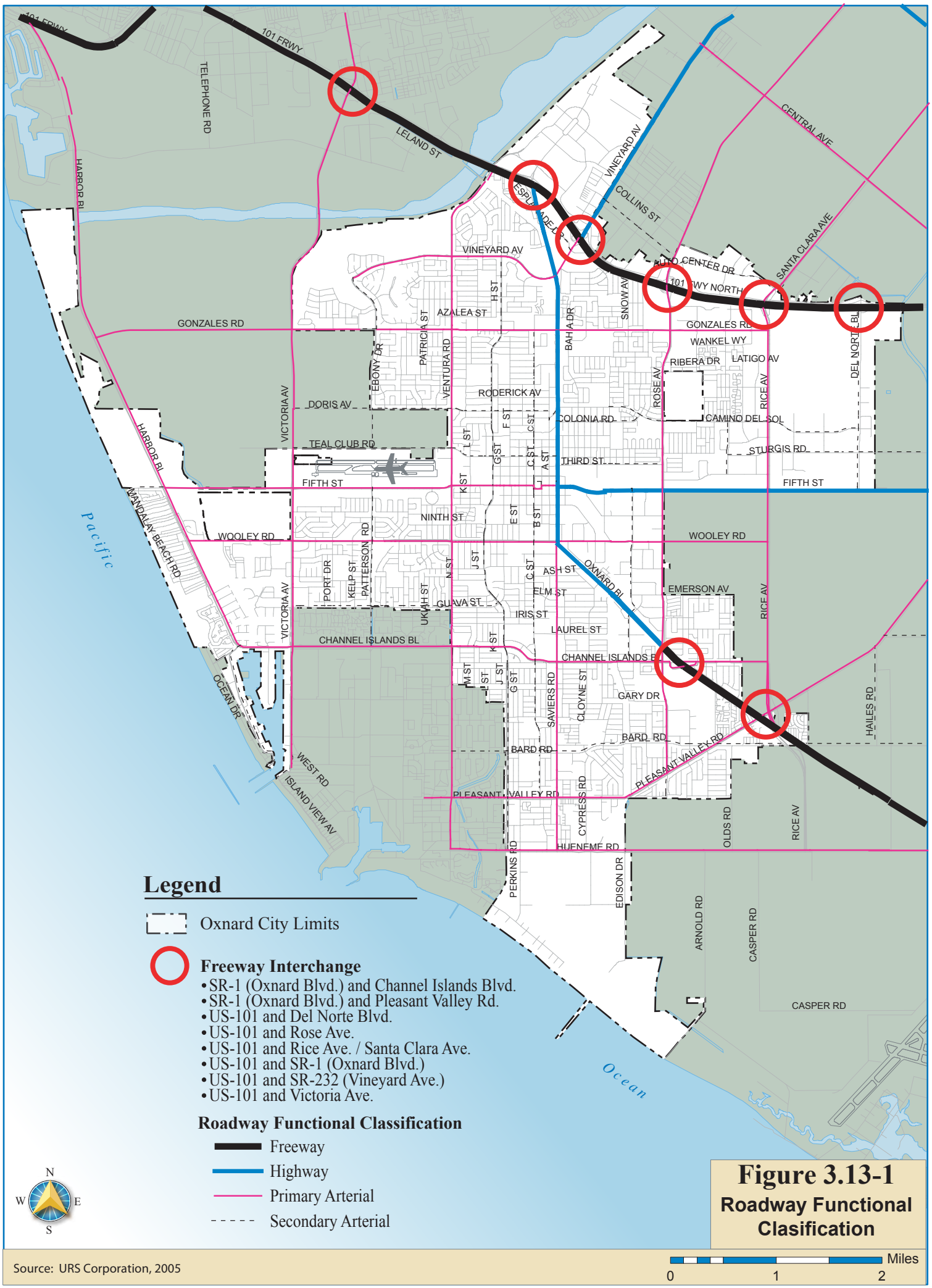
3.13.3 Environmental Setting

This section describes the existing conditions of traffic and transportation in the PWIMP Planning Area.

Functional Classification of Roadways. A functionally classified roadway system allows streets to be grouped according to their purpose and function within the transportation network. Urban streets generally serve two primary functions: traffic movement or mobility, and accessibility. Functional classification describes the level of mobility and access provided by facilities within a community's transportation network.

The City of Oxnard currently provides standards for facilities described in four functional categories: freeways, arterials, collectors, and local roads. Each type of road serves a specific purpose outlined below. This hierarchy of streets and highways is only a general guide to the classification of roadways, which make up the circulation system. Often a street serves a dual function (both mobility and accessibility) and it is difficult to provide a definitive classification. In addition, the width of a roadway does not always correspond directly to its function in the overall circulation system, although the wider roadways tend to have more regional functions within the overall circulation system. Figure 3.13-1 illustrates the functional classification of Oxnard's road network.

- **Freeways.** Freeways (expressways) are intended to serve both intra- regional and inter-regional travel. Freeways provide for high speed, through traffic movement on continuous routes. Freeways provide connections to other regional highways and are capable of carrying heavy traffic volumes. Speed limits on freeways are usually the highest allowed by law. Access to freeways is strictly controlled and accomplished through on- and off-ramps. Freeways provide no access to adjacent properties (but do provide high visibility). Collector streets require 80 feet of Right-of-Way (ROW) and are typically designed to accommodate three to four lanes of traffic.
- **Arterials.** Arterials provide for mobility within Oxnard and adjacent areas. Arterials are designed to carry through traffic on continuous routes and join major traffic origins and destinations, freeways, and other arterials. For arterials, access is less restricted than freeways, although access to and from adjacent property is generally selective. Collector streets require 80 feet of ROW and are typically designed to accommodate



Legend

Oxnard City Limits

Freeway Interchange

- SR-1 (Oxnard Blvd.) and Channel Islands Blvd.
- SR-1 (Oxnard Blvd.) and Pleasant Valley Rd.
- US-101 and Del Norte Blvd.
- US-101 and Rose Ave.
- US-101 and Rice Ave. / Santa Clara Ave.
- US-101 and SR-1 (Oxnard Blvd.)
- US-101 and SR-232 (Vineyard Ave.)
- US-101 and Victoria Ave.

Roadway Functional Classification

- Freeway
- Highway
- Primary Arterial
- Secondary Arterial

N W E S

Figure 3.13-1
Roadway Functional Clasification

Source: URS Corporation, 2005

0 1 2 Miles

three to four lanes of traffic.

- **Collectors.** Collectors provide for internal traffic movement within Oxnard and connect local roads to arterials. Collectors are designed to take traffic off of local roads and feed it into arterials and freeways. Collector streets require 80-feet of ROW and are typically designed to accommodate two lanes of traffic. Collector streets require 80 feet of ROW and are typically designed to accommodate two lanes of traffic.
- **Local Roads.** Local roads provide direct access to adjacent property and connect with collectors and arterials. Local roads are typically developed as two lane undivided roadways. Long-term planning is limited to protecting the ability of future developments to extend local roads through existing parcels. Collector streets require 80 feet of ROW and are typically designed to accommodate one lane of traffic in each direction.
- **Alleys.** Alleys are narrow roadways providing secondary access to land uses. Generally, alleys provide access to the rear of properties and pass through the middle of a block. Alleys are generally no more than twenty-five feet in width because they provide for turning movements into adjacent properties along with allowing vehicles to pass one another.

Major Oxnard Corridors. Major corridors in the PWIMP Planning Area include state highways and freeways, and roadways, which serve inter-county and intra-county travel. According to the Ventura County Congestion Management Plan (CMP), the only major CMP corridors that impact Oxnard are State Route (SR) 118 and US-101. Figure 3.13-2 illustrates Oxnard's major north-south and east-west corridors in Oxnard.

- **Major North-South Travel Corridors.** There are eight north-south travel corridors within the City: Harbor Boulevard, Victoria Avenue, Ventura Road, Oxnard Boulevard, Saviers Road, Rose Avenue, Rice Avenue, and Del Norte Boulevard.

- **Major East-West Travel Corridors.** There are eight primary east-west travel corridors within the City: Fifth Street, Camino Del Sol, Channel Islands Boulevard, Gonzales Road, Hueneme Road, Pleasant Valley Road, Vineyard Avenue, and Wooley Road.

State Highways. Parts of five state highways and routes pass through the PWIMP Planning Area. These state highways are described below.

SR-1 - SR-1 (Pacific Coast Highway) is a 656-mile north south route and is a part of the California Scenic Highway System. SR-1 extends from the Los Angeles County line to Santa Barbara County and provides interregional, recreational, commuter and local travel through both rural and urban settings. In relation to Oxnard, SR-1 has a junction with SR-34, SR-232, and US-101.

- **State Route 34 (SR-34)** - SR-34 (Fifth Street) is a 13-mile east-west route that starts on the west at the intersection of SR-1 / Oxnard Boulevard and Fifth Street in Oxnard. SR-34 continues to the City of Camarillo and ends at SR-118.

101 FRWY
101 FRWY
TELEPHONE RD
HARBOR BL
Santa Clara River
LELAND ST
CENTRAL AVE
VINEYARD AV
COLLINS ST
ESPLANADE DR
SANTA CLARA AVE
VINEYARD AV
CENTER ST
101 FWY NORTH
GONZALES RD
AZALEA ST
H ST
SNOW AV
BAHIA DR
GONZALES RD
WANKEL WY
RIBERA DR
LATIGO AV
DEL NORTE BL
PATRICIA ST
VENTURA RD
EBONY DR
VICTORIA AV
DORIS AV
RODERICK AV
RICE AV
COLONIA RD
TEAL CLUB RD
L ST
F ST
C ST
G ST
THIRD ST
STUDIO DR
HARBOR BL
FIFTH ST
K ST
E ST
B ST
FIFTH ST
Pacific
WANDALAY BEACH RD
NINTH ST
ROSE AV
PIER WK
WOOLEY RD
PATTERSON RD
WOOLEY RD
PORT DR
KELP ST
J ST
ASH ST
OXNARD BL
VICTORIA AV
UKIAH ST
N ST
ELM ST
EMERSON AV
IRIS ST
LAUREL ST
RICE AV
CHANNEL ISLANDS BL
H ST
CHANNEL ISLANDS BL
OCEAN DR
M ST
L ST
J ST
G ST
SAVIERS RD
CLOYNE ST
GARY DR
HAILES RD
BARD RD
BARD RD
PLEASANT VALLEY RD
WEST RD
ISLAND VIEW AV
PLEASANT VALLEY RD
CYPRESS RD
OLDS RD
RICE AV
HUENEME RD
PERKINS RD
EDISON DR
ARNOLD RD
CASPER RD
CASPER RD
Ocean
Legend
Oxnard City Limits
South Coast Area Transit (SCAT)
City of Oxnard
City of Port Hueneme
Existing Major Traffic Corridors
Traffic Corridor
Traffic Signals by Agency
Caltrans District 7 (37)
City of Oxnard (125)
City of Port Hueneme (7)
Ventura County (8)
N
W
E
S
Figure 3.13-2
Streets and Highways
Source: City of Oxnard, 2005 and URS Corporation, 2006
0
1
2
Miles

- **State Route 118 (SR-118)** - SR-118 is a 47-mile east-west route and is a part of the California Scenic Highway System. SR-118 extends from SR- 126, in Ventura, to the Los Angeles County line within Ventura County. SR-118 travels north its last four miles, widening out to four lanes at Vineyard Avenue (SR-232), then crossing the Santa Clara River. In relation to the PWIMP, SR-118 has a junction with SR-34 and SR-232.
- **State Route 232 (SR-232)** - SR-232 (Vineyard Avenue) is a 4-mile north-south route and extends from SR-1 to SR-118 within Ventura County. SR-232 starts on the west at the intersection of SR-1 / Oxnard Boulevard and Vineyard Avenue. SR-232 continues northeast on Vineyard Avenue, intersects with US-101, and ends at SR-118. In relation to the PWIMP, SR-232 has a junction with SR-1, SR-118 and US-101.
- **US Highway 101 (US-101)** – US-101 is a 1,540-mile north south-route that terminates in Washington State. US-101 extends from the Los Angeles County line to the Santa Barbara County line within Ventura County. US-101 is heavily used by commuters traveling between Ventura, Los Angeles and Santa Barbara Counties and the route experiences heavy seasonal recreational traffic bound for vacation destinations along the coast. Regional activity centers such as Oxnard's Esplanade Shopping Center generate a great deal of localized traffic activity that impacts US-Weekend traffic, which has a high recreational component, also results in sporadic traffic congestion for US-101. Locations on US-101 with especially heavy traffic are the stretches between Camarillo and the Santa Clara River Bridge in Oxnard. In relation to the PWIMP, US-101 has a junction with SR-1, SR-232 and SR-34.

Major Arterials. Significant traffic generator routes pass through the PWIMP Planning Area. These arterials are described below.

- **Bard Road.** Bard Road serves as a secondary arterial from Saviers Road to Pleasant Valley Road. Bard Road provides east-west access to Oxnard's south central and southeast neighborhoods and also serves as a route from the City of Port Hueneme and the Navy's Construction Battalion Center to SR-1.
- **C Street.** C Street functions as a local arterial from Gonzales Road to Bard Road. Although it does not have a cross section consistent with the local arterial standard, C Street functions as the one carrying traffic parallel to relatively congested Oxnard Boulevard.
- **Channel Islands Boulevard.** From Harbor Boulevard in Oxnard through the City of Port Hueneme to Rice Avenue, Channel Islands Boulevard is primarily a four lane street with limited driveway access in commercial and residential areas.
- **Del Norte Boulevard.** Del Norte Boulevard provides access to US-101 from the Northeast Industrial Area. Del Norte Boulevard functions as a secondary arterial from US-101 to Sturgis Road and as a local roadway from Sturgis Road south to Fifth Street (SR-34).
- **Emerson Avenue.** Emerson Avenue is a local arterial that provides access to the Channel Islands Business Center from Rose Avenue and SR-1 via Statham Boulevard.

East of Rose Avenue, Emerson Avenue functions as a collector street for the Lemonwood Neighborhood.

- **Fifth Street (SR-34).** Fifth Street is the principal east-west street serving the Central Business District of Oxnard and the mid Oxnard region on both the east and west sides of Oxnard. Fifth Street is currently designated SR-34 east of Oxnard Boulevard. Fifth Street functions as a secondary arterial except for the segments from Patterson Road to H Street and Oxnard Boulevard to Rose Avenue, which presently function as primary arterials. Fifth Street provides access to Harbor Boulevard, which is a major route into and out of Oxnard.
- **Gonzales Road.** From Victoria Avenue to Rice Avenue in Oxnard, Gonzales Road is a four-lane divided primary arterial serving mostly residential and commercial areas. Gonzales Road is also a six-lane road at certain locations including east of Entrada. Gonzales Road extends out to Harbor Boulevard into Ventura County.
- **Harbor Boulevard.** From the Santa Clara River south to Fifth Street in Oxnard, Harbor Boulevard is a two-lane road serving primarily recreational and agricultural uses. South of Fifth Street to Channel Islands Boulevard, Harbor Boulevard is a four-lane city street with limited driveway access.
- **H Street/ J Street.** H and J Street presently function as local arterials from Vineyard Avenue to Channel Islands Boulevard. H and J Streets don't have cross sections consistent with the local arterial standard.
- **Hueneme Road.** From Ventura Road in the City of Port Hueneme to J Street in Oxnard, Hueneme Road is a four lane divided roadway. From J Street in Oxnard east to Las Posas Road, Hueneme Road is primarily a two-lane road serving light industrial and agricultural areas. Hueneme Road is part of the National Highway System and is a Port of Hueneme access route.
- **Lombard Avenue.** Lombard Avenue functions as a local arterial serving a portion of the Oxnard Northeast Industrial Area.
- **Oxnard Boulevard (SR-1.)** Oxnard Boulevard is one of the principal entrances to Oxnard from both the north and south. Oxnard Boulevard is also the principal north south access to the Central Area and continues southerly through the Five Points intersection to southeast commercial and residential areas. Although Oxnard Boulevard's development as a commercial strip is an obstacle, its location in the center of Oxnard has led to its functioning as a primary arterial. Oxnard Boulevard is currently designated as SR-1 and the State of California is responsible for operations and maintenance. Oxnard Boulevard is one of the three major arterials that create the Five Points Intersection (Oxnard Boulevard/ Saviers Road/ Wooley Road).
- **Patterson Road.** Patterson Road is a local arterial which provides access to residential neighborhoods in the northwest and southwest areas of Oxnard. Patterson Road provides access to the Oxnard Airport, the City of Port Hueneme and the U.S. Navy Construction Battalion Center.
- **Pleasant Valley Road.** From US-101 in the City of Camarillo south to SR-1 in

Oxnard, Pleasant Valley Road is a two-lane road serving light industrial and agricultural areas. South of SR-1 to Ventura Road in the City of Port Hueneme, Pleasant Valley Road is a four-lane city street serving residential and commercial areas.

- **Rice Avenue.** From US-101 south to Fifth Street in Oxnard, Rice Avenue is primarily a six-lane city street with limited access serving light industrial areas. South of Fifth Street to SR-1, Rice Avenue is a four-lane divided rural highway in Ventura County and extends to Hueneme Road. Rice Avenue is part of the National Highway System and is a Port of Hueneme access route.
- **Rose Avenue.** From US-101 south to Pleasant Valley Road, Rose Avenue is primarily a four-lane road with six lanes at certain locations
- **Santa Clara Avenue.** From SR-118 to north of US-101 in Oxnard, Santa Clara Avenue is a two-lane rural road through agricultural areas.
- **Saviers Road.** From Oxnard Boulevard south to Hueneme Road in Oxnard, Saviers Road is a four-lane city street serving primarily commercial and residential areas. Saviers Road is one of the three major arterials that create the Five Points Intersection (Oxnard Boulevard/ Saviers Road/ Wooley Road).
- **Ventura Road.** From US-101 in Oxnard south to Hueneme Road in the City of Port Hueneme, Ventura Road is a four-lane city street with limited driveway access that serves commercial and residential areas.
- **Victoria Avenue** - From Olivas Park Drive in the City of Ventura south to Channel Islands Boulevard, Victoria Avenue is a four lane, divided street that serves the agricultural areas north of Wooley Road and the residential and commercial areas south of Wooley Road.
- **Vineyard Avenue (SR-232).** Vineyard Avenue is an important connection between Route 101 and central Oxnard via Oxnard Boulevard. Between Oxnard Boulevard and the Route 101 interchange, Vineyard Avenue is a six-lane divided facility. Northeast of Route 101, Vineyard Avenue is a secondary arterial facility. Vineyard Avenue is a principal entrance to Oxnard for westbound traffic on US-101.
- **Wooley Road** - In Oxnard from Victoria Avenue east to Rose Avenue, Wooley Road is a divided four lane city street serving residential, commercial areas and light industrial areas. Wooley Road from Harbor Boulevard to Victoria Avenue is a secondary arterial with two to four lanes. Wooley Road also extends out to Rice Avenue with two lanes into Ventura County as a collector west of Harbor Boulevard. Wooley Road is one of the three major arterials that create the Five Points Intersection (Oxnard Boulevard/ Saviers Road/ Wooley Road).

Existing Traffic Volumes and Level of Service. The purpose of Level of Service (LOS) is to determine how much traffic during the rush hour is acceptable on our state freeways, highways and major streets. A LOS measurement makes sure that traffic is measured the same way throughout the City of Oxnard and other regions. To evaluate traffic operating conditions and to provide a basis for comparison of operation conditions, traffic planners use

the LOS. LOS is a qualitative measure of traffic flow representing the measurement of several factors, including speed and travel time, traffic interruption, freedom to maneuver, safety, driving comfort and convenience and operating costs.

LOS is identified by letter grades ranging from A through F. Table 3.13-1 illustrates the characteristics associated with the LOS grade for signalized intersections. LOS A represents the best driving conditions, while LOS F represents the worst conditions. LOS A, B and C indicate conditions where traffic moves without significant delays over periods of peak travel demand. LOS D and E are progressively worse peak hour operating conditions and F conditions represent where demand exceeds the capacity of an intersection.

Table 3.13-1
Level of Service (LOS) Descriptions for Signalized Intersections

LOS	Description	Duration (seconds)
A	Free/Flow/Insignificant Delays	< 10.00
B	Stable Operation/Minimal Delays	10.10 – 20.00
C	Stable Operation/Acceptable Delays	20.01 – 35.00
D	Approaching Unstable/Tolerable Delays	35.10 – 55.00
E	Unstable Operation/Significant Delay	55.10 0 80.00
F	Forced Flows/Excessive Delays	> 80.00

Source: Transportation Research Board, Highway Capacity Manual, 2000
Comment: Delay in seconds is illustrated with decimal place values because of accuracy – For a general understanding of the traffic delay, the decimal places can be removed. For example, 20.1 – 35.0 would become 20 – 35

The Highway Capacity Manual (HCM) contains considerable detail on roadway conditions, including width, terrain and other factors. These factors have been simplified and generalized for planning purposes. LOS for signalized intersections is evaluated based upon average vehicle delay experienced by vehicles entering an intersection. Control delay, or signal delay, includes initial deceleration, queue move up time, stopped delay and final acceleration delay. As delay increases, the LOS decreases. Calculations for signalized and unsignalized intersections are different due to the variation in traffic control.

In general, a deficient LOS in a City would increase congestion and reduce the mobility of residents by use of transit, private automobile, passenger railroad, etc. This decrease in mobility could have fluctuating impacts on City business and revenue generation, especially if goods movement from the Port of Hueneme were impacted as to be a decreased economic resource for Oxnard. Also, a City's deficient LOS does not assist in an emergency situation, such as fire departments, medical response teams and general citywide evacuation for any reason. In the 2030 General Plan, the acceptable LOS for Oxnard intersections was grade C or better. A LOS of a grade C or better is still considered acceptable for the PWIMP.

Existing Road Conditions. A summary of the existing road conditions within the PWIMP Planning Area is as follows.

- **SR-1 (Oxnard Boulevard):** SR-1 on Oxnard Boulevard is two lanes in each direction and carries a large volume of truck traffic from the Port of Hueneme, the fourth busiest ocean port in the State of California. This portion of SR-1 (Oxnard Boulevard) traveling through Oxnard is heavily congested and operates at Level of Service F.

- **SR-118:** On westbound SR-118, traffic volume increases approaching the Cities of Oxnard and Ventura, with 37,000 Average Daily Trips (ADT) using the bridge over the Santa Clara River. SR-118 has been subjected to heavy truck use due to trucks bypassing the congestion, steep grade and weighing station on US-101. According to the Ventura County CMP, 16 percent of the total volume of vehicles on SR-118 is truck traffic. This volume of trucks creates severe congestion, noise, and safety impacts on the two-lane segment in Oxnard.
- **US-101:** US-101 experiences heavy daily traffic with volumes ranging from 133,000 to 199,000 ADT, with about 5 percent of this volume consisting of truck traffic, according to the Ventura County CMP. About 46 percent of daily truck traffic from the Port of Hueneme, approximately 300 truck trips per day, use US-101 to travel between the Port of Hueneme and the Los Angeles area. The amount of truck traffic from the Port of Hueneme is expected to increase as Port of Hueneme operations are expected to continue to expand.

Based on recent traffic counts including turning movement counts, often referred to as AM PM Peak counts, and 24- hour counts, often referred to as Average Daily Trip (ADT) counts, the LOS for Oxnard intersections were calculated.

The Highway Capacity Manual by the Transportation Research Board calculates a signalized and non-signalized intersection differently based on the differences in the amount of queue time and the characteristics of the intersection. For example, there is a difference in the amount of time a driver is required to wait at a red light at a signalized intersection as compared with a driver without that particular wait at an un-signlaized intersection. Un-signalized intersections do not use a v/ c ratio, but rather an amount of time measured in seconds for the LOS analysis.

Most Deficient Intersections

Based on the 2030 General Plan, six intersections have a deficient LOS in the AM and PM peak periods. These intersections include:

- Fifth Street and Del Norte
- Harbor Boulevard and Gonzales
- SR-1 (Oxnard Boulevard)/ Saviers Road and Wooley Road (Five Points)
- Victoria Avenue and Doris Avenue
- Victoria Avenue and Teal Club Drive
- SR-232 (Vineyard Avenue) and SR-1 (Oxnard Boulevard)

Critical AM

Based on the 2030 General Plan, five intersections had a deficient LOS in the AM peak period. These intersections include:

- Harbor Boulevard and Fifth Street
- Lombard Street and Gonzales Road

- Ventura Road and Gonzales Road
- Victoria Avenue and Gonzales Road
- US-101 and Del Norte Boulevard

Critical PM Intersections

Based on the 2030 General Plan, fourteen intersections had a deficient LOS in the PM peak period (See Figure 3.13-3). These intersections include:

- C Street and Gonzales Road
- H Street and Gonzales Road
- Rice Avenue and Fifth Street
- Rose Avenue and Third Street
- Rose Avenue and Auto Center Drive
- Rose Avenue and Camino Del Sol
- Rose Avenue and Channel Islands Boulevard
- Santa Clara Avenue and Auto Center Drive
- Santa Clara Avenue and Central Avenue
- SR-1 (Oxnard Boulevard) and Pleasant Valley Road
- SR-232 (Vineyard Avenue) and Myrtle Street
- Rose Avenue and Fifth Street
- Rose Avenue and SR-1 (Oxnard Boulevard)
- Rose Avenue and Wooley Road=

3.13.4 Impact Analyses

This section includes a discussion of the relevant significance criteria, the approach and methodology to the analyses, and any identified impacts and mitigation measures.

3.12.4.1 Significance Criteria

Significance thresholds below are based on Appendix G (Environmental Checklist Form) of the *CEQA Guidelines* and modified from the City's *May 2017 CEQA Guidelines*, which indicates that a potentially significant impact on traffic and transportation would occur if the construction and/or operation of the PWIMP would:

- Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections) based on adopted City of Oxnard level of service (LOS) standards;

101 FRWY
101 FRWY
TELEPHONE RD
LELAND ST
HARBOR BL
CENTRAL AVE
VINEYARD AV
COLLINS ST
ESPLANADE DR
VINEYARD AV
AUTO CENTER DR
101 FWY NORTH
SANTA CLARA AVE
GONZALES RD
AZALEA ST
H ST
BAHIA DR
SNOW AV
GONZALES RD
WANKEL WY
RIBERA DR
LATIGO AV
DEL NORTE BL
VICTORIA AV
EBONY DR
PATRICIA ST
VENTURA RD
RODERICK AV
ROSE AV
RICE AV
DORIS AV
COLONIA RD
CAMINO DEL SOL
HARBOR BL
TEAL CLUB RD
L ST
F ST
C ST
G ST
C ST
A ST
THIRD ST
STURGIS RD
FIFTH ST
K ST
FIFTH ST
Pacific
MANDALAY BEACH RD
NINTH ST
E ST
B ST
WOOLEY RD
WOOLEY RD
PORT DR
KELP ST
PATTERSON RD
N ST
J ST
C ST
ASH ST
OXNARD BL
VICTORIA AV
UKIAH ST
GUAVA ST
ELM ST
EMERSON AV
RICE AV
IRIS ST
LAUREL ST
CHANNEL ISLANDS BL
K ST
CHANNEL ISLANDS BL
OCEAN DR
M ST
L ST
J ST
G ST
SAVIERS RD
CLOYNE ST
GARY DR
HAILES RD
BARD RD
BARD RD
PLEASANT VALLEY RD
WEST RD
ISLAND VIEW AV
PLEASANT VALLEY RD
CYPRESS RD
OLDS RD
RICE AV
HUENEME RD
PERKINS RD
EDISON DR
ARNOLD RD
CASPER RD
CASPER RD
Ocean
Legend
Oxnard City Limits
Intersections with LOS of D-E-F in both AM and PM
Intersections with Highest Deficiencies
Intersections with LOS of D-E-F in AM or PM
Oxnard Intersections with Traffic Signal Deficiencies in AM
Oxnard Intersections with Traffic Signal Deficiencies in PM
N
W
E
S
Figure 3.13-3
Level of Service (LOS)
Source: URS Corporation, 6-2006
Miles
0
1
2

- Exceed, either individually or cumulatively, a LOS standard established by the Ventura County Congestion Management Program (CMP) for designated roads or highways;
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);
- Result in inadequate emergency access; and/or
- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks).

3.13.4.2 Approach and Methodology

As described in Chapter 2, Project Description, the City's PWIMP is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. However, the design details, final options, and the timing of construction phases are not precisely known, despite the best estimates provided in the schedules in Chapter 2. Further, it is not practical or prudent to try to provide project-level or detailed quantitative analysis at this time as many of the details are not known and the timing will likely change and/or the requirements for project-level analysis could change and be different in the future. As such, the environmental impact analysis for this section has been prepared at a programmatic level of detail and it addresses the full range of potential environmental effects associated with implementation of the PWIMP, but the analysis is more qualitative and general. Specifically, the analysis focuses on providing a discussion on potential significant impacts and provides broad mitigation measures that can and should be implemented at the project-level. This approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168, which suggests that the level of detail is dictated by "ripeness"; detailed analysis should be reserved for issues that are ripe for consideration.

For the purposes of this PEIR, construction of PWIMP project components would have temporary effects on segments of the roadway network in the project area by increasing traffic volumes on roads that provide access to the construction work areas. Construction-generated traffic potentially would have an impact on traffic flow and traffic safety conditions by increasing congestion on area roads. Construction characteristics, including proposed labor and equipment, location of construction, and rate of construction need to be developed for each and every individual PWIMP project component to conservatively estimate the number of vehicles that would be required for facilities installation. This should be done in subsequent environmental analyses and are not specified in this PEIR.

The following analysis is focused primarily on construction-related traffic effects. Traffic, transportation, and circulation impacts from long-term operation and maintenance of the PWIMP would be less than significant because of the limited trip generation (and minimal effects on traffic congestion) associated with those on-going activities (i.e., fewer than ten full-time workers needed at any one time to operate and maintain the new facilities, and one or two workers needed for other typical maintenance procedures). Therefore, typical traffic standards such as level of service (LOS), which are often calculated by counties' congestion management agencies and are a useful measure for analyzing potential long- term effects on traffic flow, were not used in this analysis. The direct impacts of project construction would not be long-term, ongoing effects. The duration

of potentially significant impacts related to short-term disruption of traffic flow and increased congestion generated by construction vehicles would be limited to the period of time needed to complete construction of a particular PWIMP project component(s). Therefore, mitigation measures identified in this PEIR are focused on reducing the short-term project construction effects rather than long-term mitigation measures as long-term operations are not expected to have any significant impacts on traffic, transportation, and circulation.

As described in Chapter 2, Project Description, the following describes typical construction methods to be used for PWIMP project/facility components:

- Construction of stationary facilities (e.g., AWPF expansion, desalter expansion, pump stations, reservoirs, and wells) would include site preparation, equipment delivery, and building construction. Some excavation and grading would be required for locations with uneven gradient. Ground clearing and excavation of the sites would be performed using heavy construction equipment such as bulldozers, backhoes, cranes, and graders. Upon completion of excavation, construction activities would also include pouring concrete footings for tanks, laying pipeline and making connections, installing support equipment such as control panels, and fencing the perimeter of the site.
- Proposed new and rehabilitated/replaced pipelines and conveyance facilities would be installed using both conventional open-trench and horizontal directional drilling construction techniques, with most of the construction using the former method. Pipe sections would be placed in a trench of varying depth depending on pipe size and topography, and covered using conventional equipment such as backhoes and compactors. For portions of the alignment where it is not feasible to perform open-cut trenching (such as State highway crossings, stream and drainage crossings, and high utility congestion areas), tunneling technology methods such as boring and jacking, micro-tunneling or horizontal directional drilling may be used.
- All construction activities would be restricted to the ROW approved by the applicable landowner or agency. All roadways disturbed during pipeline/conveyance facility installation would be restored. Generally, trench spoils would be temporarily stockpiled within the construction easement, then backfilled into the trench after pipeline/conveyance facility installation.

3.13.4.3 Impacts and Mitigation Measures

Based on the significance criteria and approach and methodology described above, the potential impacts are discussed below.

Impact 3.13-1: Construction and operation of the PWIMP could cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections) based on adopted City of Oxnard level of service (LOS) standards. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction Impacts

Construction would temporarily disrupt transportation and circulation patterns in the vicinity of the PWIMP projects thus disrupting local vehicle, bicycle, and pedestrian traffic along the haul

routes from stationary facilities and along the planned pipeline/conveyance alignments. Although construction-generated traffic would be temporary during peak excavation and earthwork activities, average daily truck trips could exceed 40 round-trip truck trips per day, depending on the PWIMP project and/or number of PWIMP projects under construction at any one time. The primary impacts from the movement of trucks would include short-term and intermittent lessening of roadway capacities due to slower movements and larger turning radii of the trucks compared to passenger vehicles and temporary lane closures and possible detours during certain times. As a result, the following mitigation measures are proposed to reduce any impacts to less than significant levels

Temporary Construction Mitigation Measures

Mitigation Measure 13.1-1a: Prepare and Implement Traffic Control Plan(s). As is consistent with existing policy, the City shall require the contractor to prepare and implement effective traffic control plans to show specific methods for maintaining traffic flows for each PWIMP project to be constructed. Examples of traffic control measures to be considered include: 1) use of flaggers to maintain alternating one-way traffic while working on one-half of the street; 2) use of advance construction signs and other public notices to alert drivers of activity in the area; 3) use of "positive guidance" detour signing on alternate access streets to minimize inconvenience to the driving public; 4) provisions for emergency access and passage; and 5) designated areas for construction worker parking.

Mitigation Measure 13.1b: Return Roads to Pre-construction Condition. Following construction, the City shall ensure that road surfaces that are damaged during construction are returned to their pre-construction condition or better.

Significance After Mitigation: Less-Than-Significant Impact.

Long-Term Operational Impacts

Operation of the PWIMP would require trucks to periodically deliver/pick up replacement parts, lubricants, water treatment chemicals, trash, and other consumables. For planning purposes, it has been conservatively assumed that there would be two truck trips to the AWPF, new wells, and regional desalter at the City Water Yard each day. Visits by trade persons, vendors, consultants, and other non-plant personnel are expected to be minimal and would likely occur primarily during nonpeak commute periods. Therefore, the operation of PWIMP facilities would be a less-than-significant impact on the transportation system and no mitigation measures are required or necessary.

Significance After Mitigation: Less-Than-Significant Impact.

Impact 3.13-2: Construction of the PWIMP could exceed, either individually or cumulatively, an LOS standard established by the Ventura County Congestion Management Program (CMP) for designated roads or highways. As discussed above, the long-term operations of the PWIMP would not significantly affect traffic, transportation, and circulation and is not discussed further. The potential temporary construction impacts are discussed below.

Temporary Construction Impacts

As discussed above, construction activities associated with the PWIMP would result in increased vehicle trips. This could temporarily exceed, either individually or cumulatively, existing LOS standards established by the Ventura County Congestion Management Program (CMP) for designated roads or highways. However, the Proposed Project/Action would not result in any long-term degradation in operating conditions or level of service on any project roadways. With the implementation of **Mitigation Measure 13.1a,** impacts associated with exceeding level of service standards would be reduced to a less-than-significant level.

Significance After Mitigation: Less-Than-Significant Impact.

Impact 3.13-3: Construction and operation of the PWIMP could result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction Impacts and Long-Term Operational Impacts

Construction and operation of the PWIMP facilities would not be located in a location, which would or could result in a change in air traffic patterns, including either an increase in traffic levels or change in location in substantial safety risks. Therefore there is no impact.

Significance Determination: No Impact.

Impact 13.3-4: Construction and operation of the PWIMP could substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment). The potential temporary construction and long-term operation impacts are discussed below.

Temporary Construction Impacts and Long-Term Operational Impacts

Delivery of hazardous materials and disposal of hazardous wastes during construction would occur on prearranged routes and would be in compliance with all applicable regulations and standards governing the safe transport of these materials. Therefore, no significant impacts would occur; and no mitigation is required.

Significance Determination: Less-than-Significant Impact.

Impact 13.3-5: Construction and operation of the PWIMP could result in inadequate emergency access. The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction Impacts and Mitigation Measures

Construction of the PWIMP facilities would have temporary effects on traffic flow, due to added truck traffic during construction activities that could result in delays for emergency vehicle access in the vicinity of the project. Implementation of **Mitigation Measure 13.3-1a** would require the contractor to establish methods for maintaining traffic flow in the project vicinity and minimizing disruption to emergency vehicle access to land uses along the truck route and/or pipeline alignment. Implementation of **Mitigation Measure 13.3-1a** would also ensure potential impacts associated with temporary effects on emergency access would be mitigated to a less-than-significant level.

Significance After Mitigation: Less-Than-Significant Impact.

Long-Term Operational Impacts

Over the long-term, the PWIMP facilities would require operation and routine maintenance procedures. Daily traffic would be generated by operational and maintenance personnel monitoring the various new, expanded, and rehabilitated facilities. Operation and maintenance of the new, expanded, and rehabilitated facilities is estimated to require fewer than ten new full-time workers at any one time. Maintenance procedures will generally involve routine maintenance checks, landscape maintenance, weekly visual inspection of pipeline/conveyance alignments, and ensuring ongoing access to system facilities, among other tasks, with one or two workers expected to perform these maintenance activities. Given the minimal number of employees onsite at any one time, operational and maintenance activities would not generate a significant increase in traffic to the existing circulation system, or result in a level of service degradation over the long-term, including resulting in inadequate emergency access. Therefore, no mitigation is required.

Significance Determination: Less-than-Significant Impact.

Impact 13.3-6: Construction and operation of the PWIMP could conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks). The potential temporary construction and long-term operational impacts are discussed below.

Temporary Construction Impacts

The construction activities associated with the PWIMP and individual PWIMP facilities would be short term and would not conflict with adopted policies, plans, or programs supporting alternative transportation. Any short-term effects would be considered less-than-significant. Further, with the implementation of **Mitigation Measure 13.3-1a**, any impacts would be further reduced to less than significant levels.

Significance Determination: Less-than-Significant Impact.

Long-Term Operational Impacts

Once constructed, the operations of the PWIMP and individual facilities would not conflict with adopted policies, plans, or programs supporting alternative transportation. Therefore, no significant impacts would occur; and no mitigation is required.

Significance Determination: Less-than-Significant Impact.

3.13.5 Cumulative Effects

Construction of the PWIMP has the potential to have significant impacts on traffic and transportation in the area. However, with the implementation of the identified mitigation measures above would reduce these impacts to less-than-significant levels. As for cumulative impacts, the City would need to further analyze the construction of each of these PWIMP facilities on a project-level basis at the appropriate time with a full understanding of other projects being constructed in the area at the same time to be able to further assess the potential for the PWIMP to have cumulative traffic and transportation impacts.

Chapter 4 Alternatives

This section presents potential environmental impacts of the PWIMP or Proposed Program/Project. The scope of the analysis and key attributes of the analytical approach are presented below to assist readers in understanding the manner in which the impact analyses have been conducted in this Program EIR.

4.1 CEQA Requirements for Alternatives

CEQA requires that a reasonable range of feasible alternatives be evaluated in an EIR. The CEQA Guidelines, Section 15126.6, *Consideration and Discussion of Alternatives to the Proposed Project*, specify the following:

> "(a) Alternatives to the Proposed Project. An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives. An EIR need not consider every conceivable alternative to a project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation. An EIR is not required to consider alternatives that are infeasible. The lead agency is responsible for selecting a range of project alternatives for examination and must publicly disclose its reasoning for selecting those alternatives. There is no ironclad rule governing the nature or scope of the alternatives to be discussed other than the rule of reason. (*Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553 and *Laurel Heights Improvement Association v. Regents of the University of California* (1988) 47 Cal.3d 376)."

With respect to the feasibility of alternatives, the CEQA Guidelines state, "among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, jurisdictional boundaries, and whether an applicant can reasonably acquire, control or otherwise have access to the alternative site." The CEQA Guidelines also state that the alternatives discussion should not be remote or speculative, and need not be presented in the same level of detail as the assessment of the proposed project.

4.2 Alternatives Evaluated in this PEIR

As described in Chapter 1 – Introduction and Chapter 2 – Project Description, the PWIMP provides a phased program for constructing improvements to the City's infrastructure facilities that will accommodate planned growth while maintaining treatment reliability, meeting future regulatory requirements, and optimizing costs through the City's 2030 planning horizon. Specifically, the PWIMP addresses future planning needs including infrastructure additions and upgrades for City's water, wastewater, recycled water, and stormwater utilities. The PWIMP builds upon previous planning efforts using a coordinated methodology, which will allow the City to take full advantage of potential linkages and synergies between the four water utility systems. In addition, the PWIMP is also coordinated with a streets plan in an attempt to allow timing of future streets upgrades to be tied together with infrastructure upgrades. As such, the PWIMP identified numerous alternatives to the various needs and improvements of each of the four water utilities and went through an elaborate and public driven workshop process for

evaluating them from a technical and economic perspective. The result of the PWIMP is the recommended improvements to move forward with and which is evaluated in this PEIR as the Proposed Project. Also, the majority of the individual components of the PWIMP is the rehabilitation and replacement of existing facilities of which there are no real alternatives, other than not rehabilitation and/or replacing the aging infrastructure. As detailed in Chapter 3 – Environmental Analysis, the PWIMP would have several potentially significant impacts to the environment. However, with the implementation of the identified and corresponding mitigation measures, all of the potentially significant impacts can be reduced to less-than-significant levels. As a result, the only alternative that needs to be evaluated in this Program EIR is the CEQA required No Project Alternative. The No Project Alternative is discussed below. In addition, we have provided a summary of other water supply related alternatives that were eliminated from further consideration and the rationale.

4.2.1 No Project Alternative

Section 15126.6 (e) of the CEQA Guidelines requires the analysis of a No Project Alternative. The purpose of describing and analyzing a No Project Alternative is to allow decision-makers the opportunity to compare the impacts of approving the proposed project with the impacts of not approving the proposed project. The CEQA Guidelines state that the No Project Alternative is the circumstance under which the project would not proceed. If the No Project Alternative would not result in the preservation of existing conditions, the consequences of not approving a project should also be discussed.

Under the No Project Alternative, the PWIMP would not be implemented. Construction of the expanded AWPF, desalter, and new water and IPR/ASR wells and other facilities would not occur. As a result, secondary effluent produced from the OWTP would not be diverted from the existing ocean outfall for tertiary and advanced water treatment at the AWPF facility. Further rehabilitation of the existing pipelines and conveyance facilities that are at the end of their useful lives would not occur. This would cause the need for emergency repairs rather than a planned, orderly, and cost effective method for ensuring reliability with the various water, wastewater, recycled water, and stormwater pipeline and conveyance facilities.

Agricultural users would not be provided an alternative source of quality irrigation water and proposed new recycled water conveyance pipelines and storage would not be constructed. As a result, current groundwater pumping practices for irrigation would be continued as allowed by assigned allocations; unused groundwater pumping allocations (credits) would not be available for City use.

Groundwater injections afforded by new IPR/ASR wells would not occur, and over-drafted aquifer conditions would continue to occur or worsen. Additional potable water supplies potentially provided by treatment of extracted groundwater (allowed by transfer of unused groundwater pumping in lieu of groundwater recharge) would not be available for extraction and treatment by the proposed regional desalter expansion(s).

The No Project Alternative could result in a shortage in the amount of reliable and affordable water supplies available to meet both potable and non-potable demands. A shortage would require the City to consider other alternative solutions to meet the goal of the City to provide current and future residents and businesses with a reliable and affordable source of high-quality water.

The No Project Alternative was included as the Base Case Scenario in the groundwater flow modeling conducted for the PWIMP. The results of the modeling are discussed in the PWIMP, which is located on the City's website: www.oxnard.org. These results assist in understanding the potential condition of the

groundwater aquifer in 2030 under the No Project Alternative (i.e., existing conditions). To summarize, groundwater aquifer conditions under the No Project Alternative in the lower aquifer system (LAS) in the Southern Oxnard Plain will remain significantly above sea level, only occasionally dropping to near sea level during extended drier climatic periods. These conditions would indicate a low potential for coastal landward flow (i.e., seawater intrusion). In contrast, groundwater aquifer conditions in the LAS in the Southern Oxnard Plain and Pleasant Valley areas would continue to experience severe overdraft conditions and water quality degradation in the LAS of the southern Oxnard Plain and Pleasant Valley areas.

The No Project Alternative would avoid the less-than-significant significant with mitigation impacts identified for the PWIMP Program. However, several of the beneficial impacts of the PWIMP related to groundwater recharge in the LAS would not be realized, including increased groundwater elevations, minimization of coastal landward flow of seawater, and reduction of severe overdraft conditions and water quality degradation. In addition, the No Project Alternative fails to meet any of the stated objectives for the Proposed Project.

4.2.2 Alternatives Eliminated From Further Consideration

Summarized below are the alternatives that were considered and eliminated from further consideration – along with the rationale for elimination.

Relocation of the Oxnard Wastewater Treatment Plant. The PWIMP identified the possibility of the City relocating it's existing OWTP rather than rehabilitating the existing facility on the same site. However, the details of the proposed new location, timing and numerous other necessary details are not known at this time. Concerns for rehabilitation of the existing include the ability to meet demands during the rehabilitation construction period. Concerns for the relocation of the existing OWTP to a new location include costs, economics, location and etc. As a result, the possibility of relocating the existing OWTF cannot be adequately addressed or analyzed in this PEIR. Further, the existing OWTP needs immediate improvements to function properly, regardless if it is relocated or rehabilitated. As a result, the City should prepare a separate environmental document on this possibility, if and when the City decides to really consider relocating the existing OWTP and when more details are known and are ripe for discussion and analysis. For these reasons, this potential alternative is eliminated from further consideration in this PEIR.

Alternative Locations for New PWIMP Facilities. The exact locations of the new facilities such as the new wells, storage facilities, and new pipeline/conveyance facilities have not been precisely identified at this time. These new facilities would need to be evaluated further at the project level with additional and separate environmental analysis and document(s). For purposes of this PEIR, it is assumed that the potential impacts of a different location would be essentially the same and can be reduced to less-than-significant levels with the incorporation with the identified mitigation measures. As a result, this alternative(s) of relocating new PWIMP facilities to different locations is eliminated from further consideration.

Increased Groundwater Pumping. Under this alternative, the City would increase its current allocation for groundwater from UWCD or increase groundwater pumping from its own wells without the use of additional recycled water or recharge through DPR/IPR/ASR wells. However, to eliminate groundwater overdraft and bring extractions within safe yield, the FCGMA adopted Ordinance No. 5. This ordinance established historical allocations for each well pumped in the Oxnard Plain Basin and a schedule of pumping allocation reductions. Under this alternative, the imposed groundwater reductions under

Ordinance No. 5 will continue to affect the existing local water supplies of the City, by limiting the amount of groundwater that the City can buy from UWCD or extract from its own wells without recharging the Oxnard Plain and Pleasant Valley aquifers. Extraction beyond the current pumping allocation (with reductions) would be subject to a penalty fee based upon the cost to import water and the current groundwater conditions within the FCGMA, resulting in significant economic ramifications for the City. This alternative would result in continued pumping of groundwater and would contribute to the continuation or worsening of overdraft conditions in the Oxnard Plain and Pleasant Valley aquifers. Overdraft has historically resulted in groundwater storage reductions, declining groundwater levels to below sea level, water quality degradation, and ground subsidence. While purchase of additional groundwater may increase water supply reliability in the short term and provide temporary water supply security in meeting planned growth and associated water demand, it fails to meet the remaining objectives for reduced water supply costs and enhanced local water supply stewardship through wastewater recycle and reuse. For these reasons, this potential alternative is eliminated from further consideration in this PEIR.

Purchase of Imported Water Supplies. Under this alternative, the City would increase surface water deliveries from the State Water Project provided to the Calleguas Municipal Water District (CMWD) by the Metropolitan Water District of Southern California (MWD or Metropolitan). The imported water supplies of the City would be contracted through CMWD under a tiered rate program. CMWD restructured its rate system to generally be consistent with the approach used by MWD in allocating water among its member agencies. In general, CMWD has developed a 10-year purchase order for each of its member agencies, including the City. As part of its purchase order, the City is provided an allocation of 90 percent of its maximum demand. This allocation is termed Tier 1 water and is priced at a lower rate than water purchases that exceed this allocation termed Tier 2 water. The Tier 1allocation increases as a function of the 10-year rolling averages of total purchases exclusive of agricultural water purchases. Over the course of the purchase order, each signatory agrees to purchase 60 percent of its maximum demand for the rolling 10-year average. If the purchase order minimum is not reached, then the signatory would pay CMWD the difference in volume times the average water rate over the life of the contract. Tier 2 water prices significantly exceed the Tier 1 water price. However, if CMWD is able to manage its water resources to the point that it does not have to purchase Tier 2 water from MWD, then it will reimburse each of its member agencies in a relative proportion among those agencies that exceeded their Tier 1 allocation. Any City purchases that exceed the Tier 1 historical 10-year rolling average will be purchased at the Tier 2 premium amount. In addition, imported supply may not be available in all years; for example, due to State Water Project supply limitations in drought years and other emergency situations.

Under this alternative, the City would purchase water above its Tier 1 CMWD allocation. Tier 2 water would be purchased at a premium cost, resulting in significant economic ramifications for the City. In addition, increased reliance on imported surface water exposes the City to a risk that the water may not be available when needed (i.e., drought years). When considered with other demands on state water, additional City demand for imported surface water has the potential to adversely affect northern California Bay-Delta ecosystems. While purchase of additional imported surface water may increase water supply reliability in the short-term and provide temporary water supply security in meeting planned growth and associated water demand, it fails to meet the remaining objectives of the PWIMP. For these reasons, this potential alternative is eliminated from further consideration in this PEIR.

Seawater Desalination. Under this alternative, the City would address its concerns with respect to water supply by construction of a desalination plant to convert seawater into fresh water. Desalination is a

process that removes dissolved minerals (including but not limited to salt) from water. A number of technologies have been developed for desalination, including RO, distillation, electrodialysis, and vacuum freezing. The most common desalination techniques considered by municipalities, water districts, and private companies for the development of seawater desalination in California include RO or distillation.

- **Reverse Osmosis.** With this technology, pressure is applied to the intake water, forcing the water molecules though a semipermeable membrane. The salt molecules do not pass through the membrane, and the water that passes through becomes potable product water.
- **Distillation**. With this technology, the intake water is heated to produce steam. The steam is then condensed to produce product water with low salt concentration.

Recent technology has identified another desalination concept using two-stage nanofiltration. This process is thought to provide energy savings and improved water quality.

Plant specifics in terms of capacity and recovery (i.e., percent of product water per unit input flow) have not been explored. However, in general, for every 100 gallons of seawater input, 15 to 50 gallons of fresh water could be produced, which is a recovery of 15 to 50 percent. The remainder is waste concentrate containing dissolved solids (California Coastal Commission, 1993). The cost to produce water from desalination depends on the technology used and the plant capacity, among other factors. Current price estimates for desalinated water produced in California range from $850 to $1,200 per acre-foot.

Seawater desalination presents a potentially beneficial method to meet the City of Oxnard's water supply needs. These beneficial effects include, but are not limited to:

- Generally, and especially during emergency and drought periods, supplies of seawater available for desalination may be less limited than regional or local surface or groundwater supplies, and could provide the City significantly improved water reliability;
- Seawater desalination could replace or reduce the need for excessive groundwater pumping in coastal areas, potentially resulting in a reduction in the degree of seawater intrusion;
- Seawater desalination could assist the City in implementing programs to reduce groundwater pumping and allow the groundwater aquifer to recover from overdraft conditions; and
- Ongoing technical advances in seawater desalination techniques may increase the cost-effectiveness of the technology as traditional sources of surface and groundwater supplies become increasingly less available and the cost of these sources increase, making seawater desalination a cost-effective water supply.

Seawater desalination does, however, have several potential drawbacks. Because all or portions of seawater desalination plants are often located within the coastal zone and in proximity to the shoreline, environmental impacts to sensitive resources can be high.

Construction-related impacts could include air emissions; disturbance of dune, surf zone, and seafloor ecology; disturbance of seabirds, marine mammals, other land and marine species, and their habitats; disturbance to archaeological and paleontological resources; erosion; interference with coastal access and recreation; noise; nonpoint source pollution; and obstruction of views by machinery, piping, or tall structures. Potentially significant operational impacts associated with desalination plants include energy use, air quality, the marine environment, and growth inducement. The location of desalination plants within the coastal zone also presents regulatory authority and legislative considerations. The California

Coastal Commission often becomes involved in the process of reviewing permits for desalination plants or related facilities.

Under this alternative, the City would construct a desalination plant to produce potable water supplies. While this alternative would meet two of the project objectives, including increased water supply reliability and water supply security in meeting planned growth and associated water demand, the cost to produce desalinated water is economically infeasible on the scale necessary to meet the proposed project objectives. In addition, seawater desalination does not meet the other objectives of the PWIMP. Therefore, seawater desalination is not considered a feasible alternative to the PWIMP.

4.2.3 Environmentally Superior Alternative

Section 15126.6(e)(2) of the CEQA Guidelines requires an EIR to identify an environmentally superior alternative. Of the two alternatives considered in this section (Proposed Project and the No Project Alternative), the Proposed PWIMP Project appears to be environmentally superior to the No Project Alternative. The No Project Alternative would not meet any of the goals and objectives of the PWIMP and would not allow the city to have reliable water, wastewater, recycled water and stormwater facilities to accommodate the planned and approved growth through the City's 2030 General Plan and planning process. Further, the Proposed PWIMP Project would meet all of the objectives, would have many beneficial long-term impacts to the City's water supplies and utilities/infrastructure, and would not result in any significant environmental impacts that could not reasonably be reduced to less-than-significant levels. The PWIMP would help contribute to indirect significant unavoidable impacts identified in City's 2030 General Plan as water would remove an obstacle for growth. However, the City has already approved this plan growth and commissioned the PWIMP and this environmental document to accommodate this planned and approved growth. As a result, the Proposed PWIMP Project is considered to be the environmentally superior alternative.

Chapter 5 Growth Inducement Effects

This section presents potential growth inducement effects of the PWIMP or Proposed Program/Project. The scope of the analysis and key attributes of the analytical approach are presented below to assist readers in understanding the manner in which the impact analyses have been conducted in this Program EIR.

5.1 Determination of Growth Inducement Effects

Section 15126.2(d) of the CEQA Guidelines requires that an EIR discuss "the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. This discussion should include an analysis of how the proposed project might remove barriers to population growth and characteristics of the project that might encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. (CEQA Guidelines §15126.2(d)). In discussing potential growth, it should not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

Case law interpreting section 15126.2(d) of the CEQA Guidelines suggests that a program EIR is not required to make a detailed analysis of the project's impacts on growth. *(Napa Citizens for Honest Government v. Napa County Bd. of Supervisors* (2001) 91 Cal.App.4th 342, 369.) "Nothing in the Guidelines, or in the cases, requires more than a general analysis of projected growth." *(Id.)* Nonetheless, a general discussion and analysis is important to fully informing the decision makers and the public regarding the potential impacts of a project (*Laurel Heights II* (1993) 6 Cal. 4th. 1112.).

Growth can potentially impact the environment in a variety of ways. These impacts may include the following:

- Increasing pressure to convert agricultural resources to residential and commercial uses;
- Reducing air quality due to increased traffic, use of fireplaces etc.;
- Harm to biological resources due to increasing pressure to develop habitat;
- Hydrology/water quality impacts due to increases in impervious surface and sources of pollutants
- Land use planning impacts;
- Population/housing;
- Public services impacts due to increased demand;
- Transportation/traffic impacts; and/or
- Utilities/service systems impacts

However, many of these potential impacts of growth can be avoided or minimized by through good land use planning practices.

5.2 Assessment Methods and Conclusions

The main objective of the PWIMP is to make significant improvements to the City's water related utilities

including the City's water, wastewater, recycled water, and stormwater systems in order to meet current demand and planned growth as identified in the City's 2030 General Plan which was approved by the City Council in 2011. The potential indirect and direct growth inducement effects are discussed below.

Indirect Growth Inducement Potential Effects. The General Plan EIR identified several significant unavoidable impacts associated with the implementation of the 2030 General Plan, which include significant unavoidable impacts to agricultural resources, air quality, noise, and traffic and transportation. As a result, implementation of the PWIMP could be considered to have indirect growth inducing effects as it would remove a barrier to growth by providing improved water supplies and utilities to support the current, planned, and 2030 growth. In as such, it would then be reasonable conclude that the implementation of the PWIMP would contribute to the same indirect significant and unavoidable growth inducing impacts as identified in the 2030 General Plan EIR. These include, but not limited to, the following:

- Lack of transportation facilities for the population to travel between their place of employment, recreational facilities, service facilities, shopping and their homes;
- Lack of educational facilities including elementary and high school facilities, secondary education facilities, and vocational institutions;
- Employment patterns such as high unemployment or limited employment opportunities within the region;
- Availability of housing to accommodate all income categories;
- Availability of wastewater treatment capacity;
- Availability of emergency services such as police, fire, and medical facilities;
- Availability of electricity; and/or
- Availability of water supply and distribution.

Water availability removes a barrier to growth. However, it is but one of many such barriers, all of which combine to control where and to what extent growth occurs.

Direct Growth Inducement Potential Effects. The PWIMP does not directly create or induce growth in the Oxnard area because it does not provide a significant number of additional permanent jobs nor does it approve land development. Only the City or the County, through their general planning, zoning and permitting authority can directly induce growth. Therefore, the PWIMP, in and of itself, does not directly effect or foster growth in the surrounding environment.

Chapter 6 Cumulative Effects

This section presents potential cumulative environmental impacts of the PWIMP or Proposed Program/Project. The scope of the analysis and key attributes of the analytical approach are presented below to assist readers in understanding the manner in which the impact analyses have been conducted in this Program EIR.

6.1 Determination of Cumulative Effects

The CEQA guidelines (Section 15355) define cumulative impacts as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." This section of the Guidelines further notes that:

a) *The individual effects may be changes resulting from a single project or a number of separate projects.*

b) *The cumulative impact from several projects is the change in the environment, which results in the incremental impacts of the project when added to other closely related past, present, and reasonable foreseeable probably future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.*

A cumulative impact is significant if, when considered collectively with the impacts of the other projects, it exceeds the threshold of significance for a particular individual environmental resource area, as described in Chapter 3 - Environmental Analysis.

6.2 Assessment Methods

For the purposes of this analysis, potentially significant cumulative effects are addressed in terms of short-term cumulative impacts (i.e., those impacts that would be cumulatively considerable during construction) and long-term cumulative impacts (i.e., those impacts that would be cumulatively considerable during operation). As described in Chapter 3 – Environmental Analysis, the construction and operation of the PWIMP would have less-than-significant effects to the environment with the implementation of the identified mitigation measures. Therefore, it is unlikely that the long-term operation of the PWIMP would have a significant adverse cumulative impact on the environment. In fact, the long-term operation is expected to have a cumulative beneficial impact to the City's water supplies, utilities, and infrastructure. As for temporary cumulative construction impacts, construction would occur over the period of 15-to-20 years, it would be speculative at best to determine which other projects would be constructed at the same time as to one or several PWIMP projects and potentially cause a significant direct or indirect cumulative environmental effect. However, it is acknowledged that construction impacts could have temporary significant and cumulative impacts to air quality, noise, and traffic and transportation. As a result, temporary cumulative construction effects should be done on a project-level basis at the appropriate time through the preparation of the appropriate separate environmental documentation to meet CEQA requirements (i.e. Addendum, Categorical Exemption, Initial Study/Mitigated Negative Declaration, or Project-level Environmental Impact Report), depending on the nature of the specific project(s).

6.2 Conclusion on Cumulative Effects

Temporary construction of the PWIMP and facility(s) in conjunction with other undetermined projects over the next 15-to-20 years has the potential to have direct and/or indirect cumulative environmental

impacts. These could result in potentially significant temporary impacts, perhaps even significant and unavoidable impacts on air quality, noise, and traffic and transportation - depending upon the other projects being constructed nearby at the same time. As a result, temporary cumulative construction effects should be analyzed on a project-level basis at the appropriate time through the preparation of the appropriate separate environmental documentation to meet CEQA requirements (i.e. Addendum, Categorical Exemption, Initial Study/Mitigated Negative Declaration, or Project-level Environmental Impact Report), depending on the nature of the specific project(s). With the implementation of the identified mitigation measures in Chapters 3.3-Air Quality, 3.12-Noise, and 3.13-Traffic and Transportation, any cumulative impacts can be reduced to less-than-significant levels.

The long-term operation of the PWIMP would not likely have a significant adverse direct or indirect cumulative impact on the environment. In fact, the long-term operation of the PWIMP is expected to have a cumulative beneficial impact to the City's water supplies, utilities, and water resources related infrastructure and facilities.

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Chapter 8 References

This section presents the major references used in the preparation in this Program EIR. These are provided below.

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Appendix A

City of Oxnard Public Works Integrated Master Plan and Engineering Reports

CITY OF OXNARD CALIFORNIA

PUBLIC WORKS

Integrated Master Plan

Executive Summary

REVISED FINAL DRAFT • SEPTEMBER 2017

carollo

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This document is released for the purpose of information exchange review and planning only under the authority of Tracy Anne Clinton, State of California Professional Engineer No. 48199 September 2017.

BRIEF HISTORY AND OVERVIEW OF THE CITY OF OXNARD PUBLIC WORKS DEPARTMENT'S INTEGRATED PLANNING EFFORTS: MAY 2014 – AUGUST 2017

In May 2014, the City of Oxnard (City) Public Works Department began developing the Public Works Integrated Master Plan (PWIMP, or Plan). The Plan unfolded to address future planning needs for all major utilities within the City's jurisdiction: water, wastewater, recycled water, and stormwater. The Plan uses a coordinated methodology to allow the City to take full advantage of potential linkages and synergies among its four major water utility systems.

The Final Draft Plan was published in December 2015 as a seven-volume set of notebooks containing more than forty master planning Project Memorandums. This was followed shortly after in early 2016 with the publication of the Final Draft Master Plan Summary Report (April 2016), and the Final Draft Executive Summary Report (May 2016).

As typical in master planning, these initial planning reports were published as first drafts. This practice recognizes that the initial planning findings and reports are not considered 'final' until further environmental and financial studies are completed.

Consequently, these Final Draft master-planning documents served as the basis for the City to proceed with cost of service studies to gain approval for the planned wastewater and water utility rate increases for the near-term capital projects, and to support a formal Proposition 218 process. The resulting Wastewater Cost of Service Study was approved in early 2017, and the Water Cost of Service Study was approved in summer 2017.

Between the time of publication of the Final Draft master-planning documents in December 2015 and the final adoption of the Cost of Service Studies/Rates in early 2017, the City continued to review and to optimize the final master planning recommended policies, projects, and programs. Therefore, certain projects included in the Final Draft planning documents have been refined and updated.

These refinements were made to incorporate the latest in recent findings from the advanced facilities planning conducted, in part, for the Cost of Service Studies, and as part of the preliminary designs proceeding concurrently for critically needed facilities. It should be noted that the refinements and optimizations were generally not related to capacity needs, but to achieve improved financial and implementation strategies, and to accommodate technology updates and global climate change strategies, as follows:

1. Project phasing and timing (but not for increased capacity), including: a phased primary treatment upgrade program, and a phased secondary treatment upgrade program.
2. Technology updates, including membrane bioreactors (MBR) to meet potential nutrient requirements, and to save costs related to advanced treatment for recycled water.
3. Global climate change, resiliency, and adaption projects to plan for increasing sea levels.

The Plan coordinates the need and timing of planned water utility facilities as related to the elements and projections in the City's 2030 General Plan, with a forward projection through the year 2040. The recommended master planning projects, timing, and phased implementation are noted in the Capital Improvement Plan (CIP) for both the near-term projects (the next several years) as defined in the Cost of Service Studies, and the longer-term projects (extending through 2040) as defined in the Plan.

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Further, the time horizon for the near-term CIP serves as the basis for the newly adopted rates, and does not extend to the end of the long-term planning period (thru 2040). This is in recognition of the flexible design and adaptive nature of the recommended Plan.

In summary, the refined and updated near-term projects that were identified and developed as part of the Cost of Service Studies were subsequently incorporated into the recommended Final Draft CIP and Integrated Master Plan. Nevertheless, it is the near-term CIP that is the basis for the newly adopted rates. The overall CIP and Integrated Master Plan recommended herein was developed by merging the related planning efforts: the Water and Wastewater Cost of Service Studies, the Preliminary Design of critically needed facilities, and the long-term master planning recommendations.

The City of Oxnard's Public Works Integrated Master Plan consists of an Executive Summary, a Summary Report, and a seven-volume set of notebooks containing more than 40 Project Memorandums.

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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

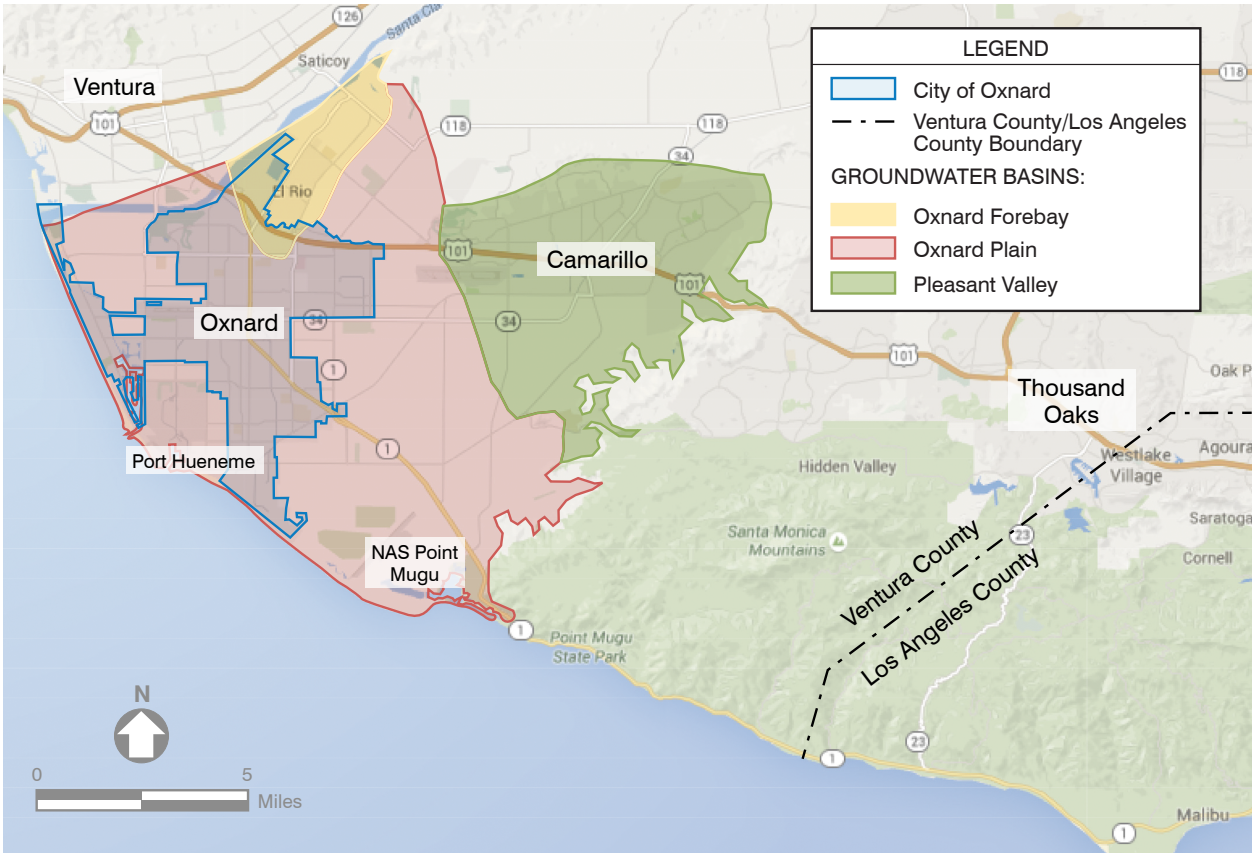

Figure 1. The City of Oxnard in relation to its surrounding communities and groundwater basins.

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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.

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.

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.

FACILITIES 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.

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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.

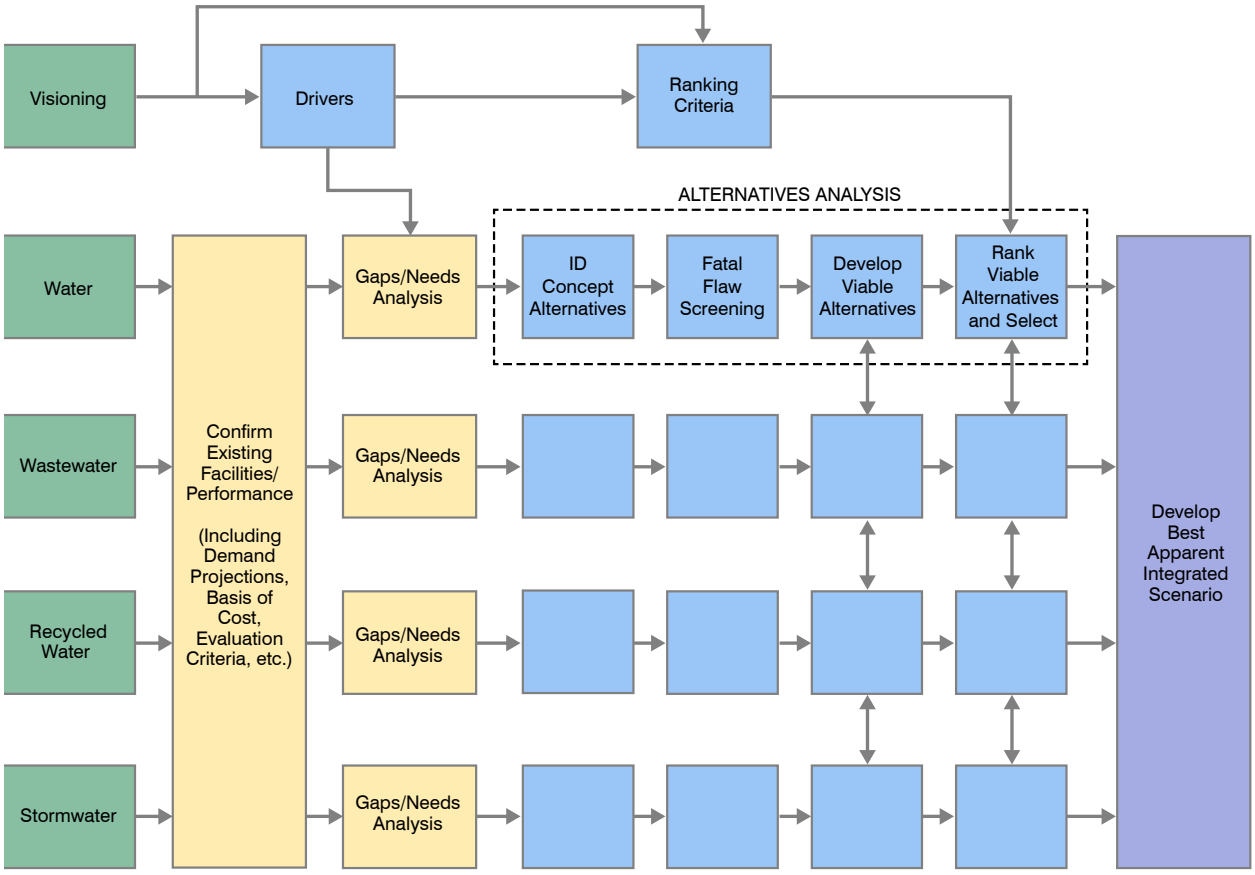

Figure 2. An overview of the Integrated Master Planning Process.

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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.

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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.

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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.

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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

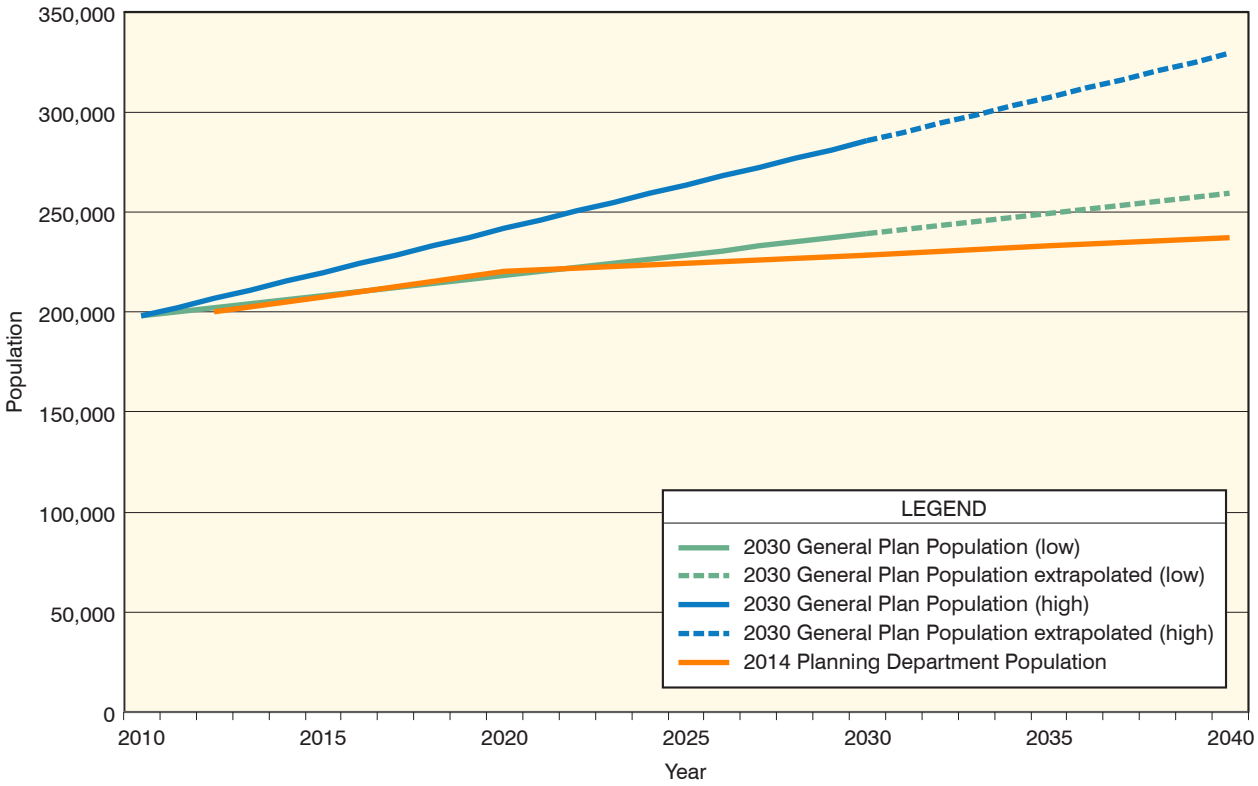

Figure 3. The City's historical and projected population through 2040, assuming population increase due to residential infill and mixed use development.

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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.

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.

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).

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- **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, a Title 22 Engineer's Report and Report of Waste Discharge was submitted to the Regional Board and Division of Drinking Water. The City also developed 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.

An additional consideration is that the Sustainable Groundwater Management Act (SGMA) was passed through the California legislature in September 2014. The goal of this act is to have a sustainable management of groundwater by the year 2042. The full implications of SGMA are not known at the time of publication of this Plan.

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.

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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.

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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 "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, 2017). 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).

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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.

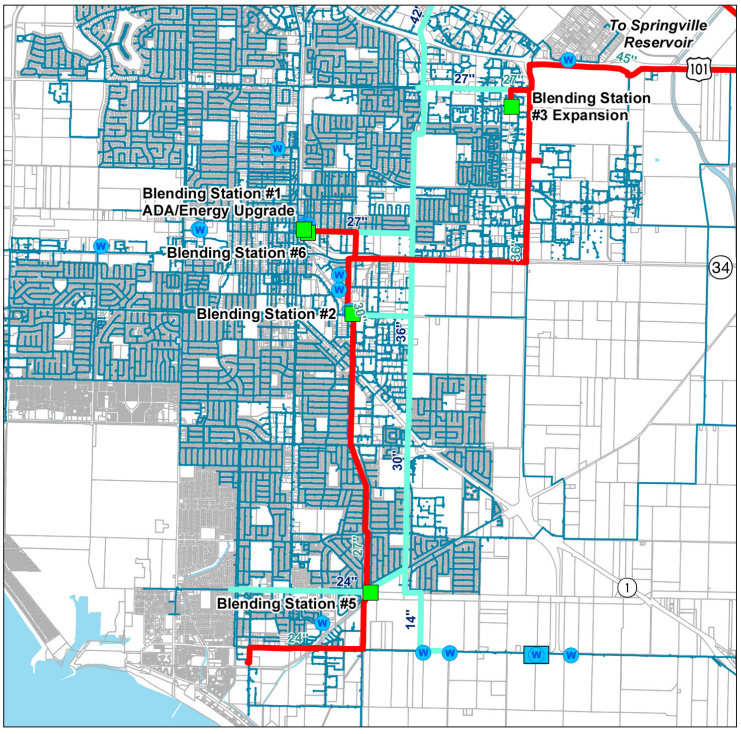

Figure 4. The City's water system is a combination of hydraulic blending stations, treatment, and distribution pipelines.

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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.

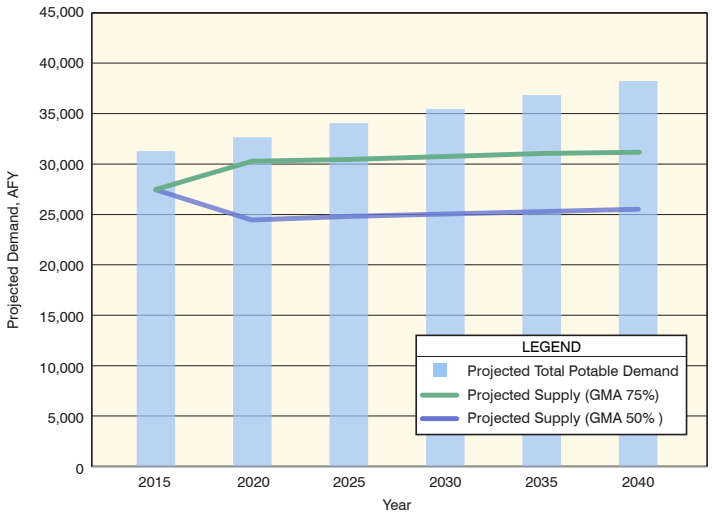

Figure 5. Due to an expected shortfall in supply, the Integrated Master Plan evaluated options for securing a sustainable water supply for the future.

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

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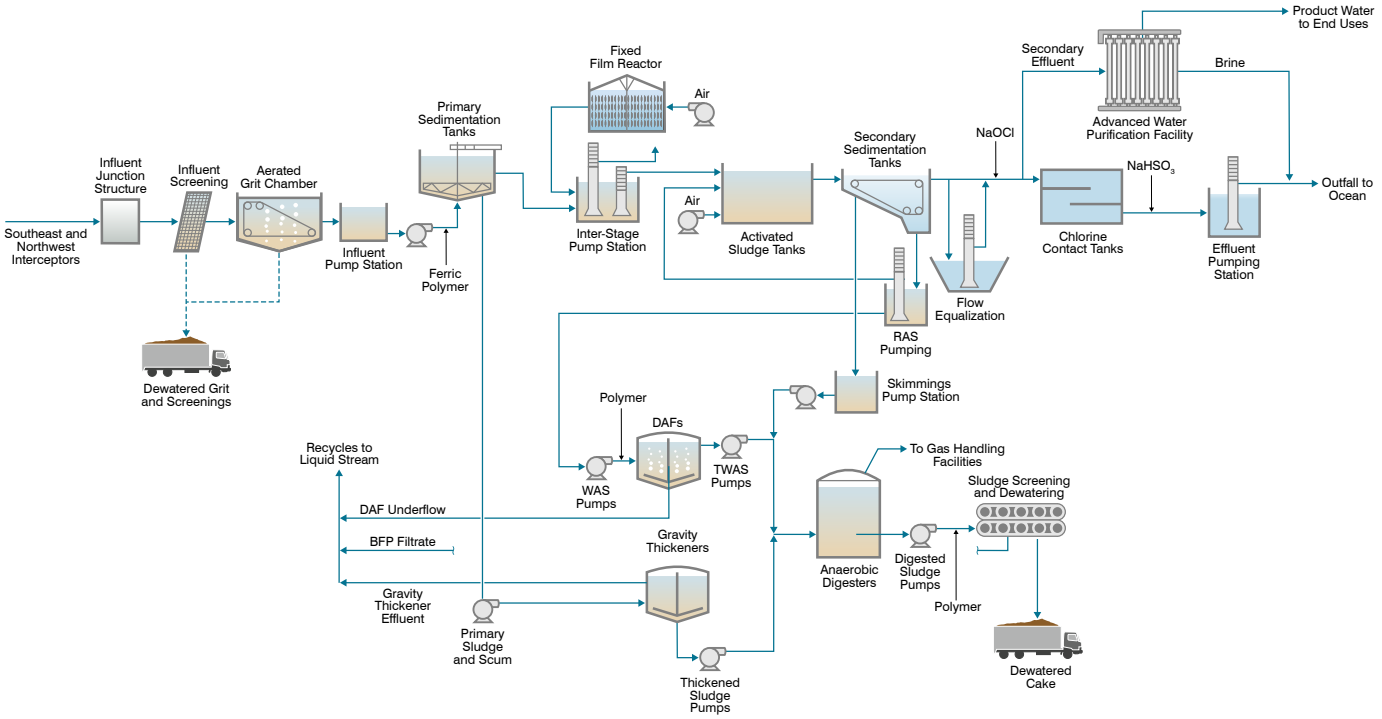

Figure 6. A schematic of the treatment processes currently in use at the Oxnard Wastewater Treatment Plant.

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

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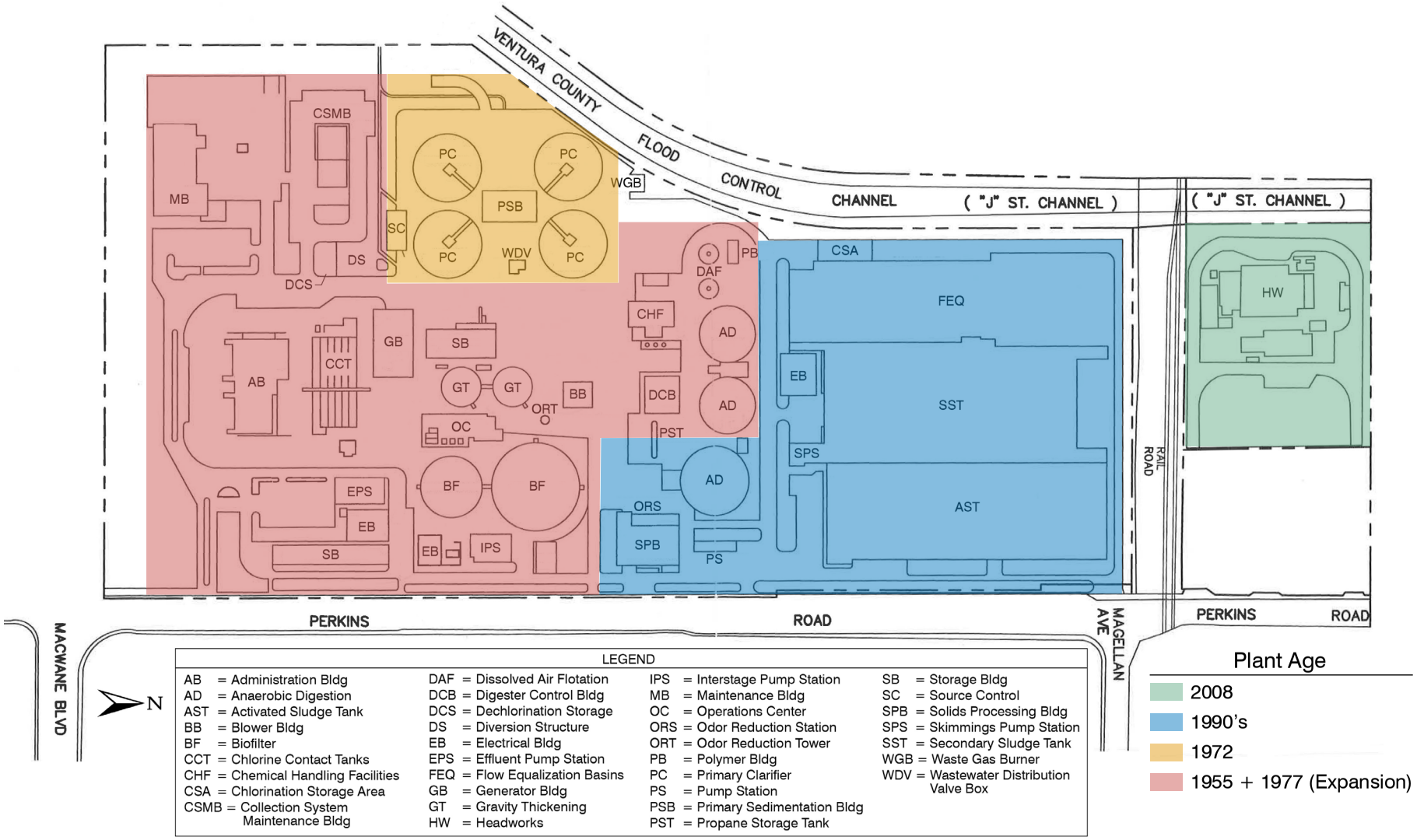

Figure 7. The Oxnard Wastewater Treatment Plant consists of preliminary, primary, and secondary treatment, effluent disinfection and solids handling facilities.

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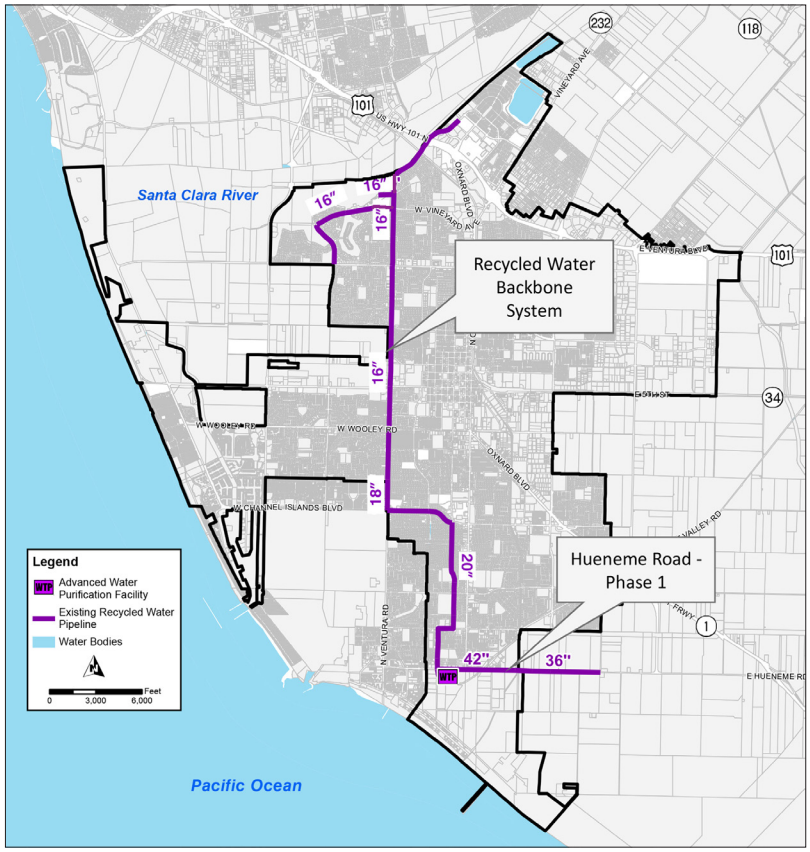

Figure 8. The City serves both urban and agricultural reuse customers with recycled water.

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 is constructing an Aquifer Storage and Recovery Demonstration well (ASR Demo Well), which is expected to finish in 2018. 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

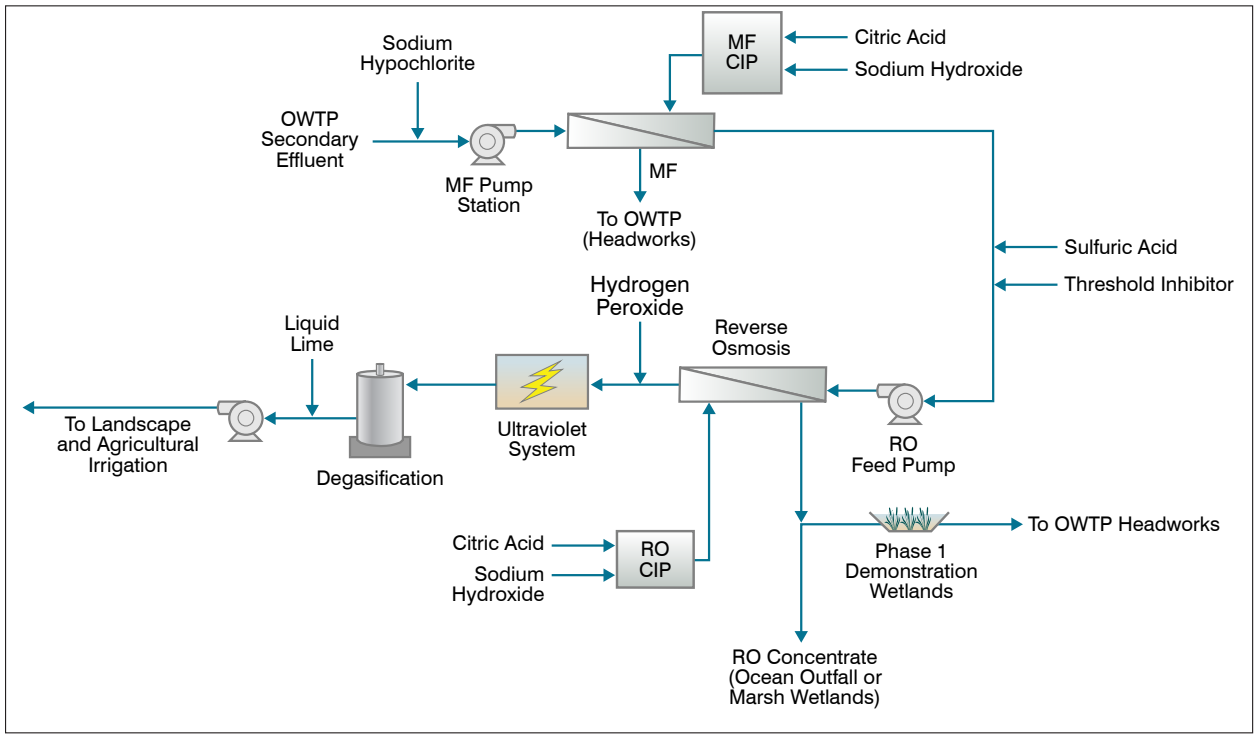

Figure 9. The Advanced Water Purification Facility includes microfiltration, reverse osmosis, and advanced disinfection.

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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.

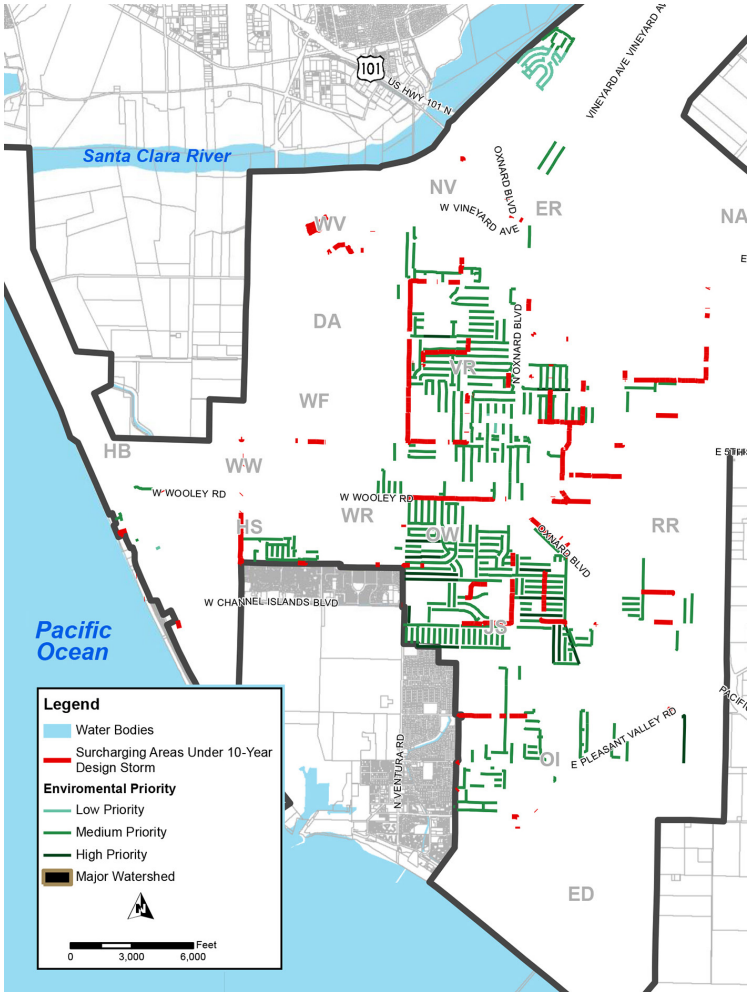

Figure 10. High Priority Green Alleys Environmental Improvements and Flooding Areas.

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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.

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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 Capital Improvement Plan (CIP). The complete CIP is presented at the end of the Executive Summary.

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 (through 2040).

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. Once the implementation timing was determined based on the technical aspects noted above, the CIP was then revised, as needed, to meet the City's near-term financial and budget limitations noted in the Cost of Service Studies. These projects cover the needs of the entire planning period for this Integrated Master Plan (through 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 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, numerous integration workshops and meetings with the City, and additional facilities planning conducted after the December 2015 publication of the project memos.

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, unless otherwise noted in the CIP. 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.

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PROJECT PHASING

The projects presented in the Capital Improvement Plan were split into three projects timing phases:

- Immediate Needs (First 2 years)
- Near-Term Needs (Years 3 to 5)
- Long-Term Needs (beyond 5 years)

This project timing matches the Cost of Service Studies approved (Carollo, 2017).

While the estimated project costs and phasing presented are consistent with those developed for the Cost of Service Studies (Carollo, 2017), 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 Studies (Carollo, 2017), the actual 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 Studies, 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.

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 locating 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 Cost of Service Studies and 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, over time, 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).

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

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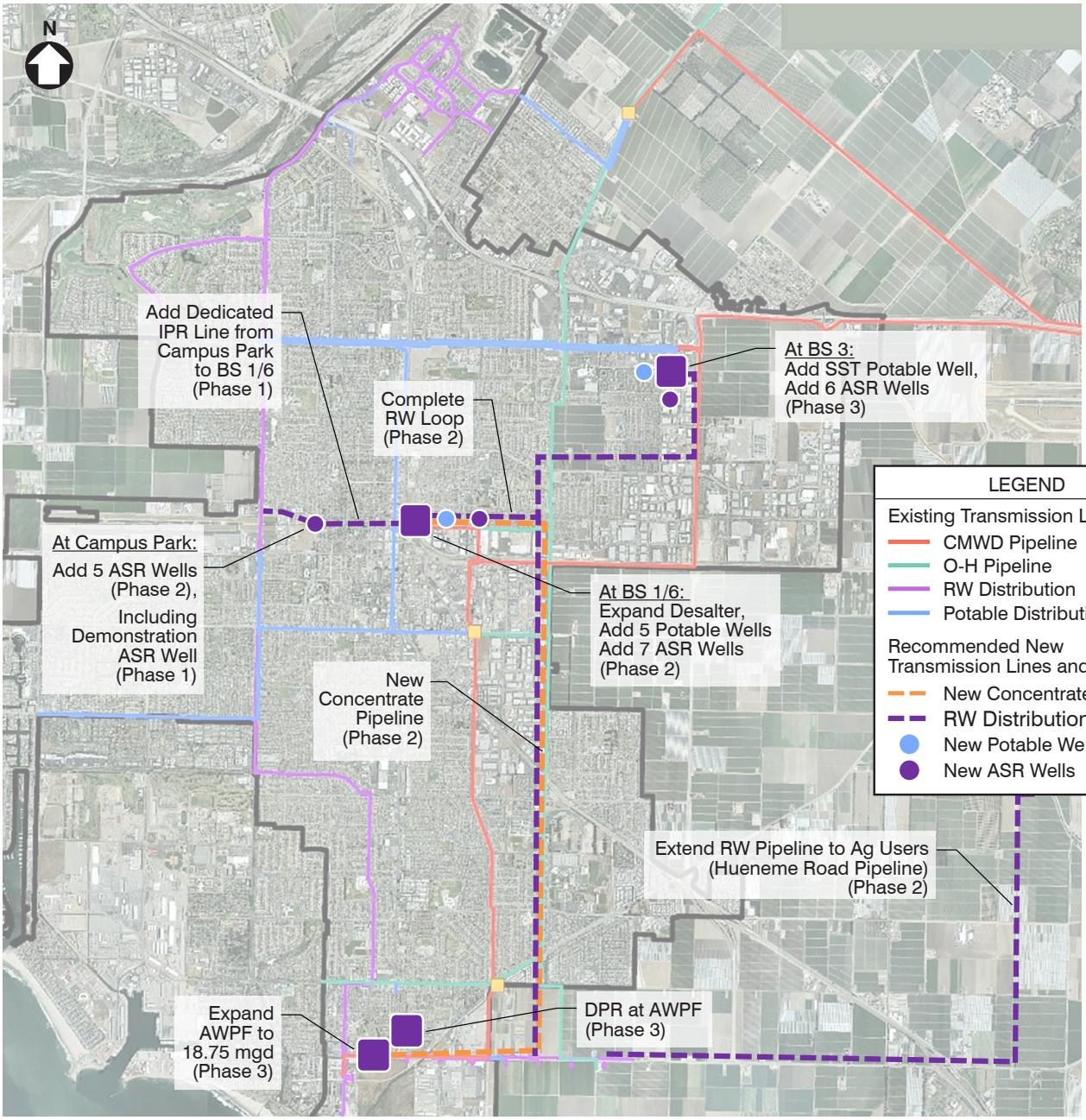

Figure 11. Recommended water/recycled water projects for water supply.

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.

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

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

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its high level of service to its customers, two main projects are recommended, and 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.

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.

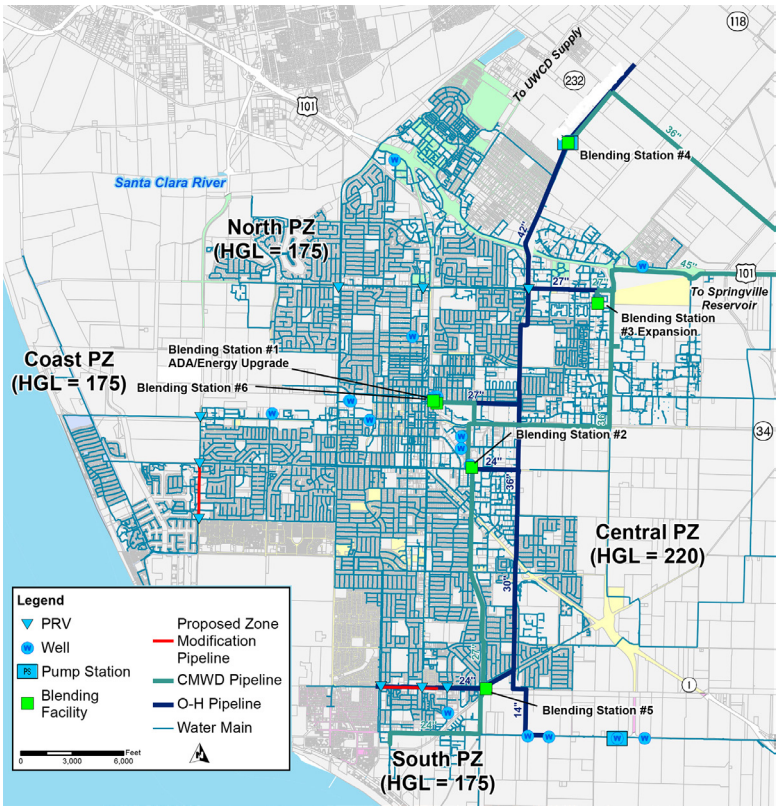

Figure 12. Proposed Pressure Zone Separation within the City's Water System.

WASTEWATER

Figure 13 shows the recommended projects for the wastewater treatment facility, which are categorized by implementation phase. The projects and phasing shown here represent one possible solution to upgrading the Oxnard Wastewater Treatment Plant. Between the time of original publication of the Final Draft Plan in 2015 and this Revised Final Draft publication in 2017, the City continued to review and optimize the recommended policies, projects and programs. Therefore, certain wastewater projects have been refined and updated. However the overall intent is the same, to upgrade the facilities that have served their useful life to achieve improved financial and implementation strategies, to accommodate technology updates, and address climate change strategies. It should be noted that these refinements and optimizations were generally not related to capacity needs.

Two overarching wastewater treatment locations were considered, namely, repair in place and relocate most of the wastewater treatment 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 approximately a dozen 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.

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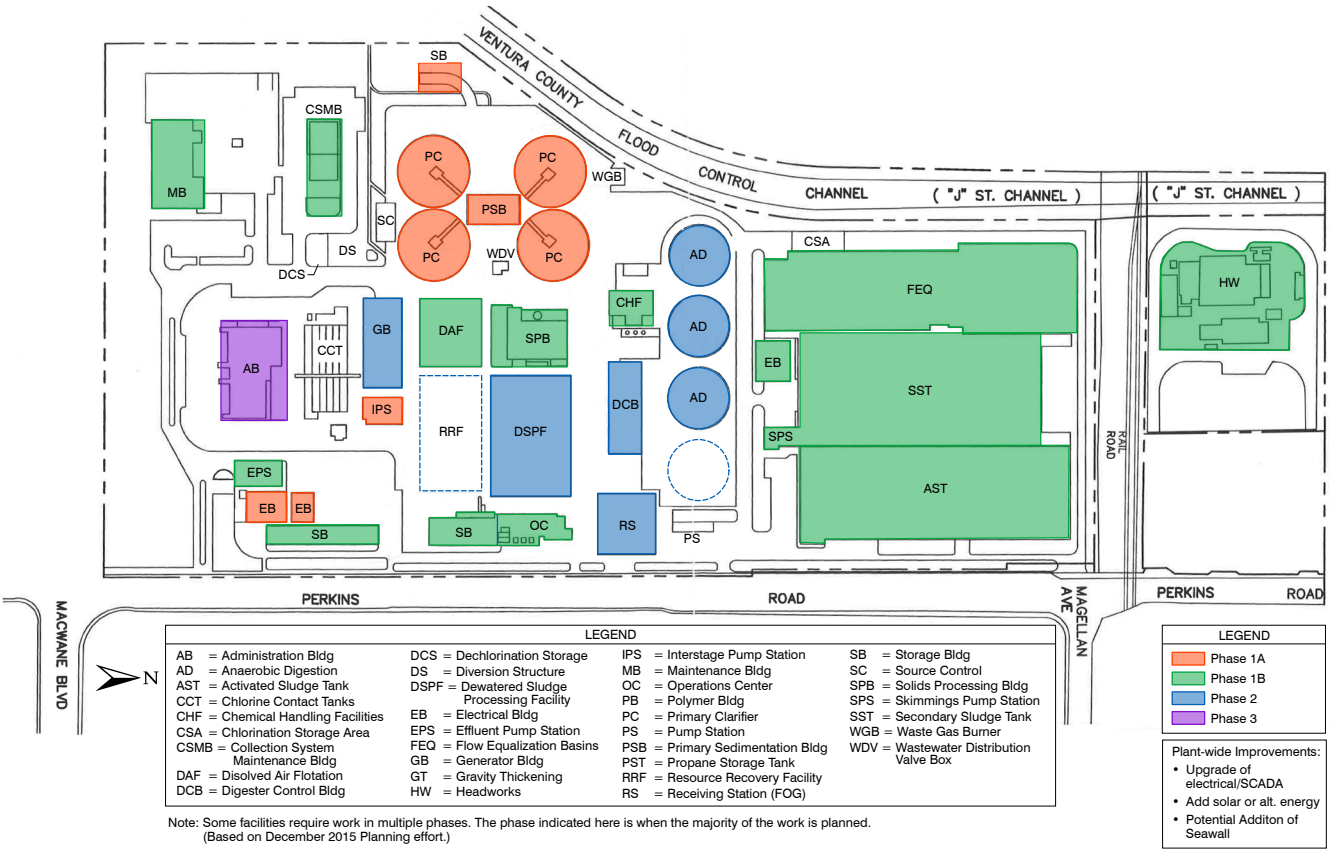

Figure 13. Recommended Wastewater Treatment Plant Projects by Implementation Phase.

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.

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. A new influent new splitter box is recommended to improve flow control.

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.

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 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.

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

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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.

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

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

- 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, possibly relocating all or many of the treatment processes to a different location near the Advanced Water Purification Facility could be 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, 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

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of the various regulatory and integration aspects of the water reuse program.

If the City chooses to relocate some or all of 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.

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. Over time, 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.

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.

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 should 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 is planned to 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 would be installed for supplemental water supply use, which would also occur in phases. First, the Campus Park site would 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 would also have operational storage sized to offset peak hour flows, booster pumping, and add conditioning

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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 would 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 would be added near Blending Station No. 1/6 site and additional property near Blending Station No. 1/6 would need to be acquired, which the City has 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.

To provide direct potable reuse at some future date would 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 could 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 approximately 20 projects related to repair and replacement, which should be addressed in Phase 1.

Capacity

Stormwater collection system improvements focused on the capacity needs determined from collection system modeling. The modeling identified over a dozen 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.

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

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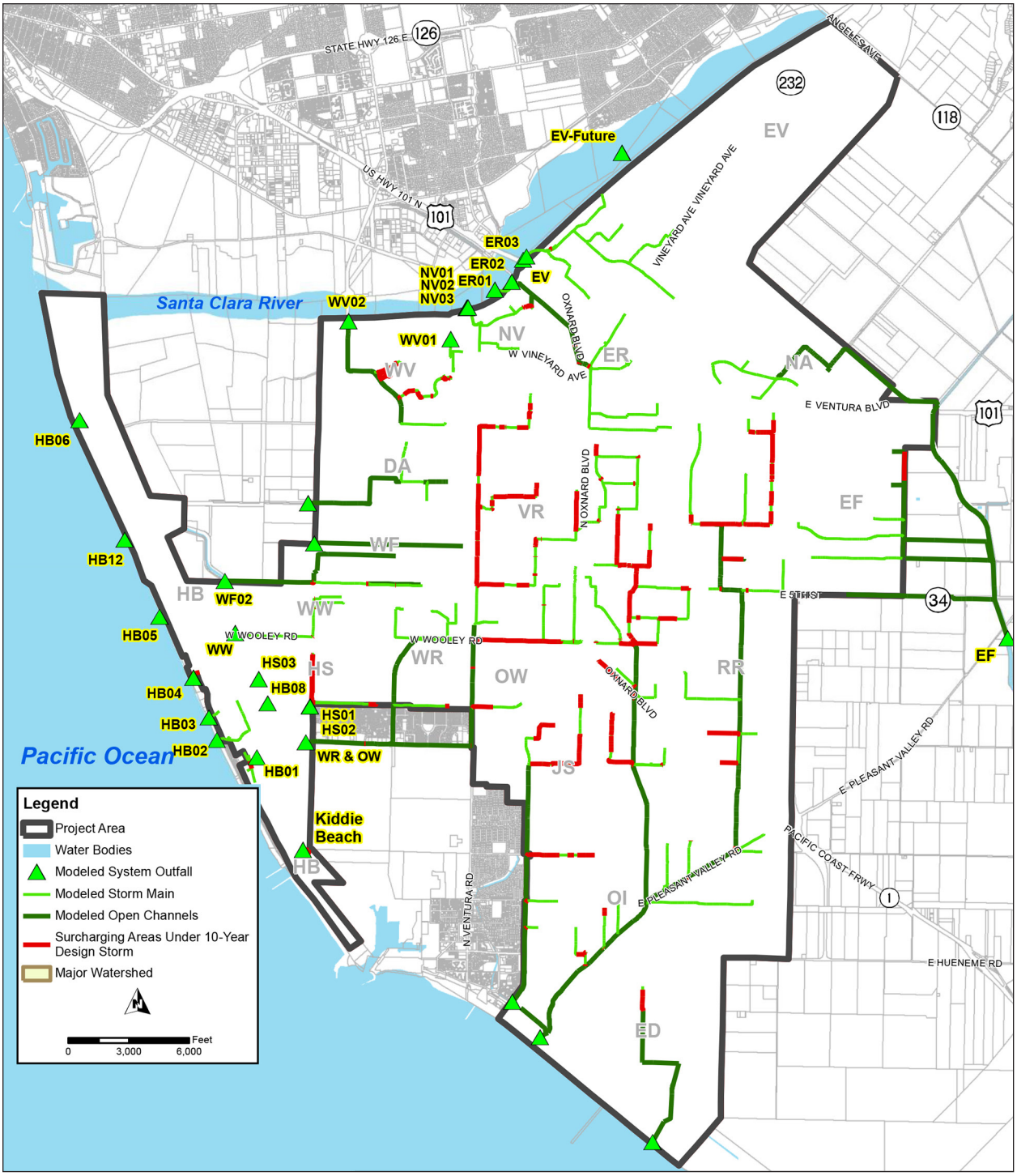

Figure 14. Capacity upgrades needed for 10-year design storm under 2040 conditions.

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

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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.

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.

Several overarching systems were reviewed and evaluated for upgrades.

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

In combining the water system utility plans to produce the Integrated Master Plan, the City developed a 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 3 summarizes the Capital Improvement Plan project costs by implementation timing for the recommended projects. Timing for designing and constructing the Integrated Master Plan facilities can be seen in the CIP provided herein.

Table 3. Recommended Overall Capital Improvement Plan for the City's Integrated Master Plan

PLAN IMPLEMENTATION TIMING	Years 1 to 2 (FY 2017/18 - 2018/19)	Years 3 to 5 (FY 2019/20 - 2021/22)	Years 6 to 10 (FY 2022/23 - 2026/27)	Years 11-16 (FY 2027/28 - 2032/33)	Years 17-23 (FY 2033/34 - 2039/40)	Total[1]
Water	$3,175,000	$61,839,333	$62,527,333	$19,238,333	$80,600,000	$227,380,000
Wastewater[1]	$8,405,000	$68,425,064	$244,311,000	$58,908,334	$112,983,933	$493,033,330
Recycled Water	$11,166,667	$81,033,333	$57,500,000	$80,500,000	$22,200,000	$252,400,000
Stormwater	$8,363,333	$18,118,000	$2,936,667	$1,338,000	$1,930,000	$32,686,000
Total by Phase	**$31,110,000**	**$229,415,730**	**$367,275,000**	**$159,984,667**	**$217,713,933**	**$1,005,499,330**

(1) Project costs correspond to refinements and updates provided by City after Dec. 2015 publication date.

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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 all or parts 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.

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Capital Improvement Plan

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Table B1 Potable Water System Capital Improvements Program (CIP) Projects

Project ID 2017	Project ID 2015	Project Name	Project Description	Driver	Start Year	Years to Implement	Total	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
			Production Total				**$47,590,000**	**$1,955,000**	**$13,705,000**	**$30,350,000**	**$1,580,000**	**$0**
W-1	W-P-35	Existing desalter upgrades	Membrane replacement, CIP automation, electric valve actuator replacements, discharge piping reconfiguration	R&R	2017	5	$5,000,000	$930,000	$4,070,000	$0	$0	$0
W-2	W-P-28 W-P-40	Desalter, piping and permeate tank cathodic protection	Investigate requirements for electrical isolation and CP of buried piping and RO finished water, and design and install capital project as warranted; Replacement of CP system at WTP and steel permeate tank	R&R	2020	2	$110,000	$0	$110,000	$0	$0	$0
W-3	W-P-62 W-P-65	Expand water treatment facility and storage (incl. booster pump station)	Expand disinfection system at Blending Station 1/6. Install new 1.5 MG storage reservoir for finished water. Install new booster pump station for new storage tank	Water Supply	2021	8	$6,600,000	$0	$500,000	$5,100,000	$1,000,000	$0
W-4	W-P-19	Blending Station #2 upgrade	R&R of mechanical, electrical, and AUX equipment	R&R	2028	1	$430,000	$0	$0	$0	$430,000	$0
W-5	W-P-20	Blending Stations #1 and #6 upgrade	R&R of wells, mechanical, electrical, and AUX equipment	R&R	2018	4	$3,400,000	$850,000	$2,550,000	$0	$0	$0
W-6	W-P-21	Water System CMMS	Water CMMS System (City Works)	R&R	2017	3	$300,000	$175,000	$125,000	$0	$0	$0
W-7	W-P-22	Water System SCADA Improvements	Perform water SCADA system improvements (design and implementation plan year 1)	R&R	2020	5	$5,000,000	$0	$2,000,000	$3,000,000	$0	$0
W-8		Security Improvements at Water Yard and Blending stations	Access Control, Cameras		2020	5	$500,000	$0	$250,000	$250,000	$0	$0
W-9		Chemical Tank Replacements	Replacement of chemical tanks (required every 10 years)	R&R	2025	3	$450,000	$0	$0	$300,000	$150,000	$0
W-10	W-P-32	Blending Station #3 Rehabilitation	R&R of wells, mechanical, electrical, and AUX equipment, VFD replacement	R&R	2019	2	$2,500,000	$0	$2,500,000	$0	$0	$0
W-11	W-P-33	Blending Station #4 Rehabilitation	Pumps, mechanical, electrical, and AUX equipment, VFD	R&R	2019	2	$400,000	$0	$400,000	$0	$0	$0
W-12	W-P-34	Blending Station #5 Rehabilitation	Mechanical, electrical, and AUX equipment	R&R	2019	2	$200,000	$0	$200,000	$0	$0	$0
W-13	W-P-61	Construct 3 new potable wells at BS 1/6	Add potable water wells, land management	Water Supply	2020	7	$11,000,000	$0	$1,000,000	$10,000,000	$0	$0
W-14	W-P-66	Construct 2 new potable wells (BS 1/6) and 1 new stainless steel well at BS 3	Add potable water wells	Water Supply	2023	4	$11,700,000	$0	$0	$11,700,000	$0	$0
			Transmission Total				**$2,405,000**	**$405,000**	**$1,620,000**	**$380,000**	**$0**	**$0**
W-15	W-P-23 W-P-36 W-P-37	Del Norte Transmission Main Cathodic Protection (CP)	Install 20 missing test stations; Replace rectifiers and anodes and resurvey; Locate and repair discontinuity near the east end of the Del Norte Pl	R&R	2019	2	$450,000	$0	$450,000	$0	$0	$0

Project ID 2017	Project ID 2015	Project Name	Project Description	Driver	Start Year	Years to Implement	Total	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
W-16	W-P-26	Gonzalez 36-inch Pipeline CP	Replace the seized test traffic box lids; test the CP system	R&R	2018	1	$5,000	$5,000	$0	$0	$0	$0
W-17	W-P-27 W-P-10 W-P-5 W-P-6	Oxnard Conduit CP	Excavate & install new test stations at BFV near Del Norte connection, 9+10, 39+10, 57+45, 69+50, 111+50, 165+20; Install new test stations in ex manhole at 284+80; Corrosion engineer to conduct Close Interval Survey (CIS); Replace deep anode beds at Rectifiers #1 , #2, & #3; Locate, excavate, and bond across approximately three (3) points of electrical isolation	R&R	2017	4	$890,000	$400,000	$490,000	$0	$0	$0
W-18	W-P-38 W-P-39	Wooley Road / United CP	Replace 5 test stations and add 2 new stations; Replace rectifier and anode; resurvey	R&R	2020	1	$160,000	$0	$160,000	$0	$0	$0
W-19	W-P-7 W-P-24	3rd Street Lateral CP	Replace rectifer and anode bed; resurvey; Replace all test stations at an interval of 1,000-ft minimum and 2,000-ft maximum; Locate & repair discontinuity between 27+88 and South Hayes WTP; Provide electrical isolation at the main treatment plant	R&R	2020	3	$360,000	$0	$310,000	$50,000	$0	$0
W-20	W-P-25 W-P-8	Industrial Lateral CP	Replace all test stations; resurvey	R&R	2020	3	$130,000	$0	$100,000	$30,000	$0	$0
W-21	W-P-11	3rd St 27" UWCD CP	Bond UWCD pipeline to Oxnard Extension at rectifier	R&R	2020	2	$110,000	$0	$110,000	$0	$0	$0
W-22		Condition assessment program	Physical condition assessment of mains program	R&R	2022	5	$300,000	$0	$0	$300,000	$0	$0
			Distribution Total				**$58,965,000**	**$815,000**	**$24,551,000**	**$23,574,000**	**$10,025,000**	**$0**
W-23	W-P-9	Replacement of AMR Devices	Design and construct a new Advance Metering Infrastructure (AMI) system (Cost is possibly reduced by 1/2 if shared with wastewater division)	R&R	2017	7	$22,000,000	$200,000	$13,000,000	$8,800,000	$0	$0

Project ID 2017	Project ID 2015	Project Name	Project Description	Driver	Start Year	Years to Implement	Total	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
W-24		Pipe Capacity Improvements	Pipe capacity improvements for 8-inch to 24-inch pipe	Water Supply	2019	9	$13,040,000	$0	$5,620,000	$6,870,000	$550,000	$0
	W-P-51 W-P-52 W-P-53 W-P-54 W-P-56 W-P-57 W-P-58 W-P-59 W-P-67 W-P-68 W-P-69 W-P-70 W-P-71 W-P-72		Upgrade 322 feet to 8" pipe Upgrade 238 feet to 12" pipe Upgrade 164 feet to 14" pipe Upgrade 3,804 feet to 30" pipe Upgrade 69 feet to 6" pipe Upgrade 391 feet to 8" pipe Upgrade 1,011 feet to 10" pipe Upgrade 2,447 feet to 12" pipe Upgrade 32 feet to 6" pipe Upgrade 233 feet to 8" pipe Upgrade 1,243 feet to 10" pipe Upgrade 997 feet to 12" pipe Upgrade 2,453 feet to 14" pipe Upgrade 937 feet to 24" pipe								
W-25	W-P-12 W-P-13 W-P-14 W-P-15	Neighborhood CIP Pipe Replacement*	Replace existing distribution pipes in La Colonia Neighborhood, Redwood Neighborhood, Fremont North Neighborhood, and Bryce Canyon South Neighborhood	R&R	2018	6	$10,500,000	$615,000	$5,931,000	$3,954,000	$0	$0
W-29		Large Valve Replacement Program	Replace valve 10-inch and larger	R&R	2022	10	$1,926,000	$0	$0	$926,000	$1,000,000	$0
W-30		Small Valve Replacement Program	Replace valves 8-inch and smaller	R&R	2022	10	$3,780,000	$0	$0	$1,780,000	$2,000,000	$0
W-31		Air / Vac Valve Replacement Program	Replace air and vacuum valves and covers	R&R	2022	10	$1,422,000	$0	$0	$672,000	$750,000	$0
W-32		Hydrant Replacement Program	Replace dry barrel hydrants to wet barrel	R&R	2022	10	$1,197,000	$0	$0	$572,000	$625,000	$0
W-33	W-P-74 W-P-75 W-P-76 W-P-77	North Zone Modifications	Install 1000 feet of 24-inch pipeline from BS#3 to the North Pressure Zone, Rehab 3 Pressure Reducing Stations (PRS), modify minor piping	Pressure Zone Separation	2027	4	$1,100,000	$0	$0	$0	$1,100,000	$0
W-34	W-P-78 W-P-79 W-P-80 W-P-81	Coast Zone Modifications	Install 3000 feet of 8-inch pipeline, construct 3 new Pressure Reducing Stations (PRS), modify minor piping	Pressure Zone Separation	2027	4	$1,600,000	$0	$0	$0	$1,600,000	$0
W-35	W-P-82 W-P-83 W-P-84 W-P-85	South Zone Modifications	Install 6000 feet of 8-inch pipeline, construct 3 new Pressure Reducing Stations (PRS), modify minor piping	Pressure Zone Separation	2027	3	$2,400,000	$0	$0	$0	$2,400,000	$0
				2017 Potable Water System CIP Subtotal			**$108,960,000**	**$3,175,000**	**$3,9876,000**	**$5,4304,000**	**$11,605,000**	**$0**

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Project ID 2017	Project ID 2015	Project Name	Project Description	Driver	Start Year	Years to Implement	Total	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
Additional 2015 Projects												
	W-P-1	Electrical Rehabilitation - Well Nos. 30, 32, 33 & 34		Operations Optimization	2026	1.5	$1,000,000	$0	$0	$666,667	$333,333	$0
	W-P-2	Sodium Hypochlorite Piping Replacement		Operations Optimization	2022	1.5	$30,000	$0	$0	$30,000	$0	$0
	W-P-4	Generator and ATS Service		Operations Optimization	2019	1.5	$20,000	$0	$20,000	$0	$0	$0
	W-P-16	Fire Flow Improvements - Install/Replace 18,500 feet of 8" pipe		R&R	2020	2	$4,600,000	$0	$4,600,000	$0	$0	$0
	W-P-17	Fire Flow Improvements - Install/Replace 13,500 feet of 12" pipe		R&R	2020	2	$4,400,000	$0	$4,400,000	$0	$0	$0
	W-P-18	Fire Flow Improvements - Install 250 feet of 14" pipe		R&R	2020	1	$100,000	$0	$100,000	$0	$0	$0
	W-P-64	Blend Station Tie-In (@ Blending Station 1/6)		Water Supply	2022	1	$250,000	$0	$0	$250,000	$0	$0
	W-P-60	Construct new concentrate line from Oxnard Wastewater Treatment Plant (OWTP) to Blending Station 1/6		Water Supply	2020	3	$18,800,000	$0	$12,533,333	$6,266,667	$0	$0
	W-P-28	Blending Station 1/6 - Install electrical isolation at all steel and cast iron water risers		R&R	2022	2	$30,000	$0	$0	$30,000	$0	$0
	W-P-30	Well 23 & 31 Rehabilitation		R&R	2022	1.5	$210,000	$0	$0	$210,000	$0	$0
	W-P-31	Wells Electrical & Variable Frequency Drive (VFD) Replacement		R&R	2022	1.5	$770,000	$0	$0	$770,000	$0	$0
	W-P-41	Age Replacement- 109,100 feet of 6" pipe		R&R	2033	2	$25,500,000	$0	$0	$0	$0	$25,500,000
	W-P-42	Age Replacement - 47,000 feet of 8" pipe		R&R	2034	2	$11,700,000	$0	$0	$0	$0	$11,700,000
	W-P-43	Age Replacement - 55,000 feet of 10" pipe		R&R	2035	2	$17,100,000	$0	$0	$0	$0	$17,100,000
	W-P-44	Age Replacement - 24,000 feet of 12" pipe		R&R	2036	2	$7,900,000	$0	$0	$0	$0	$7,900,000
	W-P-45	Age Replacement - 2,300 feet of 14" pipe		R&R	2037	1	$900,000	$0	$0	$0	$0	$900,000
	W-P-46	Age Replacement - 4,000 feet of 16" pipe		R&R	2037	1	$1,700,000	$0	$0	$0	$0	$1,700,000
	W-P-47	Age Replacement - 3,700 feet of 24" pipe		R&R	2037	2	$2,300,000	$0	$0	$0	$0	$2,300,000

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Project ID 2017	Project ID 2015	Project Name	Project Description	Driver	Start Year	Years to Implement	Total	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
	W-P-48	Age Replacement - 5,000 feet of 36" pipe		R&R	2038	2	$3,900,000	$0	$0	$0	$0	$3,900,000
	W-P-49**	Age Replacement - 5,300 feet of 42" pipe		R&R	2038	2	$5,500,000	$0	$0	$0	$0	$5,500,000
	W-P-50**	Age Replacement - 3,800 feet of 48" pipe		R&R	2038	2	$4,100,000	$0	$0	$0	$0	$4,100,000
	W-P-55	Connection to OH / United pipeline		Water Supply	2020	1.5	$310,000	$0	$310,000	$0	$0	$0
	W-P-73	Expand desalter at Blending Station 1/6 to 15 mgd (3.75 mgd expansion)		Water Supply	2028	3	$7,300,000	$0	$0	$0	$7,300,000	$0
				Unmatched 2015 Water Projects Subtotal			**$118,420,000**	**$0**	**$21,963,333**	**$8,223,333**	**$7,633,333**	**$80,600,000**
						Overall Total	**$227,380,000**	**$3,175,000**	**$61,839,333**	**$62,527,333**	**$19,238,333**	**$80,600,000**

Notes:
1. Projects W-25 through @-28 combined into single project ID'ed as W-25.
2. Project start years correspond to refinements and updates provided by City after December 2015 publication date.

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Table B2 Wastewater Collection System and Treatment System Capital Improvements Program (CIP) Projects

Project ID 2017	Project ID 2015	Unit Operation	Project Name	Project Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
Wastewater Collection System Projects													
C-1	WW-P-6		Central Trunk Manhole Rehabilitation Phase 1	Rehabilitate 47 existing manholes	R&R	2018	1	**$1,410,000**	$1,410,000	$0	$0	$0	$0
C-2	WW-P-13		Central Trunk Manhole Rehabilitation Phase 2[2]	Rehabilitate 27 existing manholes	R&R	2020	1	**$810,000**	$0	$810,000	$0	$0	$0
C-3	WW-P-8		Harbor Blvd Manhole Rehabilitation	Rehabilitate 12 existing manholes	R&R	2019	1	**$100,000**	$0	$100,000	$0	$0	$0
C-4			Pleasant Valley Manhole Rehabilitation	Rehabilitate 14 existing manholes	R&R	2019	1	**$200,000**	$0	$200,000	$0	$0	$0
C-5	WW-P-9		Redwood Tributary Manhole Rehabilitation	Rehabilitate 38 existing manholes	R&R	2019	1	**$300,000**	$0	$300,000	$0	$0	$0
C-6			Annual Existing Manhole Rehabilitation	Various locations throughout the City based on sewer inspection	R&R	2022	5	**$1,000,000**	$0	$0	$1,000,000	$0	$0
C-7	WW-P-16		Rice Avenue Sewer Improvement	Install new 24-inch sewer from Latigo to Camino Del Sol to replace existing 18-inch sewer line.	R&R	2020	2	**$1,300,000**	$0	$1,300,000	$0	$0	$0
C-8	WW-P-1		Existing Sewer Deficient Capacity Replacement	Ventura Road from Doris Avenue to Oxnard Airport	Capacity	2020	2	**$1,755,197**	$0	$1,755,197	$0	$0	$0
C-9	WW-P-2		Existing Sewer Deficient Capacity Replacement	Third Street & Navarro Street	Capacity	2021	1	**$364,869**	$0	$364,869	$0	$0	$0
C-10	WW-P-7		Existing asbestos concrete pipe (ACP) Replacement	Various locations throughout the City	R&R	2019	8	**$4,000,000**	$0	$1,500,000	$2,500,000	$0	$0
C-11			Annual Existing Pipe Repair	Various locations throughout the City based on sewer inspection	R&R	2019	8	**$1,600,000**	$0	$600,000	$1,000,000	$0	$0
C-12			Collection System Chemical Addition	Construct 3 new magnesium hydroxide addition facilities to reduce nuisance odors and protect sewer infrastructure	Performance	2019	2	**$4,400,000**	$0	$4,400,000	$0	$0	$0

Project ID 2017	Project ID 2015	Unit Operation	Project Name	Project Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
C-13	WW-P-10 WW-P-18		Devco Development Lift Station	Construct new lift station at Devco development & abandon existing lift station #23. The new lift station will accommodate sewer flows from existing lift station #23, Devco, Village (Wagon Wheel) developments. The lift station cost is $1,500,000 & the City cost is $500,000.	R&R, Performance	2019	1	**$500,000**	$0	$500,000	$0	$0	$0
C-14	WW-P-12		Existing Lift Station #4 (Mandalay & Wooley) Rehabilitation	Install new supervisory control and data acquisition (SCADA) & motor control center (MCC) panels. Install new valve vault door. Rehabilitate wet well coating.	R&R	2019	1	**$500,000**	$0	$500,000	$0	$0	$0
C-15	WW-P-11		Existing Lift Station #6 (Canal) Rehabilitation	Install new pumps. Replace MCC panel. Install new emergency standby generator.	R&R	2019	1	**$500,000**	$0	$500,000	$0	$0	$0
C-16			Existing Lift Station #20 (Beardsley) Rehabilitation	Install new MCC panel and concrete pad.	R&R	2019	1	**$300,000**	$0	$300,000	$0	$0	$0
C-17	WW-P-5		Meter Vault/Vortex Structure Coating Rehabilitation[2]	Rehabilitate coating in meter vault/vortex structure	R&R	2018	1	**$280,000**	$280,000	$0	$0	$0	$0
Additional Wastewater Collection System Projects from 2015 Capital Improvements Program													
	WW-P-3		Project 3: S Victoria Ave and W Hemlock St - Sewers in the Channel Islands Neighborhood		Capacity	2027*	2	**$1,112,267**	$0	$0	$0	$1,112,267	$0
	WW-P-14		Phase 1 Central Trunk replacement		R&R	2033**	2	**$36,500,000**	$0	$0	$0	$0	$36,500,000
	WW-P-15		Phase 2 Central Trunk Replacement		R&R	2036**	2	**$30,000,000**	$0	$0	$0	$0	$30,000,000
							Wastewater Collection System Total	**$86,932,333**	**$1,690,000**	**$13,130,066**	**$4,500,000**	**$1,112,267**	**$66,500,000**

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Project ID 2017	Project ID 2015	Unit Operation	Project Name	Project Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
Wastewater Treatment System Projects													
--			Accelerated design for renewal improvements (year 6-10)			2018	6	**$15,130,000**	$1,500,000	$86,360,000	$5,000,000		
			Preliminary Treatment/Headworks										
T-1	WW-P-83		Headworks Odor Control System[2]	Install new odor control dampers and fan. Repair existing foul air ductwork.	Small Equipment Replacement	2018	1	**$220,000**	$220,000	$0	$0	$0	$0
T-2	WW-P-67		Headworks Fiberglass Covers Replacement & Concrete Coating Repair[2]	Install new grit chamber & wet well fiberglass covers. Rehabilitate grit chamber & wet well concrete coating. Year 1 to 2: high foot traffic areas. Year 3 to 5: remaining areas.	R&R	2018	2	**$499,100**	$90,000	$409,100	$0	$0	$0
T-3	WW-P-66		Headworks Rehabilitation[2]	Install new odor control system. Enclose bar screen & conveyor areas to minimize odor complaints. Install screen wall along north and west property areas. In 2011, City settled $4.6M lawsuit related to Headworks construction and nuisance odor complaints.	R&R	2020	2	**$7,250,000**	$0	$7,250,000	$0	$0	$0
T-4	WW-P-41		Non-hazardous Waste Receiving Station	New non-hazardous waste receiving station with metering and screening systems	Performance	2026	1	**$2,100,000**	$0	$0	$ 2,100,000	$0	$0
			Primary Treatment										
T-5			Primary Clarifier Rehabilitation	Install new effluent launders. New primary clarifier #4 walkway. Install polymer addition system to improvement primary treatment efficiency.	R&R	2017	1	**$655,000**	$655,000	$0	$0	$0	$0

Project ID 2017	Project ID 2015	Unit Operation	Project Name	Project Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
T-6			Primary Clarifier Abandonment	Abandon existing primary clarifiers. Repurpose a portion existing secondary sedimentation tanks as primary clarifiers. Convert remaining secondary sedimentation tanks to membrane bioreactors (MBR).	R&R	N/A	0	**$0**	$0	$0	$0	$0	$0
T-7	WW-P-23		Primary Clarifiers, Old Headworks Structure and Primary Building Demolition[2]	Remove equipment, concrete, piping and electrical systems in old headworks and primary tanks area. Reroute piping and electrical systems	R&R	2025	1	**$7,300,000**	$0	$0	$7,300,000	$0	$0
			Secondary Treatment										
T-8			Biotowers Rehabilitation	Install wire wrap or mesh around biotowers to prevent block wall from falling.	R&R	2017	1	**$630,000**	$630,000	$0	$0	$0	$0
T-9	WW-P-20		Biotower Demolition[2]	Remove superstructure, remove concrete below ground, reroute piping and electrical; restore grade	R&R	2023	1	**$2,850,000**	$0	$0	$2,850,000	$0	$0
T-10	WW-P-69		Activated Sludge Tank (AST) Rehabilitation[2]	Install new air flow meters, air control valves, and dissolved oxygen meters.	R&R	2017	1	**$150,000**	$150,000	$0	$0	$0	$0
T-11	WW-P-72 WW-P-74 WW-P-76		Activated Sludge Tank (AST) Upgrades	Replace diffusers and add return sludge piping, aeration piping, gates and controls	R&R, Performance	2023	1	**$4,600,000**	$0	$0	$4,600,000	$0	$0
T-12	WW-P-72		Modify Activated Sludge Tank (AST) for MBR or other technology operation	Partition Tanks, add internal recycle system	Performance	2023	2	**$7,200,000**	$0	$0	$7,200,000	$0	$0
T-13	WW-P-68 WW-P-72		Convert Activated Sludge Tanks conversion to Flow Equalization Tank	Convert existing AST 4 to 8. Remove diffusers and add flow equalization pumps. Concrete repair and	R&R, Performance	2024	1	**$5,525,000**	$0	$0	$5,525,000	$0	$0

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Project ID 2017	Project ID 2015	Unit Operation	Project Name	Project Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
				seismic retrofit - EQ Tank									
T-14	WW-P-70 WW-P-73		Convert Secondary Clarifiers to Primary Clarifiers	Convert existing secondary clarifiers 6 to 12. Install clarifier mechanisms, replace primary sludge pumps, isolation gates and scum systems. Replace collectors, skimmers, and drives. Concrete repair and re-painting - SSTs.	R&R	2025	1	**$8,300,000**	$0	$0	$8,300,000	$0	$0
T-15			Remove existing Secondary Clarifiers and prepare for new Membrane Bioreactor (MBR) or other Technology	Demolish existing secondary clarifiers 13 to 18. Remove equipment, re-route piping and electrical, reinforce walls of aeration basin, modify inlet and outlet channels	R&R	2023	2	**$7,150,000**	$0	$0	$7,150,000	$0	$0
T-16	WW-P-75 WW-P-97		New MBR or other technology Tanks	Construct new tanks, channels, membranes and piping, pump gallery, pumps, cranes, roof and ventilation systems, aeration blowers	R&R, Resource Sustainability	2023	2	**$57,200,000**	$0	$0	$57,200,000	$0	$0
T-17	WW-P-97		MBR or other Technology Building	New Chemical systems, electrical room, SCADA system, effluent pumps	Resource Sustainability	2023	2	**$12,350,000**	$0	$0	$12,350,000	$0	$0
T-18			Convert Existing Secondary Clarifier to Screening & Transfer Pump Station	Install screen channels for primary effluent, convert to flow equalization basin, add transfer pumping and pipes	R&R	2024	1	**$7,150,000**	$0	$0	$7,150,000	$0	$0
T-19	WW-P-96 WW-P-80 WW-P-81		Disinfection and Effluent Pumping	New Disinfection system, effluent wet well and pumps	Small Equipment Replacement, R&R	2024	1	**$7,215,000**	$0	$0	$7,215,000	$0	$0

Project ID 2017	Project ID 2015	Unit Operation	Project Name	Project Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
T-20			Relocate Existing Primary Influent Piping	Connect to main header and re-route to influent channel of clarifiers. Provide controls and valves	R&R	2024	1	**$3,510,000**	$0	$0	$3,510,000	$0	$0
Solids Treatment													
T-21	WW-P-44 WW-P-45 WW-P-51		Sludge Thickening Facility[2]	Demolish Dissolved Air Flotation Tank (DAFT) structures, gravity thickener tanks and chemical storage. New building with Rotating Drum Screens for primary sludge and Gravity Belt thickeners for waste secondary sludge	R&R, Performance	2026	1	**$24,700,000**	$0	$0	$24,700,000	$0	$0
T-22	WW-P-43		Digester 2 Cover Replacement and Clean Digesters 1 & 3[2]	Install digester 2 cover and clean digester 1 and 3.	R&R	2019	3	**$3,700,000**	$0	$3,700,000	$0	$0	$0
T-23	WW-P-87 WW-P-89		Digesters 1 and 3 Rehabilitation[2]	Replacement of mixing systems, roof and concrete walls repair; heat exchanger upgrades	R&R	2025	2	**$8,500,000**	$0	$0	$8,500,000	$0	$0
T-24	WW-P-40		Replace Belt Filter Presses & Conveyor	Year 1 to 2: Replace two existing belt filter presses. Year 3 to 5: Replace two existing belt filter presses and conveyor.	R&R	2017	4	**$2,610,000**	$1,180,000	$1,430,000	$0	$0	$0
T-25	WW-P-94		FOG Receiving Station[2]	Fats Oils Grease receiving station with tank heaters and pumps, for transfer to digesters	Resource Sustainability	2026	1	**$845,000**	$0	$0	$845,000	$0	$0

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Pump Station													
T-26	WW-P-22		Interstage Pump Station Rehabilitation[2]	Install new pumps, motors, variable frequency drives. Rehabilitate wet well concrete coating. Upgrade control facility to meet building seismic code.	R&R	2020	2	**$2,087,199**	$0	$2,087,199	$0	$0	$0
T-27			Effluent Pump Station Rehabilitation	Install new isolation valve, pumps, motors, variable frequency drives. Rehabilitate wet well concrete coating. Install bypass piping. Upgrade control facility to meet building seismic code.	R&R	2019	3	**$8,900,000**	$0	$8,900,000	$0	$0	$0
Electrical/Instrumentation													
T-28			Electrical Building ARC Flash Protection	Install temporary 25kV circuit breakers on each side of 16kV and 480 volt transformers.	Performance	2017	2	**$575,000**	$575,000	$0	$0	$0	$0
T-29	WW-P-93		Cogenerators Rehabilitation[2]	Year 1 to 2: Rebuild two existing cogenerators. Year 3 to 5: Rebuild one existing cogenerator.	R&R	2017	3	**$1,215,000**	$810,000	$405,000	$0	$0	$0
T-30	WW-P-32		Electrical/Instrumentation Manhole Rehabilitation	Rehabilitate seven existing electrical and instrumentation manholes.	R&R	2017	1	**$175,000**	$175,000	$0	$0	$0	$0
T-31	WW-P-33		Emergency Standby Generator Replacement[2]	Install new emergency standby generator	R&R	2020	2	**$5,000,000**	$0	$5,000,000	$0	$0	$0
T-32	WW-P-34		Plant Motor Control Center (MCC) Panel Replacement[2]	Install new MCC panels	R&R	2020	2	**$2,087,199**	$0	$2,087,199	$0	$0	$0

Project ID 2017	Project ID 2015	Unit Operation	Project Name	Project Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
T-33	WW-P-30 WW-P-31		New Main Electrical Building[2]	New Building; new transformers; reroute electrical duct banks and run new cabling; new Automatic transfer switches; demolish old electrical building and equipment, and restore grade.	R&R	2020	2	**$6,000,000**	$0	$6,000,000	$0	$0	$0
T-34	WW-P-59		New North Electrical Building	New Building; new Motor Control Centers	R&R	2024	2	**$4,400,000**	$0	$0	$4,400,000	$0	$0
T-35			Site Electrical Improvements	Install cables, duct banks, and wiring	R&R	2024	3	**$10,920,000**	$0	$0	$10,920,000	$0	$0
T-36	WW-P-39		Computerized Maintenance Management System (CMMS)	Install new CMMS system for plant maintenance record keeping, including work scheduling, equipment records keeping, labor hours, and costs.	R&R	2017	1	**$300,000**	$300,000	$0	$0	$0	$0
T-37	WW-P-35		Supervisory Control and Data Acquisition and (SCADA) System	Temporary convert existing fiber network to Ethernet to prevent SCADA drop-out.	R&R	2017	1	**$225,000**	$225,000	$0	$0	$0	$0
T-38	WW-P-35		New SCADA System	Install new SCADA system	R&R	2020	2	**$4,946,500**	$0	$4,946,500	$0	$0	$0
T-39	WW-P-35		New Supervisory Control and Data Acquisition (SCADA) system	Replace plant-wide SCADA systems and PLCs with current technology. Reprogram all processes for new Plant Control System	R&R	2024	2	**$9,620,000**	$0	$0	$9,620,000	$0	$0
			Site Work										
T-40	WW-P-42		Site Piping Replacements	Install new process water piping, buried valves, fire line.	R&R	2020	5	**$23,970,000**	$0	$1,350,000	$22,620,000	$0	$0
T-41			Site Security	Install site cameras, security fencing, building locks	R&R	2019	2	**$1,000,000**	$0	$1,000,000	$0	$0	$0
T-42			Storm water Site Improvements		R&R	2019	3	**$2,100,000**	$0	$2,100,000	$0	$0	$0

Project ID 2017	Project ID 2015	Unit Operation	Project Name	Project Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
Building													
T-43			Laboratory HVAC Unit	Install new 20-ton HVAC unit.		2017	1	**$205,000**	$205,000	$0	$0	$0	$0
T-44	WW-P-57		New Chemical Storage Building[2]	Demolish old structures, Centralized chemical storage, new storage tanks, pumps and piping to various processes	R&R	2026	1	**$2,730,000**	$0	$0	$2,730,000	$0	$0
T-45	WW-P-56		Collection System Maintenance Building Rehabilitation[2]	Rehabilitate existing building to meet building code requirements.	R&R	2026	1	**$500,000**	$0	$0	$500,000	$0	$0
T-46	WW-P-49		Administration Building and Laboratory Rehabilitation[2]	Rehabilitate existing building to meet building code requirements.	R&R	2025	1	**$850,000**	$0	$0	$850,000	$0	$0
T-47			Plant Control Center Building Rehabilitation	Rehabilitate existing building to meet building code requirements.	R&R	2025	1	**$850,000**	$0	$0	$850,000	$0	$0
T-48	WW-P-58		Maintenance Building Rehabilitation	Rehabilitate existing building to meet building code requirements.	R&R	2026	1	**$500,000**	$0	$0	$500,000	$0	$0
T-49	WW-P-27 WW-P-28		Storage Warehouse Building	New storage warehouse building	R&R	2026	1	**$1,500,000**	$0	$0	$1,500,000	$0	$0
Additional Wastewater Projects from 2015 Capital Improvements Program													
	WW-P-84	Preliminary Treatment	Small Equipment Replacement - Headworks 2		Small Equipment Replacement	2023*	3	**$6,306,000**	$0	$0	$6,306,000	$0	$0
	WW-P-21	Secondary Treatment	Add Baffle Walls in ASTs		R&R	2027*	1	**$380,000**	$0	$0	$0	$380,000	$0
	WW-P-95	Secondary Treatment	Coating Replacement on Chlorine Contact Tanks		R&R	2028*	2	**$1,359,000**	$0	$0	$0	$1,359,000	$0
	WW-P-79	Secondary Treatment	Small Equipment Replacement - wet weather storage 2		Small Equipment Replacement	2026*	3	**$527,000**	$0	$0	$175,667	$351,333	$0
	WW-P-98	Secondary Treatment	Add UV/AOP after MBR		Resource Sustainability	2026*	2	**$13,200,000**	$0	$0	$6,600,000	$6,600,000	$0
	WW-P-46	Solids Treatment	Demolish Operations Center and Vac Filter Building		R&R	2027*	1	**$448,000**	$0	$0	$0	$448,000	$0

Project ID 2017	Project ID 2015	Unit Operation	Project Name	Project Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY2017/18-2018/19)	Years 3 to 5 (FY2019/20-2021/22)-	Years 6 to 10 (FY2022/23-2026/27)	Years 11 to 16 (FY2027/28-2032/33	Years 17 to 23 (FY20363/34-2039/40)
	WW-P-88	Solids Treatment	New Digester 2		R&R	2030*	3	**$12,950,000**	$0	$0	$0	$12,950,000	$0
	WW-P-90	Solids Treatment	New Digester Control Building		R&R	2029*	5	**$1,543,000**	$0	$0	$0	$1,234,400	$308,600
	WW-P-47	Solids Treatment	Move Dewatering Facility and add New Centrifuges		Performance	2030*	3	**$23,370,000**	$0	$0	$0	$23,370,000	$0
	WW-P-48	Solids Treatment	Add Dewatering Capacity		Performance	2030*	3	**$2,160,000**	$0	$0	$0	$2,160,000	$0
	WW-P-50	Solids Treatment	Add Sludge Silos		Performance	2032*	3	**$6,370,000**	$0	$0	$0	$2,123,333	$4,246,667
	WW-P-91	Electrical / Instrumentation	New Cogen Building		R&R	2032*	3	**$4,630,000**	$0	$0	$0	$1,543,333	$3,086,667
	WW-P-36	Electrical / Instrumentation	Small Equipment Replacement - Electrical 1		Small Equipment Replacement	2028*	2	**$275,000**	$0	$0	$0	$275,000	$0
	WW-P-37	Electrical / Instrumentation	Small Equipment Replacement - Electrical 2		Small Equipment Replacement	2032*	2	**$626,000**	$0	$0	$0	$313,000	$313,000
	WW-P-38	Electrical / Instrumentation	Small Equipment Replacement - Electrical 3		Small Equipment Replacement	2036*	2	**$653,000**	$0	$0	$0	$0	$653,000
	WW-P-92	Electrical / Instrumentation	Small Equipment Replacement - Cogen		Small Equipment Replacement	2026*	3	**$2,233,000**	$0	$0	$744,333	$1,488,667	$0
	WW-P-60	Building	Rehab Grit Screening Building - Seismic Retrofit		R&R	2027*	2	**$1,866,000**	$0	$0	$0	$1,866,000	$0
	WW-P-65	Building	Plant Paving Resurfacing		R&R	2030*	3	**$410,000**	$0	$0	$0	$410,000	$0
	WW-P-99	Building	Solar or Alternative Energy Facility		Resource Sustainability	2027*	10	**$1,540,000**	$0	$0	$0	$924,000	$616,000
	WW-P-100		Seawall		Resource Sustainability	2033	5	**$37,260,000**		$0	$0	$0	$37,260,000
							Wastewater Treatment Total	**$406,100,998**	**$6,715,000**	**$55,294,998**	**$239,811,000**	**$57,796,067**	**$46,483,933**
							Wastewater Treatment System and Collection System Total	**$493,033,331**	**$8,405,000**	**$68,425,064**	**$244,311,000**	**$58,908,334**	**$112,983,933**

Notes:
1. 2017 Project ID's were arbitrarily assigned for Project ease. C = Collection System Project; T = Treatment System Project.
2. Projects and costs correspond to refinements and updates provided by City after December 2015 publication date. Costs may not correspond to project costs in PM 1.4 Basis of Cost.
3. Projects approved by Council in 2017 Cost of Service Rate studies.
4. Costs were equally split between years to implement.

*Projects start year correspond to refinements and updates provided by City after December 2015 publication date.
**Projects start year was adjusted by City at August 7, 2017 meeting, based on recent CCT inspection.

Table B3 Recycled Water Capital Improvements Program (CIP) Projects

Project ID	Project Name	Driver	Start Year[1]	Years to Implement	Total	Years 1 to 2 (FY2017/18-2018/19)[2]	Years 3 to 5 (FY2019/20-2021/22)[2]	Years 6 to 10 (FY2022/23-2026/27)[2]	Years 11 to 16 (FY2027/28-2032/33[2]	Years 17 to 23 (FY20363/34-2039/40)[2]
RW-P-1	Recycled Water Retrofits	R&R	2019	6	$4,000,000	$0	$2,000,000	$2,000,000	$0	$0
RW-P-2	Phase 1 Advanced Water Purification Facility (AWPF) Improvements (Disinfection conversion, security, A/V upgrade)	R&R	2020	2	$1.000,000	$0	$1,000,000	$0	$0	$0
RW-P-3	UV/Advanced Oxidation Process Brine Treatment	Water Supply	2023	3	$5,700,000	$0	$0	$5,700,000	$0	$0
RW-P-4	Construct Aquifer Storage and Recovery (ASR) Demonstration Well @ Campus Park Site (and associated monitoring wells)	Water Supply	2018	3	$4,400,000	$1,466,667	$2,933,333	$0	$0	$0
RW-P-5	Land Acquisition and Improvements - Near Blending Station 1/6 & 3	Water Supply	2020	2	$10,000,000	$0	$10,000,000	$0	$0	$0
RW-P-6	Recycled Water Pond for Off-Spec Water at Campus Park	Water Supply	2021	1.5	$1,600,000	$0	$1,066,667	$533,333	$0	$0
RW-P-7	Phase 2 - Expansion of AWPF to 12.5 mgd (including backup power)	Water Supply	2020	3	$27,500,000	$0	$18,333,333	$9,166,667	$0	$0
RW-P-8	Recycled Water Storage @ AWPF	Water Supply	2019	4	$8,000,000	$0	$6,000,000	$2,000,000	$0	$0
RW-P-9	Construct 1 duty + 1 standby ASR Wells @ Campus Park	Water Supply	2021	3	$7,800,000	$0	$2,600,000	$5,200,000	$0	$0
RW-P-10	Construct 1 duty + 1 standby ASR Wells @ Campus Park	Water Supply	2025	3	$7,800,000	$0	$0	$5,200,000	$2,600,000	$0
RW-P-11	Construct 1 duty + 1 standby ASR Wells @ Blending Station 1/6	Water Supply	2022	2	$7,800,000	$0	$0	$7,800,000	$0	$0
RW-P-12	Chemical Feed Expansion @ Blending Station 1/6	Water Supply	2022	2	$ 300,000	$0	$0	$300,000	$0	$0
RW-P-13	Operational Storage for ASR Wells @ Blending Station 1/6	Water Supply	2022	2	$2,100,000	$0	$0	$2,100,000	$0	$0
RW-P-14	Booster Pumping for ASR @ Blending Station 1/6	Water Supply	2022	2	$7,200,000	$0	$0	$7,200,000	$0	$0
RW-P-15	Construct 1 duty + 1 standby ASR Wells @ Blending Station 1/6	Water Supply	2024	1.5	$7,800,000	$0	$0	$7,800,000	$0	$0
RW-P-16	Rehabilitate Well 18 @ River Ridge Golf Course to Groundwater Recharge Well	Water Supply	2022	2	$2,500,000	$0	$0	$2,500,000	$0	$0
RW-P-17	Phase 3 - Expand AWPF to 18.75 mgd	Water Supply	2029	2.5	$28,100,000	$0	$0	$0	$28,100,000	$0
RW-P-18	Construct 2 duty + 1 standby ASR Wells @ Blending Station 1/6	Water Supply	2029	2	$11,500,000	$0	$0	$0	$11,500,000	$0
RW-P-19	Construct 2 duty + 1 standby ASR Wells @ Blending Station 3	Water Supply	2029	2.5	$11,500,000	$0	$0	$0	$11,500,000	$0
RW-P-20	Chemical Feed Expansion @ Blending Station 3	Water Supply	2029	2.5	$ 500,000	$0	$0	$0	$500,000	$0
RW-P-21	Operational Storage for ASR Wells @ Blending Station 3	Water Supply	2029	2.5	$2,100,000	$0	$0	$0	$2,100,000	$0
RW-P-22	Booster Pumping for ASR @ Blending Station 3	Water Supply	2029	2.5	$7,200,000	$0	$0	$0	$7,200,000	$0
RW-P-23	Construct 2 duty + 1 standby ASR Wells @ Blending Station 3	Water Supply	2031	1.5	$11,500,000	$0	$0	$0	$11,500,000	$0
RW-P-24	Connect Initial ASR Well at Campus Park to Recycled Water Backbone Line in Ventura Road - 2,000 feet of 20" pipe	Water Supply	2017	2	$700,000	$700,000	$0	$0	$0	$0
RW-P-25	Construct Dedicated Indirect Potable Reuse (IPR) Pipeline from Campus Park to Blending Station 1/6 - 4,000 feet of 24" pipe	Water Supply	2017	2	$2,500,000	$2,500,000	$0	$0	$0	$0
	Hueneme Road - Phase 2 Recycled Water Pipeline Expansion to Ag Users					$0	$0	$0	$0	$0
RW-P-26	Install 20,700 feet of 24" pipe	Water Supply	2019	2	$12,900,000	$0	$12,900,000	$0	$0	$0
RW-P-27	Install 16,000 feet of 36" pipe	Water Supply	2018	2	$13,000,000	$6,500,000	$6,500,000	$0	$0	$0
	Recycled Water Loop to ASR Sites					$0	$0	$0	$0	$0
RW-P-28	Install 9,000 feet of 24" pipe	Water Supply	2020	2	$7,500,000	$0	$7,500,000	$0	$0	$0
RW-P-29	Install 19,700 feet of 30" pipe	Water Supply	2020	2	$10,200,000	$0	$10,200,000	$0	$0	$0
RW-P-30	Direct Potable Reuse - 3, 3.1 million gallon Storage Tanks	Water Supply	2036	3	$22,200,000	$0	$0	$0	$0	$22,200,000
RW-P-31	Recycled Water Loop to Blending Station 3 Connection – Install 10,600 feet of 24" pipe	Water Supply	2029	1	$5,500,000	$0	$0	$0	$5,500,000	$0
	Recycled Water Capital Improvements Program Projects Total				$252,400,000	$11,166,667	$81,033,333	$57,500,000	80500000	$22,200,000

Notes:
1. Project start years adjusted with City input and do not correspond to December 2015 publication start years.
2. Costs were equally split between years to implement.

Table B4 Stormwater Capital Improvements Program (CIP) Projects

Project ID	Project Name	Driver	Start Year	Years to Implement	Total	Years 1 to 2 (FY2017/18-2018/19)[1]	Years 3 to 5 (FY2019/20-2021/22)[1]	Years 6 to 10 (FY2022/23-2026/27)[1]	Years 11 to 16 (FY2027/28-2032/33[1]	Years 17 to 23 (FY20363/34-2039/40)[1]
SW-P-1	Drainage Basin: WV - Length 444 ft	Capacity	2020[2]	2	$173,000	$0	$173,000	$0	$0	$0
SW-P-2	Drainage Basin: WV - Length 748 ft	Capacity	2038	2	$439,000	$0	$0	$0	$0	$439,000
SW-P-3	Drainage Basin: OI - Length 607 ft	Capacity	2020[2]	2	$237,000	$0	$237,000	$0	$0	$0
SW-P-4	Drainage Basin: RR - Length 2,436 ft	Capacity	2020[3]	2	$2,621,000	$0	$2,621,000	$0	$0	$0
SW-P-5	Drainage Basin: OI - Length 2,388 ft	Capacity	2038	2	$1,491,000	$0	$0	$0	$0	$1,491,000
SW-P-6	Drainage Basin: VR - Length 5,872 ft	Capacity	2018[2]	2	$5,768,000	$2,884,000	$2,884,000	$0	$0	$0
SW-P-7	Drainage Basin: JS - Length 1,421 ft	Capacity	2018[2]	2	$968,000	$484,000	$484,000	$0	$0	$0
SW-P-8	Drainage Basin: JS - Length 1,292 ft	Capacity	2020[2]	2	$885,000	$0	$885,000	$0	$0	$0
SW-P-9	Drainage Basin: JS - Length 426 ft	Capacity	2020[2]	2	$292,000	$0	$292,000	$0	$0	$0
SW-P-10	Drainage Basin: JS - Length 457 ft	Capacity	2020[2]	2	$313,000	$0	$313,000	$0	$0	$0
SW-P-11	Drainage Basin: JS - Length 655 ft	Capacity	2020[2]	2	$449,000	$0	$449,000	$0	$0	$0
SW-P-12	Drainage Basin: JS - Length 701 ft	Capacity	2020[2]	2	$480,000	$0	$480,000	$0	$0	$0
SW-P-13	Drainage Basin: HS - Length 1,552 ft	Capacity	2020[2]	2	$606,000	$0	$606,000	$0	$0	$0
SW-P-14	22 assets identified in the condition assessment	R&R	2018[2]	2	$3,324,000	$1,662,000	$1,662,000	$0	$0	$0
SW-P-15	Dry Weather Diversion Structure	Resource Sustainability	2021	3	$370,000	$0	$123,333	$246,667	$0	$0
SW-P-16	City-Wide Incentive Program	Resource Sustainability	2021	10	$2,420,000	$0	$242,000	$1,210,000	$968,000	$0
SW-P-17	Santa Clara River Total Maximum Daily Load (TMDL) Infiltration Basin	Resource Sustainability	2023	5	$1,850,000	$0	$0	$1,480,000	$370,000	$0
SW-P-18[4]	Mandalay Beach Areas	Capacity	2018	3	$10,000,000	$3,333,333	$6,666,667	$0	$0	$0
	Stormwater Capital Improvements Program Projects Total				**$32,686,000**	**$8,363,333**	**$18,118,000**	**$2,936,667**	**$1,338,000**	**$1,930,000**

Notes:
1. Costs were equally split between years to implement.
2. Project start year moved two years later compared to 2015 Capital Improvements Program.
3. Project start year adjusted with City input and do not correspond to December 2015.
4. Project added by City after December 2015 version.

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CITY OF OXNARD

PUBLIC WORKS
Integrated Master Plan
Summary Report

REVISED FINAL DRAFT • SEPTEMBER 2017

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PUBLIC WORKS INTEGRATED MASTER PLAN

SUMMARY REPORT

City of Oxnard

REVISED FINAL DRAFT – September 2017

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CITY OF OXNARD
PUBLIC WORKS INTEGRATED MASTER PLAN

SUMMARY REPORT

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LIST OF ABBREVIATIONS

AA	Average Annual
AACE	Association for the Advancement of Cost Engineering
AAD	average annual demand
ADD	average day demand
ADMM	Average Day Maximum Month
ADW	average dry weather
ADWF	average dry weather flow
AFY	acre feet per year
APCD	Air Pollution Control District
ASR	aquifer storage and recovery
AST	activated sludge tanks
AWPF	Advanced Water Purification Facility
BFP	belt filter press
BMP	best management practices
BOD_5	biochemical oxygen demand
BS	blending stations
CalRecycle	California Department of Resources Recycling and Recovery
CASA	California Association of Sanitation Agencies
CASQA	California Stormwater Quality Association
CCR	California Code of Regulations
CCT	chlorine contact tanks
CEC	compound of emerging concern
CEPT	Chemically Enhanced Primary Treatment
CIP	Capital Improvement Project

City	City of Oxnard
CMMS	Computerized Maintenance Management System
CMWD	Calleguas Municipal Water District
COS	Cost of Service
CP	cathodic protection
CWA	Clean Water Act
CWT	Centralized Waste Treatment
CWTF	Centralized Wastewater Treatment Facilities
DAFT	dissolved air flotation thickeners
DDW	Division of Drinking Water
DPR	direct potable reuse
EPA	Environmental Protection Agency
FCGMA	Fox Canyon Groundwater Management Agency
GIS	Geographic Information System
GPCD	gallons per day per capita
gpd	gallons per day
GREAT	Groundwater Recovery Enhancement and Treatment
GW	ground water
IPR	indirect potable reuse
LARWQCB	Los Angeles Regional Water Quality Control Board
LGS	Local Government Schema
LOS	level of service
MBR	membrane bioreactors
MC	measurable criterion
MDD	maximum day demand
MDD	Maximum Day

MG	million gallon
mgd	million gallon per day
MinHD	minimum hour demand
MT	million tons
MW	Maximum Week
NBVC	Naval Base Ventura County
NPDES	National Pollutant Discharge Elimination Systems
O&M	Operations and Maintenance
OP	overarching principle
OWTP	Oxnard Wastewater Treatment Plant
pcd	per capita daily
PHD	peak hour demand
PHWA	Port Hueneme Water Agency
PHWWF	peak hour wet weather flow
POTW	publicly owned treatment works
ppb	parts per billion
ppd	pounds per day
psi	pounds per square inch
R&R	repair and replacement
ROWD	report of waste discharge
ROWD	reverse osmosis
RW	recycled water
RWQCB	Regional Water Quality Control Board
SCADA	Supervisory Control And Data Acquisition
SMP	Salinity Management Pipeline
SST	secondary sedimentation basins

SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
TSS	total suspended solids
UV/AOP	ultraviolet/advanced oxidation process
UV/AOP	ultraviolet light
UWCD	United Water Conservation District
VCWPD	Ventura County Watershed Protection District
VFD	Variable Frequency Drive
WAS	waste activated sludge
WDR	Waste Discharge Requirements

BRIEF HISTORY AND OVERVIEW OF THE CITY OF OXNARD PUBLIC WORKS DEPARTMENT'S INTEGRATED PLANNING EFFORTS

In May 2014, the City of Oxnard (City) Public Works Department began developing the Public Works Integrated Master Plan (PWIMP, or Plan). The Plan unfolded to address future planning needs for all major utilities within the City's jurisdiction: water, wastewater, recycled water, and stormwater. The Plan uses a coordinated methodology to allow the City to take full advantage of potential linkages and synergies among its four major water utility systems.

The Final Draft Plan was published in December 2015 as a seven-volume set of notebooks containing more than forty master planning Project Memorandums. This was followed shortly after in early 2016 with the publication of the Final Draft Master Plan Summary Report (April 2016), and the Final Draft Executive Summary Report (May 2016).

As typical in master planning, these initial planning reports were published as first drafts. This practice recognizes that the initial planning findings and reports are not considered 'final' until further environmental and financial studies are completed.

Consequently, these Final Draft master-planning documents served as the basis for the City to proceed with a Cost of Service Study to gain approval for the planned wastewater and water utility rate increases for the near-term capital projects, and to support a formal Proposition 218 process. The resulting Wastewater Treatment and Collection Cost of Service Study was approved in early 2017, and the Water Division Cost of Service Study was approved in Summer 2017.

Between the time of publication of the Final Draft master-planning documents in December 2015 and the final adoption of the Cost of Service Studies/Rates in early 2017, the City continued to review and to optimize the final master planning recommended policies, projects, and programs. Therefore, certain projects included in the Final Draft planning documents for the Oxnard Wastewater Treatment Plant (OWTP) have been refined and updated.

These refinements were made to incorporate the latest in recent findings from the advanced facilities planning conducted, in part, for the Cost of Service Studies, and as part of the preliminary designs proceeding concurrently for critically needed facilities. It should be noted that the refinements and optimizations were generally not related to capacity needs, but to achieve improved financial and implementation strategies, and to accommodate technology updates and global climate change strategies, as follows:

1. Project phasing and timing (but not for increased capacity), including: a phased primary treatment upgrade program, and a phased secondary treatment upgrade program.

2. Technology updates, including membrane bioreactors (MBR) to meet potential nutrient requirements, and to save costs related to advanced treatment for recycled water.

3. Global climate change, resiliency, and adaption projects to plan for increasing sea levels.

The Plan coordinates the need and timing of planned water utility facilities as related to the elements in the City's 2030 General Plan (and projections through 2030) with a forward projection through the year 2040. The recommended master planning projects, timing, and phased implementation are noted in the Capital Improvement Plan (CIP) for both the near-term projects (the next several years) as defined in the Cost of Service Studies, and the longer-term projects (extending through 2040) as defined in the Plan.

Further, the time horizon for the near-term CIP serves as the basis for the newly adopted rates, and does not extend to the end of the long-term planning period (thru 2040). This is in recognition of the flexible design and adaptive nature of the recommended Plan.

In summary, the refined and updated near-term projects that were identified and developed as part of the Cost of Service Studies were subsequently incorporated into the recommended Final Draft CIP and Master Plan. Nevertheless, it is the near-term CIP that is the basis for the newly adopted rates. The overall CIP and Master Plan recommended herein was developed by merging the related planning efforts: the Cost of Service Studies, the Preliminary Design of critically needed facilities, and the long-term master planning recommendations.

Chapter 1

INTRODUCTION

1.1 PROLOGUE

The City of Oxnard's (City) Public Works Department faces many challenges in managing its future water resources and utilities. These challenges include identifying the best response to immediate drought conditions while planning for long-term water needs, reducing dependence on costly imported water, addressing aging infrastructure and reliability concerns, pursuing aggressive goals for energy efficiency and sustainable solutions, and managing the ongoing loss of seasoned staff and personnel.

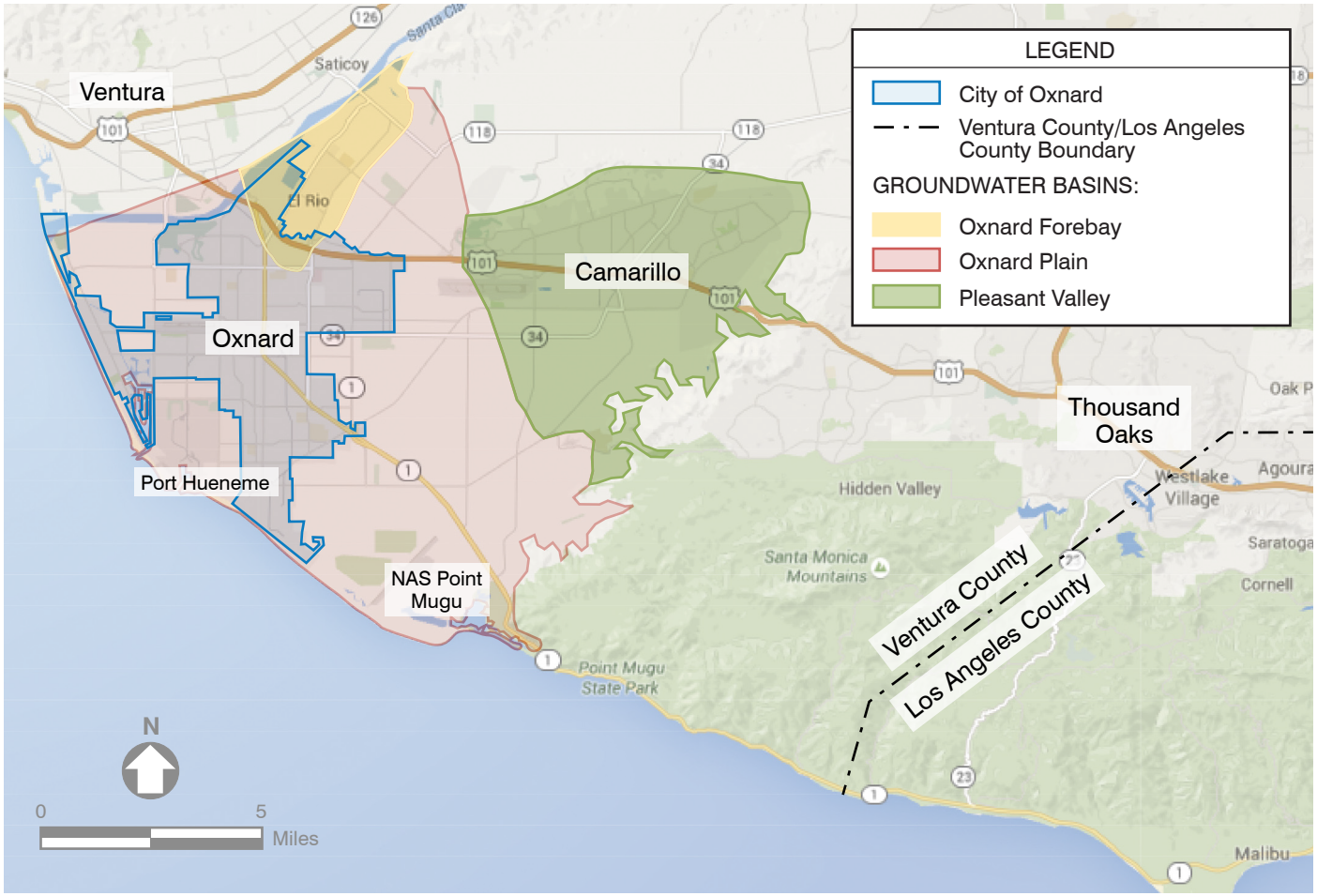
Opportunities to meet these challenges range from institutional and non-structural approaches (policies and programs) to technical and structural approaches (capital projects). Furthermore, because of the City's broad authority over utilities and streets, it has a unique opportunity to meet these challenges by 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. Oxnard is the largest city in Ventura County and is at the center of a regional agricultural industry with a growing business center (see Figure 1.1). The City has jurisdictional authority to provide potable water, wastewater treatment, and stormwater services to its nearly 200,000 citizens and numerous industrial and commercial users.

To deliver these services, the City owns and operates the 31.7 million gallon per day (mgd) average dry weather (ADW) capacity Oxnard Wastewater Treatment Plant (OWTP), which discharges secondary treated effluent to the ocean. As part of the City’s Groundwater Recovery Enhancement and Treatment (GREAT) program, the City also owns and operates a 6.25-mgd capacity Advanced Water Purification Facility (AWPF) that treats OWTP effluent for reuse throughout the City and region.

Given the City's challenges and opportunities to meet them, this Public Works Integrated Master Plan (Integrated Master Plan) develops long-term recommendations for policies, programs, and goals that successfully address the challenges and opportunities in a holistic and integrated way. In carrying out these goals, the Integrated Master Plan will help the City respond to planned population increase, challenges from new regulatory requirements, drought conditions, aging infrastructure, and reliability concerns.

In addition, 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.



PROJECT AREA FOR INTEGRATED MASTER PLAN

FIGURE 1.1

CITY OF OXNARD
SUMMARY REPORT
PUBLIC WORKS INTEGRATED MASTER PLAN

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1.2 FACILITIES OVERVIEW

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

In addition, the City owns and operates its own wastewater collection and treatment system, the OWTP, located on Perkins Road. Since its inception in the mid 1950's, the OWTP has grown from a capacity of approximately 5 mgd to its current capacity of 31.7 mgd.

The OWTP includes raw sewage pumping, influent screening and grit removal, primary sedimentation, an activated sludge secondary treatment process, effluent disinfection, and solids handling consisting of thickening, anaerobic digestion, and dewatering. Final effluent is routed to the City's AWPF or conveyed to the Pacific Ocean and discharged offshore.

To produce recycled water, the City uses the AWPF facility, dedicated in 2012, as part of the City's GREAT program. The AWPF facility provides advanced treatment of secondary treated wastewater effluent for recycled water use.

At the GREAT program's inception in 2009, its objectives were to:

- Increase water supply reliability during drought.
- Reduce water supply costs.
- Protect the water supply while trying to meet a growing water demand.
- Enhance local water supply stewardship through recycling and reusing a substantial portion of the region's wastewater.
- Maximize environmental benefits from developing and rehabilitating local saltwater wetlands.

Since the GREAT program's inception, the City shifted from its focus of using groundwater recharge as a sea water intrusion barrier to using the recycled water for an aquifer storage and recovery (ASR) operation. Because indirect potable reuse (IPR)/direct potable reuse (DPR) provides many benefits and is becoming more commonplace in the current regulatory climate, the City has renewed interest in it.

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

1.3 MASTER PLAN PURPOSE AND DRIVERS

This Integrated Master Plan provides a phased program for constructing improvements to the City's infrastructure facilities that will accommodate planned growth while maintaining treatment reliability, meeting future regulatory requirements, and optimizing costs through the planning horizon (2040). Included with this document is the overall vision for the City's future infrastructure, the goals and objectives to achieve that vision, and an assessment of the City's existing facilities to meet those goals and objectives throughout the planning horizon.

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

- **Rehabilitation/Replacement (Condition)** – A condition trigger was assigned when the process or facility had reached the end of its economic useful life. This trigger is determined by the need to maintain a facility so it can operate reliably and meet performance requirements related to existing regulatory permits, 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 necessitated new facilities. Determining when the new facilities would be built depended on the amount of lead-time needed to plan, design, and construct the facilities according to the new requirements.
- **Economic Benefit** – An economic benefit trigger was assigned when life-cycle costs, consisting of capital costs and operations and maintenance costs, could be significantly reduced. For example, an economic benefit might be realized when an increase in initial capital investment achieves 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 reduced operational and safety-related risks. For example, this type of trigger would be applied when improving process control and automation or addressing an operational concern, such as adding flexibility/reliability or decreasing complexity, or reducing salts/ammonia going to the advanced facilities.
- **Growth Leading to Increased Demands/Flows/Loads** – A flow or pollutant load trigger was assigned when an increase in existing capacity was 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 operation.
- **Resource Sustainability** – A 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** – A policy trigger was assigned when policymakers made management and/or political decisions.

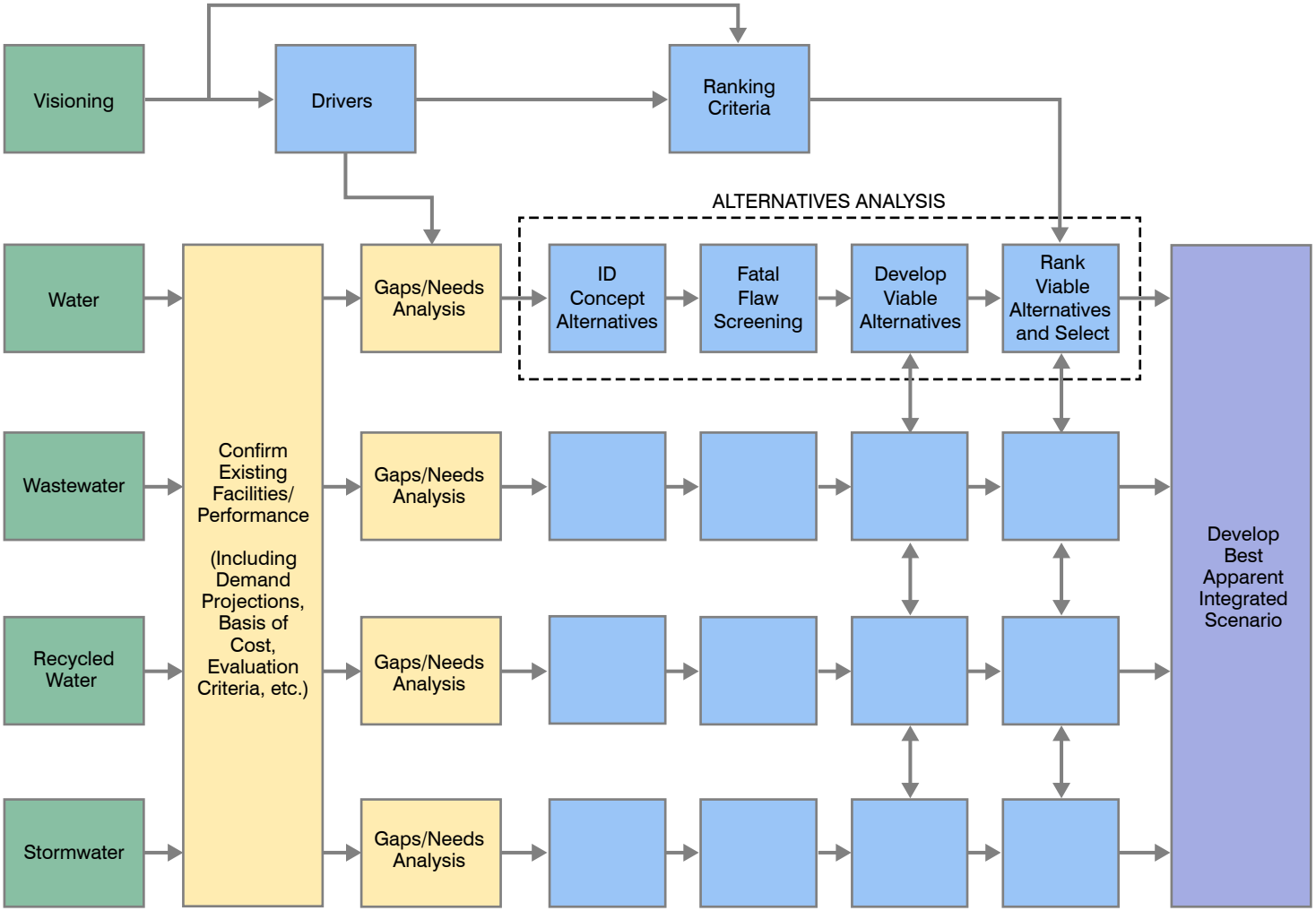
1.4 APPROACH TO THE INTEGRATED MASTER PLAN

The Integrated Master Plan addresses future planning needs for all major water utilities within the City's jurisdiction, which include water, wastewater, stormwater, and recycled water. The Plan builds on previous planning efforts using a coordinated methodology, allowing the City to take full advantage of potential linkages among the four water utility systems.

In addition, this Plan is coordinated with a Streets Master Plan to time future streets improvements with utility upgrades. This effort involved using the City's Geographic Information System (GIS) to identify large streets projects and upgrades to water infrastructure and then planning to complete these upgrades simultaneously to limit impacts on the City's streets. The City GIS staff/department will lead the effort to combine the Integrated Master Plan with the GIS planning system.

To develop this Integrated Master Plan, the following six major planning steps were completed. These steps are shown in Figure 1.2 and described below.

- **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 facility's condition, criticality, and risk of failure.
- **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 (R&R), capacity, regulatory compliance, and other planning drivers. Future needs were identified based on pending regulatory requirements, planned capacity increases, R&R, cost-effectiveness, and performance improvements that drive the need for future facility improvements.
- **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.
- **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.



MASTER PLANNING PROCESS OVERVIEW

FIGURE 1.2

CITY OF OXNARD
SUMMARY REPORT
PUBLIC WORKS INTEGRATED MASTER PLAN

CITY OF OXNARD CALIFORNIA

carollo Engineers...Working Wonders With Water®

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- **Develop the Best Apparent Scenario.** The best combination of policies, projects, and ongoing programs across all utilities were evaluated and determined, and the best apparent integrated scenario was developed.
- **Develop Recommended CIP.** 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.

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

Chapter 2

INTEGRATED MASTER PLAN OBJECTIVES, ASSUMPTIONS, AND CRITERIA

2.1 INTRODUCTION

This chapter establishes the overall master planning process by determining planning objectives and strategies, documenting key planning considerations and assumptions, and describing current and proposed regulatory requirements that apply to the Integrated Master Plan.

2.2 OBJECTIVES AND STRATEGIES

For this Integrated Master Plan, specific goals and objectives were developed considering the broad drivers established in Chapter 1. These goals and objectives provide a framework and boundaries for the City's planning process and can guide the development of alternatives and strategies as projects progress. Table 2.1 summarizes the Integrated Master Plan goals with corresponding objectives.

2.2.1 Water and Recycled Water

In addition to the goals and objectives included in Table 2.1, specific water supply goals that provide a framework for alternatives development and comparison were identified. These water supply goals include:

- Provide reliable/resilient supply to meet future conditions (i.e., changes to demand, regulations, and water quality).
- Meet City's water quality objectives.
- Protect existing water rights by maximizing use of groundwater allocation.
- Minimize future reliance on imported water by maximizing use of AWPF Facility.
- Attract industry and jobs.
- Keep rates affordable.

The Oxnard Plain Groundwater Basin's safe yield is a major constraint placed on the City's system. The Fox Canyon Groundwater Management Agency (FCGMA) protects the quantity and quality of the local groundwater by overseeing and managing all contractual withdrawals within the Oxnard Plain Groundwater Basin.

Table 2.1 Integrated Master Plan Goals and Objectives Public Works Integrated Master Plan City of Oxnard		
Goal No	**Planning Goals**	**Integrated Master Plan Objectives**
1	Provide compliant, reliable resilient and flexible systems	• Improve system reliability consistent with industry standards. • Implement redundancy/backup systems for routine maintenance and repairs and for addressing security threats. • Implement innovative technology.
2	Integrate gray and green infrastructure with an emphasis on energy efficiency	• Optimize the systems' energy efficiency.(1) • Investigate green and gray infrastructure options, such as low impact development techniques for stormwater, or alternative energy sources.
3	Effectively manage assets (economic sustainability) Integrate community interests and maximize public acceptance (social sustainability)	• Maximize the cost/benefit ratio. • Spend public money wisely. • Develop sustainable ongoing communication processes. • Minimize impacts to the public.
4	Mitigate and adapt to potential impacts of climate change	• Minimize potential climate change-related impacts to the system (e.g., sea level rise or changing rainfall patterns).
5	Protect environmental resources Enhance environmental sustainability	• Maintain permit/regulatory compliance. • Position City for future regulatory changes. • Maximize water conservation. • Maximize wastewater reclamation and reuse. • Manage groundwater extraction. • Maximize the beneficial reuse of biosolids.

Notes:
(1) The City's Energy Action Plan sets a community-wide reduction in energy use of 10% by 2020, measured against a 2005 baseline.

2.2.2 Wastewater

While no goals specific to wastewater were identified, all projects proposed in this Integrated Master Plan are centered on the goals presented in Table 2.1. Key considerations for wastewater planning in Oxnard revolved around repairing and replacing (R&R) the existing system to maintain its reliability and safety as well as meeting or surpassing all regulatory requirements for wastewater effluent discharge.

2.2.3 Stormwater

In addition to the goals presented in Table 2.1, two stormwater specific objectives include maintaining the existing infrastructure and ensuring compliance with the Total Maximum Daily Load (TMDL). The Integrated Master Plan focuses on stormwater projects that will improve stormwater quality entering the environment and that can potentially harvest stormwater as an additional water supply. By including stormwater in the Integrated Master Plan, the integrated water utility system can become more robust, adaptable, and cost efficient.

2.3 KEY PLANNING CONSIDERATIONS AND ASSUMPTIONS

Although each utility (water, wastewater, recycled water, and stormwater) has its own set of specific design criteria based on each system's unique features, a common set of planning considerations and assumptions formed the basis for developing and evaluating each project. These key planning considerations are discussed in the following sections.

2.3.1 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.

The Integrated Master Plan is flexible and sensitive to changes in the timing of future water utility infrastructure capacity. With this flexibility and sensitivity, constructing additional capacity can occur quickly when needed, providing for the least-cost future Capital Improvement Plan.

2.3.1.1 Land Use Projections

Land use projections were based on the City's 2030 General Plan and on conversations with the City's Planning Department. The future division between residential, commercial, and industrial users is assumed to remain largely the same as the current mix. As such, residential infill and mixed-use development are expected to form the largest population increase. Specific developments that will trigger significant growth include RiverPark, The Village, and potentially the South Shore and Teal Club Specific Plans.

2.3.1.2 Population Projections

A wide range of population projections were considered conceptually and three were evaluated in more detail. These three population projections are described below.

Two of the three projections were based on the City's 2030 General Plan, which was adopted in 2011 and extends through the year 2030. Using a variety of assumptions, this plan forecasted the 2030 population to be between 238,996 and 285,521. These two population forecasts are referred to as the low and high forecasts of the 2030 General Plan.

Because the 2030 General Plan population projections used data before the 2008 recession, the effects of the recession on population growth were not taken into account in these low and high forecasts. In response to this discrepancy, the City's Planning Department updated the 2030 General Plan population forecast in 2014 based on the 2010 Census and housing projections developed by Traffic Analysis Zone. The updated information formed the basis for the third projection, which projected a population below the low forecast of the 2030 General Plan.

As shown in Figure 2.1, the City's population forecasts vary significantly. The lowest population forecast (2014 Update) reflects an average growth rate of 0.5 percent per year, whereas the highest projection (2030 General Plan – High Forecast) reflects an average annual growth rate of 1.5 percent for the next 25 years.

The City's population is currently trending toward the General Plan's low forecast. Because of this, the Integrated Master Plan used the General Plan's low forecast to establish the planned needs and phasing of future capacity. These lower population projections were modified somewhat when combined with higher, more conservative per capita flows used to project water and wastewater flows.

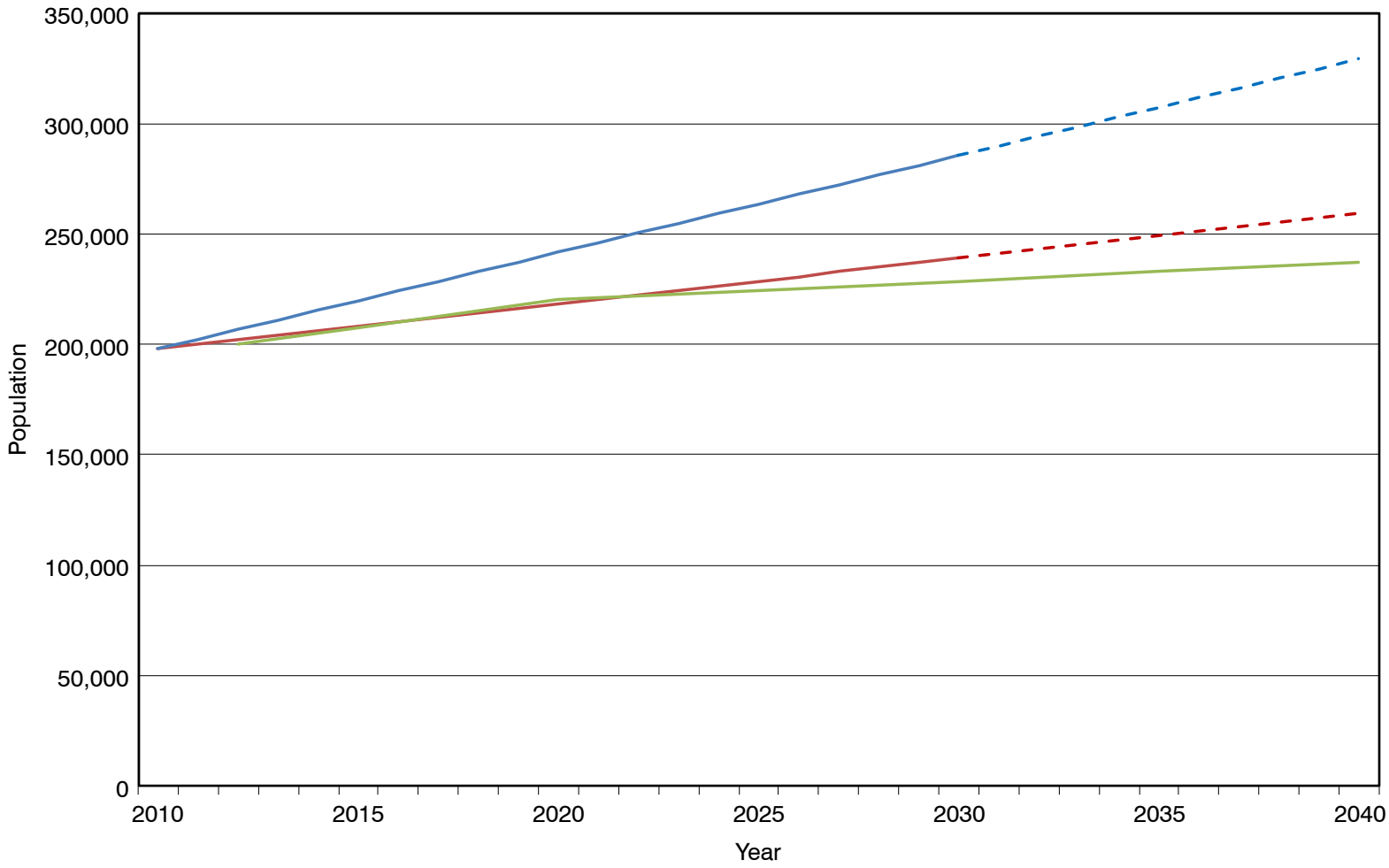
2.3.2 Climate Change

In addition to population, climate change can affect all utilities considered in the Integrated Master Plan. The chemistry and dynamics of atmospheric greenhouse gases, including water vapor, and carbon dioxide, hold heat in the atmosphere and create a natural greenhouse effect for the planet. Since the onset of the Industrial Revolution, data show that human-generated emissions of greenhouse gases, such as carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons, have been accumulating in the atmosphere and are intensifying Earth's natural greenhouse effect more rapidly than expected (Rahmstorf, *et al.,* 2007).

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

2.3.2.1 Sea Level Rise

Sea level is the ocean's elevation relative to a reference elevation. Data has shown that sea levels have increased over the last 100 years and are expected to accelerate at a faster rate in the future. Depending on the projection used, sea levels could rise anywhere from 7 to 18 feet by the year 2100. Since rising sea levels will affect the City's facilities, especially the OWTP, planning efforts incorporated these projections into the wastewater planning.



LEGEND
2030 General Plan Population (low)
2030 General Plan Population extrapolated (low)
2030 General Plan Population (high)
2030 General Plan Population extrapolated (high)
2014 Planning Department Population

HISTORICAL AND PROJECTED POPULATION

FIGURE 2.1

CITY OF OXNARD

SUMMARY REPORT

PUBLIC WORKS INTEGRATED MASTER PLAN

CITY OF OXNARD CALIFORNIA

carollo Engineers...Working Wonders With Water®

ox1115f13-9587(SumRepFIG2-1).ai

2.3.2.2 Rainfall

The City has experienced an increase in extreme precipitation events consistent with climatologist's' projections of a changing, warming climate. Although the amount of annual rainfall has increased only slightly, rainfall events are likely occurring more frequently and becoming more intense, with distribution patterns changing as well. Until regional climate models can provide more accurate projections for the Oxnard area, long-term planning should assume that more frequent and intense precipitation events and changing weather patterns will continue.

2.3.2.3 Drought

The number of dry days during summer months is also expected to increase, extending California's already long dry season. As such, longer, drier, and more frequent periods of drought are anticipated, with up to 2.5 times the number of critically dry years by the end of the century. Until more accurate scientific information and regional model results indicate otherwise, the California Department of Water Resources recommends that local agencies assume a 20 percent increase in the frequency and duration of future dry conditions to prepare for future droughts (DWR 2008h).

2.3.3 Sustainability

The City seeks to develop sustainable water solutions and infrastructure. As such, the Integrated Master Plan used the Envision® Sustainability Rating System as a framework for developing the evaluation criteria and metrics for strategies and alternatives. Each of the five Integrated Master Plan goals (shown in Table 2.1) were assessed through the lens of the Envision® tool to help further define these goals in a way that produces measureable metrics for comparing alternatives.

2.3.3.1 Envision®

The Envision® Rating System was developed through a joint collaboration between the Zofnass Program for Sustainable Infrastructure at the Harvard University Graduate School of Design and the Institute for Sustainable Infrastructure[1]. It provides a holistic framework for evaluating and rating the community, environmental, and economic benefits of all types and sizes of infrastructure projects. The Envision® Rating System evaluates, grades, and recognizes infrastructure projects that use transformational and collaborative approaches to assess the sustainability indicators throughout a project's life cycle.

The Integrated Master Plan used Envision® to make an initial assessment of sustainability at the "big picture" level. This assessment was informed by the City's overarching values and goals for sustainability as much as it was by the goals and objectives of the Integrated

[1] The Institute for Sustainable Infrastructure (ISI) is a 501 (c) (3) not for profit organization, structured to develop and maintain a sustainability rating system for civil infrastructure in the United States. ISI was founded by the American Council of Engineering Companies (ACEC), the American Public Works Association (APWA), and the American Society of Civil Engineers (ASCE) and is governed by a nine-member Board of Directors appointed by the founding organizations.

Master Plan. With the assessment, a minimum performance level for reducing greenhouse gas emissions was identified and stretch goals were established to show the range of sustainable principles that could be implemented. This assessment also helped to develop criteria used to evaluate and compare alternatives.

From the initial assessment, two types of evaluation tests emerged. The first type was termed an overarching principle (OP), which is the minimum threshold every alternative must meet to be considered viable. The second type was termed a measurable criterion (MC), which is a result that can be measured, quantified, and assigned (a "metric") to determine the relative performance of alternatives.

Table 2.2 summarizes the OP and MC associated with each of the five major goals of the Integrated Master Plan.

Table 2.2 Evaluation Criteria Established for Integrated Master Plan
Public Works Integrated Master Plan
City of Oxnard

Goal	Objective	Type of Criteria	Metric	Unit of Measure	Associated Envision® Credit
#1	**Provide Compliant, Reliable, Resilient and Flexible Systems**				
	Improve system reliability consistent with industry standard.	OP	--	--	
	Implement redundancy/backup for routine maintenance and repairs and address threats to security.	OP	--	--	
	Provide flexibility to respond to changes in regulatory requirements, and reuse water demand or technological advances.	MC	Project Cost Differential	Incremental cost to change from current conditions.	CR2.2 Avoid traps and vulnerabilities CR2.3 Prepare for long-term hazards.
	Provide the ability to implement in a timely manner for a given need.	MC	Implementation Time	Years	

Table 2.2 Evaluation Criteria Established for Integrated Master Plan Public Works Integrated Master Plan City of Oxnard					
Goal	**Objective**	**Type of Criteria**	**Metric**	**Unit of Measure**	**Associated Envision® Credit**
#2	**Investigate Gray and Green Infrastructure with an Emphasis on Energy Efficiency**				
	Investigate gray and green infrastructure.	OP			NW2.1 Manage Stormwater (through LID).
	Maximize energy efficiency/sustainable energy use.	MC	Net non-renewable Energy Use (Energy use – Energy production – Renewable energy use/ purchase)	kWh/year	RA2.1 Reduce energy consumption. RA2.2 Use renewable energy.
#3	**Manage Assets Effectively (Economic Sustainability)**				
	Maximize cost/benefit ratio.	MC	Capital Costs O&M Costs Life-cycle Costs	Total Project Cost ($) Total O&M Cost ($/year) Annual Costs ($/year)	LD3.3 Extend Useful Life.
#4	**Mitigate and Adapt to Potential Impacts of Climate Change**				
	Minimize impacts to system due to events related to climate change.	OP			CR2.1 Assess climate threat. CR2.2 Avoid traps and vulnerabilities. CR2.3 Prepare for long-term adaptability.
	Minimize contribution to climate change factors through reducing/minimizing GHG emissions.	MC	Greenhouse Gas Emissions	Metric tons of CO2 equivalent emissions per year	RA1.1 Reduce net embodied energy. CR1.1 Reduce greenhouse gas emissions.
	Maintain regulatory/permit compliance.	OP			QL2.1 Protect public health.
	Maximize sustainable water use.	MC	Potable Water Offset	MG per year	RA3.1 Protect fresh water availability.

Table 2.2 Evaluation Criteria Established for Integrated Master Plan Public Works Integrated Master Plan City of Oxnard					
Goal	**Objective**	**Type of Criteria**	**Metric**	**Unit of Measure**	**Associated Envision® Credit**
					RA3.2 Reduce potable water consumption.
		MC	Groundwater Replenishment	MG per year	RA3.1 Protect fresh water availability.
	Maximize beneficial reuse of solids.	MC	Solids Reused	Tons per year	RA1.5 Divert waste from landfills.
Notes: OP = Overarching Principle MC = Measured Criteria QL = Quality of Life		RA = Resource Allocation LD = Leadership NW = Natural World		CR = Climate & Risk	

2.3.3.2 Energy

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. As part of this effort, the City completed an Energy Action Plan in April 2013 and committed to pursuing the "Gold Level" as defined in Southern California Edison's Energy Leadership Partnership Program.

This goal targets a 10 percent reduction in energy use for City Government facilities. Oxnard's Energy Plan expands this 10 percent reduction to the community at large, calling for a 10 percent citywide reduction in electricity and natural gas use. By implementing all recommended Energy Plan programs, State programs, and programs implemented since 2005, Oxnard is expected to decrease its greenhouse emissions by 114,000 million tons (MT) of CO_2 equivalent, which is an 8 percent reduction.

As part of the planning efforts for the Integrated Master Plan, the Energy Plan's recommendations were incorporated into the recommended CIP. The following three main recommendations were applicable:

- **Incorporate Greening Guidelines:** Incorporate green strategies by constructing new facilities that reduce energy consumption.
- **Increase Onsite Electricity Generation at City Wastewater Treatment and Materials Recovery Facility:** Investigate increasing the fats, oil, and grease collected for bio-gas electricity generation at the wastewater treatment plant.
- **Recycled Water Outreach and Education Program:** Expand use of the AWPF facility and educate the public on the energy savings associated with it.

2.3.4 Basis of Costs

Cost estimates were also coordinated across each utility to ensure comparable and consistent estimates. These estimates are described below.

The Association for the Advancement of Cost Engineering International (AACE International, formerly known as the American Association of Cost Engineers) has suggested levels of accuracy for five estimate classes. These five estimate classes are presented in the AACE International Recommended Practice No. 17R-97 (Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries). For projects in the Integrated Master Plan, cost estimates were developed following the AACE International Recommended Practice No. 17R-97 estimate Classes 4 and 5. Class 4 and 5 estimates are appropriate for master planning purposes and are derived from previous project costs and factored estimates where the former were not available.

Additionally, due to the differing nature of projects that occur within a treatment plant and for a collection or distribution system, two approaches were taken to estimate costs. The first approach, outlined in Table 2.32.3, is the method used for all projects recommended within the fence line of the OWTP and AWPF. The second approach, also outlined in Table 2.3, is the method used for all other capital improvement projects recommended for the Integrated Master Plan, including the water blending stations.

Table 2.3 Basis for Estimating Project Costs for the Integrated Master Plan
Public Works Integrated Master Plan
City of Oxnard

Item	Estimated Cost at OWTP and AWPF[1]	Estimated Cost for All Other Projects[2]
Base Construction Cost from Carollo Cost Curves and past projects (Bid Tabs)[3]:	"A"	"A"
• Adjust base construction cost for field piping[4]	15% of "A"	--
• Adjust base construction cost for electrical/instrumentation[4]	20% of "A"	--
• Adjust base construction cost for sheeting/shoring/piles and painting[4]	10% of "A"	--
Subtotal ("B")	**145%**	**100%**
Construction Contingency	15% of "B"	30% of "B"
Subtotal Construction Cost ("C")	**167%**	**130%**
Add 24% of Construction Cost to Cover Project Cost Factor[5]	24% of "C"	24% of "C"
Total Estimated Project Cost ("D")	**207%**	**161%**

Table 2.3 Basis for Estimating Project Costs for the Integrated Master Plan Public Works Integrated Master Plan City of Oxnard
Notes: (1) Used to estimate all costs considered within the fence line of the treatment facilities. (2) Used to estimate all costs considered outside the fence line (i.e., pipelines, well pumps, booster pumping, and storage). (3) Adjust this cost to 20-City Index ENR CCI of 9962 (February 2015) and needed city location adjustment factors. (4) Costs are adjusted based on site-specific conditions. (5) Includes all "soft" costs: engineering, administration, legal, and construction management.

The main difference in these approaches is that the OWTP and AWPF projects use a construction contingency of 15 percent, whereas all other projects use a construction contingency of 30 percent. The different contingencies reflect the type of work being done and the more detailed nature of the OWTP and AWPF projects.

Table 2.4 presents the economic criteria used to estimate annual costs for all projects. When developing annual costs, these criteria are applied to capital and Operations and Maintenance (O&M) costs.

Table 2.4 Economic Criteria
Public Works Integrated Master Plan
City of Oxnard

Item	Assumption
Costs in Time and Place(1)	Costs are based on Oxnard costs in February 2015
Inflation Rate(2)	Annual inflation rate is assumed to be 3 percent
Interest Rate(2)	5 percent for amortization purpose
Amortization Period	20 years

Note:
(1) 20-City Average Index ENR CCI of 9,962 was used for February 2015. A R.S. Means Location Factor of 106.6 for Oxnard was used (ENR, 2015) (RSMeans, 2015).
(2) The inflation and interest rate are based on past experience with and an understanding of the economic climate of this industry.

2.4 REGULATORY REQUIREMENTS

2.4.1 Water

Water treatment and supply facilities must meet all state and federal water quality guidelines. The Environmental Protection Agency (EPA) establishes federal regulations in the form of the Safe Drinking Water Act, and the California Division of Drinking Water (DDW) administers state guidelines. Because the City's drinking water supply is a blend of surface water and groundwater, regulations apply to both.

2.4.1.1 Current

Local groundwater wells are a major source of the City's water, making groundwater regulations the most relevant. Since wholesalers providing surface water to the City must meet treatment regulations before the water enters the system, surface water regulations related to treatment are not summarized in this chapter. In this case, the CMWD is responsible for meeting all applicable surface water treatment regulations. The City, however, must meet any distribution-related regulation related to water quality. Table 2.5 summarizes current regulations focused on water quality within groundwater and distribution systems.

In addition to regulations related to groundwater quality, the quantity of groundwater use is managed by the FCGMA, an organization created by the California Legislature in 1982 to oversee Ventura County's vital groundwater resources. As an independent, special district separate from the County of Ventura or any city government, the FCGMA manages and protects both confined and unconfined aquifers within several groundwater basins beneath the southern portion of Ventura County.

The FCGMA establishes a set of ordinances directed at groundwater extraction. The most recent ordinance, Emergency Ordinance E, limits extractions from groundwater extraction facilities, including the City, due to the drought's impacts on underlying aquifers.

An additional consideration is that the Sustainable Groundwater Management Act (SGMA) was passed through the California state legislature in September 2014. The goal of this act is to have a sustainable management of groundwater by the year 2042. The full implications of SGMA are not known at the time of publication of this updated Plan but should be considered as projects move forward.

2.4.1.2 Future Potential Regulations

Future regulations that could potentially affect the City's system are also summarized in Table 2.5.

2.4.2 Wastewater

2.4.2.1 Water Quality

2.4.2.1.1 *Current*

Wastewater discharges are governed by both federal and state requirements. The primary laws regulating water quality are the Clean Water Act (CWA) and the California Water Code. Under the CWA, the EPA or a delegated State agency regulates discharging pollutants into waterways through the issuance of National Pollutant Discharge Elimination Systems (NPDES) permits. NPDES permits set limits on the amount of pollutants that can be discharged into the waters of the United States. Since the OWTP is located in the Los Angeles Region, the Los Angeles Regional Water Quality Control Board (LARWQCB) has authority to issue permits for wastewater discharge and waste discharge requirements for recycled water use.

Currently, the OWTP discharges to the Pacific Ocean under existing NPDES permit (CA0054097), which was adopted by the LARWQCB on July 26, 2013. This permit establishes discharge limits for conventional constituents, nutrients, metals, and organics. The aim of these limits is to protect aquatic life and other beneficial uses of the receiving water. Table 2.6 lists conventional constituents and metals with their permit limits.

2.4.2.1.2 *Future (Potential)*

As analytical techniques for detecting toxic compounds improve and detection limits drop, additional parameters might exceed California ocean plan objectives. As such, effluent limits might be added to the OWTP NPDES permit.

2.4.2.2 Air Quality

2.4.2.2.1 *Current*

At a local level, the Ventura County Air Pollution Control District (APCD) is primarily responsible for controlling air pollution from the OWTP. Beyond the local level, air quality permits are required by State and Federal laws as part of doing business in Ventura County. The OWTP currently holds permits from the District for the following sources:

- Two effluent pump natural gas engines.
- Three electrical generator waste gas engines.
- Two waste gas burners.
- One odor reduction tower.
- One odor control system (headworks).
- One odor reduction station (solids processing building).
- Six standby diesel engines for electricity generators.
- One emergency standby diesel engine for air compressor.

The APCD also regulates the emission of certain odorous substances, such as sulfur dioxide and hydrogen sulfide. Improvements and changes to the wastewater process and discharge location are likely to require revised air quality permits. Table 2.7 summarizes these concentration levels.

Table 2.5 Overview of Relevant Drinking Water Regulations
Public Works Integrated Master Plan
City of Oxnard

Regulation	Compliance Date	Requirements and Maximum Contaminant Level (MCL)
Current Applicable Regulations		
Safe Drinking Water Act and National Primary Drinking Water Regulations	Ongoing	Maximum contaminant levels (MCLs), maximum contaminant level goals (MCLGs), and/or treatment techniques set for 83 contaminants, including turbidity, seven microorganisms (two of which are indictors), four radionuclides, 16 inorganic contaminants, and 57 organic contaminants.
Stage 1 Disinfectants and Disinfection Byproducts Rule	1/1/01 – monitoring 1/1/02 – MCL compliance	Reduced total trihalomethanes (TTHM) limit from 0.1 to 0.080 milligrams per liter (mg/L); reduced haloacetic acids (HAA5) limit from 0.08 to 0.060 mg/L. Established an MCL for bromate of 0.010 mg/L; Established an MCL for chlorite of 1.0 mg/L Compliance for TTHMs & HAA5 based on a running annual average.
Stage 2 Disinfectants and Disinfection Byproducts Rule	10/1/06 – first provision 1/1/13 – all provisions	Perform Initial Distribution System Evaluation to identify new DBP compliance locations. Change compliance calculations from RAA to Locational Running Annual Averages.
Radionuclides Rule	12/31/07	Updated standards: Combined radium 226/228: 5 pCi/L. Total beta particles and photon emitters: 4 mrem/yr. Gross alpha particles (excluding U and Rn): 15 pCi/L. Uranium MCL: 30 μg/L.
Arsenic Rule	1/23/06	Arsenic MCL: 0.010 mg/L.
Secondary Drinking Water Regulations	Ongoing	Non-enforceable standards for aesthetic parameters.
Partnership for Safe Water	Ongoing	Voluntary standards and practices to minimize risk of microbial contamination of treated water.
Inorganic Chemicals	Various	Existing National Primary Drinking Water Regulations (NPDWRs) set standards for a number of different metals and other inorganic chemicals, including aluminum and nitrate.
Synthetic and volatile organic chemicals	Various	Existing NPDWRs for a number of different herbicides, pesticides, solvents, and other organic chemicals. Monitoring and reporting requirements.
Lead and Copper Rule and 2007 Revisions	1993 - 4/10/2008	Requires water suppliers to optimize their treatment system to control corrosion in a customer's plumbing. If lead action levels are exceeded, the suppliers are required to educate their customers about lead and suggest actions to reduce their exposure through public notices and public education programs.
Revisions Cr(VI)	CA MCL - 4/2014	DDW established MCL of 10 μg/L.

Table 2.5 Overview of Relevant Drinking Water Regulations
Public Works Integrated Master Plan
City of Oxnard

Regulation	Compliance Date	Requirements and Maximum Contaminant Level (MCL)
Future Regulations		
New "lead free" standard under the SDWA	1/4/14	Amends SDWA Section 1417 – Prohibition on Use and Introduction into Commerce of Lead Pipes, Solder, and Flux: Changes the definition of "lead-free" by reducing lead content from 8 percent to a weighted average of no more than 0.25 percent in the wetted surface material. This change primarily affects brass/bronze.
Combined Volatile Organic Compounds	Projected 10/14 proposal, 6/15 final	Efforts to define a VOC Rule are ongoing. The novel "group risk" approach focuses on total public health as opposed to each chemical. This may be combined using a common analytical method, treatment, or MCLG.
Revised trichloroethylene and tetrachloroethylene MALss	Unknown	These may be regulated separately from other VOCs.
Revised Lead and Copper Rule	Projected 2017	The EPA is evaluating all aspects of the current rule.
Nitrosamines	Unknown	The EPA is collecting data for possible future group MCL for nitrosamines (byproduct of chloramines). California Notification Level of 0.01 µg/L for NDMA.
Revised Total Coliform Rule	April 2016	Requires that MCL for Total Coliforms (including fecal coliform and E. coli) are no more than 5 percent of samples total coliform-positive.

Table 2.6 OWTP NPDES Permit Limits
Public Works Integrated Master Plan
City of Oxnard

Constituent	Units	Effluent Limitations[1]				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Biochemical Oxygen Demand (BOD_5)	mg/L	30	45	--	--	--
	lbs/day	7,960	11,900	--	--	--
Total Suspended Solids (TSS)	mg/L	30	45	--	--	--
	lbs/day	7,960	11,900	--	--	--
pH	standard units	--	--	--	6.0	9.0
Oil and Grease	mg/L	25	40	--	--	75
	lbs/day	6,630	10,600	--	--	19,900
Settleable Solids	ml/L	1.0	1.5	--	--	3.0
Turbidity	NTU	75	100	--	--	225
Chronic Toxicity	TUc	--	--	99	--	--
Gross alpha	PCi/L	--	--	15	--	--
Gross beta	PCi/L	--	--	50	--	--
Combined Radium-226 & Radium-228	PCi/L	--	--	5.0	--	--
Tritium	PCi/L	--	--	20,000	--	--
Strontium-90	PCi/L	--	--	8.0	--	--
Uranium	PCi/L	--	--	20	--	--
Benzidine[2]	ug/L	0.0068	--	--	--	--
	lbs/day	0.0018	--	--	--	--
Heptachlor epoxide[2]	ug/L	0.002	--	--	--	--
	lbs/day	0.00053	--	--	--	--
Polychlorinated biphenyls (PCBs)[2]	ug/L	0.0019	--	--	--	--
	lbs/day	0.0005	--	--	--	--
Tetrachlorodibenzo-p-dioxin (TCDD) Equivalents[2]	ug/L	0.00000039	--	--	--	--
	lbs/day	0.0000001	--	--	--	--

Notes:
(1) From the 2013 NPDES Permit No. CA0054097.
(2) The reasonable potential analysis' result is inconclusive. Therefore, limitations are carried over from Order No. R4-2007-0029, as amended by Order No. R4-2010-0048, to avoid backsliding.

Table 2.7 Hydrogen Sulfide and Sulfur Dioxide Ground Level Concentrations - Emission Limits Public Works Integrated Master Plan City of Oxnard		
Substance	**Limit Ground Level Concentration (ppm)**	**Duration**
Hydrogen Sulfide(1)	0.06 or 0.03	Averaged over 3 consecutive minutes Averaged over 60 consecutive minutes
Sulfur Dioxide(1)	0.25 or 0.04	Averaged over 60 consecutive minutes Averaged over 24 hour period
Notes: (1) Source: Ventura County Air Pollution Control District Regulation 4, Rule 54, (July 1994). (2) http://www.vcapcd.org/Rulebook/Reg4/RULE%2054.pdf.		

2.4.2.2.2 *Future (Potential)*

A recent amendment to the APCD's air quality regulations may affect the OWTP in the near future. This amendment, called Rule 54, was amended in January 2014 to limit sulfur dioxide emissions to 75 parts per billion (ppb) at or beyond the property line. Although existing sources do not need to demonstrate compliance, all sources must meet the combustion emission limit on a dry basis using a revised calculation to account for percent oxygen content.

In addition to this amendment, a draft amendment to Rule 74.15.1 regarding boilers, steam generators, and process heaters might also affect regulations. This rule would limit nitrogen oxide emissions for new or replacement units rated greater than 2 million BTU/hr and less than 5 million BTU/hr. These new limits would be based on similar standards adopted by the San Joaquin Valley in Rule 4307.

2.4.2.3 Biosolids

Currently, the OWTP disposes of its screenings, grit, and dewatered anaerobically digested solids (biosolids) by hauling it to a nearby landfill. To best use the energy and nutrient content, alternatives to landfilling biosolids were considered in the Integrated Master Plan.

2.4.2.3.1 *Current*

The EPA's 40 CFR 503 regulations are the main federal regulations of biosolids. The 40 CFR 503 regulations establish metal concentration limitations, pathogen density reduction requirements, vector attraction reduction requirements, and site management practices for the land application of biosolids. The 40 CFR 503 regulations also establish requirements for the surface disposal and incineration of biosolids.

In California, State regulations of biosolids land application are more stringent than federal regulations. The State Water Resources Control Board (SWRCB) has adopted General Waste Discharge Requirements for the Discharge of Biosolids to Land for use as a Soil

Amendment in Agricultural, Silvicultural, Horticultural, and Land Reclamation Activities (Biosolids General Order).

The Biosolids General Order goes beyond the requirements of 40 CFR 503 by requiring additional biosolids testing, soil testing, groundwater sampling, and wind and dryness limitations. Regulations for biosolids reuse and disposal in landfills in California are also more stringent and fall under the jurisdiction of the California Department of Resources Recycling and Recovery (CalRecycle). In addition to regulating the co-disposal of biosolids in landfills and the use of biosolids for alternative daily cover, CalRecycle also regulates facilities that compost biosolids.

2.4.2.3.2 *Future (Potential)*

Using or disposing of biosolids is becoming increasingly difficult in California. Many California utilities are restricting the land application of biosolids, and fewer landfills are accepting them. Furthermore, the State of California has passed several bills that directly affect the ability to send biosolids to landfills in the future.

Two bills in particular affect the land application of biosolids: Assembly Bill 341 and Assembly Bill 1594. In 2013, California passed Assembly Bill 341, which requires a 75 percent reduction of solid waste sent to landfills by 2020. (It is expected that by 2025, a 90 percent reduction of solid waste sent to landfills will be required.) In September 2014, Assembly Bill 1594 was passed, requiring that green waste no longer qualifies for diversion credit when used as alternative daily cover at a landfill. When this bill is fully implemented January 1, 2020, the diversion credits that utilities currently receive will be eliminated.

Approximately 30 percent of the solid waste stream sent to landfills is organic, which CalRecycle is working to eliminate from landfills in support of the Air Resources Board Assembly Bill 32 Scoping Plan's target to reduce greenhouse gas emissions to 1990 levels by 2020. Although the Assembly Bill 32 Scoping Plan does not explicitly state that organic waste streams are or will be prohibited from use as alternative daily cover, it does state that opportunities for phasing out landfilling organic material are being pursued, and that legislation could be developed as early as 2016.

2.4.3 Recycled Water

2.4.3.1 Current

The City has served urban irrigation uses since 2015 and agricultural uses since 2016. The City also plans to use recycled water for aquifer storage and recovery (ASR) and groundwater recharge for potable reuse. The permitting process for potable reuse occurs on a case-by-case basis.

Based on the uses of recycled water being considered by the City, the following regulations and policies apply:

- Urban/Agricultural Reuse – California Code of Regulations (CCR), Title 22, Division 4, Chapter 3, Section 60301 et seq. (Title 22) & the Recycled Water Policy (SWRCB Res No. 2009-0011, recycled water (RW) Policy).

- IPR/Groundwater Recharge – DDW's Groundwater Recharge Regulations and SWCRB's Recycled Water Policy and Anti-Degradation Policy.

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

2.4.3.1.1 *Non-Potable*

The DDW is now California's primary agency responsible for protecting public health, regulating drinking water, and developing uniform water recycling criteria appropriate for particular water uses.

The DDW published the Title 22 recycled water regulations (CDPH, 2014a). Based on the level of treatment the AWPF will provide, per Title 22, non-potable uses of the City's recycled water include surface irrigation of food crops, parks, playgrounds, school yards, residential and freeway landscaping, unrestricted access golf courses, and some construction uses. The RW can also be used in industrial or commercial cooling or boiler operations as well as recreational impoundments.

2.4.3.1.2 *Indirect/Direct Potable Reuse*

The primary State agencies responsible for regulating an IPR project include DDW, LARWQCB, and the SWRCB. Because the purpose of IPR is to discharge to the existing Oxnard Plain Groundwater Basin and withdraw for potable reuse, several regulations apply. All of the applicable regulations that pertain to the installation and operation of IPR are summarized in Table 2.8.

2.4.3.2 Future (Potential)

For recycled water, endocrine-disrupting chemicals and other compounds of emerging concern (CECs) are most likely to be regulated. The RW Policy highlights CECs as a potential issue for recycled water.

While there are no current regulations for these constituents in recycled water, in accordance with the Recycled Water Policy, the State Water Board convened a science advisory panel (Panel) to guide the future monitoring of CECs in recycled water. The Panel developed a report that recommended ways to monitor for specific CECs in recycled water used for groundwater recharge reuse.

Table 2.8 Summary of All Applicable Regulatory Requirements for Recycled Water Systems Public Works Integrated Master Plan City of Oxnard		
Governing Agency	**Applicable Regulation/Policy**	**Regulatory Concept/Objective**
DDW	Title 22, Division 4, Chapter 3 of the California Code of Regulations	Stipulates criteria for both non-potable uses of recycled water and groundwater recharge for subsequent potable use, with the most recent version updated as of June 2014 (CDPH, 2014).
	60320.208	Requires that specific pathogen reduction targets must be met through multiple treatment processes. The log reduction requirements for viruses, *Giardia,* and *Cryptosporidium* are 12, 10, and 10, respectively.
	60320.210	Requires that a total nitrogen standard of ≤10 mg/L must be met at all times.
	60320.218	Requires a minimum TOC value of ≤0.5 mg/L is required.
	60320.226	Requires that, before operation, monitoring wells are placed in appropriate locations to monitor the movement and water quality of the injected water.
LARWQCB	Update WDRs Permit	Requires an amendment to the existing permit or a reissuance of a WDRs/WRR will be necessary prior to discharge.
SWRCB	Recycled Water Policy	Include Salt Nutrient Management Plans (SNMPs), Recycled Water Groundwater Recharge Projects (GRPs), anti-degradation, and monitoring constituents of emerging concern (CECs).
	SNMPs	Manages salts and nutrients from all sources "… on a basin-wide or watershed-wide basis in a manner that ensures attainment of water quality objectives and protection of beneficial uses."
	GRPs	Requires compliance with regulations adopted by CDPH (now DDW) for groundwater recharge projects (CDPH, 2014).
	Anti-Degradation Policy (Resolution 68-16)	"… [Ensures that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."
	CEC Monitoring	Requires implementation of a monitoring program for CECs and priority pollutants, consistent with recommendations from DDW.

2.4.4 Stormwater

2.4.4.1 Water Quality

In cooperation with the federal EPA, the SWRCB has issued stormwater permits under the NPDES program. The City is a co-permittee, along with nine other cities and the Ventura County Watershed Protection District (VCWPD), for the MS4 NPDES permit issued by the California Regional Water Quality Control Board (RWQCB). The current MS4 permit was issued on July 8, 2010 (Permit CAS004002, Order No. R4-2010-0108). Pursuant to the

permit, VCWPD has developed a countywide Stormwater Quality Management Plan that includes management measures/best management practices (BMPs).

Ventura County, through the use of a stormwater ordinance, also regulates stormwater quality in the County. The Ventura County Stormwater Ordinance (Ordinance No. 4142) prohibits non-stormwater discharges into County stormwater facilities and seeks to reduce pollutants in stormwater to the maximum extent practicable. Each co-permittee is responsible for adopting and enforcing stormwater pollution prevention ordinances, implementing self-monitoring programs and BMPs and conducting applicable inspections.

2.4.4.1.1 *Total Maximum Daily Load (TMDLs)*

Within Ventura County are a number of water bodies with TMDLs. The City of Oxnard is a participating party in the Santa Clara River Bacteria TMDL and implements the Harbor Beaches TMDL on its own.

Santa Clara River Bacteria TMDL went into effect in March 2012. The TMDL Implementation Plan is currently being developed through an agreement among the County of Ventura and the cities of Fillmore, Oxnard, Santa Paula, and Ventura (VCWPD, 2015). In addition, the same parties have developed the receiving water monitoring plan.

The Harbor Beaches TMDL went into effect in December 2008, and dry and wet weather implementation plans were submitted in 2009 and 2010. The City has implemented, and continues to implement, BMPs aimed at reducing sources and transporting bacteria into the receiving waters at Kiddie and Hobie Beaches.

2.4.4.1.2 *Water Quantity*

The Federal Emergency Management Agency administers the National Flood Insurance Program. To ensure compliance with the National Flood Insurance Program, communities must adopt a floodplain management ordinance addressing construction and habitation in flood zones. Ventura County adopted their Flood Plain Management Ordinance (Ordinance 3741) in 1985. Since then, several revisions have been made, with the latest ordinance adopted in 1990 (Ordinance 3954). The ordinance addresses the risks of development within the floodplain and includes a list of prohibited discharges, exemption procedures, and requirements for construction and permitting.

2.4.4.2 Future (Potential)

In January 2015, the VCWPD submitted their report of waste discharge (ROWD), which applies the renewal of waste discharge requirements set forth in the current order (Order No. R4-2010-0108). While the provisions of the next permit are unknown, the VCWPD is anticipating that it will be based on the MS4 Permit for Los Angeles County. The VCWPD ROWD includes proposed recommendations for changing or modifying specific provisions of the Los Angeles County Permit (VCWPD, 2015), and the justification for these recommendations for the purpose of the VCWPD permit renewal process.

At the statewide level, California Stormwater Quality Association (CASQA) (2015) outlined their strategic visions and goals for stormwater management to achieve the goals of the Clean Water Act. For future regulations, CASQA identified the need for stormwater to be considered a non-point source rather than a point source and for regulations related to stormwater capture and use as a resource.

Chapter 3

INTEGRATION AND LINKAGE OPPORTUNITIES

3.1 INTRODUCTION

This Integrated Master Plan addresses future planning needs for all major water utilities under the City's jurisdiction, including water, wastewater, recycled water, and stormwater. Although these utility systems are integrally linked because of their positions in the water cycle, the City seeks to take full advantage of potential linkages and synergies among the systems. As such, this Plan builds on previous planning efforts by creating a single master plan that incorporates all planning efforts.

Through the planning process, additional opportunities for integration and linkages were identified. These opportunities are illustrated in Figure 3.1 and are described in this chapter.

3.1.1 Integration Workshops

Throughout the planning process, the project team met with the City for several integration workshops to review analyses and recommendations, identify common elements and linkages, coordinate project timing, and adjust the alignment of recommended projects and programs. While some of these workshops focused on specific systems and their connections to the broader plan, other workshops looked at the Master Plan's various projects and initiatives as a whole. The workshops allowed key team members from each utility to come together and provide input, coordination, and feedback on many elements of the Integrated Master Plan.

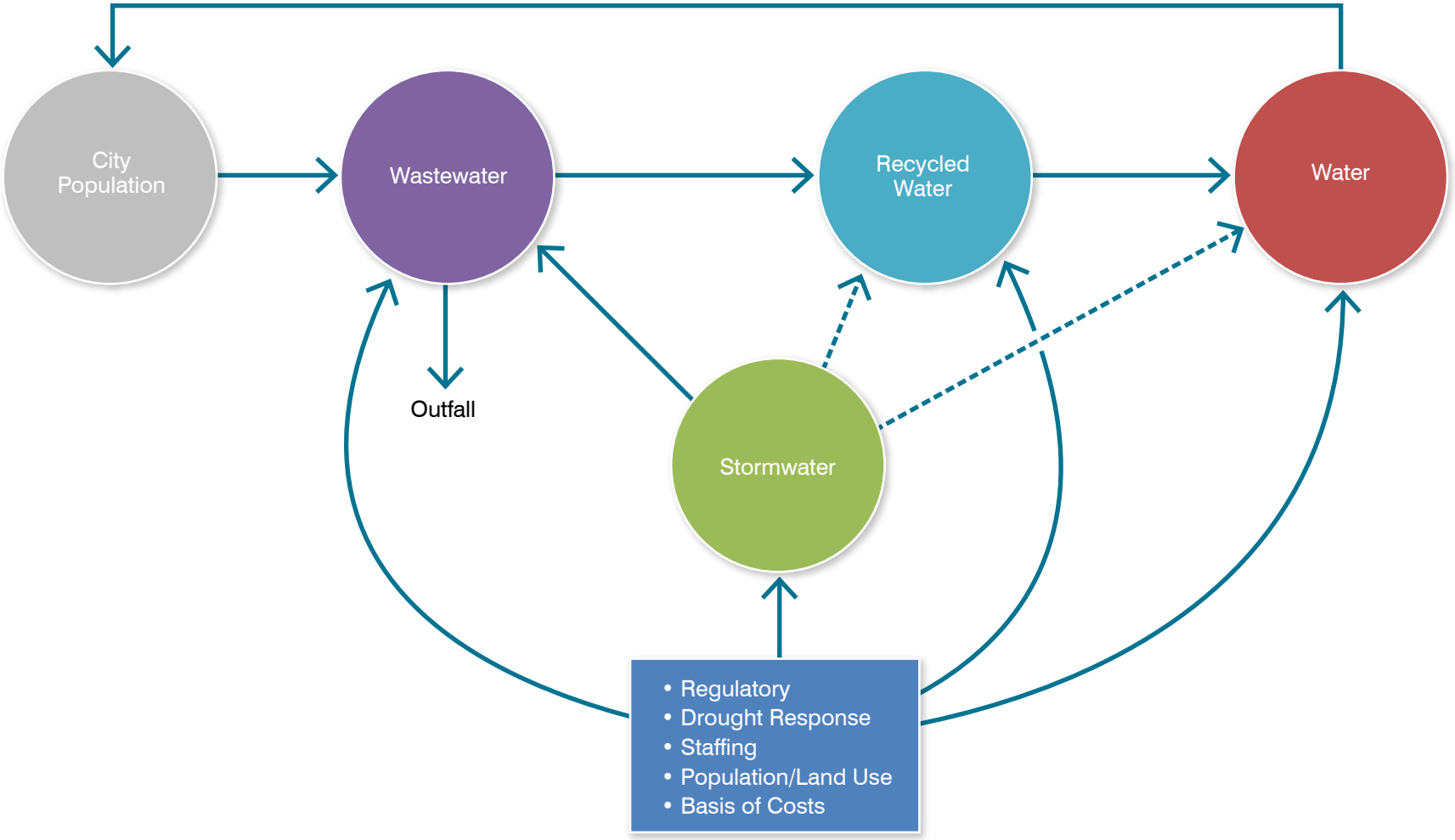
3.2 KEY LINKAGES AND INTEGRATION OPPORTUNITIES

Early on in the planning process, the project team identified several key issues, including the impact of population and land use projections on each system, the potential regulatory cross connections among systems, and the importance of using the same cost basis throughout the planning efforts. Below are brief summaries of the significance of each issue.

3.2.1 Population/Land Use

Population and land use direct the planning efforts for all water systems. For example, historical use and projected population can determine water demands and future wastewater flows, and land use can determine the amount of stormwater generated in an area. Thus, the ability to review population and land use data was an important part of this Master Plan.

Ideally, water system plans should be coordinated to keep system needs consistent. When water plans are performed separately, the basis for projected population differs, eliciting separate results for a system's demands, flows, and loads. Given the benefits of a coordinated plan, a significant part of the Integrated Master Plan involved coordinating the planning efforts for all four systems.



POTENTIAL INTEGRATION OPPORTUNITIES AND LINKAGES

FIGURE 3.1

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3.2.2 Agreements and Contracts

As part of the Integrated Master Plan, Carollo was asked to organize the City's current contracts and agreements and provide recommendations and modifications at the City's request. To organize existing and future contracts and agreements, Carollo worked with City staff to form a Microsoft Access 2007 database that provided a comprehensive and convenient organizational structure that would be fully scalable for future build-out.

3.2.3 Basis of Costs

For the entire Integrated Master Plan, the recommended construction and project costs were based on the same cost-estimating levels and contingencies. This provided consistent cost estimates throughout the project, which rarely happens when plans are drafted separately. These cost estimates were then used in the City's Cost of Service (COS) Studies (Carollo, 2017) to explore and recommend future utility rates and rate increases as a whole. With this consistency, the City had a complete understanding of the water infrastructure needs and, more importantly, the costs and financial impacts of the projects recommended for all four systems.

3.2.4 Regulations

Not only did the project team review and summarize the impacts of regulations governing each specific water system, but it also looked at the ways regulations will affect all four water systems as a whole. For example, the Integrated Master Plan coordinated its recommendations with a Salt Nutrient Management Plan. Because the City plans on using recycled water for surface irrigation and sub-surface injection, this coordination is critical to ensuring that the increased use of recycled water doesn’t adversely affect the watershed.

In addition to the Salt Nutrient Management Plan (Carollo, 2016), a Title 22 Engineers Indirect Potable Reuse (IPR) Permit Report (Carollo, 2016) and Report of Waste Discharge (ROWD) (Carollo, 2016) were developed alongside the Integrated Master Plan so the City could obtain a permit to operate its Aquifer Storage and Recovery (ASR) Demonstration Well. The ASR Demonstration Well is an important project to determine the feasibility of conducting an IPR operation within the City, which is necessary to provide a future sustainable water supply.

3.2.5 Water Resources/Supply

The City of Oxnard seeks to secure a sustainable water supply for its community through the GREAT program. This program proposes using recycled water treated at the AWPF and through IPR operations as an additional water source as well as using recycled water conveyed to nearby agricultural users for pump-back allocation so the City can expand its groundwater pumping and treatment operations equally. By planning the potable and recycled water systems together in the Integrated Master Plan, several alternatives,

including ASR of recycled water and additional groundwater pumping and treatment, could be combined in one integrated system.

3.2.6 Source Control

Source water for the OWTP and AWPF is directly affected by the Local Limits Study (Carollo, 2017) and the Best Management Practices (BMPs) for Centralized Waste Treatment (CWT) Facilities. Both are described in further detail below.

The Local Limits Study sets limits on the level of pollutants that industrial dischargers within the City's service area can discharge into the OWTP influent wastewater. Because these limits shape the quality of wastewater entering the OTWP, they also determine the treatment capacity and requirements for the water that leaves it. Thus, this particular Local Limits Study considered not only the information necessary for limits at the OWTP, but also the linkage between the OWTP and the AWPF. With this Study, the City can further understand the possible effects of discharging brine to the OWTP outfall under current and future flow scenarios. Ultimately, the study recommended 21 constituent limits.

Centralized Wastewater Treatment Facilities (CWTFs) treat hazardous and nonhazardous materials such as industrial tank residuals, called "tank bottoms," and oil field operations wastes. They are regulated under 40 CRF 437 and are mandated by publicly-owned treatment works (POTWs) through the POTWs' industrial pretreatment programs.

Because CWTFs can send harmful materials into the public drinking water, POTWs will not always accept discharge from CWTFs, especially Subcategory D facilities that accept multiple waste streams. To address this issue, Carollo designed BMPs that protect POTWs' waste treatment processes and conveyance systems, ensuring that the processes comply with regulations for treated effluent, water reuse, biosolids disposal/reuse, and air emissions. The BMPs also protect the environment and worker and public safety. Carollo's BMPs were endorsed by several major California POTWs that accept CWT waste discharges and were shared and endorsed by the California Association of Sanitation Agencies (CASA) and the WateReuse Association.

3.2.7 Outfall Considerations

Another key integration issue is the connection between the OWTP outfall and the AWPF capacity. As the AWPF capacity increases and more water is treated, less wastewater is discharged to the City's ocean outfall. With less water to dilute the effluent, the effluent becomes more concentrated.

To assess the impacts of increasing the AWPF's capacity, an analysis was conducted. This analysis revealed that the City might have difficulty meeting all of its NPDES permit limits with the increased capacity. As a result, potential linkages between the OWTP and the AWPF were explored to the fullest extent.

Possible mitigation measures include changing regulatory compliance points and/or dilution studies, changing treatment processes at the OWTP, and adding concentrate to the outfall to "dilute" the discharge. This potential impact on effluent was also considered when planning the recycled water and potable water supply alternatives. However, in this case, the project team considered how a reduction in AWPF capacity (less than the previously planned 25 mgd ultimate capacity) could be managed and put to best use.

3.2.8 Drought Considerations

As the severe drought continues in California and much of the West, the City faces many challenges, including reduced surface water import and local groundwater pumping (via the Fox Canyon Groundwater Management Agency) as well as mandatory reductions in potable water use. In response, the City has tried to find ways to deliver recycled water to its users.

Although the AWPF is operational and designed to produce 6.25 mgd of high quality advanced treated reverse osmosis (RO) recycled water, the City lacks the infrastructure required to deliver all of the recycled water it produces. Thus, the City has initiated plans to design and construct a distribution pipeline along Heuneme Road to deliver water to agricultural customers in the Oxnard Plain. However, it will take several years for this pipeline to be constructed and operational.

Since the CMWD Salinity Management Pipeline's route (SMP) runs parallel to the City's planned pipeline and the SMP was underutilized at the time, the City saw an opportunity to use the CMWD SMP to temporarily deliver water to agricultural customers in the Oxnard Plain. In response, the Los Angeles Regional Water Quality Control Board (RWQCB) amended the City's waste discharge requirements (WDRs), Order No. R4-2011-0079-A01 and Monitoring and Reporting Program R4-2008-A01, in July of 2015 to allow temporary use of the SMP to deliver AWPF water to farmers. Delivery of recycled water via the SMP began in early 2016.

Metropolitan Water District Conservation and Retrofit Grants:

The Metropolitan Water District offers recycled water retrofit grants to its retail customers. To take advantage of this program, the City applied for several grants, receiving one for its River Ridge golf courses. The City also plans to apply for grants for its other urban use customers as they show interest and in and commitment to utilizing recycled water and eventually use it as a water source.

Recycled Water Retrofits:

When the recycled water retrofit program began in 2010, emphasis was on retrofitting urban projects such as golf courses, parks, school yards, cemeteries, and other commercial facilities. Once the urban project began to identify and interview potential users for these retrofits, agricultural users' interest in and acceptance of recycled water grew. As a result,

by 2012, the project emphasized urban reuse less and reuse for agricultural purposes more.

Currently, the City delivers recycled water to the two adjacent River Ridge golf courses and has made plans to deliver recycled water to the RiverPark development and the adjacent paper company. The City has also committed to serving the agricultural community, with user agreements already in place. In addition, in 2015, the City expanded an initiative to connect other urban irrigation users along the recycled water backbone pipeline. These projects help with the drought-mandated water use reductions and were coordinated with the long-term projects recommended in this Integrated Master Plan.

3.2.9 Staffing

Through these planning efforts, the City could review staffing needs throughout the Public Works Department. The City also conducted a salary survey from January 2015 through March 2015. For this survey, the following tasks were performed:

- Job descriptions for 92 total classifications were reviewed to understand each classification's duties and responsibilities; the survey's appropriate classification benchmarks for all classifications were then identified.
- Organization, classification, and salary data/material were gathered from ±18 comparable agencies relevant to the department’s competitive labor market.
- Job comparability analyses were conducted for the benchmark classes in each survey agency.
- Internal relationship analyses were conducted for department positions within the department and for classifications across other City departments to determine commonalities and linkages.
- The external market survey data and the results of an internal job content relationship analysis were used to develop specific salary range slotting recommendations within the City’s current salary grade/range structure for all Utilities & Engineering Department positions.

Through this analysis, the following five priority positions were deemed necessary for the City:

- Environmental Compliance and Water Supply Management Division Manager.
- Technical Services/Water Quality Manager.
- Wastewater Division Manager.
- Wastewater Operations Manager/Chief Operator.
- Water Division Manager.

For each position, a subconsultant for Carollo worked to evaluate staffing needs and helped the City develop and implement strategies for recruiting and advertising for the positions.

3.2.10 Streets

A final key point of integration for the Integrated Master Plan involves the City's Streets Master Plan. To minimize overall disruption to the community, planned improvements recommended for the Master Plan must be coordinated with street upgrades.

Existing documents that outline current and future street planning efforts were reviewed and summarized for the Integrated Master Plan. The specific planning documents reviewed include:

- Pavement Management Plan.
- Oxnard Bicycle and Pedestrian Facilities Master Plan.
- Intelligent Transportation Systems Master Plan.
- City of Oxnard Green Alleys Plan.
- Oxnard Transportation Demand Management Plan.
- Santa Clara River Trail Master Plan.
- Oxnard 2030 General Plan.

Based on the findings in these documents, a Streets Master Plan was developed. A large component of the Streets Master Plan involves integrating the Integrated Master Plan's recommended capital improvement projects across all disciplines into one living Geographic Information Systems (GIS) database that also houses existing infrastructure information. This database will provide the City with a dynamic management tool that explicitly optimizes the timing of water infrastructure related projects to minimize construction projects' impact on affected communities and coordinate such projects with street improvement projects and the projects recommended in the summarized reports.

WATER SYSTEM MASTER PLAN

4.1 INTRODUCTION

The City provides a blend of surface and groundwater through its water distribution system, which consists of six blending stations (BS) that take water from each of the City's water sources and combine it before distributing it throughout the City.

In addition to the overall Integrated Master Plan goals established in Chapter 2, planning efforts identified specific goals for the water supply. These goals are as follows:

- Goal 1: Provide reliable/resilient supply to meet future conditions (i.e., changes to demand, regulations, and water quality).
- Goal 2: Meet the City's water quality objectives.
- Goal 3: Protect existing water rights by maximizing use of groundwater allocation.
- Goal 4: Minimize future reliance on imports by maximizing use of AWPF-produced water.
- Goal 5: Attract industry and jobs.
- Goal 6: Keep rates affordable.

This chapter will provide an overview of the existing water system and its strengths and vulnerabilities, as well as the regulatory requirements and climate change issues the system will face. This chapter also makes recommendations for meeting the defined goals.

The analysis and evaluations contained in this Summary Report are based on data and information available at the time of the original date of publication of the Project Memos (PMs), December 2015. After development of the December 2015 Final Draft PMs, the City continued to move forward on two concurrent aspects: 1) advancing the facilities planning for the water, wastewater, recycled water, and stormwater facilities; and 2) developing Updated Cost of Service (COS) Studies (Carollo, 2017) for the wastewater/collection system and the water/distribution system. The updated 2017 COS studies contain the most recent near-term Capital Improvement Projects (CIP). The complete updated CIP based on the near-term and long-term projects is contained in Appendix B.

4.2 DESCRIPTION OF EXISTING FACILITIES

4.2.1 Source of Supply

To serve its constituents, the City of Oxnard gets water from the following sources:

- *Groundwater* from local wells that draw from the Oxnard Plain Groundwater Basin (some of which are treated through reverse osmosis).

- *Groundwater* from the United Water Conservation District (UWCD), which draws from the Oxnard Plain Forebay.
- *Surface Water* imported from the State Water Project via the Calleguas Municipal Water District (CMWD).
- *Recycled Water* from the Advanced Water Purification Facility (AWPF) (discussed in detail in Chapter 6 - Recycled Water System).

4.2.2 Treatment/Blending

Although the exact ratio of the blend at the City's blending stations varies, the City stated that future blending will be in a 1:1 (surface water to groundwater) ratio. This ratio produces water with a total dissolved solids (TDS) level between 600 and 700 mg/L, which meets the upper limit of the secondary drinking water standards (1,000 mg/L) at a fairly cost-effective unit rate.

Figure 4.1 is a schematic of the City's water system, showing how the six blending stations are linked together. Figure 4.2 is a map of the City's water system facilities, including the locations of the blending stations. Table 4.1 summarizes the major characteristics of each blending station. The City's individual facilities are all described in the following sections.

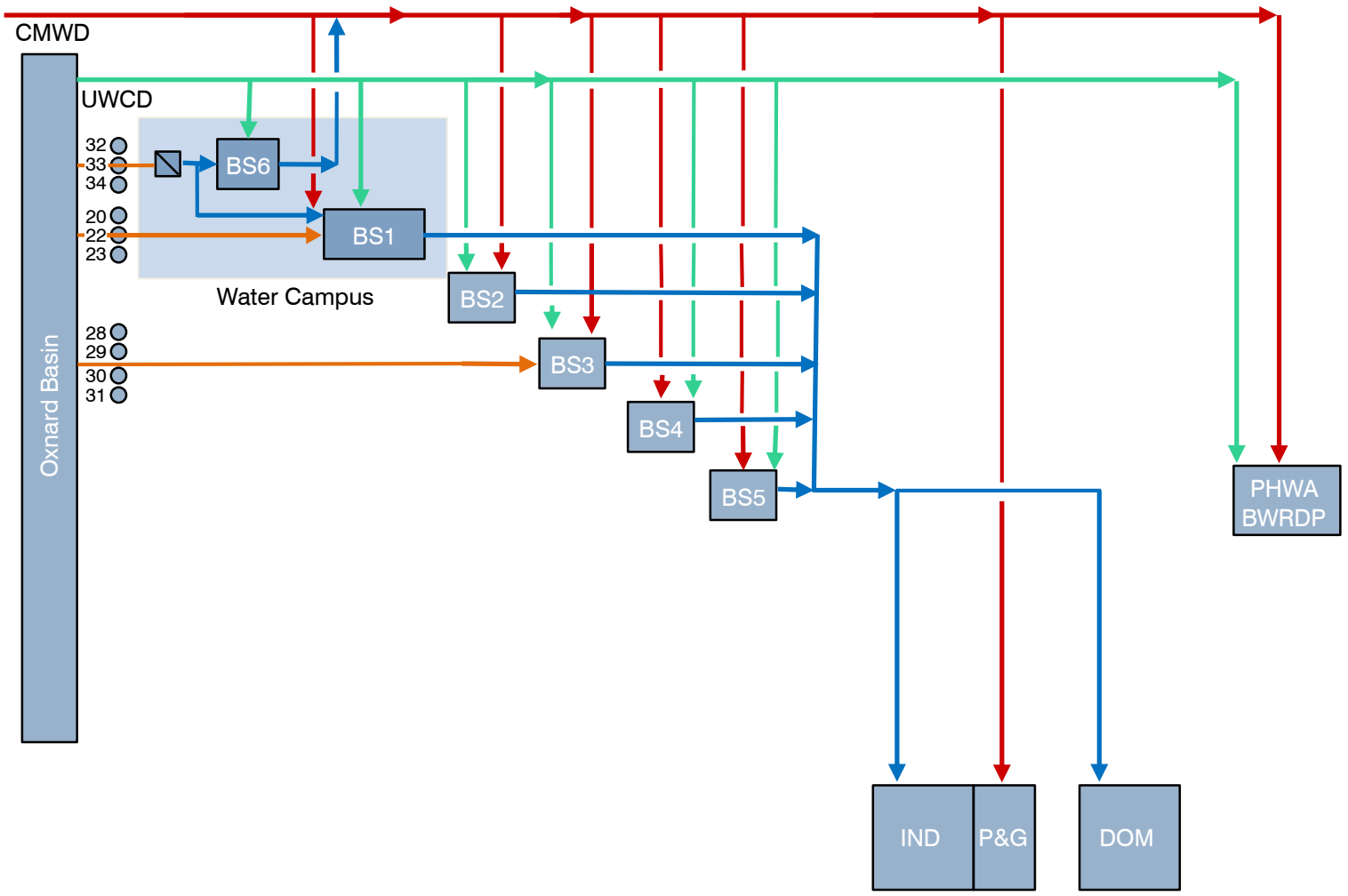
4.2.3 Distribution System

To reflect the system's ongoing growth, the City's transmission and distribution system consists of a variety of pipe types and sizes. To manage these pipes, the City has implemented an infrastructure management system (GIS database) that it continually populates with pipe attributes (diameter, material, year installed, etc.).

Based on the 2013 March GIS database, the distribution system includes nearly 613 miles, or 3.25 million linear feet, of pipe, the majority of which is between 6 to 12 inches in diameter. Figure 4.3 illustrates the City's existing water distribution system.

The City's water system currently operates in one pressure zone. However, some areas of the City have difficulties with pressures higher than the 80 pounds per square inch (psi) maximum pressure desired for the system while other areas need to be augmented to meet the minimum pressure targets.

The only above-ground engineered storage facilities within the system are the 600,000 gallons of permeate storage at Blending Stations (BS) No. 1 and No. 6, which are located adjacent to each other and referred to collectively as BS Nos. 1/6. The City also uses 70 percent of the 18.0 million gallon (MG) Springville Reservoir owned by CMWD. In total, the City has 12.5 MG of above-ground storage.



OVERALL WATER SYSTEM SCHEMATIC

FIGURE 4.1

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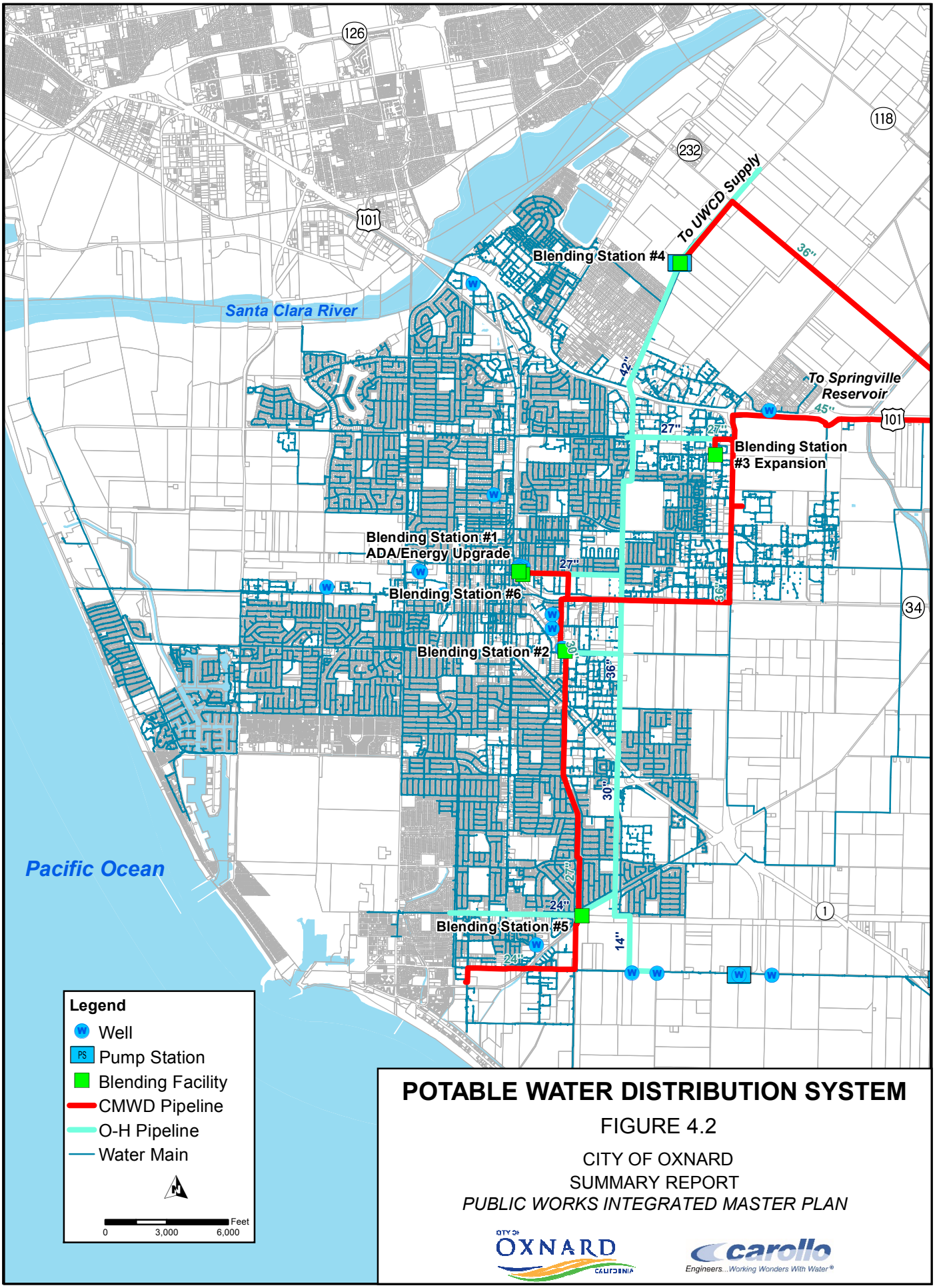

POTABLE WATER DISTRIBUTION SYSTEM

FIGURE 4.2

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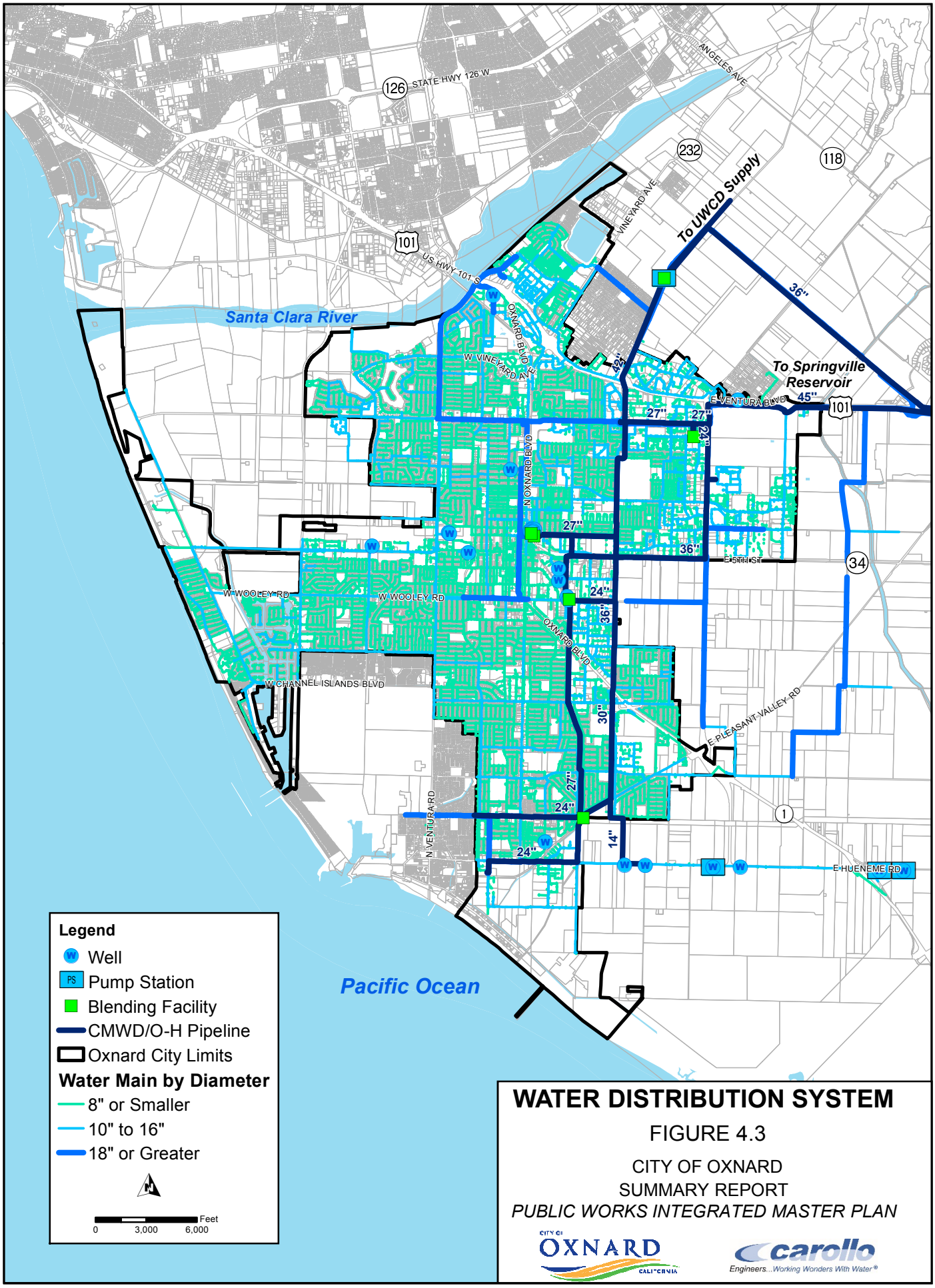
Table 4.1 Blending Station Facility Summary
Public Works Integrated Master Plan
City of Oxnard

	BS No. 1	BS No. 2	BS No. 3	BS No. 4	BS No. 5	BS No. 6
Location	Third Ave. & Hayes	E Wooley & Richmond Rd	Southwest of Gonzales Rd and Rice Ave.	N Rose Ave South of Central Ave.	Pleasant Valley Rd East of Saviers Rd.	Co-Located with BS No. 1
Status	Operational	Stand-By	Operational	Operational	Operational	Operational
Construction Date	1900 Updates in 1965, 1986, 2008	1971	1975 Update in 2006	1994	2007	2010
Local Wells Available	**Yes**	**No**	**Yes**	**No**	**No**	**Yes**
Well No. - Capacity gallons per minute (gpm)	20 – 2,900 22 – 3,000 23 – 2,800	--	28 – 2,000 29 – 3,000 30 – 2,000 31 – 2,000	--	--	32 – 2,000(1) 33 – 3,000(1) 34 – 2,500(1)
Total Well Capacity, mgd	12.5	--	13	--	--	10.8
Imported Water Available						
CMWD Capacity, mgd	29.5	18.7	42	27.8	8	--
UWCD Capacity, mgd	29.5	27.8	29.5	30.2	8	--
Treatment	**Yes**	**No**	**Yes**	**No**	**No**	**Yes**
Type	Desalting [reverse osmosis(RO)] & Chloramination	--	Chloramination	--	--	Desalting [reverse osmosis(RO)] & Chloramination
Capacity, mgd	--	--	--	--	--	7.5 (permeate)
Permeate Storage, gallons	--	--	--	--	--	600,000
Backup Generator	Yes 3 @ 750 kW	No --	Yes 1 @ 1,000 kW	Yes 1 @ 500 kW	No --	No --

Notes:

(1) These wells are fed directly to the desalter at BS No. 6. Due to water quality, the wells are not able to blend directly into the City's distribution system.



WATER DISTRIBUTION SYSTEM

FIGURE 4.3

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4.2.4 Condition Assessment

A condition assessment was conducted to identify rehabilitation and replacement (R&R, or renewal) needs for the City's water system. For this effort, asset management methodology was used to identify existing water assets and to conduct a visual condition assessment of above-ground assets. The effort also included an evaluation of structures, a desktop evaluation of below-ground assets, and a cathodic protection system evaluation.

To prioritize the R&R needs, a risk assessment was also conducted that examined the vulnerability (likelihood of failure) and criticality (consequence of failure) for each asset. Consistent risk scoring methodology was applied to both above- and below-ground assets to prioritize each asset type.

4.2.4.1 Above Ground Assets

In total, 165 above-ground assets were assessed, including structures and equipment owned and operated by the City. Specifically, Carollo observed approximately 11 building structures, 41 pumps, 16 wells, and a variety of other assets, with the recorded age of each asset varying from 1965 to the present. Each asset was placed into an inventory and categorized according to its asset type and discipline.

Table 4.2 lists the assets with the highest above-ground risk, which was determined from the assessment. The results of the condition assessment analysis are as follows:

- Water Campus BS No. 1/6 – fair to good condition with a few exceptions noted in Table 2.
- BS No. 2 – fair to poor condition.
- BS No. 3 – fair to very good condition, with two wells (Well Nos. 30 and 31) in need of minor rehabilitation.
- BS No. 4 – fair to poor condition, with three Variable Frequency Drives (VFDs), two pumps, electrical equipment, and a central valve train in disrepair.
- BS No. 5 – fair to good condition.
- Wells – fair to good condition, except as noted in Table 4.2.

Table 4.2 Highest Above-Ground Risk Assets
Public Works Integrated Master Plan
City of Oxnard

Site/Asset	Risk[(1)]
Blend Station 2	
Supervisory Control and Data Acquisition (SCADA) System	2.01
Water Campus (BS1 and BS6)	
RO Building RO Filter (#1-3)	0.48
RO Building Cartridge Filter (#1-4)	0.48
Chemical Building Lab PLC	0.33

Table 4.2 Highest Above-Ground Risk Assets Public Works Integrated Master Plan City of Oxnard	
Site/Asset	**Risk[(1)]**
Well 18	
Motor Control Center (MCC) Single Box	0.40
Pump	0.36
Well 27	
MCC Cabinet	0.40
Pump	0.36
Blend Station 4	
Standby Generator	0.30
MCC	0.30
Switchboard	0.30

Note:

(1) Risk = Criticality x Vulnerability; Criticality = consequence of failure; Vulnerability = likelihood of asset failure.

4.2.4.2 Below-Ground Assets

Using GIS data of the Oxnard distribution system, a desktop evaluation was conducted on the City's below-ground water system assets. The dataset included information on the diameters and materials used for 30,632 of the 39,341 segments. The year of installation for each asset was available for 38,065 of the 39,341 segments.

A pipe's useful life will vary based on several factors, with pipe age and material the easiest to quantify. The majority (72 percent) of the City's distribution piping is of two types: asbestos cement pipe and polyvinyl chloride, which have relatively long useful lives of 65 and 85 years, respectively. However, approximately 87 percent of the asbestos cement pipe installed in the City is more than 30 years old. The polyvinyl chloride piping is relatively newer, with the majority installed within the last 20 years.

4.2.5 Cathodic Protection

A survey was conducted on the City's water infrastructure to assess the existing level of cathodic protection. From this assessment, the following improvements were identified:

- Several Key Pipelines: Install new test stations and replace rectifiers and anode-ground beds (Del Norte Pipeline, Oxnard Conduit, Wooley Road/United, 3rd Street Lateral, Industrial Lateral).

- Water Treatment Facility at BS No. 1/6: Investigate requirements of electrical isolation and cathodic protection (CP) of buried piping; design and install as needed.

- 600,000 Gallon Steel Water Tank at the Water Treatment Facility: Install internal CP system.

In addition to these projects, conducting an annual cathodic protection survey, providing a report for all City facilities, and bi-monthly rectifier monitoring is also recommended in the Integrated Master Plan.

4.2.6 Electrical Systems Protection

A study of the electrical systems for the existing six blending stations was performed. The study included a short circuit study, a protective device coordination evaluation, and an arc flash evaluation.

These evaluations were performed for distinct reasons. The short circuit study determined the short circuit current available at each piece of electrical equipment and identified underrated equipment. The protective device coordination evaluation identified protective devices (circuit breakers, fuses, etc.) that were not coordinated in the electrical system and might not minimize disruption of electrical power during a short circuit. The arc flash evaluation determined the maximum arc flash incident energy at each piece of electrical equipment and identified appropriate personnel protective equipment to be worn if work is performed on the equipment while it is being energized.

The results of the electrical systems investigation were then used to develop the electrical system study for each site. Study results identified pieces of existing electrical distribution equipment not sufficiently rated for the worst-case short circuit current and showed the arc flash incident energy at each piece of electrical equipment based on the existing protective device settings.

Concerns and code violations in the existing electrical equipment installations were observed and documented. Obsolete equipment and equipment nearing the end of its useful life were identified, as were equipment in need of repair and possible changes in the existing installation from code violations, such as equipment needing painting or relocation or incorrectly labeled equipment.

4.2.7 Operational Approach and Strategy of Existing System

Generally, the blending stations are operated to provide a target blended water quality and to meet system pressures. Table 4.3 shows the overall production breakdown by blending station as well as the approximate blend of the three major sources at each blending station.

Table 4.3 Operational Approach to Blend Station Source Breakdown[1] Public Works Integrated Master Plan City of Oxnard						
	BS No. 1	**BS No. 2**	**BS No. 3**	**BS No. 4**	**BS No. 5**	**Desalter Permeate Flow[2]**
Overall Annual Production[3]	23%	0.1%	30%	13%	3%	13%
Production by Source						
CMWD	22%	39%	47%	53%	46%	0%
UWCD	60%	61%	26%	47%	54%	0.5%
Local Wells	18%		27%			99.5%

Notes:

(1) Based on annual average production data provided by the City from 2009-2012.
(2) Based on permeate from the BS No. 6 desalter.
(3) For these to add up to 100 percent, contributions to industrial from UWCD (4 percent) and CMWD (13 percent) need to be added.

4.3 WATER SUPPLY

As noted, the City obtains drinking water from three primary sources: local groundwater, groundwater from the UWCD, and water imported from the CWMD. A thorough analysis of the City's water supply is included in the *2010 Urban Water Management Plan* (Kennedy/Jenks, 2012). Relevant information from that study was summarized and updated, as necessary, for use in this Plan.

4.3.1 Historical/Existing Supply

Table 4.4 summarizes the City's historical and current water supply allocations. This information was derived from the 2010 Urban Water Management Plan and was updated throughout the Integrated Master Plan development process with the most current information known at the time of development.

Table 4.5 presents the historical water production from 2002 through 2013 according to water supply source. As shown in the table, the City's total water supply has remained relatively constant between 2002 and 2013, fluctuating only between 26,919 and 28,826 acre feet per year (AFY). The annual water supply in 2013 was 28,443 AFY, or 25.4 mgd.

Table 4.4 Current Water Supply Allocations
Public Works Integrated Master Plan
City of Oxnard

Source	Type of Source	Transport Facility Details	Historical Source Allocation	Current Source Allocation
Local Wells	Groundwater	10 wells	• Baseline: 936 AFY(1) • Historical Pumping: 11,205 AFY(1) • One-Time Ferro Pit Credit: 11,000 AFY + 1,000 AFY per year (2012 – 2019)(1) • 700 AFY Transfer from Port Hueneme Water Agency (PHWA) (2002 Three-Party Agreement)(1)	• 7,186 AFY(2) • 700 AFY Transfer from (PHWA) (2002 Three-Party Agreement)
Calleguas Municipal Water District	Surface Water	Treated State Water Project water via Springville Reservoir and the Oxnard and Del Norte Conduits (36 inch)	Tier 1 Entitlement of 17,379 AFY(3)	Tier 1 Entitlement of 13,826 AFY(4)
United Water Conservation District	Groundwater	Oxnard-Hueneme Pipeline (42 inch)	• 9,378 AFY(5)	• 7,328 AFY(1)

Notes:

(1) Based on historical pumping.
(2) Groundwater pumping allocations have been reduced due to Emergency Ordinance E, Temporary Emergency Allocation.
(3) Tier 1 water (from Metropolitan Water District of Southern California) corresponds to the amount "contracted for" by the City. It is in essence a capacity reservation and includes the water being delivered to PHWA.
(4) Based upon current planning efforts for 2015 Urban Water Management Plan.
(5) Based upon "new" historical pumping (from Jan 1, 2003, to Dec 31, 2012) as noted in the Emergency Ordinance E.

According to Table 4.4 and Table 4.5, the City generally uses less water than allocated from the three main uses, with some exceptions. Historic use is factored into water supply availability in the future.

Table 4.5 Historical Annual Water Supply by Source
Public Works Integrated Master Plan
City of Oxnard

Year	Groundwater[(1)] (AFY)	UWCD Water (AFY)	CWMD Water (AFY)	System Total (AFY)
2002	6,971	7,067	13,170	**27,208**
2003	6,784	8,834	11,302	**26,919**
2004	12,743	3,820	11,717	**28,279**
2005	12,933	3,159	11,262	**27,354**
2006	14,056	4,001	9,964	**28,021**
2007	440	16,660	11,453	**28,552**
2008	4,245	9,863	13,573	**27,681**
2009	7,478	13,036	8,311	**28,826**
2010	7,172	10,852	9,769	**27,793**
2011	10,731	6,372	10,549	**27,652**
2012	5,174	9,828	12,538	**27,539**
2013	5,748	9,424	13,271	**28,443**

Note:
Source: Production data provided by the City.
(1) Includes water lost to brine from the City's desalter.

4.3.2 Historical/Existing Supply Quality

As noted in Section 4.2.7, the water quality of the blended sources dictates the amount of water drawn from each source, making it central to the water system's operation.

TDS is the primary driver for water quality. For TDS, the system produces a blended water quality of less than 700 mg/L. Although hardness is not currently a driver, it will likely be in the future. Table 4.6 summarizes the water quality of the various sources available to the City.

Table 4.6 Water Quality of Existing and Potential Sources of Water Public Works Integrated Master Plan City of Oxnard			
Source	**TDS, mg/L**	**Hardness, mg/L**	**Nitrate, mg/L**
CMWD(1)	350	120	10-60
UWCD(2)	1,000	530	22-50
Local Wells(3)	1,200	700	31
AWPF Effluent	50(4)	80(5)	--
Current Blended Distribution System(6)	700	350	<45

Notes:

(1) Based on CMWD's 2013 Annual Water Quality Report.
(2) Based on UWCD historical water quality data from 2009-2014.
(3) Based on local well water quality data from 2013-2104 and the City of Oxnard's 2013 Annual Water Quality Report.
(4) Based on AWPF 2015 monitoring data.
(5) Based on AWPF pilot performance.
(6) Based on the City of Oxnard's Annual Report Data.

4.3.3 Projected Supply

The City's available water supply was projected from 2015 to 2040, which is the end of the planning horizon. This projection was predicated on the following assumptions:

- Imported surface water from CMWD remains equal to the historical allocation.
- Groundwater pumping is restricted to between 50 and 75 percent of historical allocation by the Fox Canyon Groundwater Management Agency (FCGMA).
- Future additional groundwater credits are not reliable and are therefore not included.
- Pump-back allocation for any recycled water (RW) supplied to agricultural users will be at a 1:1 ratio, with a maximum of 5,200 AFY available.

Table 4.7 and Table 4.8 summarize the existing and projected available water supply for the two groundwater pumping restriction assumptions: low (75 percent) and high (50 percent), respectively.

Table 4.7 Summary of Projected Supply (assuming Low Groundwater Pumping Restriction[1])
Public Works Integrated Master Plan
City of Oxnard

Supply	Historical Allocation	Projected Supply/Demand (AFY)					
		2015	2020	2025	2030	2035	2040
Local Groundwater[2]	12,456	7,348[11]	9,581	9,581	9,581	9,581	9,581
Baseline	*954*	--	*954*	*954*	*954*	*954*	*954*
Historical Use	*11,502*	--	*8,627*	*8,627*	*8,627*	*8,627*	*8,627*
UWCD[3]	9,070	7,161[11]	6,803	6,803	6,803	6,803	6,803
CMWD[4]	12,500	13,826	13,826	13,826	13,826	13,826	13,826
Ag Development Re-Allocation[5]		0	149	376	603	830	1,057
Subtotal Supply		**28,335**	**30,359**	**30,586**	**30,813**	**31,040**	**31,267**
Recycled Water Offset[6]		--	1,475	1,475	1,475	1,475	1,475
Loss (Brine)[7]		(800)	(1,890)	(1,890)	(1,890)	(1,890)	(1,890)
Total Firm Supply		**27,535**	**29,944**	**30,171**	**30,398**	**30,625**	**30,852**
Other Potential Supplies							
PHWA Exchange[8]		700	700	700	700	700	
RW Pump Back Allocation[9]		--	3,620	3,620	3,620	3,620	3,620
Good Deeds Trust[10]		1,000					
Total Potential Supply		**29,235**	**34,264**	**34,491**	**34,718**	**34,945**	**34,472**

Notes:
(1) A restriction in the groundwater pumping of 75 percent of historical allocation (regulated by the FCGMA) is assumed on all groundwater sources, unless otherwise noted.
(2) The City's groundwater allocation is made up of a baseline and historical use allocation. The assumed FCGMA restriction on groundwater pumping is applied to the historical allocation only.
(3) The assumed FCGMA restriction is applied to the historical UWCD allocation.
(4) CMWD projection Tier 1 allocation as of Jan 1, 2015. It does not include 4,700 AFY allocated to PWHA.
(5) Estimate for ag reallocation is based on planned ag conversion acreage through 2040 and on using a reallocation factor of 1 AFY per acre converted.
(6) Based on contracts as of 2015; does not account for future urban or ag uses at this time. For details, see PM 4.2.
(7) Based on an existing (as of 2015) desalting capacity of 7.5 mgd (8,400 AFY).
(8) Annual transfer of FCGMA credits from PWHA, per 2002 Three Party Water Supply Agreement.
(9) Based on a 1:1 pump-back allocation ratio of RW supplied to ag users (Southland, Houweling, Reiter, and River Ridge Golf Course).
(10) Only through 2019. UWCD has not transferred the allocation since 2013, and the City has requested a refund for payments made.
(11) Based on Emergency Ordinance E, Temporary Allocations.

Table 4.8 Summary of Projected Supply (Assuming High Groundwater Pumping Restriction[1])
Public Works Integrated Master Plan
City of Oxnard

Supply	Historical Allocation	Projected Supply/Demand (AFY)					
		2015	2020	2025	2030	2035	2040
Local Groundwater[2]	12,456	7,348[11]	6,705	6,705	6,705	6,705	6,705
Baseline	*954*	--	*954*	*954*	*954*	*954*	*954*
Historical Use	*11,502*	--	*5,751*	*5,751*	*5,751*	*5,751*	*5,751*
UWCD[3]	9,070	7,161[11]	4,535	4,535	4,535	4,535	4,535
CMWD[4]	12,500	13,826	13,826	13,826	13,826	13,826	13,826
Ag Development Re-Allocation[5]		0	149	376	603	830	1,057
Subtotal Supply		**28,335**	**25,215**	**25,442**	**25,669**	**25,896**	**26,123**
Recycled Water Offset[6]		--	1,475	1,475	1,475	1,475	1,475
Loss (Brine)[7]		(800)	(1,890)	(1,890)	(1,890)	(1,890)	(1,890)
Total Firm Supply		**27,535**	**24,800**	**25,027**	**25,254**	**25,481**	**25,708**
Other Potential Supplies							
PHWA Exchange[8]		700	700	700	700	700	
RW Pump Back Allocation[9]		--	1,810	1,810	1,810	1,810	1,810
Good Deeds Trust[10]		1,000					
Total Potential Supply		**29,235**	**27,310**	**27,537**	**27,764**	**27,991**	**27,518**

Notes:
(1) A restriction in the groundwater pumping of 50 percent of historical allocation (regulated by the FCGMA) is assumed on all groundwater sources, unless otherwise noted.
(2) The City's groundwater allocation is made up of a baseline and historical use allocation. The assumed FCGMA restriction on groundwater pumping is applied to the historical allocation only.
(3) The assumed FCGMA restriction is applied to the historical UWCD allocation.
(4) CMWD projection is based on Tier 1 allocation as of Jan 1, 2015. It does not include 4,700 AFY allocated to PWHA.
(5) Estimate for ag re-allocation is based upon planned ag conversion acreage through 2040 and using a re-allocation factor of 1 AFY per acre converted.
(6) Based on contracts as of 2015; does not account for future urban or ag uses at this time. For details, see PM 4.2.
(7) Based on existing (as of 2015) desalting capacity of 7.5 mgd (8,400 AFY).
(8) Annual transfer of FCGMA credits from PWHA, per 2002 Three Party Water Supply Agreement.
(9) Only through 2019. UWCD has not transferred the allocation since 2013 and the City has requested a refund for payments made.
(10) Based on a 0.5:1 pump-back allocation ratio of RW supplied to ag users (Southland, Houweling, Reiter, and River Ridge Golf Course).
(11) Based on Emergency Ordinance E, Temporary Allocations.

4.4 WATER DEMANDS

Water demands represent water that leaves the distribution system through metered connections, unmetered connections, pipe joints (leaks), or breaks. Water demands occur throughout the distribution system and are based on the number and type of consumers in each location.

4.4.1 Historical Water Demands

The City has provided historical customer billing records per account for 2002 through 2012. These records are summarized in Table 4.9 and Figure 4.4.

As shown in Table 4.9, residential is the largest category of the City's demands, with the combined single- and multi-family water demand comprising 53 percent of the City's total demand. This percentage is relatively low because industrial users have high demands, with Proctor and Gamble alone generating 8.5 percent of demand. Other users make up 5.8 percent.

Figure 4.4 illustrates the seasonal demand categorized according to use type. Since most commercial and multi-family residential sites will also include a separate irrigation meter, commercial and multi-family residential demands are fairly consistent throughout the year. Seasonal peaking is most pronounced in the single family residential, industry (other than Proctor and Gamble) irrigation, and agricultural use types.

4.4.2 Projected Water Demands

Typically, water demand based on land use is projected from a combination of General Plan information, specific plans, vacant land information, aerial photography, and water demand factors. The City's projected water demands are made up of two main components:

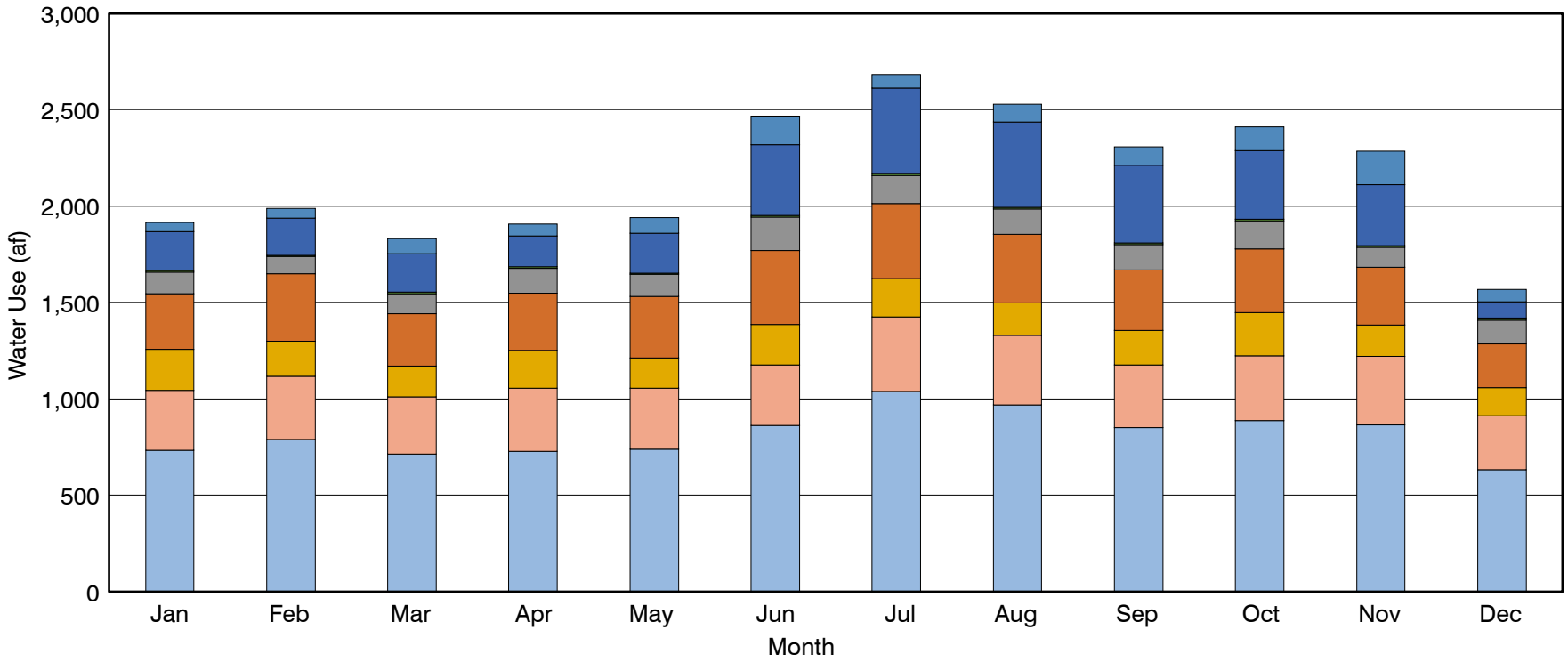
- Residential Development: Future demand estimated using three main factors: 1) projected population increase reported in number of new dwelling units, 2) the population density of the dwelling units (set at 4 persons per dwelling unit), and 3) the water use target (per person).
- Commercial/Industrial Development: Future demand estimated using the City's plans for near-term (through 2020) and long-term (through 2040) developments.

Though residential demand has steadily declined in recent years from drought conditions and a robust conservation program, a water usage target of 132.4 gallons per day per capita (gpcd) was used to estimate future demand. There are two reasons for this. First, the City may see water usage rebound since the recession has ended and the State has enacted mandatory use restrictions because of drought. Second, for the year 2020, the Water Conservation Act of 2009 (Senate Bill X7-7) target is 132.4 gpcd.

Table 4.9 Historical Annual Consumption by Customer Class
Public Works Integrated Master Plan
City of Oxnard

Calendar Year	Annual Demand by Customer Class (AFY)								Total Annual Demand (AFY)
	Single Family Residential	Multi-Family Residential	Commercial	Industrial	Proctor & Gamble	Government	Irrigation	Agriculture	
2002	10,753	4,317	4,089	1,750	2,331	140	2,911	1	26,291
2003	10,694	4,274	3,904	1,791	2,370	152	2,712	1	25,898
2004	11,327	4,339	3,938	1,809	2,309	142	3,396	2	27,262
2005	10,886	4,212	4,040	1,704	2,386	141	3,003	2	26,373
2006	11,153	4,152	4,237	1,689	2,207	155	3,143	2	26,738
2007	11,478	4,114	4,216	1,708	1,618	146	3,529	2	26,811
2008	10,893	4,128	4,083	1,624	1,593	110	3,693	441	26,565
2009	10,608	4,097	3,654	1,225	1,481	88	3,458	1,155	25,766
2010	9,794	3,969	3,459	1,395	3,482	94	3,090	850	26,133
2011	9,679	3,918	3,582	1,319	2,142	95	3,037	1,069	24,842
2012	9,805	3,936	3,834	1,505	2,193	101	3,374	1,086	25,833
% of Total	**38.0%**	**15.2%**	**14.8%**	**5.8%**	**8.5%**	**0.4%**	**13.1%**	**4.2%**	

Note:
Source: Data for January 2002 through December 2012 provided by the City, excluding recycled water demand. Meters are read on a monthly basis. Customer classification was consolidated from the 21 billing classifications the City uses for its billing system.



LEGEND

- Single Residential (LS, S, SH)
- Multi Residential (M, MH)
- P&G (I1)
- Commercial (C, C1, CC, CM)
- Industrial (I, I2, I3)
- Government (CS, GB, SS)
- Irrigation (CI, GI, II)
- Agriculture (A)

HISTORICAL SEASONAL USE CATEGORIZED BY TYPE

FIGURE 4.4

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Population is another key variable in forecasting residential demand. As a result, a sensitivity analysis was developed for the City based on three population forecasts: a high and low population estimate from the City's 2030 General Plan and a 2014 estimate provided by the City's planning department. After discussions with the City, the 2030 General Plan low population estimate was chosen as the appropriate forecast for the water demand estimates, which resulted in a moderately conservative projected demand.

To determine the water usage for the proposed commercial/industrial developments, a water demand factor had to be assigned to each land use type, expressed in gallons per day (gpd)/acre. These were then summarized by near- and long-term developments and added to the residential demand estimates, which resulted in the average annual (AAD) and average day (ADD) water demand projections summarized in Table 4.10.

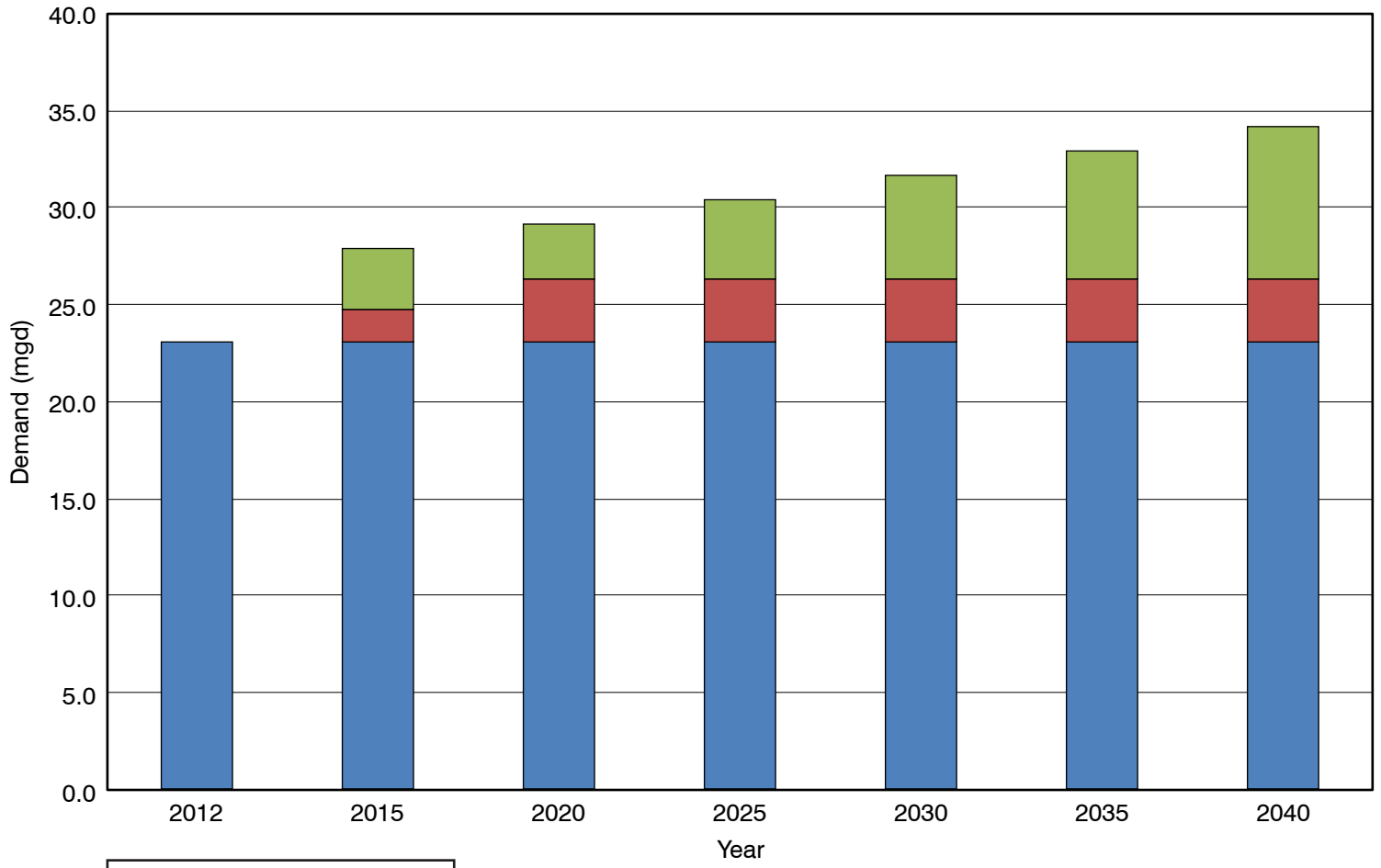
Table 4.10 Water Demand Projections
Public Works Integrated Master Plan
City of Oxnard

Year	2030 GP Population[1]	Per Capita Water Use (gpcd)	AAD[2] (AFY)	ADD (mgd)	MDD[3] (mgd)	PHD[4] (mgd)
2015	210,873	132	31,274	27.9	41.9	62.9
2020	220,248	132	32,664	29.2	43.7	65.6
2025	229,622	132	34,054	30.4	45.6	68.4
2030	238,996	132	35,445	31.6	47.5	71.2
2035	248,370	132	36,835	32.9	49.3	74.0
2040	257,744	132	38,225	34.1	51.2	76.8

Notes:
(1) This is the 2030 GP low population projection.
(2) Average annual demand forecast including residential, commercial, and industrial.
(3) Maximum Day Demand (MDD) estimated using an assumed MDD/ADD factor of 1.5.
(4) Peak Hour Demand (PHD) estimated using an assumed PHD/MDD factor of 1.5.

Peaking factors account for fluctuations in average water demand caused by seasonal or hourly conditions. The peaking factors defined for the Integrated Master Plan include maximum day demand (MDD) and peak hour demand (PHD) periods determined from the historical water system demand data for a select period and by dividing the quantity by the ADDs. Table 4.10 shows the resulting flows for MDD and PHD.

Figure 4.5 graphically shows the contributions of existing near- and long-term development customers to the total forecasted water demands. Approximately 11 mgd is associated with new developments, which equates to about 30 percent of the total 2040 demand.



NEAR- AND LONG-TERM PROJECTED WATER DEMANDS

FIGURE 4.5

CITY OF OXNARD
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4.5 MASTER PLAN/DESIGN CRITERIA

Table 4.11 summarizes the key planning and design criteria used to evaluate the existing water system's ability to meet the future demand needs. These criteria were then used to evaluate alternatives and plan for future system improvements.

Table 4.11 Planning/Design Criteria for Water System Public Works Integrated Master Plan City of Oxnard

Description	Value	Units
Source Water Use Priority		
Local Groundwater	1	--
Recycled Water (AWPF Effluent)	2	--
UWCD	3	--
CMWD	4	--
Groundwater Allocation Assumptions		
FCGMA Pumping Allocation	50-75% of historical(1)	--
FCGMA Pump-Back Allocation	1:1	--
Groundwater credits	None	--
Blended Water Quality Objectives/Targets		
TDS	500	mg/L
Hardness	100	mg/L
Nitrate	45	mg/L
All Public Health Goals	Meet	--
Distribution System Pressure Criteria		
Max, without Service Lateral Pressure Regulator	80	psi
Max, Triggering Potential Improvements(2)	200	psi
Min, under PHD conditions	50	psi
Min, under MDD + Fire Flow conditions	20	psi
Pipeline Criteria		
Maximum Velocity at PHD	7	fps
Maximum Velocity at MDD + Fire Flow	10	fps
Design Velocity for New Pipelines	7	fps
Hazen-Williams C-factor	130	--
Minimum Size for Pipeline Replacement	8	inches

Table 4.11 Planning/Design Criteria for Water System Public Works Integrated Master Plan City of Oxnard		
Description	**Value**	**Units**
Fire Fighting Requirements		
Open Space / Single Family Residential / Multi-Family Residential	1,000/1,500/2,500	gpm for 2 hours
Commercial; Mixed Use	3,000	gpm for 4 hours
Industrial; Agricultural	4,500	gpm for 4 hours
Storage Volume Criteria		
Operational	25% of MDD	MG
Fire Fighting	Highest fire flow requirement of pressure zone	
Emergency	100% of MDD(3)	MG

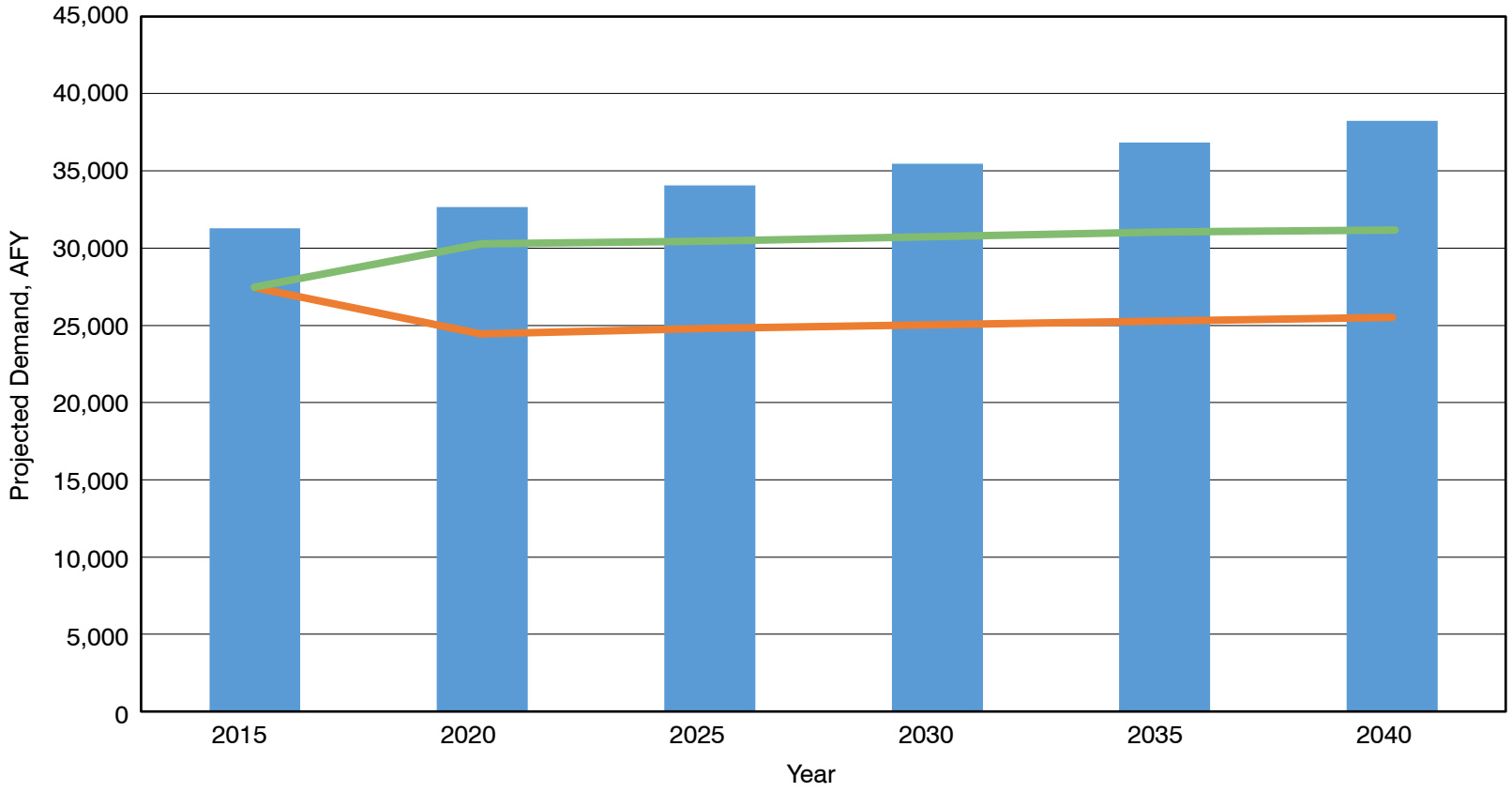
Notes:
(1) 75 percent of historical allocation was used for the alternative supply analysis; 50 percent was used to develop the recommended projects for water supply.
(2) Maximum pressures evaluated under ADD conditions.
(3) The emergency storage is assumed to be stored as groundwater.

4.6 FUTURE FACILITY NEEDS

The existing water system's capacity and performance were compared with the above criteria to identify existing shortfalls in the system. Although the system generally has adequate capacity to meet current demand conditions, it does so with little reliability. Thus, if key components, such as pumps, wells, and/or treatment processes, are in disrepair, meeting demand requirements would be a challenge.

4.6.1 Water Supply

Volume of Supply – Though the City currently meets water demand requirements, projections for the Integrated Master Plan show a potential supply gap of between 3,800 and 10,700 AFY. This gap is based on quantity and groundwater pumping restrictions, which are expected to be between 50 and 75 percent of historical in the long-term. Figure 4.6 graphically compares the projected available supply with demand over the planning horizon.



LEGEND
Projected Total Potable Demand
Projected Supply (GMA 75%)
Projected Supply (GMA 50%)

PROJECTED AVAILABLE WATER SUPPLY VERSUS PROJECTED POTABLE WATER DEMAND OVER THE PLANNING HORIZON (2015 - 2040)

FIGURE 4.6

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Quality of Supply – From a water quality and regulatory standpoint, the system meets current regulations for drinking water quality. However, the City wishes to improve its taste and odor parameters.

Due to hardness in the water, many of the City's customers use point-of-use softeners that return salt to the wastewater system. As a result, the City aims for a more acceptable hardness level in the blended drinking water that would reduce or eliminate the need for point-of-use softeners.

Because the groundwater (both local and UWCD) sources have relatively high hardness levels, the City's desire for a more acceptable hardness level directly affects the water supply analysis. However, the City can use low hardness water from the AWPF through indirect potable reuse (IPR) / direct potable reuse (DPR), which has a hardness of approximately 10 mg/L.

4.6.2 Water Distribution

Although the above discussion focuses solely on water supply, the conveyance (distribution) system was also evaluated for its ability to meet future water demands, and assessing the system's capacity and performance. As with any water distribution system, conducting regular routine maintenance is imperative for maintaining a reliable system for the long term. Routine maintenance includes flushing the water lines, exercising the valves, and also conducting an active leak detection program. These actions along with other required maintenance help to routinely rehabilitate the pipelines thereby extending the useful life of the system. For this evaluation, four major areas were assessed in addition to the R&R needs identified. These areas are as follows:

Capacity Improvements – Pipeline capacity improvements are needed to meet level of service criteria (LOS) and to accommodate growth that requires additional demands to serve new customers. To estimate growth projections, the hydraulic model was run for existing conditions and the years 2020, 2030, and 2040. Pressure and velocity results were also investigated, and when either pressure or velocity exceeded LOS criteria (see Table 4.11), improvements were included to accommodate the demands.

Pressure Zone Separation – Meeting system pressure targets with a single pressure zone is a challenge and is expected to worsen with increased demands. As a result, a pressure zone analysis was conducted using the updated and calibrated system hydraulic model to assess whether the City would benefit from being split into two or three pressure zones.

Hydraulic modeling was conducted under two conditions: PHD conditions to identify minimum system pressures and minimum hour demand (MinHD) conditions to identify maximum system pressures. During PHD conditions, the modeling found pressures under 40 psi in the City's northeastern portion. However, during MinHD conditions, pressures in excess of 80 psi were seen in the City's southern portion. Thus, when considering the

City's target minimum and maximum pressures, pressure zone separation seems warranted.

Fire Flow Requirements – The fire flow analysis tool was used in the system hydraulic model to calculate the available pressure and flow at each fire flow node on a case-by-case basis. Based on this analysis, when each respective fire flow demand was applied, 100 of the 980 fire flow nodes resulted in residual pressures of less than 20 psi. To correct the fire flow conditions for these 100 nodes, 39 projects were identified.

Storage Needs – The City currently has only 600,000 gallons of above-ground engineered storage reservoirs and in addition, relies on the Springville Reservoir (owned by CMWD) for its distribution system storage, with rights to 12.5 MG of the 18 MG reservoir's capacity. As such, an analysis was conducted to determine whether the existing storage is sufficient for operational, fire, and emergency needs. Although the storage requirements used for the analysis were based on MDD, they do vary based on the type of storage considered.

Based on the analysis, by 2040, an additional 1.5 MG of above-ground storage is recommended to meet fire and operational needs. It is assumed that groundwater pumping can provide water under emergency conditions as long as the appropriate redundancy for backup power and sufficient well capacity are provided.

4.6.3 Summary of Needs

Given the water system capacity and performance summary, future facility needs fell within four major categories:

- **Water Supply/Quality** – Includes system improvements needed to help the City maintain a sustainable water supply, meet projected demands, and sustain acceptable water quality through the planning period.
- **R&R** – Includes R&R of both the above- and below-ground assets deemed critical for reliable operation. Additional redundancy and reliability are also needed to provide a sustainable supply.
- **Operations Optimization** – Includes optimization projects that the City and AECOM identified for the City's water system operation.
- **Pressure Zone Separation** – Includes system improvements needed to separate the existing system into four distinct pressure zones.

4.7 ALTERNATIVES ANALYSIS

Although R&R and Operations Optimization are slightly more straightforward, providing a sustainable supply for the City over the planning period is more nuanced. As such, several alternatives were considered in concert with the City's GREAT program, which began nearly a decade ago but was revised based on future needs and projections. These alternatives are briefly described in the following sections.

To reduce the supply gap, the same key sources of the GREAT program (recycled water and groundwater treatment) were the first primary sources considered for the Integrated Master Plan. Although desalination was also considered as another primary source, it was not cost effective at the time compared to other available sources. In addition, some secondary sources/offsets (e.g., conservation, recycled water for irrigation, stormwater, and intertie with Ventura) were considered. However, none were reliable as a primary source.

Given the layout of the City's current water system facilities, the locations of any new facilities, such as additional potable pumps, IPR wells and facilities, and blending stations, were also important to consider. As such, a fatal flaw analysis was conducted of viable locations throughout the City for either groundwater treatment (desalting) or IPR via ASR or groundwater recharge. Table 4.12 summarizes the results of this analysis.

Table 4.12 Priority Locations for Additional Water System Facilities
Public Works Integrated Master Plan
City of Oxnard

Site	Phase	Suitable For?	Reason
Water Campus (BS No. 1/6)	1	ASR and Desalting	Significant existing infrastructure Additional land nearby for purchase.
Campus Park	2	ASR Only	ASR Demonstration Well Site Close proximity to Water Campus.
BS No. 3	3	ASR and Desalting	Significant existing infrastructure Additional land nearby for purchase.
College Park	4	ASR Only	Relatively near to AWPF, less piping needed.
Community Park	4	ASR Only	Located along Recycled Water Backbone System pipeline.
AWPF	Alt.(1)	DPR	Ideally located next to AWPF and connection to potable system.

Notes:
(1) DPR could be an alternative to any of the first 4 sites.

Using the location priorities as a guide and considering the planning criteria established in Table 4.11, the following three main alternatives for a reliable water supply were considered:

- **Alternative 1: Groundwater Treatment Focused** – The premise of this alternative is to maximize groundwater pumping by distributing AWPF effluent to agricultural uses and then pumping an equivalent amount of local groundwater through pump-back allocations to meet potable demand. For this alternative, more potable wells would be needed to increase the overall local groundwater pumping capacity to meet potable demand, and additional desalting capacity would be needed to meet hardness objectives.
- **Alternative 2: Combination of Groundwater and ASR/IPR** – This alternative seeks to add flexibility and resiliency to Alternative 1 by combining the use of additional groundwater pumping and treatment with the use of recycled water by expanding the

IPR/ASR. As part of this alternative, facilities will be needed (in addition to groundwater pumping) to distribute recycled water to meet potable demands to IPR/ASR wellfields. These facilities will then send excess AWPF effluent to agricultural uses for irrigation.

Using AWPF effluent through IPR/DPR will dramatically improve the overall blended water quality related to TDS and hardness. However, because local groundwater pumping will increase, this alternative would also require adding desalting capacity to meet the hardness objectives.

- **Alternative 3: ASR/IPR Focused** – Alternative 3 seeks to maximize use of the AWPF by sending as much effluent to IPR/ASR wells and using the IPR to meet all additional potable water demands. For this alternative, groundwater pumping/treatment would still be utilized and expanded but not to the degree of the other alternatives. Water from the IPR/ASR wells would serve to meet additional potable demands and hardness objectives.

Each alternative was developed to include major conveyance and treatment facilities needed for complete operation and was projected to supply an equivalent blended water quality that would meet the target water quality objectives (shown in Table 4.11).

In addition, the three alternatives were evaluated for their lifecycle cost estimates, energy comparisons, water quality considerations, and other non-economic factors. Table 4.13 summarizes the lifecycle costs of the alternatives, and Table 4.14 contains the results of the overall alternative comparison, including non-economic considerations.

Table 4.13 Comparison of Water Supply Alternative Costs(1)
Public Works Integrated Master Plan
City of Oxnard

Cost ($ M)	Alt 1 – GW Treatment Focused	Alt 2 – Combined GW /IPR-ASR	Alt 3 – ASR-IPR Focused
Water System Improvements	$40	$23	$10
Recycled Water System Improvements	$74	$113	$158
Concentrate Conveyance	$20	$20	$20
Total Construction Cost	**$134**	**$156**	**$188**
Total Project Cost(2)	**$175**	**$201**	**$243**
Annual Costs ($ M/yr)			
Annualized Project Cost(3)	$14	$16	$20
Incremental O&M(4)	$19	$19	$19
Total Annual Cost	**$33**	**$35**	**$39**

Notes:
(1) Costs derived using the methodology outlined in Chapter 2.
(2) Project costs include project cost factor (as outlined in Chapter 2) as well as costs for land acquisition.
(3) Annualized at 5 percent over 20 years.
(4) O&M costs include energy, maintenance, and chemicals but do not include labor costs.

According to the economic comparison in Table 4.13, providing water supply through the recycled water system appears to be more costly than through groundwater alone. However, the costs do not necessarily reflect the risks involved with heavy reliance on the local groundwater supply, especially given the FCGMA's recent cutbacks on groundwater pumping. The relative energy use and blended water quality of the three alternatives was not estimated to be significantly different.

Given the overall comparison of alternatives shown in Table 4.14, Alternative 2: Combination of Groundwater (GW) and ASR / IPR might be an advantage. This alternative seems to offer the most reliability and resiliency for addressing future impacts from regulations or climate change while minimizing the risk to future supply. Alternative 2 also allows the City to maintain significant local control of the AWPF, its best water source, while still working with farmers to provide much needed water for irrigation.

Table 4.14 Overall Comparison of Water Supply Alternatives[1]
Public Works Integrated Master Plan
City of Oxnard

No.	Goal	Alt 1 – GW Treatment Focused	Alt 2 – Combined GW /ASR-IPR	Alt 3 – ASR/IPR Focused
PWIMP Overall Goals[2]				
#1	Reliability/Redundancy	+	+++	++
#3	Lifecycle Costs	+++	++	+
#2/4	Energy Use/GHGs	+	++	++
#5	Potable Water Offset	+++	++	+
#5	Groundwater Replenishment	+	++	+++
Water Supply Specific Goals				
	Water Quality	+++	+++	+++
	Maximize GW Pumping	+++	+++	+++
	Minimize Imported Water	++	++	++
	Local Control of Water Supply	+	++	+++
Total		**18+**	**21+**	**20+**

Notes:
(1) "+" = good, "++" = better, "+++" = best.
(2) As summarized in Chapter 2.

4.8 RECOMMENDED PROJECTS

After discussing the results of the above analysis with the City, Alternative 2: Combination of Groundwater and ASR / IPR was chosen as the recommended project for the water system plan. However, given the unknown future of groundwater pumping within the Oxnard Basin, a groundwater pumping allocation of 50 percent of historical was assumed over the long-term (rather than the 75 percent used in the alternative analysis).

This means that approximately 12,000 AFY of additional supply is needed to cover the supply gap projected by 2040. Furthermore, it was assumed that a cap of 5,200 AFY could be presented to farmers with the hope of receiving pump-back groundwater credit. This

means that more ASR wells will be needed to take full advantage of the AWPF effluent for IPR use.

Summarized in the following sections are the recommended projects for the water system's Capital Improvement Plan (CIP), which are based on the existing system condition assessment and capacity as well as the performance needs for meeting projected future demands and water quality objectives. These projects cover the needs through the planning period (2015-2040) and are summarized in Table 4.15 according to the project type or driver. Figure 4.7 illustrates the locations of the recommended water supply projects.

The projects were split into phases that loosely follow the project timing: 1) Phase 1 – Immediate Needs (First 2 years); 2) Phase 2 – Near-Term Needs (Years 2 to 10); and 3) Phase 3 – Long-Term Needs (Beyond 10 years).

The phases presented here are what are recommended based upon the technical needs identified within this assessment. However, the actual timing of implementation may defer when compared and balanced against the financial considerations of total implementation of the Integrated Master Plan. Costs and timing for these projects is summarized under Chapter 9 as well as in the Cost of Service (COS) Rate Study (Carollo, 2015a).

Recycled water projects related to meeting water supply needs (e.g., AWPF expansion, ASR wells, etc.) are summarized in Chapter 6.

4.8.1 Water Supply/Quality

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 BS No. 1/6 and BS No. 3 are the most favorable locations for potable groundwater pumping and have significant infrastructure in place, these were the two sites identified to build new additional potable wells.

In general, most of the City's distribution system can handle current and future demand flows, with the exception of some pipes in the immediate vicinity of the blending stations where velocities exceeded LOS criteria. The list of recommended projects involves replacing these pipes; however, the exact year for replacement still needs to be determined after detailed year-by-year coordination with the other master plans included in the Integrated Master Plan.

Additional desalting of the groundwater will be needed in the future to meet the hardness objective of 100 mg/L. The existing 7.5 mgd desalter located at BS No. 1/6 is built to be expanded to a total permeate capacity of 15 mgd; therefore, expanding the desalter is more cost effective than building desalting capacity at another location.

Table 4.15 Recommended Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
Water Supply/Quality - Treatment					
BS No. 1/6	Add potable water wells	2	5	wells	2,000 gpm (ea.)
BS No. 3	Add potable water well (stainless steel)	2	1	wells	2,000 gpm
BS No. 1/6	Expand existing desalter by 7.5 mgd (split into 2 phases at 3.75 mgd each)	2/3	1	--	Total: 15 mgd
BS No. 1/6	Construct a new permeate storage tank for operational storage	2	1	tank	2.0 MG
BS No. 1/6	Expand existing disinfection	2	1	--	--
BS No. 1/6	New connection to Oxnard-Hueneme (O-H)/UWCD Pipeline	2	--	--	--
Concentrate Conveyance	Construct brine line from OWTP to BS No. 1/6 (14 and 24 inch)	2	32,100	lf	--
Water Supply – Distribution System (Capacity Improvements)					
(Location Varies)	Replace 8" Pipeline	1	322	lf	--
	Replace 12" Pipeline	1	238	lf	--
	Replace 14" Pipeline	1	164	lf	--
	Replace 30" Pipeline	1	3,804	lf	--
	Replace 6" Pipeline	2	69	lf	--
	Replace 8" Pipeline	2	391	lf	--
	Replace 10" Pipeline	2	1,101	lf	--
	Replace 12" Pipeline	2	2,447	lf	--
	Replace 6" Pipeline	3	32	lf	--
	Replace 8" Pipeline	3	233	lf	--
	Replace 10" Pipeline	3	1,243	lf	--
	Replace 12" Pipeline	3	997	lf	--
	Replace 14" Pipeline	3	2,453	lf	--
	Replace 24" Pipeline	3	937	lf	--

Table 4.15 Recommended Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
R&R – Blending Stations/Treatment					
BS No. 1/6	Replace Mechanical, Electrical, and AUX Equipment(1)	1	--	--	--
BS No. 2	Replace Mechanical, Electrical, and AUX Equipment(1)	1	--	--	--
Varies	Make Water SCADA System Improvements	1	--	--	--
BS No. 3	Replace Mechanical, Electrical, and AUX Equipment(1)	2	--	--	--
BS No. 4	Replace Mechanical, Electrical, and AUX Equipment(1)	2	--	--	--
BS No. 5	Replace Mechanical, Electrical, and AUX Equipment(1)	2	--	--	--
BS No. 1/6	Install electrical isolation at all steel and cast iron water risers (2)	2	--	--	--
BS No. 1/6	Add Cathodic Protection System for Steel Storage Tank(2)	2	--	--	--
R&R – Distribution System					
Varies	Replace Automatic Meter Reader (AMR) Devices	1	--	--	--
Del Norte Forced Main	Cathodic Protection - Install 20 missing test stations Replace rectifiers and anodes; resurvey(2)	1	 --	--	--
Oxnard Conduit	Cathodic Protection - Replace deep anode beds and rectifiers #1, #2, and #3 (2)	1	 --	--	--
Wooley Road/United	 Cathodic Protection - Replace 5 test stations Replace rectifier and anode; resurvey(2)	1	 --	--	--

Table 4.15 Recommended Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
3rd Street Oxnard Extension	Cathodic Protection - Replace deep anode bed and rectifier; bond UWCD pipeline to Oxnard extension at rectifier (2)	1	--	--	--
Freemont North Neighborhood	GREAT Program Pipeline Replacements(3)	1	--	--	--
Bryce Canyon South Neighborhood	GREAT Program Pipeline Replacements(3)	1	--	--	--
Redwood Neighborhood	GREAT Program Pipeline Replacements(3)	1	--	--	--
La Colonia Neighborhood	GREAT Program Pipeline Replacements(3)	1	--	--	--
Well 23 & 31 Rehab	Rehabilitate Wells(4)	1	--	--	--
Varies	Electrical and VFD Replacement(4)	1	--	--	--
(Location varies)	Fire Flow Improvements	1			
	Add 8 inch-diameter pipeline		18,500	feet	--
	Add 12 inch-diameter pipeline		13,500	feet	--
	Add 14 inch-diameter pipeline		250	feet	--
Industrial Lateral	Cathodic Protection - Replace all test stations; resurvey(2)	2	--	--	--
Del Norte Force Main	Cathodic Protection - 48" & 36" CMCL PL - Locate and repair discontinuity near the ease end of Del Norte Pl(2)	2	--	--	--
3rd Street Oxnard Extension	Cathodic Protection - Locate and repair discontinuity near Chemical Building at BS No. 1/6(2)	2	--	--	--
Gonzales 36" Pipeline	Replace test station lids and test cathodic protection(2)	2	--	--	--

Table 4.15 Recommended Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
Oxnard Conduit	Install new test stations, conduct CIS, and locate/excavate/bond across approx. Add 3 points of electrical isolation.(2)	2	--	--	--
Del Norte Force Main	Cathodic Protection - Replace rectifiers and anodes; resurvey(2)	3	--	--	--
Del Norte Force Main	Cathodic Protection - Install new test stations and leads(2)	3	--	--	--
Wooley Road/United	Cathodic Protection - Replace test stations and install 2 additional stations(2)	3	--	--	--
Wooley Road/United	Cathodic Protection - Replace rectifier and anode; resurvey(2)	3	--	--	--
(Location Varies)	Age-Based Pipeline Replacements Replace 6" Pipeline	3	109,100	lf	--
	Replace 8" Pipeline		47,000	lf	--
	Replace 10" Pipeline		55,000	lf	--
	Replace 12" Pipeline		24,000	lf	--
	Replace 14" Pipeline		2,300	lf	--
	Replace 16" Pipeline		4,000	lf	--
	Replace 24" Pipeline		3,700	lf	--
	Replace 36" Pipeline		5,000	lf	--
	Replace 42" Pipeline		5,300	lf	--
	Replace 48" Pipeline		3,800	lf	--
Varies	Replace AMR Devices	1	--	--	--
Operations Optimization					
Well Nos. 30, 32, 33 & 34	Electrical Rehabilitation(4)	1	--	--	--
BS No. 1/6	Sodium Hypochlorite Piping Replacement(4)	1	--	--	--
BS No. 1/6	Emergency Turnouts Service(4)	1	--	--	--
BS No. 1/6	Generator and ATS Service(4)	1	--	--	--

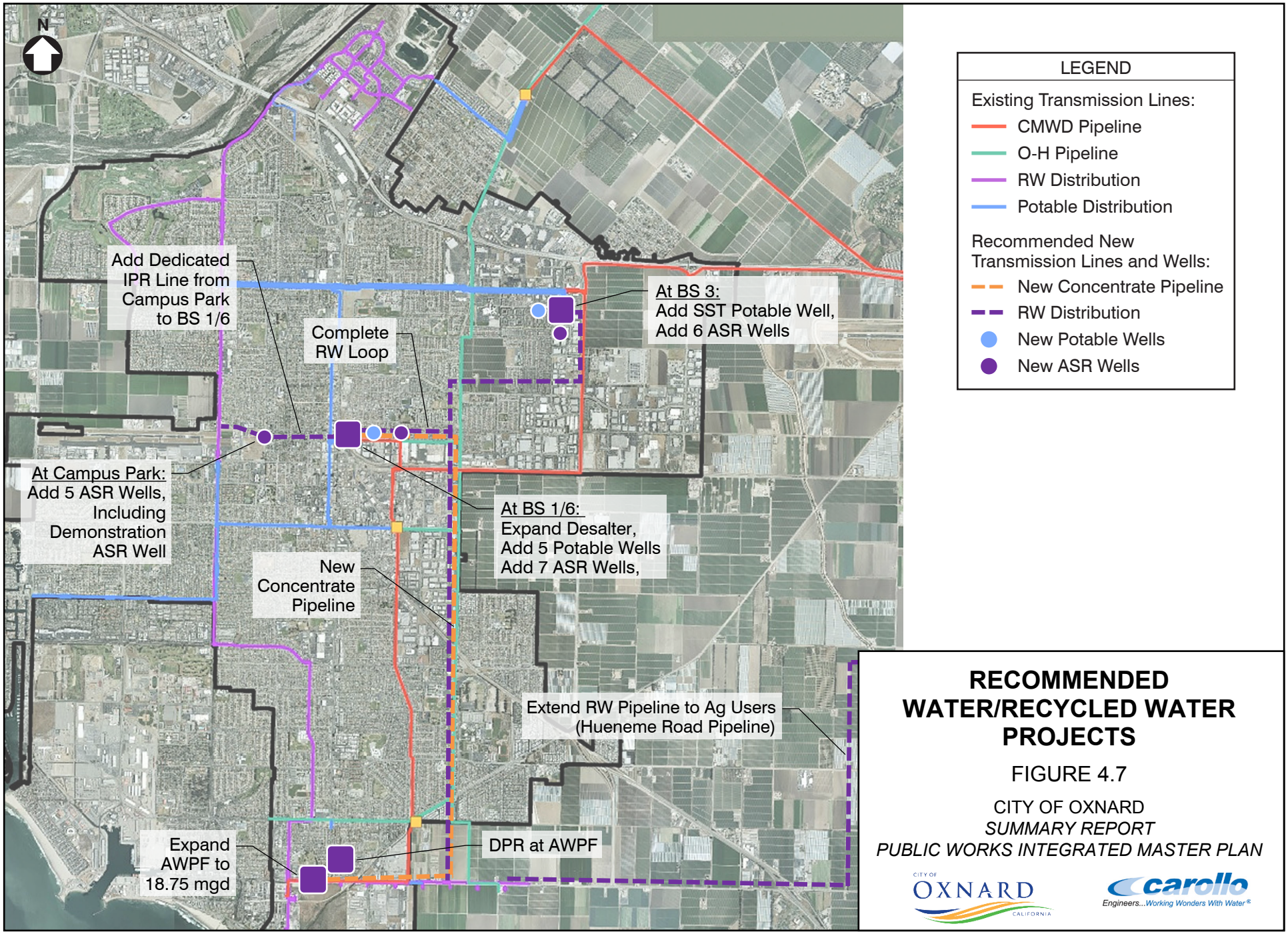
Table 4.15 Recommended Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
Pressure Zone Separation					
North Zone Modification					
Three (3) locations on Gonzalez Road	Rehab 3 Pressure Reducing Station (PRS)	1	3	Valves	--
From BS#3 up Solar Road to Gonzalez Road	BS#3 Reconfigure 24" Pipeline to feed North Zone	1	--	--	--
Along Gonzalez Road	Make Minor Piping Modification	1	--	--	--
Coastal Zone Modification					
Three (3) locations on S. Victoria Avenue	Add 3 new PRS	1	3	Valves	--
S. Victoria Avenue	Add New 8" Parallel Pipeline	1	3,000	lf	--
Along S. Victoria Avenue	Make Minor Piping Modifications	1	--	--	--
South Zone Modifications					
Three (3) locations on E. Pleasant Valley Road	Add 3 new PRS	1	3	Valves	--
E. Pleasant Valley Road	Add New 8" Parallel Pipeline	1	6,000	lf	--
Along E. Pleasant Valley Road	Make Minor Piping Modification	1	--	--	--

Notes:

*General Note: For the pipeline replacement projects, see the hydraulic models developed as part of this integrated master plan to identify the exact pipeline locations. Project costs, schedules, and phasing are based on data and information available at the time of the original publication of the Project Memos (PMs) – December 2015.

(1) Projects based on R&R recommendations done through the Condition Assessment.
(2) Projects developed from the Cathodic Protection Assessments.
(3) As documented in the City's GREAT program CIP, February 18, 2015.
(4) Projects provided by AECOM.



RECOMMENDED WATER/RECYCLED WATER PROJECTS

FIGURE 4.7

CITY OF OXNARD
SUMMARY REPORT
PUBLIC WORKS INTEGRATED MASTER PLAN

CITY OF OXNARD CALIFORNIA

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ox1115f3-9587(SumRepFIG4-7).ai

To avoid taking brine from the desalter back to the OWTP, which would then affect the AWPF effluent and cost of operation, a dedicated concentrate line is recommended. This concentrate line could be routed from the Water Campus (BS No. 1/6) to the City's ocean outfall from the OWTP. However, the use of the City's outfall is predicated on the RWQCB's permit of policy. A possible option to the dedicated concentrate line is a connection to the Salinity Management Pipeline (SMP) and agreement with CMWD.

Figure 4.7 illustrates the locations of the water system improvements recommended for securing the City's water supply. These are also shown in conjunction with the recycled water improvements, since they work in concert with one another.

4.8.2 R&R

A number of R&R related projects were identified through the efforts of this Plan and City staff. These improvements are broken into the two broad categories: above-ground assets (blending station/treatment) and below-ground assets (distribution system piping).

The blending station/treatment R&R includes routine repair and replacement of elements identified through the condition assessment effort and staff input. Replacing the cathodic protection systems is needed for the desalter and steel permeate storage tank, and the water Supervisory Control and Data Acquisition (SCADA) system is slated for complete replacement and upgrade.

In addition, distribution system piping improvements are needed to meet reliability and redundancy and to protect public health. For these improvements, methodically replacing pipes by size and age is proposed. New piping is also recommended to provide adequate fire flow water, and cathodic protection was identified for several key water mains throughout the City. Also, conducting required routine maintenance such as flushing water lines, exercising valves, and leak detection is imperative to continually help to rehabilitate the system and extend its useful life.

4.8.3 Operations Optimization

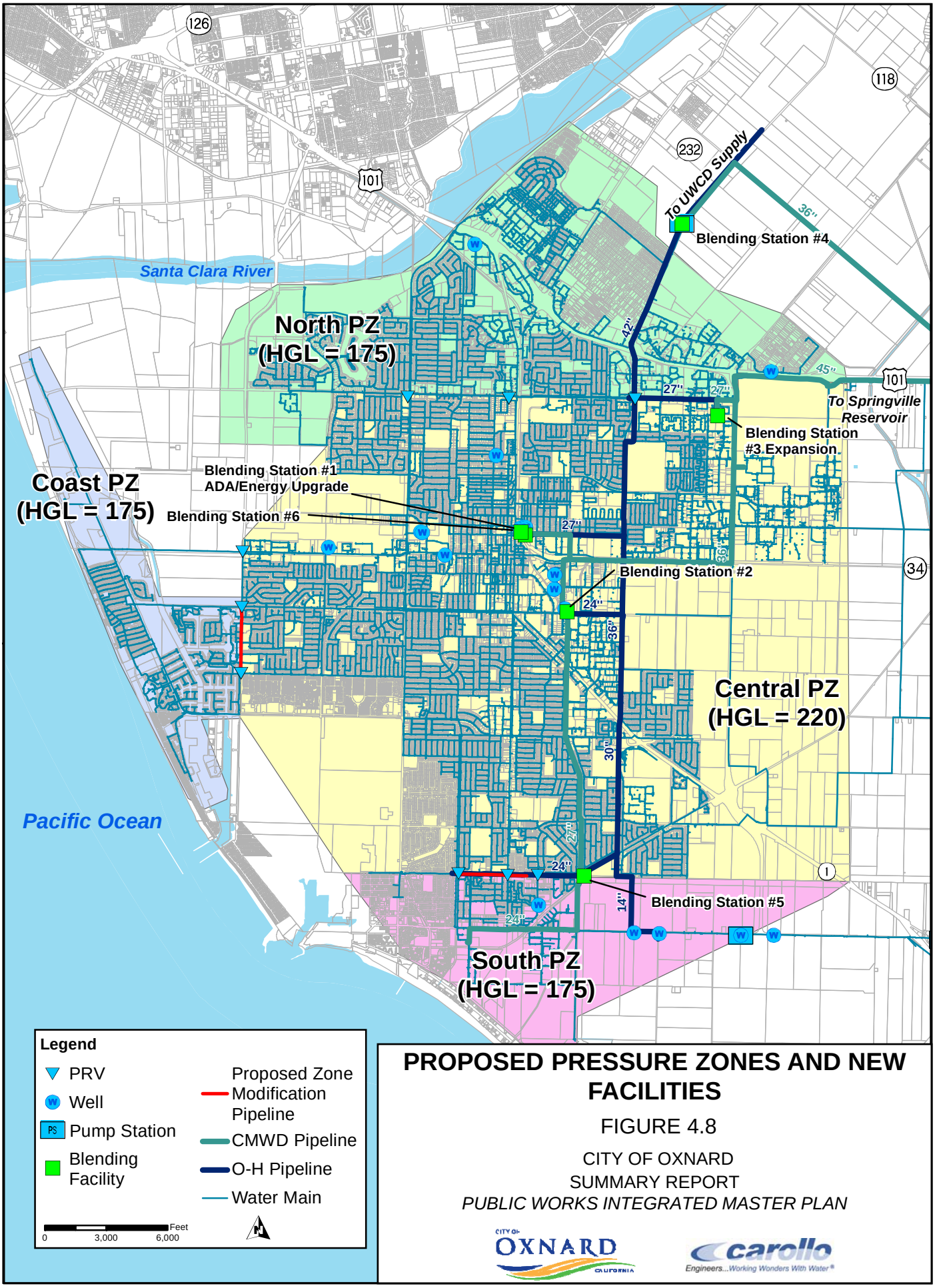
The City is working on several optimization projects for its water system operation. These projects were identified and included as recommended projects in the CIP.

4.8.4 Pressure Zone Separation

Based on the pressure zone analysis, it is recommended that the City reduce service pressures that exist outside of its established delivery pressure criteria by breaking the single pressure zone distribution system into four zones: the North, Coast, Central, and South. Figure 4.8 shows these pressure zone areas. The recommended improvements necessary for this conversion are summarized in Table 4.15.

4.8.5 Implementation Schedule

Figure 4.9 shows the implementation schedule for these water projects in the three phases previously described. Costs for the recommended water projects are summarized in Chapter 9.



PROPOSED PRESSURE ZONES AND NEW FACILITIES

FIGURE 4.8

CITY OF OXNARD
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PUBLIC WORKS INTEGRATED MASTER PLAN

CITY OF OXNARD CALIFORNIA

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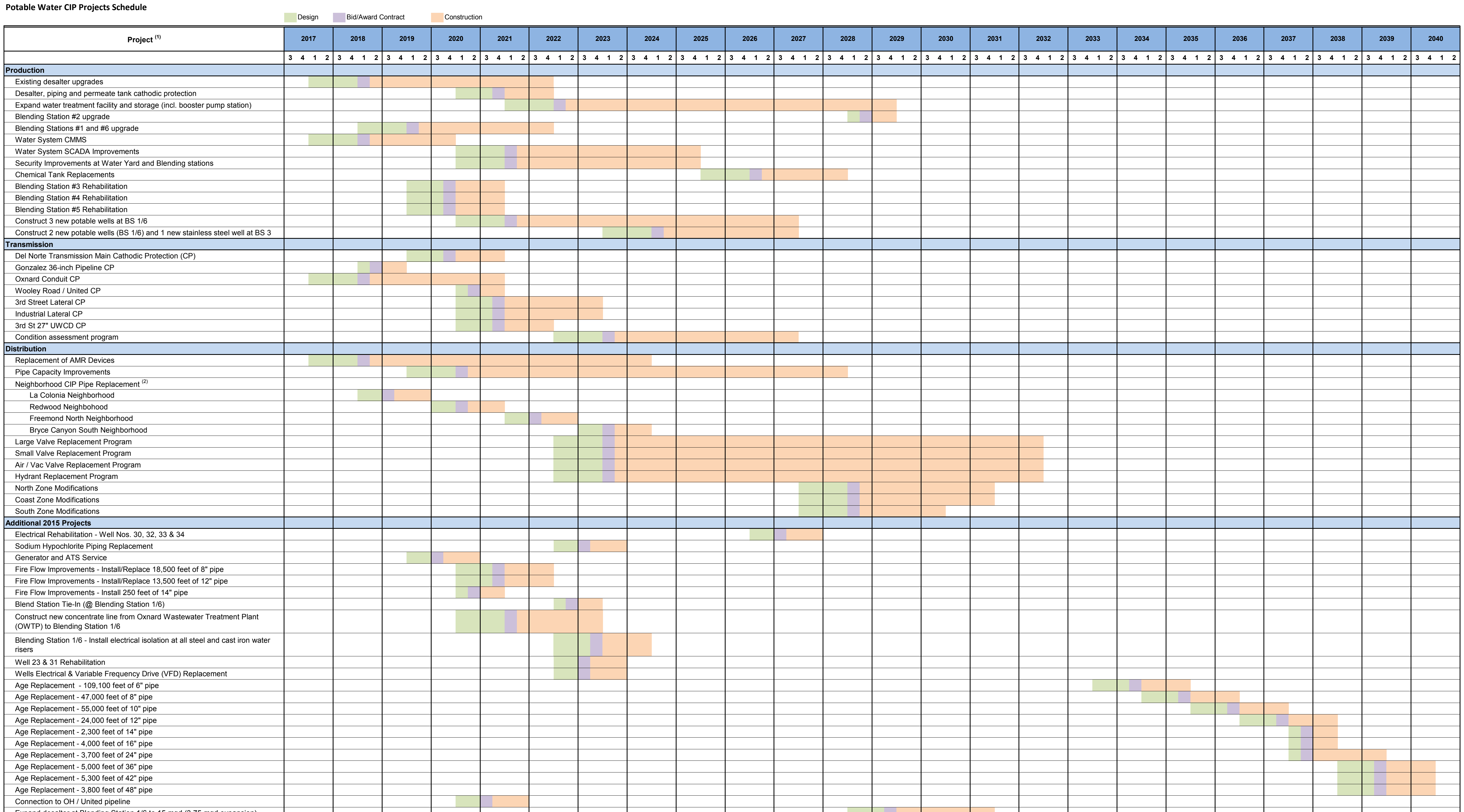

Notes:

(1) Project start years correspond to refinements and updates provided by City after Dec. 2015 publication date.

(2) Neighborhood CIP Replaement projects (La Colonia, Redwood, Freemont North, and Bryce Canyon South neighborhoods) combined into single project.

RECOMMENDED WATER PROJECTS SCHEDULE

FIGURE 4.9

CITY OF OXNARD

SUMMARY REPORT

PUBLIC WORKS INTEGRATED MASTER PLAN

CITY OF OXNARD CALIFORNIA

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WASTEWATER SYSTEM MASTER PLAN

5.1 INTRODUCTION

The City owns and operates the Oxnard Wastewater Treatment Plant (OWTP) and the associated wastewater collection system. Through the OWTP, the City provides wastewater treatment to Oxnard and several surrounding communities (the City of Port Hueneme, the Port Hueneme Water Agency, the Naval Base Ventura County facilities at Port Hueneme and Point Mugu, Ventura Regional Sanitation District, Crestview Mutual Water Company, Nyeland Acres, and Las Posas Estates) and is permitted to discharge treated wastewater to the Pacific Ocean. In addition, a portion of the treated wastewater is used as recycled water after additional treatment through the City's Advanced Water Purification Facility (AWPF).

While considering improvements to the OWTP, a number of goals were established to help develop possible improvement scenarios. Consistent with the overall Master Plan goals established in Chapter 1, the five main goals for the City's wastewater facilities are as follows:

- Goal 1: Provide a compliant, reliable, resilient, and flexible system.
- Goal 2: Manage assets effectively (economic sustainability).
- Goal 3: Mitigate and adapt to the potential impacts of climate change.
- Goal 4: Protect and enhance environmental and resource sustainability.
- Goal 5: Investigate green and gray infrastructure with an emphasis on energy efficiency.

This chapter will provide an overview of the existing wastewater system as well as its strengths and vulnerabilities and the regulatory requirements and climate change issues the system will face. This chapter also provides recommendations for ways to meet the defined goals.

The analysis and evaluations contained in this Summary Report are based on data and information available at the time of the original date of publication of the Project Memos (PMs), December 2015. After development of the December 2015 Final Draft PMs, the City continued to move forward on two concurrent aspects: 1) advancing the facilities planning for the water, wastewater, recycled water, and stormwater facilities; and 2) developing Updated Cost of Service (COS) Studies (Carollo, 2017) for the wastewater/collection system and the water/distribution system. The updated 2017 COS studies contain the most recent near-term Capital Improvement Projects (CIP). The complete updated CIP based on the near-term and long-term projects is contained in Appendix B.

5.2 DESCRIPTION OF EXISTING FACILITIES

5.2.1 Wastewater Collection System

The City's existing sanitary sewer collection system is comprised of roughly 384 miles of gravity collection system pipe ranging from 4 to 60 inches in diameter. As is typical for a

community this size, most of the sewers (67 percent) are 8 inches in diameter and most (70 percent) are made of vitrified clay pipe. The rest (22 percent) are made of polyvinyl chloride.

The City currently operates and maintains 15 lift stations located throughout the City. Except for the Patterson & Hemlock Wastewater Lift Station, which has a wet well configuration, all of the lift stations utilize a submersible pump configuration. All of the pump stations have a duty and a standby pump.

The force mains associated with the wastewater lift stations consist of approximately 4.7 miles of pressurized pipe ranging from 4 to 20 inches in diameter. The majority (67 percent) are 6 and 10 inches in diameter. Force main pipe are between 6 and 46 years old.

Figure 5.1 shows the existing wastewater collection system infrastructure.

5.2.2 Wastewater Treatment Plant

The City's existing OWTP has a permitted capacity of 31.7 mgd and treats wastewater for discharge to the existing ocean outfall. The OWTP provides preliminary, primary, and secondary treatment, which are described below.

Preliminary treatment includes bar screens, screenings conveyance, grit removal, and grit conveyance to remove solids that might damage downstream equipment. After preliminary treatment, flow is gravity fed to the influent pump station wet well, which includes six dry-pit submersible pumps. Three of the six pumps are on duty during normal operations.

From the influent pump station wet well, raw wastewater flows to four primary sedimentation basins for primary treatment. The primary treatment process includes facilities in which ferric chloride are added to enhance sedimentation. A polymer storage and feed system is planned to further enhance primary treatment performance.

After primary treatment, flow enters the secondary treatment system, which uses a fixed-film secondary treatment process followed by an air-activated sludge process to remove organic material. The City’s discharge permit for the facility does not currently require nitrogen or phosphorus removal.

The secondary treatment system is comprised of two biotowers, two three-pass activated sludge tanks (ASTs), and 18 secondary sedimentation basins (SSTs). A plant utility water pumping station is provided downstream of the secondary sedimentation basins.

The maximum hydraulic capacity of the ocean outfall is 50 mgd, so two 2.5-million gallon (MG) secondary effluent equalization basins (EQ Basins) were included as part of the activated sludge facilities to equalize the portion of secondary effluent flows greater than 50 mgd during wet weather events. (Currently, plant staff also operates the EQ Basins during the dry weather season to equalize secondary effluent during the peak power cost period of the day to minimize the cost of final effluent pumping to the ocean outfall.)

Secondary effluent leaving the SSTs and/or EQ Basin either flows by gravity or is pumped through a 48-inch secondary effluent line to two three-pass chlorine contact tanks (CCTs).

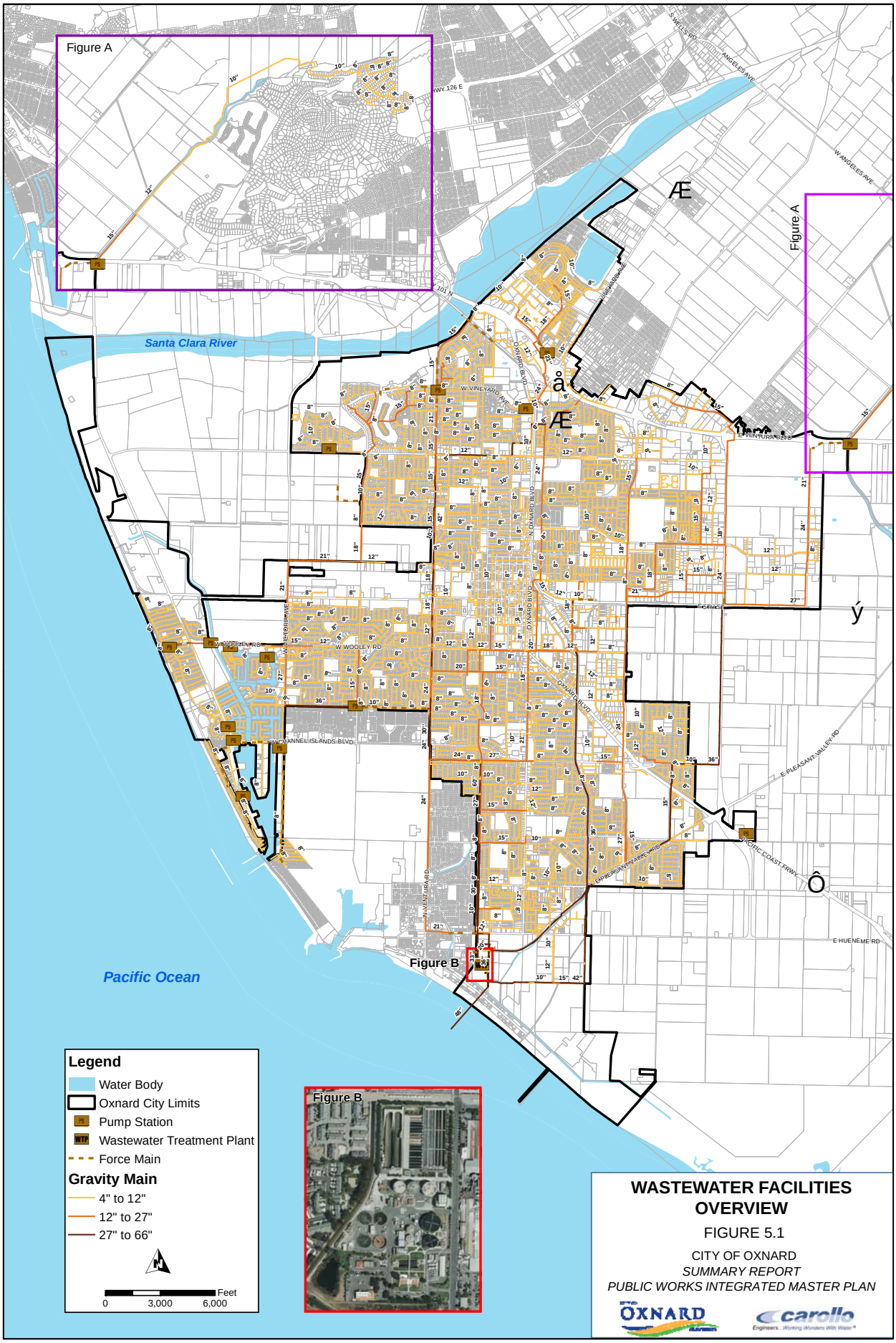
Figure A
Figure A
Santa Clara River
Pacific Ocean
Figure B
Figure B
Legend
Water Body
Oxnard City Limits
Pump Station
Wastewater Treatment Plant
Force Main
Gravity Main
4" to 12"
12" to 27"
27" to 66"
Feet
0
3,000
6,000
WASTEWATER FACILITIES OVERVIEW
FIGURE 5.1
CITY OF OXNARD
SUMMARY REPORT
PUBLIC WORKS INTEGRATED MASTER PLAN
OXNARD
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Each pass is 145 feet long. Disinfected effluent is then pumped to the 6,800-linear feet (1.3 mile) ocean outfall from the effluent pump station, which has two engine-driven pumps, two electric motor variable frequency drive (VFD) pumps, and an additional motor-driven pump.

The solids handling facilities consist of 2 gravity thickeners for primary sludge thickening, two dissolved air flotation thickeners (DAFTs) for waste activated sludge (WAS) thickening, three anaerobic digesters, and 4 belt filter presses (BFPs) for dewatering.

Table 5.1 summarizes basic design criteria for the OWTP and Figure 5.2 provides a process flow schematic.

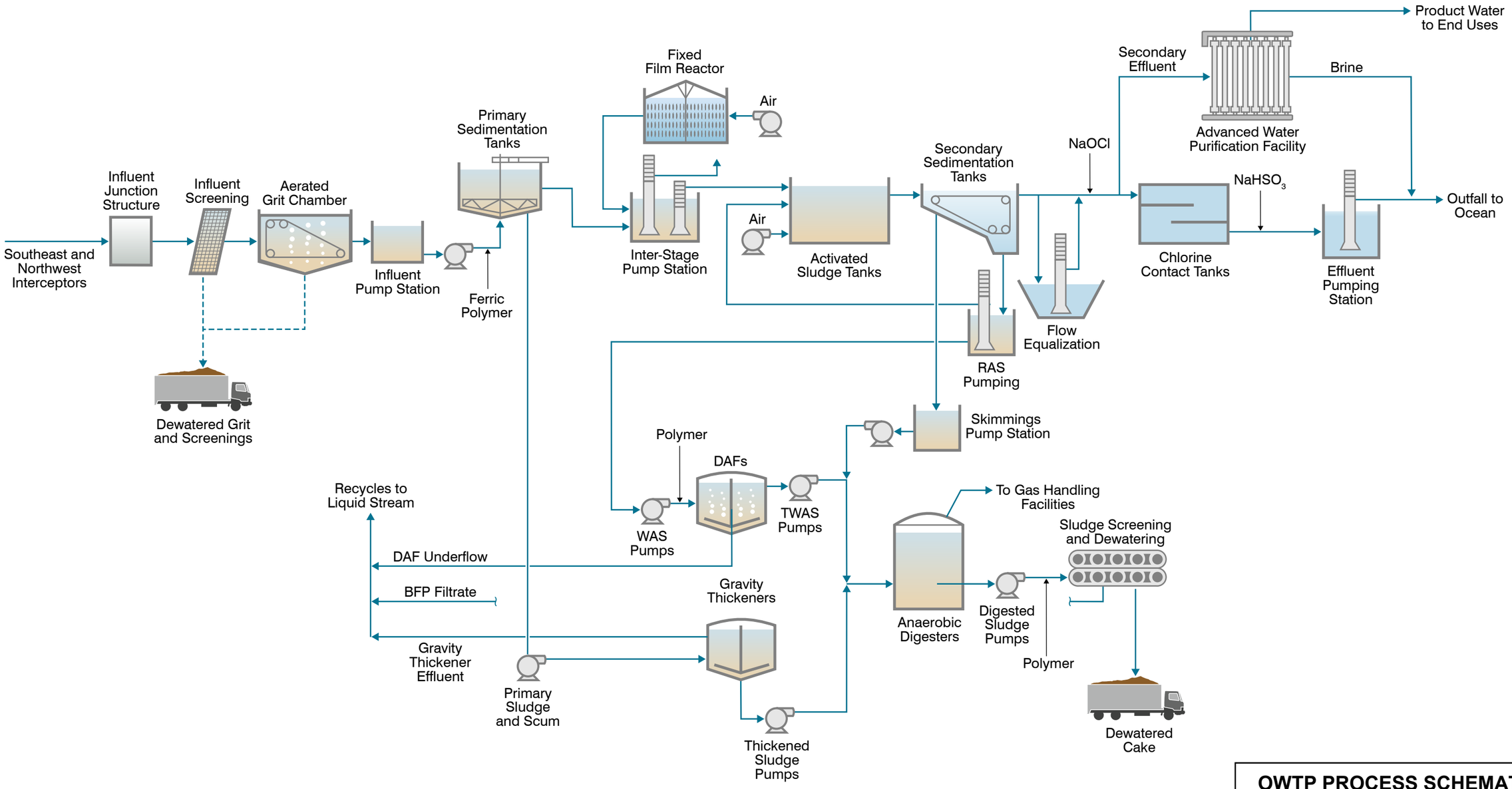
Table 5.1 Design Criteria for the Existing OWTP
Public Works Integrated Master Plan
City of Oxnard

Criteria	Main Equipment	Ancillary Equipment	Year Installed
Preliminary Treatment			
Bar Screens	4 mechanical screens (1/4-inch openings) 2 manual screens (1/2-inch opening)	Screenings Conveyor/Compactor	2008
Aerated Grit	2 chambers, each with 4 hoppers	4 Grit pumps / 3 separators	2008
Influent Pumps	6 – 18,000 gpm 450-hp pumps		2008
Primary Treatment			
Sedimentation	4 circular 105-foot diameter basins	Sludge scrapers, transfer pumps, scum ejector, optional polymer	4 basins – 1972
Interstage Pumping Station	3 variable-speed vertical mixed-flow pumps 2,800 – 21,500 gpm each 8 -21 ft TDH 250 HP each		1975
Secondary Treatment			
Biofiltration	2 – one 140-foot dia., and one 100-foot dia. Filters	4 feed and recirculation pumps, ventilation system 4 blowers, each tower	2 filters – 1975
Activated Sludge	2 tanks, each with 3 passes, 3 step-feed channels per pass. Fine air diffusers fixed on floor.	6 – single-stage blowers, return activated sludge pumps	1990

Table 5.1 Design Criteria for the Existing OWTP
Public Works Integrated Master Plan
City of Oxnard

Criteria	Main Equipment	Ancillary Equipment	Year Installed
Sedimentation	18 rectangular sedimentation basins	4 Return Activated Sludge (RAS) pumps 3 WAS pumps	1990
Flow Equalization	1 – 5-MG storage tank with 2 sections	Pump station and recirculation tubes	1990
3W Pumping Station	3 vertical turbine pumps 1,880 gpm each 185 ft TDH 125 HP each	Strainer	1988
Disinfection			
Chlorination/ Dechlorination	6 pass contact tank	Hypochlorite and bisulfite feed systems	6 passes – 1980
Effluent Pump Station	1 variable-speed mixed-flow pump 17,400 gpm @ 900 rpm 30 ft TDH		1975
	4 variable-speed engine driven mixed-flow pumps 12,000 gpm each @ 1,200 rpm 146 ft TDH		prior to 1975
Solids Handling			
Gravity Thickening (for primary solids)	2 – 59-foot diameter thickeners	Polymer and ferric chloride system for thickening, thickened primary sludge pump	2 GT – 1980
Dissolved Air Flotation (for secondary solids thickening)	2 – 25-foot diameter thickeners	Polymer system for thickening, thickened waste activated sludge pumps	2 units – 1990
Anaerobic Digestion	3 digesters, 2 at 90-foot diameter and 1 at 110-foot diameter	Heat exchanger, mixer, recirculation pumps, fixed cover, gas collection system, digested sludge pumping	90-foot dia.– 1980 110-foot dia. – 1990
Belt Filter Press (Dewatering)	4 – 2.2-m units	Polymer system for sludge conditioning	4 BFPs – 1990
Cogeneration	3 – 500-kW generators	Waste heat recovery system	1980

Note:
(1) Source: OWTP, Operation and Maintenance Manuals, and comments from Mark Moise.



OWTP PROCESS SCHEMATIC

FIGURE 5.2

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5.2.3 Condition Assessment

To identify the City's wastewater system's R&R needs, a condition assessment was conducted. This effort involved using asset management methodology to identify existing water assets and conduct a visual condition assessment of above-ground assets, a seismic evaluation of structures, a desktop evaluation of below-ground assets, and a cathodic protection system evaluation.

To prioritize the R&R needs, a risk assessment was also conducted to examine the vulnerability, or likelihood of failure, and criticality, or consequence of failure, for each asset. Consistent risk scoring methodology was applied to both above- and below-ground assets to prioritize each asset type.

5.2.3.1 Above Ground Assets

Above-ground assets included structures and equipment owned and operated by the City. To assess and value all above-ground assets, a consistent approach was used regardless of whether they were in the treatment system or collection system. The above-ground asset inventory included approximately 26 structures, 160 pumps, 15 wet wells, and a variety of other assets across the OWTP and collection system. The recorded age of each asset varied from 1955 to the present.

Several tables summarize the results of the condition assessment analysis. Table 5.2 lists the OWTP's assets, including the highest above-ground risk determined from this assessment. Table 5.3 lists the assets at the collection system Lift Stations, including the highest above-ground risk determined from the assessment.

Below are the findings of the condition assessment for above-ground assets:

- Headworks – The headworks is in fair to good condition, with some concrete deterioration noted.
- Primary Clarification – Structurally, the primary sedimentation building and clarifier basins were found to be in fair to poor condition. Mechanical and electrical assets were in poor to very poor condition.
- Biofilters – The biofilters were in poor to very poor condition.
- Interstage Pumping Station – The pumps were found to be in fair to poor condition. The structure itself is in fair condition.
- Secondary Treatment – The structures were found to be in fair to poor condition. The equipment was found to be in very poor condition.
- Disinfection Facilities – These facilities are in fair condition; concrete repairs are needed.

- Effluent Pumping – Structurally, this facility is in poor condition. Mechanical assets were rated from fair to poor condition. Electrical assets were in very poor condition.
- Thickening – The facilities are in poor to very poor condition.
- Digestion – The facilities are in poor to very poor condition, and Digester 2 is currently non-operational.
- Dewatering – The facilities are in fair to poor condition.
- Cogeneration – The facilities are in fair to poor condition.
- Electrical Facilities – The facilities are in good to very poor condition. The emergency power facility is aging.

Table 5.2 High-Risk Assets at the OWTP
Public Works Integrated Master Plan
City of Oxnard

Process/Asset	Risk[(1)]
Primary Treatment	
Primary Clarifiers (1-4) Collector Drive, Walkways, and Launders	4.48
Sludge Pump Tanks (1-4)	3.85
MCCs-DPIA, DPIB, DP2B, EDPIA	3.85
Scum Ejectors	3.22
Primary Clarifiers (2 & 4)	1.7
Large Isolation Valves	1.04
Biofilters	
Recirculation Pumps Mag Drive 1 and 2	3.4
Distributors and Drives	2.17
Biofilter Tanks 1 and 2	1.7
Biofilter Media Tanks (1 & 2)	0.8
Secondary Treatment	
Collector, Skimmer, and Drives (17-18)	1.54
Effluent Pump Station	
MCCs	3.85
Gravity Thickening	
MCCs-DP3C, DP3D	3.85
Thickened Sludge Pumps (1-3)	0.51

Table 5.2 High-Risk Assets at the OWTP
Public Works Integrated Master Plan
City of Oxnard

Process/Asset	Risk[1]
Digestion	
Digester Heat Exchanger No. 2	3.22
Digester No. 2 Tank	1.52
Digested Sludge Pumps (1-3)	0.51
Digester Control Building	1.46
Digester Hot Water Pump 1	0.51
Digester Mixing Equipment and Draft Tubes Nos. 1-3	0.51
MCCs (DP2C, EDPIC, GF)	0.46
Dewatering	
Conveyors	2.8
Belt Filter Press 1-4	2.8
Dewatering Feed Pump 5	0.51
Washwater Booster Pumps (1-4)	0.51
Electrical	
Effluent Electrical Building Switchgear	5.11
Main Electrical Building Large Standby Generators	4.69
Effluent Electrical Building (DP2A, EBPIB)	3.85
Main Electrical 500 kW Generator	0.7
Older Transformers (1 & 2)	0.51
Main Electrical Building MCCs (DP4, DP4B, GB, GC, GD)	
Administration Building MCCs (DP2D, DP3A, EDPIE, HG)	
Buildings	
Main Switchgear Building	(1.46) Seismic[2]
Plant Control Center Building	(1.46) Seismic[2]
Vacuum Filter	(1.46) Seismic[2]
Blower Building	(1.1) Seismic[2]

Note:

(1) Risk = Criticality x Vulnerability; Criticality = consequence of failure; Vulnerability = likelihood of asset failure

(2) Indicates a seismic deficiency that requires concrete testing, further Tier 2 evaluation, or replacement.

Table 5.3 High Risk Assets at Lift Stations Public Works Integrated Master Plan City of Oxnard	
Site/Asset	**Risk[(1)]**
Lift Station 23 Wagon Wheel	
Submersible Pumps (1-2)	4.27
MCC	3.85
Wet Well Structure	2.56
SCADA Panel	2.25
Valve Vault	0.68
Lift Station 6 Canal	
Submersible Pumps (1-2)	0.51
MCC	0.46
Lift Station 04 Mandalay & Wooley	
SCADA Panel	0.51
MCC	0.46

Note:

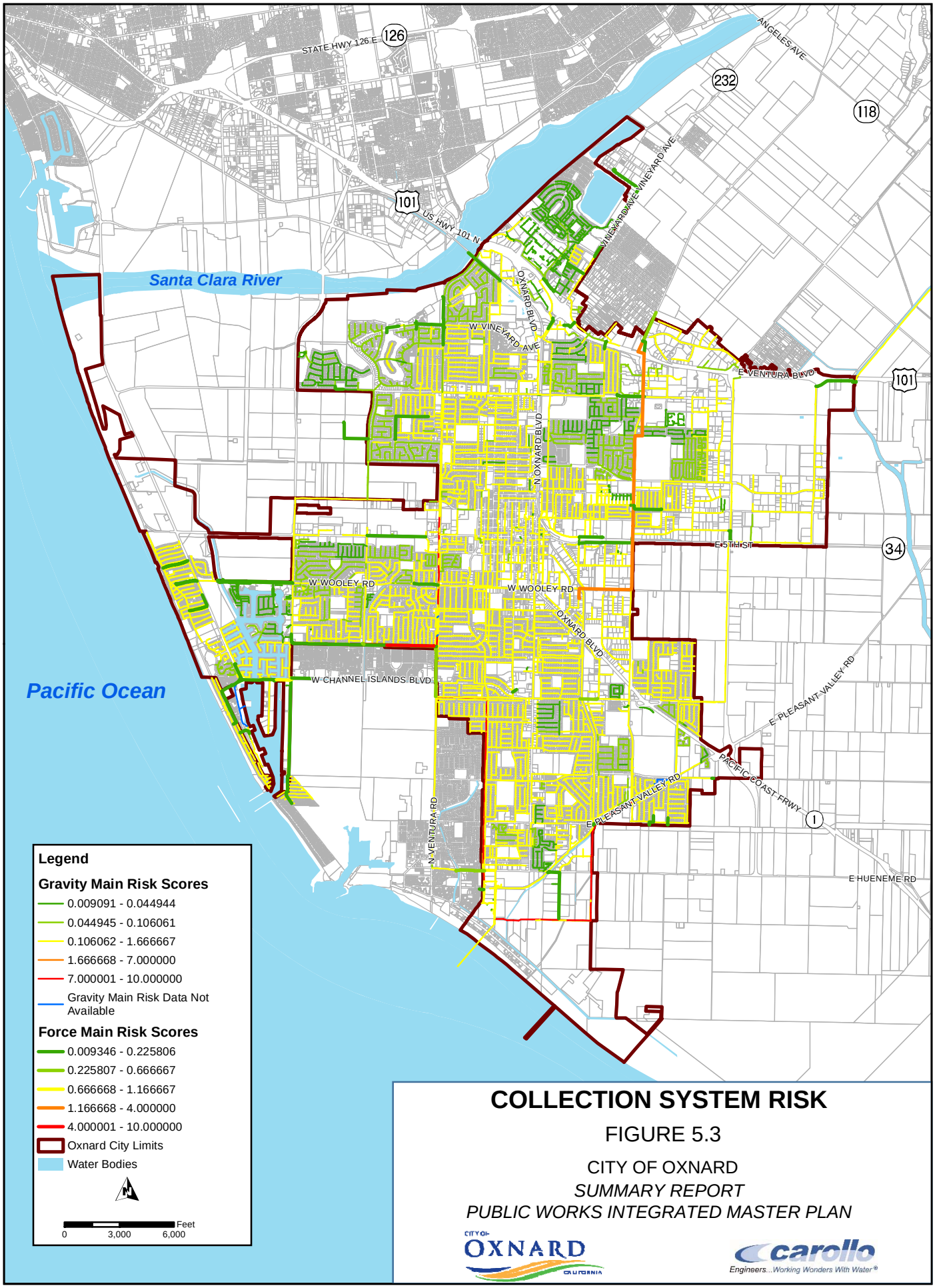
(1) Risk = Criticality x Vulnerability; Criticality = consequence of failure; Vulnerability = likelihood of asset failure.

5.2.3.1 Below Ground Assets

For the City's below-ground wastewater system assets, a desktop evaluation relying on GIS data from the Oxnard collection system was conducted. Collectively, only 18 percent of the collection system piping had a known installation year, with no year available for 206 of the 263 segments for sewer force mains and 7,123 of the 8,686 segments for sewer gravity mains. Because so few installation years were available, an installation year of 1965, which was based on a conservative estimate of development in the area, was assumed. Figure 5.3 shows the risk scores of the Oxnard collection system.

5.2.4 Seismic Assessment

Performing a seismic assessment of the OWTP structures established each structure's anticipated performance level during a seismic event and recommended retrofit strategies to meet established performance objectives for deficiencies identified. With Tier 1 screening, Tier 2 assessments of the buildings, and a seismic assessment of the water-retaining structures at the OWTP, structural and non-structural seismic vulnerabilities could be identified and evaluated. A seismic assessment was completed for a total of 18 buildings and eight water-retaining structures. The results of this analysis can be found in Table 5.4.



COLLECTION SYSTEM RISK

FIGURE 5.3

CITY OF OXNARD

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Table 5.4 Summary of Seismic Assessment and Preliminary Screening Public Works Integrated Master Plan City of Oxnard		
Structure	**Recommendations**	
Tier 1 Evaluation		
Primary Sedimentation	Replace	
Main Electrical/Main Switchgear Building	Replace	
Digester Control Building	Replace	
Operations Center/Plant Control Center Building	Replace	
Effluent Pumping Station	Replace	
Generator/Co-Generation Building	Replace	
Storage-Vacuum Filter Building	Replace	
Storage-Butler Building	Replace	
Tier 2 Evaluation		
	Structural Components	**Non-Structural Components**
Headworks Building	No Deficiencies	Retrofit Needed
Grit Screenings Building	No Deficiencies	Retrofit Needed
Blower Building	No Deficiencies	Retrofit Needed
North Area Electrical Building	No Deficiencies	Retrofit Needed
Solids Processing Building	No Deficiencies	Retrofit Needed
Maintenance Building	Retrofit Recommended: wall-to-diaphragm connection	Retrofit Needed
Collection System Maintenance Building	Retrofit Recommended: wall-to-diaphragm connection	Retrofit Needed
Chemical Handling Facilities	Retrofit Recommended: wall-to-diaphragm connection	Retrofit Needed
16 kW Switchgear/Effluent Electrical Building	Replace structure based on condition assessment and plant considerations.	--
Administration Building	No Deficiencies	Retrofit Needed

Table 5.4 Summary of Seismic Assessment and Preliminary Screening Public Works Integrated Master Plan City of Oxnard	
Structure	**Recommendations**
Concrete Testing and Assessment	
Activated Sludge Tanks/Aeration Basin	Repair/seal cracks
Secondary Sedimentation Basin	Repair/seal cracks
Flow Equalization Basin	Repair areas of damaged/cracked concrete; apply corrosion inhibitor to concrete surfaces
Primary Clarifier Tanks	Repair areas of damaged/cracked concrete; coat interior surfaces of tank with 100 percent epoxy or polyurethane coating
Gravity Thickeners	Replace
Digester Nos. 1, 2 and 3	Replace structure based on condition assessment and plant considerations.
DAF Tanks	Replace structure based on condition assessment and plant considerations.
Chlorine Contact Tank	Remove and replace existing coating in the next 10 years.

5.2.5 Cathodic Protection

A survey was conducted on the City's wastewater infrastructure to assess the existing level of cathodic protection. From this survey, the following needed improvements were identified:

- General Wastewater Treatment Plant: Almost all piping tested did not meet National Association of Corrosion Engineers Criteria for protection related to pipe-to-soil potentials. Thus, immediately replacing the entire cathodic protection system plantwide is recommended.
- Clarifiers and Digesters: Currently, no cathodic protection exists at these facilities. Thus, cathodic protection for the submerged surfaces of metallic components is recommended.

In addition to these projects, the project team recommends conducting an annual cathodic protection survey and report for all City facilities as well as bi-monthly rectifier monitoring.

5.2.6 Arc Flash Assessment

An electrical system study was also conducted for the existing OWTP. This study was comprised of a short-circuit study, a protective device coordination evaluation, and an arc flash evaluation.

Each analysis was performed for a particular reason. The short circuit study determined the available short circuit current at each piece of electrical equipment and identified underrated equipment. The protective device coordination evaluation identified protective devices (circuit breakers, fuses, etc.) not coordinated in the electrical system and not likely to minimize disruption of electrical power during a short circuit. The arc flash evaluation determined the maximum arc flash incident energy at each piece of electrical equipment and identified appropriate personnel protective equipment to be worn if working on the equipment while it is energized.

The results of the electrical systems investigation were used to develop the electrical system study for each site. With these results, pieces of existing electrical distribution equipment (e.g., the main breaker for PNL DP4) not sufficiently rated for the worst-case short circuit current could be identified. The results also showed the arc flash incident energy at each piece of electrical equipment based on the existing protective device settings.

Concerns (e.g., equipment that is damaged, scratched, rusty or not functioning, such as a broken indicator light) and code violations (e.g., insufficient working space around electrical equipment) in the existing electrical equipment installations were observed and documented in Section 5 of Project Memorandum 3.8. Obsolete equipment (approximately 40 percent) and equipment nearing the end of its useful life (approximately 30 percent) and in need of repair were identified, and possible changes in the existing installation from code violations were noted as well. For example, electrical equipment installed prior to 1989 was identified and recommended for replacement due to obsolescence and poor condition.

5.3 FLOW AND LOAD PROJECTIONS

5.3.1 Historical Wastewater Flows and Loads

Historical influent wastewater flows and loads were analyzed from 2009 through 2013, as shown in Tables 5.5 and 5.6. These influent flows and loads include residential and commercial users as well as industrial dischargers.

Table 5.5 Historical Wastewater Flows to OWTP (in mgd)
Public Works Integrated Master Plan
City of Oxnard

Flow Condition	Historical Data					
	2009	2010	2011	2012	2013	2009-2013 Average
Average Dry Weather Flow(1)	21.7	21.4	20.1	19.9	19.5	20.5
Average Annual(2)	22.4	22.2	21.6	20.5	19.7	21.3
Average Day Maximum Month(3)	24.2	24.1	24.3	21.4	20.3	22.9
Maximum Week(4)	24.6	26.9	26.0	21.9	20.7	24.0
Maximum Day(5)	26.9	30.5	31.6	25.5	23.5	27.6

Notes:
(1) Average Dry Weather (ADW) Flow = Lowest 90 day running average flow.
(2) Average Annual (AA) = Average for a 365 consecutive day period.
(3) Average Day Maximum Month (ADMM) = Highest 28 day running average flow.
(4) Maximum Week (MW) = Highest 7 day running average flow.
(5) Maximum Day (MD) = Highest observed daily flow.

Table 5.6 Historical Wastewater Loads to OWTP
Public Works Integrated Master Plan
City of Oxnard

Flow Condition	Historical Data					
	2009	2010	2011	2012	2013	2009-2013 Average
BOD_5(1)						
ADW, klb/d(2)	53.3	50.5	45.1	45.8	48.8	48.7
ADW, mg/L(3)	295	283	269	276	299	284
AA, klb/d	61.4	53.7	49.7	53.1	52.5	54.1
MM, klb/d	67.9	59.1	56.3	59.7	61.4	61.3
MW, klb/d	85.3	64.7	59.4	62.7	66.9	67.8
MD, klb/d	108	88.2	94.2	76.6	92.5	91.9
TSS						
ADW, klb/d	46.4	44.4	41.6	41.5	45.1	43.8
ADW, mg/L	257	249	248	250	277	256
AA, klb/d	49.5	49.2	48.7	46.0	47.8	48.2
ADMM, klb/d	60.5	59.5	65.5	53.1	56.5	59.0
MW, klb/d	89.8	76.5	81.8	64.5	70.7	76.7
MD, klb/d	142	211	190	104	173	164

Table 5.6 Historical Wastewater Loads to OWTP Public Works Integrated Master Plan City of Oxnard						
	Historical Data					
Flow Condition	**2009**	**2010**	**2011**	**2012**	**2013**	**2009-2013 Average**
NH3-N						
ADW, klb/d	6.53	6.26	5.97	6.22	6.30	6.26
ADW, mg/L	36.1	35.1	35.6	37.5	38.7	36.6
AA, klb/d	6.85	6.51	6.63	6.80	6.47	6.65
ADMM, klb/d	7.88	7.51	7.64	7.99	6.83	7.57
MW, klb/d	9.63	8.33	8.24	10.2	7.77	8.83
MD, klb/d	9.63	8.33	8.24	10.2	7.77	8.83

Notes:

**For flow condition definitions, see Table 5.5.

(1) These higher BOD_5 values are likely due to high soluble BOD_5 from the canning and food processing industry.
(2) ADW = Influent load during ADW flow period.
(3) ADW, mg/L calculated as ADW Load (lb/d)/average dry weather flow (ADWF) (mgd)/8.34.

5.3.2 Future Wastewater Flow and Load Projections

For domestic (residential and commercial) uses at the OWTP, flow and load projections were developed using a combined population-based per capita method. A land use-based projection method was used for industrial uses.

Residential and commercial wastewater flow and load projections were estimated using a per capita daily flow of 71.6 gallons per day (gpd)/capita, a per capita daily biochemical oxygen demand (BOD_5) load of 0.20 pounds per day (ppd)/capita, and a per capita daily (pcd) total suspended solids (TSS) load of 0.17 ppd/capita in conjunction with population projections outlined in Chapter 2.

Industrial flows and loads were projected for existing and new industries. Flows and loads for both industry types are described below.

For existing industries, the 30 significant industrial units that currently discharge at or above their permitted flow were assumed to continue discharging at 2013 flows and loadings through the planning horizon. It was assumed that the six remaining industries that currently discharge less than their permitted flow would discharge at their permitted flow through the planning horizon. The additional flow projected was assumed to have BOD_5 and TSS concentrations consistent with overall average industry concentrations. This approach was used for a conservative estimate of future flows and loads from existing industry.

New industry wastewater flow projections were estimated using projected industrial water demand projections. These demands were calculated using future land use, discussed in Chapter 2, and were allocated for 2020 and 2040. As a conservative estimate, it was assumed that the wastewater generation coefficient for the demand is 1.0, and that new industry would grow linearly from 0 to the 2020 water demand projections and then linearly again to the 2040 water demand projections.

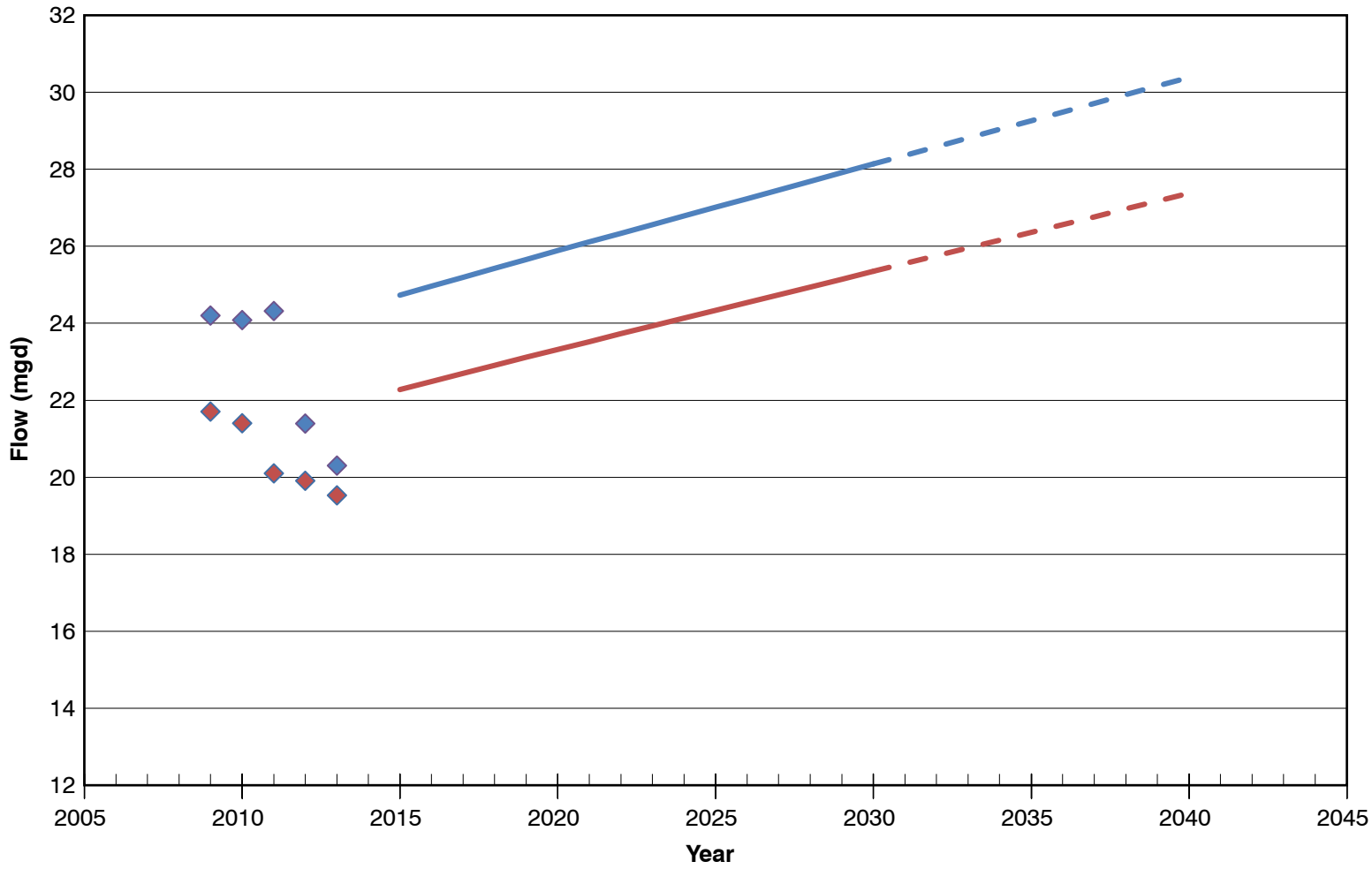
Similar to the industrial flow and load projections, both Naval Base Ventura County (NBVC) at Point Mugu and NBVC at Port Hueneme were assumed to discharge at their permitted limits throughout the planning period. It was also assumed that the incremental flow projected for these NBVCs - between their current and permitted flows - would have BOD_5 and TSS concentrations consistent with the average residential/commercial concentrations.

Projected desalter concentrate flows and loads from the Oxnard desalter and Port Hueneme Water Agency (PHWA) desalter were not included in the flow projections to the OWTP headworks. Concentrate flow from the PHWA desalter is planned to be discharged to the Calleguas Municipal Water District (CMWD) regional brine pipeline. In addition, in the future, the Oxnard desalter (located at Blending Station No. 1/6) concentrate will be discharged directly to the outfall through a separate concentrate line, bypassing the OWTP.

Flow, BOD_5, and TSS projections are shown in Figures 5.4, 5.5, and 5.6 respectively.

5.4 MASTER PLAN/DESIGN CRITERIA

Key planning and design criteria were used to evaluate the existing wastewater system's ability to meet the future needs. Table 5.7 shows the OWTP criteria, and Table 5.8 shows criteria for the collection system. The criteria were used for future system improvement planning.



LEGEND
Historical Average Dry Weather Flow
Historical Maximum Month Flow
Projected Average Dry Weather Flow
Projected Maximum Month Flow

PROJECTED OWTP INFLUENT FLOW

FIGURE 5.4

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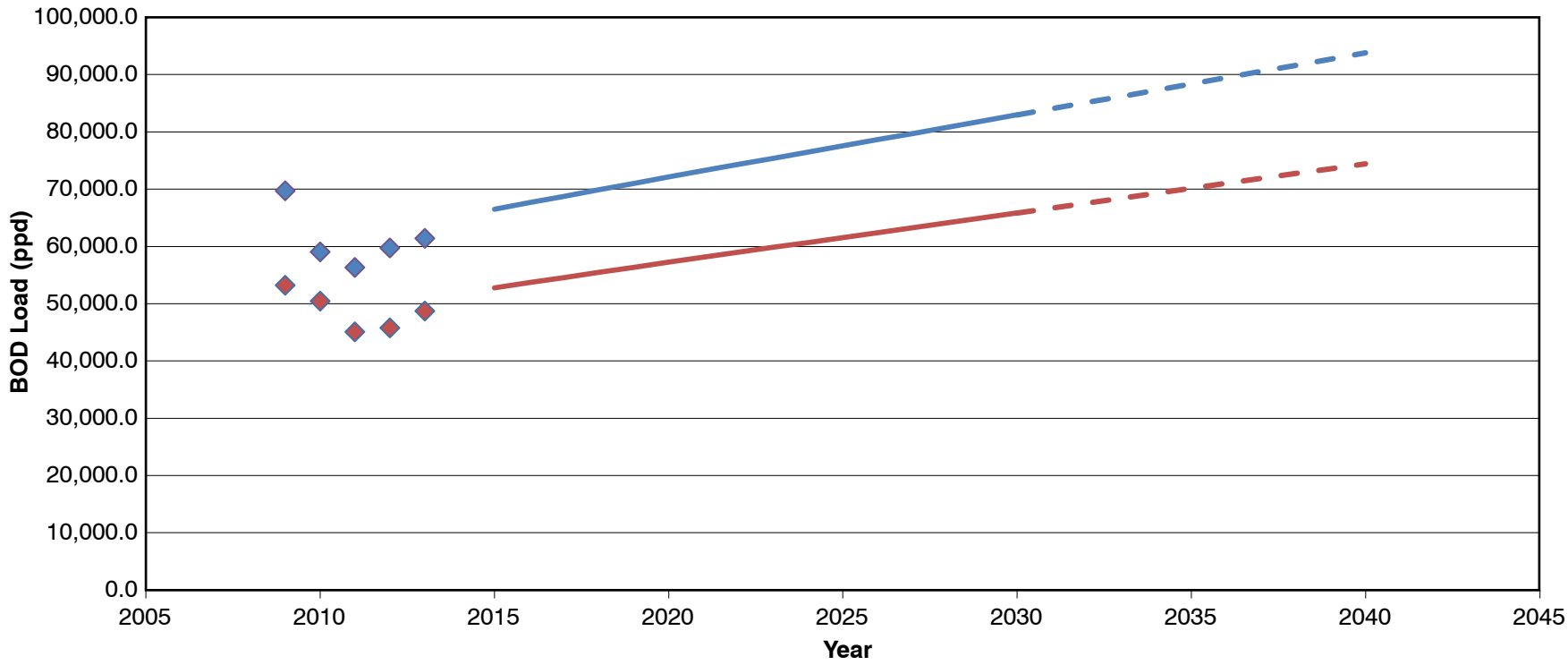

LEGEND

- Historical Average Dry Weather BOD Load
- Historical Maximum Month BOD Load
- Projected Average Dry Weather BOD Load
- Projected Maximum Month BOD Load

PROJECTED OWTP INFLUENT BOD LOAD

FIGURE 5.5

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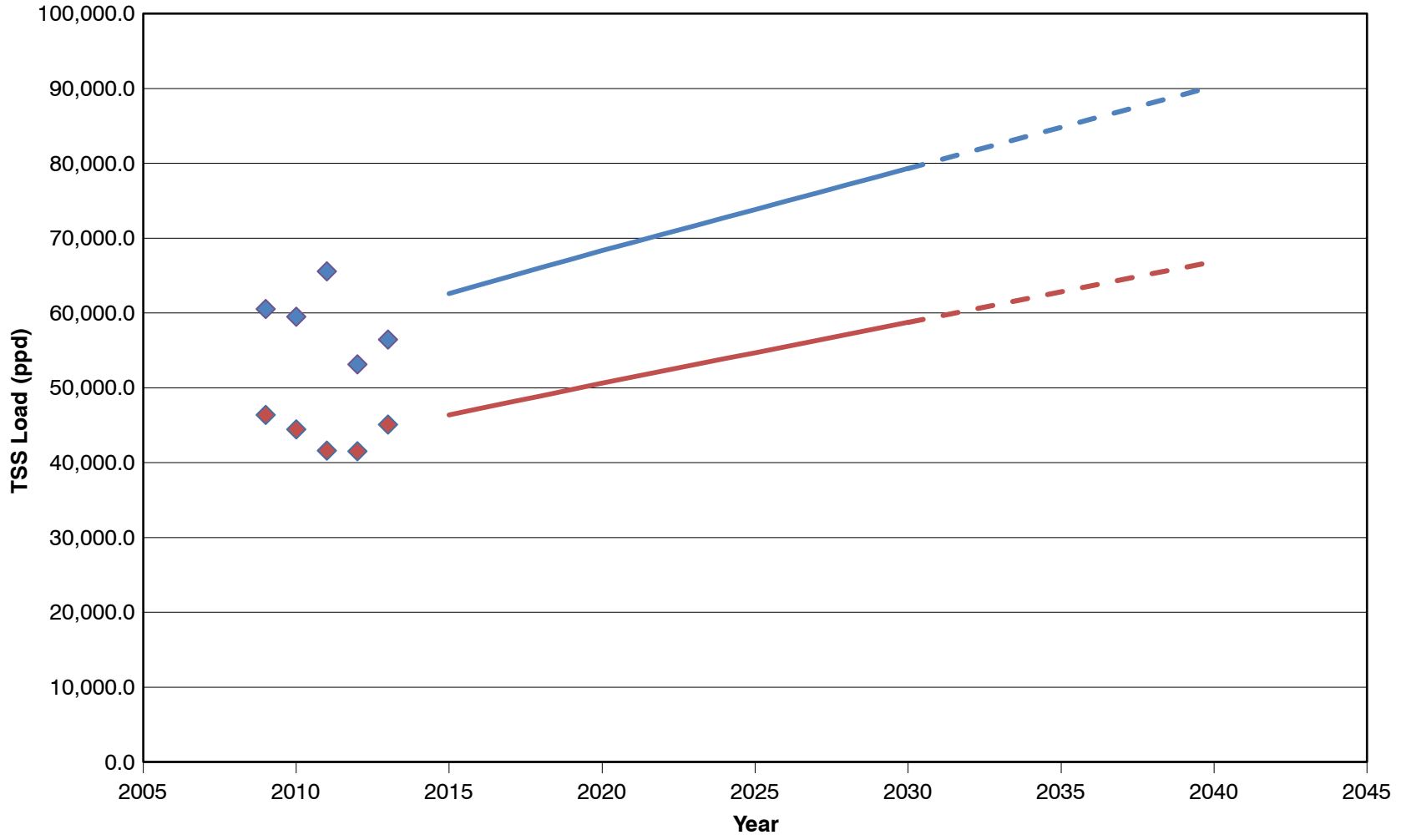

LEGEND
Historical Average Dry Weather TSS Load
Historical Maximum Month TSS Load
Projected Average Dry Weather TSS Load
Projected Maximum Month TSS Load

PROJECTED OWTP INFLUENT TSS LOAD

FIGURE 5.6

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Table 5.7 OWTP Process Performance and Criteria Summary
Public Works Integrated Master Plan
City of Oxnard

Process/ Design Parameter	Design Parameter	Units	Original Design[1]	Historical Performance (2010 – 2013)	MOP-8[2] or Typical Values[3]	Recommended Criteria for Capacity Analysis
Grit Chambers	Overflow Rate at PWWF	gpd/sf	42,315	23,056	20,000 - 50,000	42,315
	Detention Time at PWWF	min	2.8	5.1	2 to 5[4]	2.8
Primary Sedimentation Tanks	Overflow Rate:	gpd/sf				
	ADWF		1,270	809[5]	800 - 1,200[2]	1,270
	PWWF		2,200	1,598[5]	2,000 - 3,000[2]	2,220
	% BOD_5 Removal	%	35	46	25 - 40[2]	35
	% TSS Removal	%	65	70	50 - 70[2]	65
Biofiltration Units	Hydraulic Load:					
	Average	gpm/sf	0.50	--	0.9[2]	1.00
	Peak		1.50	--	2.9[2]	1.50
	Volumetric Load at ADMML	lb BOD_5/ 1,000 ft^3/d	47[6]	55	100-220[2]	100
	% BOD_5 Removal	%	--	23	40-70[2]	24
	% Soluble BOD_5 Removal	%	--	63	40-70[2]	69
Aeration Basins	Solids Retention Time (SRT)	days	--	2.0 [7]	Variable	2.5
	Hydraulic Detention Time (HRT)	hrs	--	4.3 [7]	Variable	Variable
	MLSS	mg/L	--	1002	2,000 - 4,000[2]	Depends on Peak Week Load, SVI, and Sec Sed Basin Capacity
	Sludge Volume Index (SVI) 90 Percentile	mL/g	--	177	150[3]	150
	Temperature	°C	--	19 - 27	Variable	20 - 27

Table 5.7 OWTP Process Performance and Criteria Summary Public Works Integrated Master Plan City of Oxnard						
Process/ Design Parameter	**Design Parameter**	**Units**	**Original Design[1]**	**Historical Performance (2010 – 2013)**	**MOP-8[2] or Typical Values[3]**	**Recommended Criteria for Capacity Analysis**
Secondary Sedimentation Tanks	Peak Solids Loading	lb/sf/day	--	28.7[8]	40 - 50[2]	28.7[9]
	Overflow Rate at ADWF	gpd/sf	600	341[10]	400 - 700[2]	Depends on SVI and MLSS concentration
	Overflow Rate at PWWF	gpd/sf	1,100	699[10]	1,000 - 1,600[3]	Depends on SVI and selected MLSS concentration
Chlorine Contact Basins	Detention Time: ADWF	min	20	46	30 - 60[2]	30
	PWWF		--	23	15 - 30[2]	15
Dissolved Air Floatation Thickeners	Solids Load (Peak 14-day Average)	lb/sf/hr	--	1.78[11]	0.4 - 1[2]	1.6
	Hydraulic Load (Peak 14-day Average)	gpm/sf	--	1.06[11]	0.5 - 2[2]	1.0
	Thickened Waste Activated Sludge (TWAS) Concentration	% TS	--	5.5	3.5 - 4[2]	--
Gravity Thickeners	Solids Load (Peak 14-day Average)	lb/sf/hr	1.0	1.5 [11]	1.2	1.2
	Hydraulic Load (Peak 14-day Average)	gpd/sf	700	842 [11]	700	700
	Percent Solids Capture	%	--	--	85 - 90	--
	Thickened Sludge Concentration	% TS	--	--	3.5 - 4.0	--

Table 5.7 OWTP Process Performance and Criteria Summary
Public Works Integrated Master Plan
City of Oxnard

Process/ Design Parameter	Design Parameter	Units	Original Design[1]	Historical Performance (2010 – 2013)	MOP-8[2] or Typical Values[3]	Recommended Criteria for Capacity Analysis
Anaerobic Digesters	Volatile Solids Load at ADMML	lbs VS/ CF/ day	0.1	0.10 [12]	0.1 - 0.4[2]	0.15
	HRT	days	25	25.4[12]	10 - 20[2]	15
	VS Reduction	%	55	55	50 - 65%[2]	55
	Volatile Acids	mg/L	50 - 500	194	< 300	< 300
	Alkalinity	mg/L as $CaCO_3$	2,000 - 4,000	3,378	> 1,000	> 1,000
	Volatile Acids/Alkalinity	--	0.03 - 0.13	0.06	< 0.10	< 0.10
	pH	-	6.8 - 7.4	--	6.8 - 7.4	6.8 - 7.4
Belt Filter Press	Solids Feed Rate per unit	lb/hr	820	984[13]	700 - 900	820
	Dewatered Sludge % Solids	%	18 - 22	19.6	15 - 25	20

Notes:

(1) From OWTP O&M Manuals (Brown and Caldwell, 1980) (Camp Dresser McKee Inc., 1991).
(2) Source: Water Environment Federation / American Society of Civil Engineers, 2010.
(3) Typical values based on Carollo experience.
(4) (Metcalf and Eddy, 2014).
(5) Calculated assuming 3 of 4 in service.
(6) Based on 1.73 lb BOD_5/d/sf media. 604 kcf of media at 27 sf/cf results in max BOD_5 load of 28,213 lb/d.
(7) Based on 1 of 2 in service.
(8) Peak flow rate of 74.5 mgd, return activated sludge (RAS) flow rate of 29.0 mgd, all secondary clarifiers in service, and an SVI of 150 mL/g.
(9) Given the shallow surface water depth of the OWTP primary clarifiers, a higher solids loading rate is not recommended.
(10) Assume all in service.
(11) Based on 1 of 2 in service.
(12) Digester 1 and 3 in service only.
(13) Based on all four in service for 16 hours per day.

Table 5.8 Collection System Level of Service Criteria Summary Public Works Integrated Master Plan City of Oxnard	
Design Parameter	**Recommended Criteria for Analysis**
Wet Weather Level of Service Goals	
Hydraulic Grade Line	3 ft below manhole rim elevation
Peak Wet Weather Flow	Existing: 38.5 mgd 2040: 49.6 mgd
Design Storm	10-year 24-hour storm
Dry Weather Level of Service Goals	
Depth to Diameter (d/D)	less than 75% to 85%
Peak Dry Weather Flow	Existing: 22.9 mgd 2040: 34.8 mgd

5.5 FUTURE FACILITY NEEDS

The existing wastewater system's capacity and performance were compared with the above criteria (Table 5.7) to locate system shortfalls. In general, the system has adequate capacity to meet current demand conditions but with little reliability. Much of the existing OWTP is in need of major rehabilitation and repair and is reaching the end of its remaining useful life. This means that without substantial investment into the existing treatment system, the City has a high risk of treatment failure and regulatory fines.

5.5.1 Wastewater Collection System

5.5.1.1 Capacity

To determine the necessary collection system capacity, the existing collection system model was recalibrated with recent wastewater flow data and included both dry and wet weather flow monitoring. Dry weather flow monitoring occurred from August 2, 2014, to August 24, 2014, and wet weather flow monitoring occurred from December 9, 2014, to February 25, 2015.

The collection system capacity was assessed during existing and projected dry and wet weather flow conditions. According to this assessment, the existing system can adequately convey both peak dry and wet weather flow conditions using the level of service (LOS) criteria defined in Table 5.8. However, as flows increase over time, the system will require upgrades to meet capacity restrictions. By 2040, certain sewers are expected to surcharge during peak dry weather flow conditions, which is not acceptable per the LOS criteria. Therefore, pipelines in these areas that exhibited potential capacity deficiencies should be upsized to convey peak dry weather flow without surcharge.

The collection system was also evaluated under peak wet weather flow conditions. Using the LOS criteria in Table 5.8, the analysis indicated that no improvements are needed through 2040 based on the 10-year design storm event. Surcharging does occur throughout the system during these conditions. However, the peak hydraulic grade line is more than 3 feet above the manhole's rim elevation, meaning it does not violate the LOS criteria. Thus, since no sewers violated the peak wet weather flow criteria, no sewers require upgrades.

The pump stations within the system were also evaluated to determine if upgrades were necessary for projected flows. The City provided pump curves for the pump stations but could not provide the start and stop elevations within the wet wells for the pump operation. In general, the pump stations appear able to adequately convey future flows. However, without the actual stop and start elevations, it is difficult to definitively assess this.

5.5.1.2 R&R

Because of the limited information available on the existing condition and age of the collection system piping, a detailed system rehabilitation program could not be practically developed for the Integrated Master Plan. Instead, the CIP recommendations for rehabilitation projects are based on the City's understanding of project needs.

5.5.2 Wastewater Treatment Plant

5.5.2.1 R&R

As discussed in the condition assessment section, a large portion of the OWTP is in poor condition and reaching the end of its useful life. Because of this, major investment in R&R is needed in the near future for reliable plant operations and plant safety concerns.

Replacement is recommended for a number of process facilities, namely the primary clarifiers, DAFTs, digesters, interstage pump station, effluent pump station, and cogeneration facility. All of these facilities are nearing the ends of their useful lives. Additionally, due to safety concerns, demolishing the biotowers is recommended as soon as possible.

5.5.2.2 Process Performance

The performance assessment of the OWTP assessed the following:

- The plant's overall treatment performance for meeting discharge limits and other effluent requirements.
- Each unit process' historical loading and performance.

Approximately 1 to 3 years of daily operating data were reviewed to characterize the OWTP's overall performance. During the review period, the OWTP complied with all regulated conventional pollutants. However, while the OWTP met all the limits for conventional pollutants, there was one violation for benzidene cited in the fact sheet

(Attachment F) of the 2013 NPDES permit because the reported detection limit was greater than the discharge limit.

In general, the unit processes at the OWTP have operated at loading rates well within their original design values or typical operating ranges. In addition, performance has been adequate and there are a sufficient number of units in some of the unit processes to maintain a standby unit out of service for maintenance.

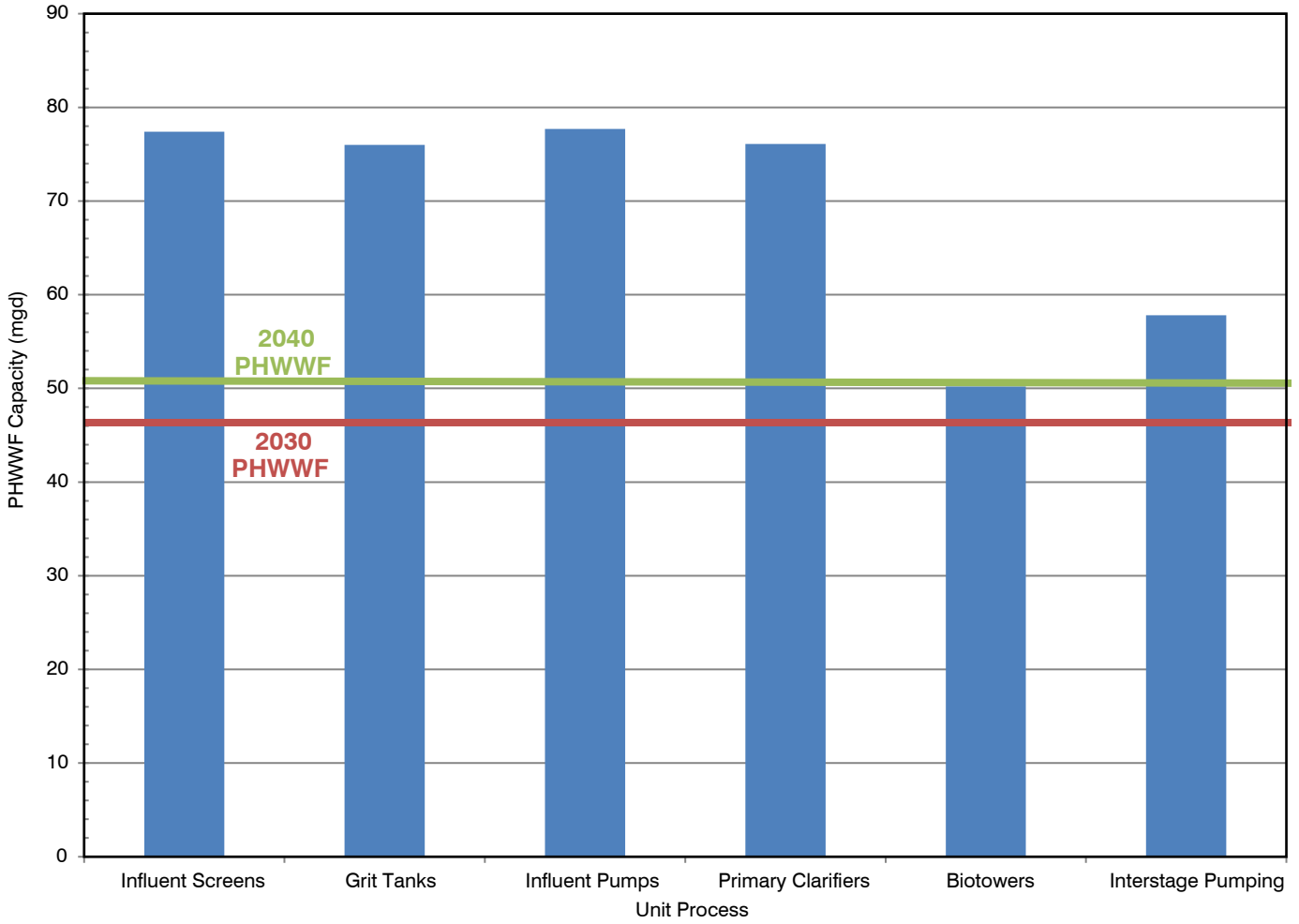
Removing the biotowers because they are a safety hazard will change the OWTP's treatment train configuration. The biotowers were originally designed to provide secondary treatment in the 1970s. In the 1980s, they were retained as part of the activated sludge system to reduce the organic load to the downstream aeration tanks. Currently, a significant portion of the biotower influent is untreated because of seal failures within the biotower itself. With the removal of the biotowers, the existing aeration tanks need to be modified to accommodate the incremental organic load. As most of the incremental organic load will be soluble BOD_5, it is recommended to add submerged baffle walls to create a biological selector zone in each aeration tank. The selector zone would be mechanically mixed, but unaerated, to maintain good sludge settling characteristics. Step feed capabilities, included as part of the original aeration basin design, can be used together with these recommended modifications to operate in a sludge reaeration (step feed) configuration to limit secondary clarifier sludge loading rates during periods of high wet weather flows and low sludge settleability. With these minor alterations, the aeration basins can treat higher loadings without expanding their footprint.

5.5.2.3 Capacity

As part of the Integrated Master Plan, the capacity of each unit process at the OWTP was assessed. This assessment considered a range of parameters, including flow, influent wastewater characteristics, treatment objectives, process configurations and limitations, and desired redundancy.

The peak hour wet weather flow (PHWWF) capacity was estimated for facilities that use peak flow to establish sizing. These facilities include the headworks, influent pumping, primary clarifiers, biotowers, and interstage pumping. Whereas pumping capacities are determined with the largest unit out of service, peak capacities for process units are determined with all units in service. Figure 5.7 summarizes the PHWWF capacity for each process.

Figure 5.8 illustrates the required EQ basin volume needed for the design storm based on flow rate treated at the OWTP. At the permitted capacity of 31.7 mgd, approximately 4.95 MG of storage will be needed in 2040, which is just under the available storage capacity. Historically, the EQ basins have never been filled to capacity. However, in 2040, the EQ basin capacity will approach its limit. Thus, determining whether additional capacity is needed will depend on how the EQ basins are operated as well as the needs of both the AWPF and the outfall.



OWTP PEAK HOUR WET WEATHER FLOW CAPACITY BAR GRAPH

FIGURE 5.7

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Engineers...Working Wonders With Water®

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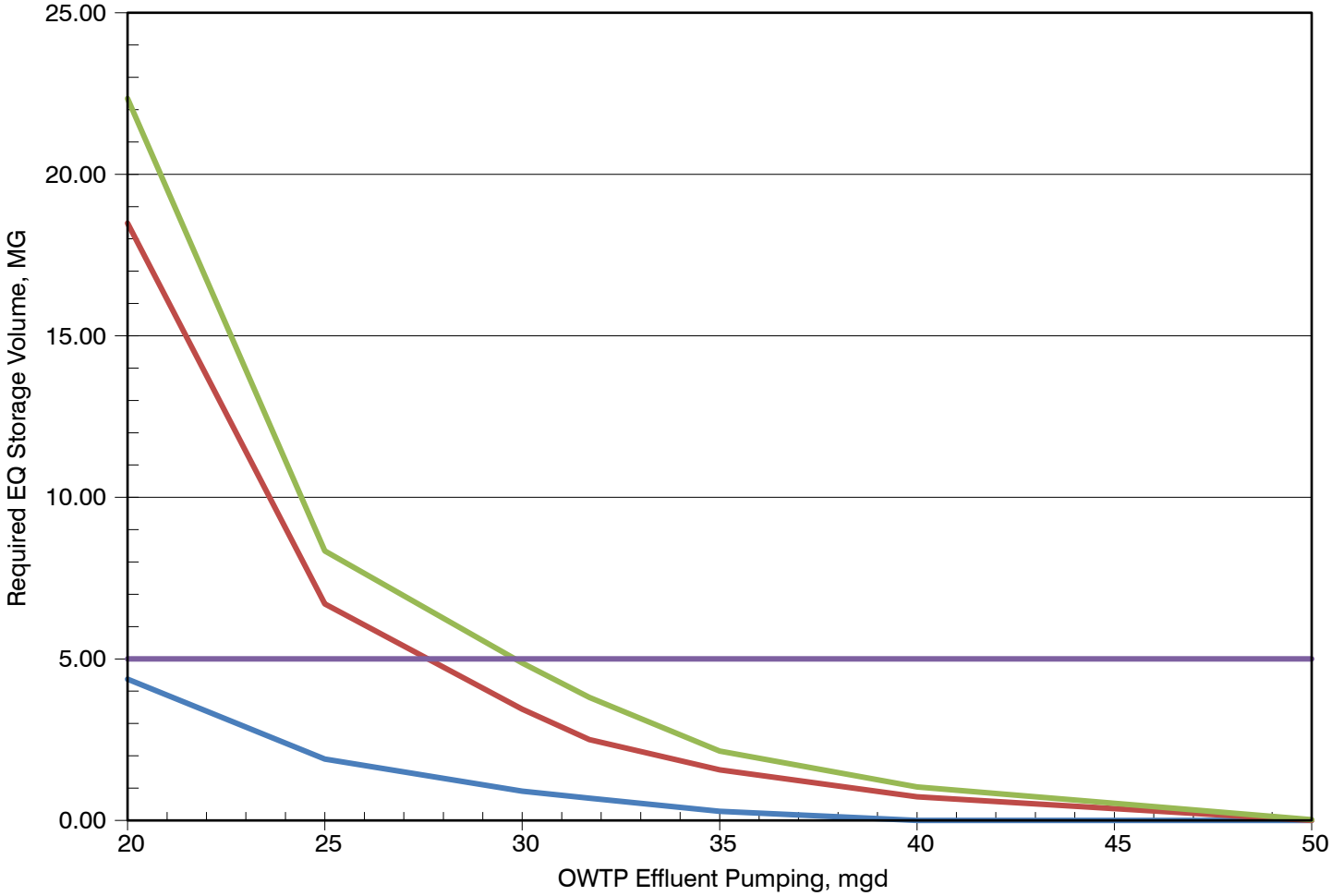

LEGEND

Current | 2030 | 2040 | Current EQ Basin Volume (5 MG)

REQUIRED EQUALIZATION (EQ) STORAGE FOR PEAK WET WEATHER FLOWS

FIGURE 5.8

CITY OF OXNARD
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The ADWF capacity was estimated for facilities using average flows or influent BOD_5 and TSS loading to establish sizing. To estimate this capacity, a plant process model was developed and calibrated to historical operating data from 2013. Figure 5.9 summarizes the capacity for each process.

As shown in Figure 5.9, all of the liquid treatment processes have sufficient capacity for projected flows through 2040. However, although the existing secondary treatment process has sufficient treatment capacity to meet the City's NPDES BOD_5 limits through the planning horizon, it does not have sufficient capacity to nitrify with or without denitrification. The City's existing NPDES permit is not expected to require nitrification/denitrification in the near future, but increased recycled water production by the AWPF will increase constituent concentrations, particularly ammonia, above those in the secondary effluent.

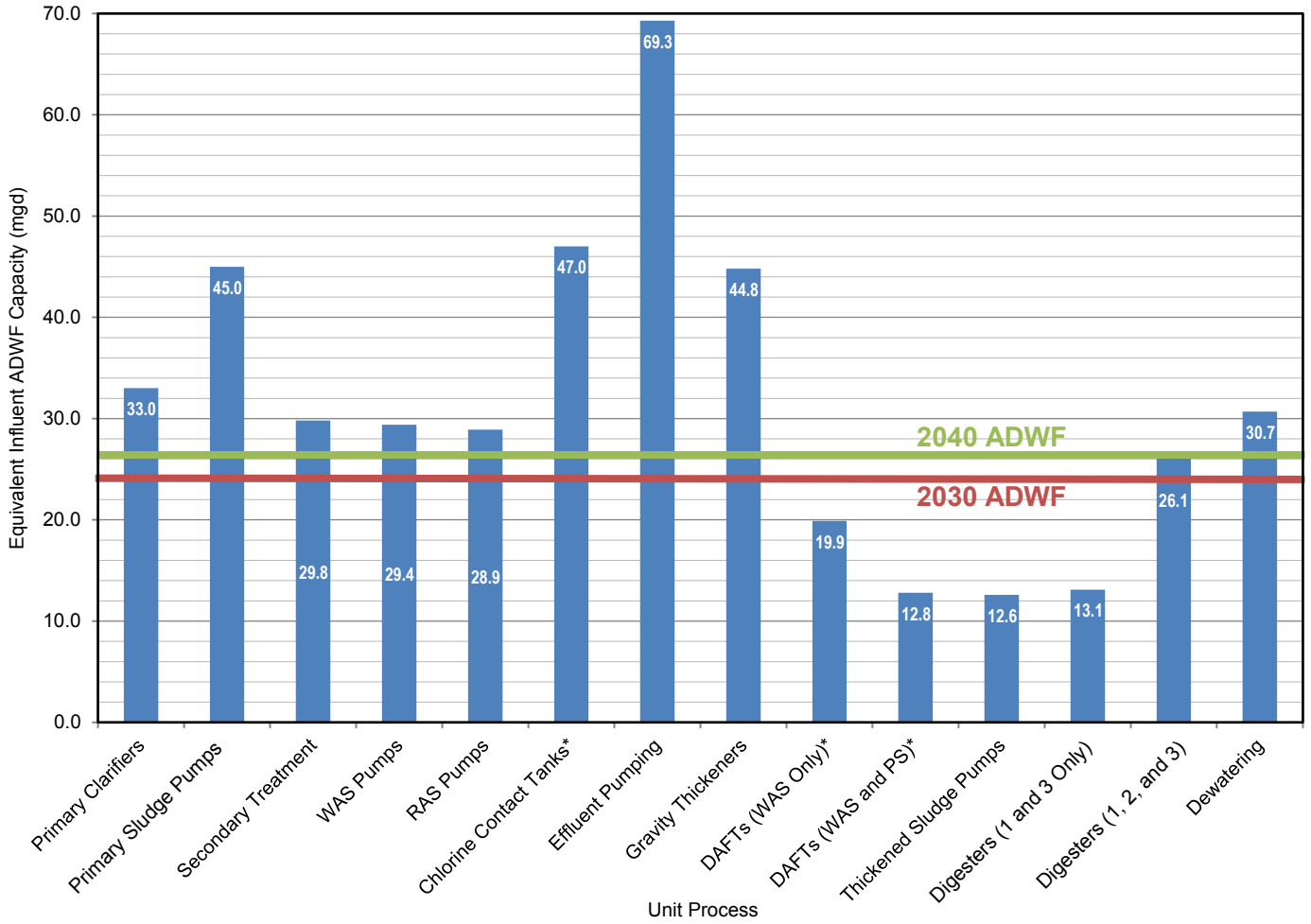
One way to address the insufficient capacity is to nitrify and denitrify in the secondary treatment process. To accommodate this, the OWTP may need to consider expanding the secondary treatment capacity or switching to an alternative process configuration such as membrane bioreactors (MBR), should the conversion be necessary with AWPF expansion.

According to Figure 5.9, the solids handing facilities do not have sufficient capacity. OWTP sludge production is expected to increase, in part because the biotowers will need to be removed and an anaerobic selector will need to be added in the ASTs. Because of the anticipated changes to sludge production, additional DAFT units, digesters, and dewatering units are needed.

5.6 ALTERNATIVES ANALYSIS

Based on the future facilities needs outlined, several alternative scenarios were considered for upgrading the OWTP facilities to meet future capacity and reliability needs. Of those scenarios, three were developed for the recommended CIP. Although each scenario has a different area of focus, it is important to recognize that these scenarios are not mutually exclusive and are instead compatible with one another, allowing for increasing levels of treatment to better address the overarching goals of this Master Plan. These three scenarios are further described below:

- **Scenario 1: Plant Reliability -** Scenario 1 includes all projects needed to meet existing and anticipated level of treatment requirements. Projects to optimize operations and maintenance as well as projects that adopt newer technologies in place of aging equipment are both included in this scenario. Because of the OWTP's age and state of repair, the majority of OWTP projects recommended in this Master Plan are related to repair and replacement required for continued plant operation. As a result, this baseline scenario includes a majority of the proposed projects.



*All unit processes assume the largest unit is out of service except for those starred.

OWTP AVERAGE DRY WEATHER FLOW CAPACITY BAR GRAPH

FIGURE 5.9

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- **Scenario 2: Energy Efficiency -** Scenario 2 focuses on projects that promote energy efficiency at the OWTP. This scenario includes all projects discussed under Scenario 1. However, Scenario 2 also includes projects to reduce energy use at the OWTP.
- **Scenario 3: Resource Recovery -** Scenario 3 focuses on projects that maximize water reuse and nutrient mining. This scenario includes all projects discussed under Scenario 1 and Scenario 2. However, Scenario 3's focus is to protect and enhance resource sustainability.

A comparative evaluation of these three scenarios was conducted, which included lifecycle cost estimates, energy comparisons, water quality considerations, and other non-economic factors. Table 5.9 summarizes the lifecycle costs of the three alternatives considered, and Table 5.10 contains the results of the overall alternatives comparison, including non-economic considerations.

For each scenario, relative energy use was also compared. Although all scenarios include energy savings from recommended small equipment replacement projects, some larger CIP projects differentiate one scenario from another. Table 5.11 compares the energy use of the larger CIP projects.

After comparing each scenario, the City selected Scenario 2: Energy Efficiency. Although Scenario 1 provides the lowest overall cost, the non-economic comparison showed a slight advantage to Scenarios 2 and 3 because they indicate moderate to high goal achievement. Since Scenario 2 costs less than Scenario 3, Scenario 2 was chosen.

5.6.1 New OWTP Location

As part of the Integrated Master Plan, relocating most of the OWTP facilities to another location near the AWPF was considered, for several reasons:

- the inefficiency of the current plant layout,
- the need to replace/rehabilitate much of the existing site, and
- the need to address the potential for rising sea levels from climate change and the current facility's low elevation (relative to mean sea level).

Although considerable work would be needed to assess the feasibility of moving the OWTP, this option had no fatal flaws and was therefore considered at the City's request.

Table 5.9 Comparison of Scenario Costs[1]
Public Works Integrated Master Plan
City of Oxnard

Cost ($ M)	Scenario 1 Plant Reliability	Scenario 2 Energy Efficiency	Scenario 3 Resource Recovery
Headworks	$14.9	$14.9	$14.9
Primary Treatment	$20.9	$20.9	$20.9
Secondary Treatment	$100.3	$100.3	$100.3
Disinfection/Effluent Pumping/Outfall	$24.5	$24.5	$24.5
Sludge Thickening	$13.4	$13.4	$13.4
Digestion	$34.4	$34.4	$34.4
Dewatering and Sludge Post Processing	$27.6	$27.6	$88.1
Cogeneration/FOG	$13.8	$16.5	$16.5
Electrical	$18.3	$18.3	$18.3
Non-Process Buildings	$25.1	$25.1	$25.1
Other	$33.6	$34.8	$38.3
Total Construction Cost	**$327**	**$331**	**$395**
Total Project Cost[2]	**$405**	**$410**	**$489**
Annual Costs ($ M/yr)	$20.3	$20.5	$24.5
Annualized Project Cost[3]	$33	$33	$39
Incremental Annual O&M[4]	$5.0	$5.4	$6.5
Total Annual Cost	$37.5	$38.3	$45.8

Notes:
(1) Costs derived using the methodology outlined in Chapter 2.
(2) Project costs include project cost factor (as outlined in Chapter 2).
(3) Annualized at 5 percent over 20 years.
(4) O&M costs include only additional O&M costs from new capital improvement projects.

Table 5.10 Non-Economic Consideration of Water Supply Alternatives
Public Works Integrated Master Plan
City of Oxnard

	Scenario 1 - Plant Reliability	Scenario 2 - Energy Efficiency	Scenario 3 - Resource Recovery
Goal 1: Compliant, reliable, flexible system	Moderate	High	High
Goal 2: Economic sustainability	Moderate	High	Moderate
Goal 3: Mitigate/adapt to climate change	Moderate	Moderate	Moderate
Goal 4: Resource sustainability	Low	Moderate	High
Goal 5: Energy efficiency	Low	High	High
Benefits	• Has a lower overall cost • Focuses on rehabilitating the existing plant as the highest priority • Provides a seawall to protect against potential sea level rise from climate change	• Has a moderate cost • Has a more flexible system to address potential future changes in the cost of energy • Provides a seawall to protect against potential sea level rise from climate change	• Has more flexibility in sludge handling and resource recovery • Has a more flexible system to address potential future changes in the cost of energy • Provides a seawall to protect against potential sea level rise from climate change
Drawbacks	• Does not directly address goal 4 or goal 5 • Is less able to adapt to potential future increases in the cost of energy • Does little to take advantage of resources produced onsite	• Does not focus on recovering nutrients and sludge onsite	• Has a high cost

Table 5.11 Potential Energy Savings
Public Works Integrated Master Plan
City of Oxnard

Recommendation	Potential Relative Energy Savings		
	Scenario 1	**Scenario 2**	**Scenario 3**
Biotower Removal and Interstage Pump Reconfiguration	Included in All Scenarios	Included in All Scenarios	Included in All Scenarios
AST Blower Replacement	Included in All Scenarios	Included in All Scenarios	Included in All Scenarios
Cogen Replacement	Included in All Scenarios	Included in All Scenarios	Included in All Scenarios
FOG Receiving Station	NA	+	+
Solar or Alternative Energy Facility	NA	+	+
Incineration	NA	NA	+
Total Potential Energy Savings	+	++	+++

Note:
(1) Only projects that could produce energy savings are included in this analysis.

One reason to move many of the OWTP facilities is that much of the existing infrastructure is nearing the end of its useful life and should be repaired or replaced within the next 15 years. Because of this, it would be beneficial to place the new facilities in an optimal location.

Another reason is that the current plant layout is inefficient and requires pumping between processes, which increases operation and maintenance costs. A new location would allow for a new efficient layout that would eliminate the need for pumping, which would lower costs.

Finally, Federal Emergency Management Agency predicts that portions of the OWTP could experience significant flooding within the next fifty years because of its low elevation. Moving most of the OWTP facilities to a new location at a higher elevation would reduce this risk.

To assess the costs of relocating the OWTP, a preliminary master planning-level cost estimate was developed. Based on the comparative cost of building OWTP facilities in the two locations discussed, there is no significant difference between the two options, assuming similar levels of treatment. Because space is theoretically not limited at a new site, conventional secondary treatment could be utilized and was thus assumed. Alternatively, a higher level of treatment could be implemented at additional cost. Table 5.12 shows the results of the cost comparison.

Table 5.12 Cost Comparison Between Upgrading the Existing Plant and Constructing a New Plant in a New Location
Public Works Integrated Master Plan
City of Oxnard

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

Notes:

(1) Engineering, legal, administration, and construction management (ELAC) is 24% of construction cost, consistent with other recommended projects in the Integrated Master Plan.
(2) ELAC is 35% of construction cost for those projects originally estimated for the existing site, but now moved to new site with this scenario, due to new site uncertainties; ELAC is 75% of construction cost for those projects based on cost curves.
(3) Spread over all the projects implemented at the new site.
(4) Totals are rounded up to the nearest $5 M.

5.7 RECOMMENDED PROJECTS

This section summarizes the recommended projects for the wastewater system. These projects are based on the existing system condition assessment, capacity, and performance needs for meeting projected future demands and discharge requirements through the Integrated Master Plan's planning period (2015-2040).

The projects were each assigned a phase that loosely follows when they will be implemented. These phases include Phase 1 – Immediate Needs; Phase 2 – Near-Term Needs; and Phase 3 – Long-Term Needs. The phases were recommended based on the technical needs identified from the condition assessment.

Note that the actual timing of implementation may differ when compared with and balanced against the financial considerations for the Integrated Master Plan's total implementation. For more detail on the costs and timing of these projects, consult Chapter 9 and the Cost of Service (COS) Studies (Carollo, 2017).

5.7.1 Wastewater Collection System

Collection system improvements focused on capacity needs were based on collection system modeling, R&R needs, and conversations with the City. Using the capacity, three main capacity projects and fifteen R&R and performance-based projects were identified. Each project is summarized in Table 5.13.

5.7.2 Wastewater Treatment Plant

The City has two options for implementing improvements needed at the OWTP. The first is to invest in the existing plant, and the second is to relocate most facilities. Both options require investing in a different set of wastewater treatment-related improvement projects. If the City chooses to invest in the existing plant, the recommended improvement projects will focus on rehabilitating aging infrastructure. If the City chooses to relocate the plant, the recommended improvement projects will focus on investing in new facilities. The recommended projects for each option are outlined below.

Table 5.13 Recommended Collection System Projects
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[(1)]	2015 Project ID	Project	Location	Driver	Start Year	Years to Implement
C-1	WW-P-6	Central Trunk Manhole Rehabilitation Phase 1	Rehabilitate 47 existing manholes	R&R	2018	1
C-17	WW-P-5	Headworks Meter Vault/Vortex Structure Coating Rehabilitation		R&R	2018	1
C-3	WW-P-8	Harbor Blvd Manhole Rehabilitation	Rehabilitate 12 existing manholes	R&R	2019	1
C-4		Pleasant Valley Manhole Rehabilitation	Rehabilitate 14 existing manholes	R&R	2019	1
C-5	WW-P-9	Redwood Tributary Manhole Rehabilitation	Rehabilitate 38 existing manholes	R&R	2019	1
C-10	WW-P-7	Existing asbestos concrete pipe (ACP) Replacement	Various locations throughout the collection system	R&R	2019	8
C-11		Annual Existing Pipe Repair	Various locations throughout the collection system based on sewer inspection	R&R	2019	8
C-12		Collection System Chemical Addition	Various locations throughout the collection system	Performance	2019	2
C-13	WW-P-10 WW-P-18	Devco Development Lift Station	Devco development, Village (Wagon Wheel) developments.	R&R, Performance	2019	1
C-14	WW-P-12	Existing Lift Station #4 (Mandalay & Wooley) Rehabilitation	Lift Station #4	R&R	2019	1
C-15	WW-P-11	Existing Lift Station #6 (Canal) Rehabilitation	Lift Station #6	R&R	2019	1
C-16		Existing Lift Station #20 (Beardsley) Rehabilitation	Lift Station #20	R&R	2019	1
C-2	WW-P-13	Central Trunk Manhole Rehabilitation Phase 2	Rehabilitate 27 existing manholes	R&R	2020	1

Table 5.13 Recommended Collection System Projects
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[(1)]	2015 Project ID	Project	Location	Driver	Start Year	Years to Implement
C-7	WW-P-16	Rice Avenue Sewer Improvement	Rice Avenue from Latigo to Camino Del Sol	R&R	2020	2
C-8	WW-P-1	Existing Sewer Deficient Capacity Replacement	Ventura Road Trunk Sewer from Doris Avenue to Oxnard Airport	Capacity	2020	2
			Conduit 4943	Capacity	2020	2
			Conduit 4956	Capacity	2020	2
			Conduit 1429	Capacity	2020	2
			Conduit 1431	Capacity	2020	2
			Conduit 1432	Capacity	2020	2
			Conduit 1443	Capacity	2020	2
			Conduit 4276	Capacity	2020	2
			Conduit 1460	Capacity	2020	2
			Conduit 1461	Capacity	2020	2
			Conduit 1462	Capacity	2020	2
			Conduit 1463	Capacity	2020	2
C-9	WW-P-2	Existing Sewer Deficient Capacity Replacement	Sewers in the La Colonia Neighborhood, Third Street & Navarro Street	Capacity	2021	1
			Conduit 2888	Capacity	2021	1
			Conduit 2889	Capacity	2021	1

Table 5.13 Recommended Collection System Projects
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[(1)]	2015 Project ID	Project	Location	Driver	Start Year	Years to Implement
C-6		Annual Existing Manhole Rehabilitation	Various locations throughout the City based on sewer inspection	R&R	2022	5
	WW-P-3	Project 3: S Victoria Ave and W Hemlock St	Sewers in the Channel Islands Neighborhood	Capacity	2027[(2)]	2
			Conduit 501	Capacity	2027[(2)]	2
			Conduit {74B96752-98B2-4F5D-AF2A-21B06EE4909C}	Capacity	2027[(2)]	2
			Conduit P-2471	Capacity	2027[(2)]	2
	WW-P-14	Phase 1 Central Trunk Replacement		R&R	2033[(3)]	2
	WW-P-15	Phase 2 Central Trunk Replacement		R&R	2036[(3)]	2

Notes:
(1) 2017 Project ID's were arbitrarily assigned for Project ease. C = Collection System Project. These are the projects from the approved Cost of Service Studies (Carollo, 2017).
(2) Project start year corresponds to refinements and updates provided by City after December 2015 publication date.
(3) Project start year was adjusted by City at August 7, 2017 meeting, based on recent CCT Inspection.
General Note: For the pipeline replacement projects, see the hydraulic models developed as part of this integrated master plan to identify the exact pipeline locations.

5.7.2.1 Existing Site

Recommended projects to keep the existing OWTP operational include R&R projects for almost every unit process. This includes replacing equipment and making structural repairs. Facilities that are unsafe or are at the end of their useful lives, including the primary clarifiers, DAFTs, digesters, interstage pump station, effluent pump station, and cogeneration facility, will also need to be replaced. Presented herein is one process treatment option for replacing the OWTP aged facilities. Several options should be considered and screened during the facilities predesign phase.

In addition to these recommendations, a major electrical system overhaul is recommended to provide more reliable backup power and to replace many plant MCCs, SCADA, and electrical buildings. A new dewatering facility, a new operations center and administration building, a non-hazardous liquid receiving station, a FOG receiving station, and a water quality early warning system are also recommended. Furthermore, in the future, the City should consider switching to MBR, adding an ultraviolet/advanced oxidation process (UV/AOP), constructing a solar facility, and adding a sea wall as needed. Figure 5.10 illustrates a layout of the recommended projects color-coded by phase.

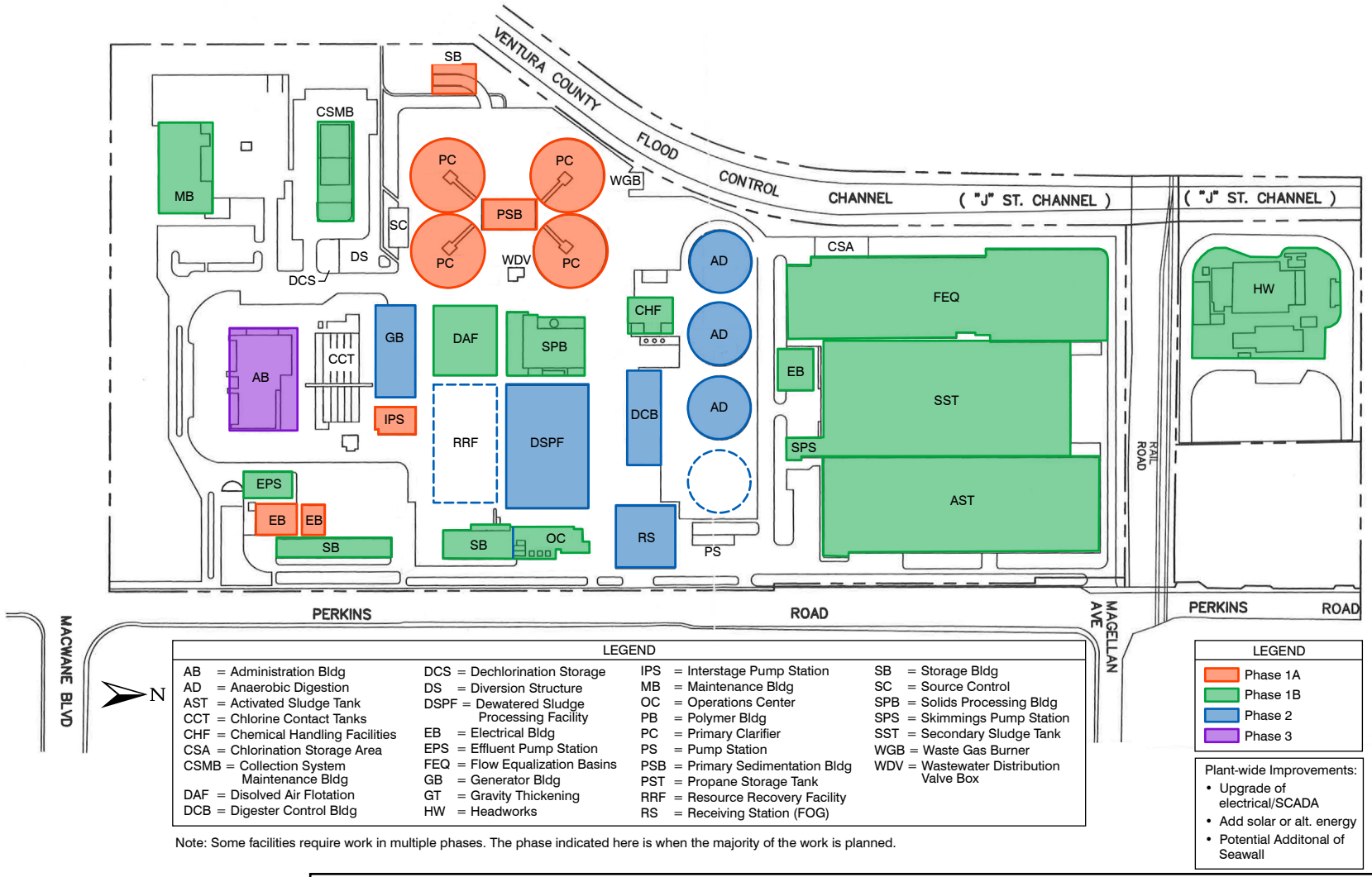
Table 5.14 lists the details of these projects. Figures 5.11A and 5.11B presents a schedule for the recommended projects.

5.7.2.2 New Location

To move many of the OWTP facilities to a new location, the City would need to consider the move's feasibility, taking into account the regulatory, timing, and financial needs. It is estimated that this upfront work could take approximately five to ten years to complete.

Given this timeframe and the condition of many of the existing OWTP facilities, a number of critical improvement projects at the OWTP will need to occur regardless of whether the OWTP will be relocated. Estimates are that these projects will cost around $20 million to $30 million. Table 5.15 shows a list of the projects requiring immediate attention.

For relocating the plant, a phased approach would be recommended. The City would start Phase 1 after implementing the projects with immediate needs. Phase 1 would involve moving all primary treatment, solids handling, and support facilities to the new site as well as rehabilitating facilities remaining in their existing location until Phase 2. These facilities include secondary treatment, disinfection, and effluent pumping facilities. The biotowers and gravity thickeners should also be demolished and the headworks rehabilitated. Assuming that the permitting and the environmental process takes five to ten years, Phase 1 could start around 2023, and Phase 2 could start around 2035.



LEGEND			
AB = Administration Bldg	DCS = Dechlorination Storage	IPS = Interstage Pump Station	SB = Storage Bldg
AD = Anaerobic Digestion	DS = Diversion Structure	MB = Maintenance Bldg	SC = Source Control
AST = Activated Sludge Tank	DSPF = Dewatered Sludge Processing Facility	OC = Operations Center	SPB = Solids Processing Bldg
CCT = Chlorine Contact Tanks	EB = Electrical Bldg	PB = Polymer Bldg	SPS = Skimmings Pump Station
CHF = Chemical Handling Facilities	EPS = Effluent Pump Station	PC = Primary Clarifier	SST = Secondary Sludge Tank
CSA = Chlorination Storage Area	FEQ = Flow Equalization Basins	PS = Pump Station	WGB = Waste Gas Burner
CSMB = Collection System Maintenance Bldg	GB = Generator Bldg	PSB = Primary Sedimentation Bldg	WDV = Wastewater Distribution Valve Box
DAF = Disolved Air Flotation	GT = Gravity Thickening	PST = Propane Storage Tank	
DCB = Digester Control Bldg	HW = Headworks	RRF = Resource Recovery Facility	
		RS = Receiving Station (FOG)	

Note: Some facilities require work in multiple phases. The phase indicated here is when the majority of the work is planned.

LEGEND
Phase 1A
Phase 1B
Phase 2
Phase 3

Plant-wide Improvements:
- Upgrade of electrical/SCADA
- Add solar or alt. energy
- Potential Additonal of Seawall

RECOMMENDED WASTEWATER TREATMENT PLANT PROJECTS BY PHASE

FIGURE 5.10

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Oxnard - Wastewater Collection System CIP Schedule

Design | Bid/Award Contract | Construction

Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2
Wastewater Collection System																								
Central Trunk Manhole Rehabilitation Phase 1																								
Central Trunk Manhole Rehabilitation Phase 2[1]																								
Harbor Blvd Manhole Rehabilitation																								
Pleasant Valley Manhole Rehabilitation																								
Redwood Tributary Manhole Rehabilitation																								
Annual Existing Manhole Rehabilitation																								
Rice Avenue Sewer Improvement																								
Existing Sewer Deficient Capacity Replacement																								
Existing Sewer Deficient Capacity Replacement																								
Existing asbestos concrete pipe (ACP) Replacement																								
Annual Existing Pipe Repair																								
Collection System Chemical Addition																								
Devco Development Lift Station																								
Existing Lift Station #4 (Mandalay & Wooley) Rehabilitation																								
Existing Lift Station #6 (Canal) Rehabilitation																								
Existing Lift Station #20 (Beardsley) Rehabilitation																								
Meter Vault/Vortex Structure Coating Rehabilitation[1]																								
S Victoria Ave and W Hemlock St - Sewers in the Channel Islands Neighborhood[2]																								
Phase 1 Central Trunk replacement[3]																								
Phase 2 Central Trunk Replacement[3]																								

Notes:
(1) Projects correspond to refinements and updates provided by City after Dec. 2015 publication date.
(2) Projects start year correspond to refinements and updates provided by City after Dec. 2015 publication date.
(3) Projects start year was adjusted by City at 8/7/17 meeting, based on recent CCT inspection.

RECOMMENDED COLLECTION SYSTEM PROJECTS SCHEDULE

FIGURE 5.11A

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Oxnard - Wastewater Treatment System CIP Schedule

Design | Bid/Award Contract | Construction

Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2	3 4 1 2
Wastewater Treatment System																								
Accelerated design for renewal improvements (year 6 - 10)[1]																								
Preliminary Treatment / Headworks																								
Headworks Odor Control System[1]																								
Headworks Fiberglass Covers Replacement & Concrete Coating Repair[1]																								
Headworks Rehabilitation[1]																								
Non-hazardous Waste Receiving Station																								
Small Equipment Replacement - Headworks 2[2]																								
Primary Treatment																								
Primary Clarifier Rehabilitation																								
Primary Clarifier Abandonment																								
Primary Clarifiers, Old Headworks Structure and Primary Building Demolition[1]																								
Secondary Treatment																								
Biotowers Rehabilitation																								
Biotower Demolition[1]																								
Activated Sludge Tank (AST) Rehabilitation[1]																								
Activated Sludge Tank (AST) Upgrades																								
Modify Activated Sludge Tank (AST) for MBR or other technology operation																								
Convert Activated Sludge Tanks conversion to Flow Equalization Tank																								
Convert Secondary Clarifiers to Primary Clarifiers																								
Remove existing Secondary Clarifiers and prepare for new MBR or other Technology																								
New MBR or other technology Tanks																								
MBR or other Technology Building																								
Convert Existing Secondary Clarifier to Screening & Transfer Pump Station																								
Disinfection and Effluent Pumping																								
Relocate Existing Primary Influent Piping																								
Add Baffle Walls in ASTs [2]																								
Coating Replacement on Chlorine Contact Tanks[2]																								
Small Equipment Replacement - wet weather storage 2[2]																								
Add UV/AOP after MBR[2]																								
Solids Treatment																								
Sludge Thickening Facility[1]																								
Digester 2 Cover Replacement and Clean Digesters 1 & 3[1]																								
Digesters 1 and 3 Rehabilitation[1]																								
Replace Belt Filter Presses & Conveyor																								
FOG Receiving Station[1]																								
Demolish Operations Center and Vac Filter Building[2]																								
New Digester 2[2]																								
New Digester Control Building[2]																								
Move Dewatering Facility and add New Centrifuges[2]																								
Add Dewatering Capacity[2]																								
Add Sludge Silos[2]																								
Pump Station																								
Interstage Pump Station Rehabilitation[1]																								
Effluent Pump Station Rehabilitation																								
Electrical / Instrumentation																								
Electrical Building ARC Flash Protection																								
Cogenerators Rehabilitation[1]																								
Electrical/Instrumentation Manhole Rehabilitation																								
Emergency Standby Generator Replacement[1]																								
Plant Motor Control Center (MCC) Panel Replacement[1]																								
New Main Electrical Building[1]																								
New North Electrical Building																								
Site Electrical Improvements																								
Computerized Maintenance Management System (CMMS)																								
Supervisory Control and Data Acquisition and (SCADA) System																								
New SCADA System																								
New Supervisory Control and Data Acquisition (SCADA) system																								
New Cogen Building[2]																								
Small Equipment Replacement - Electrical 1[2]																								
Small Equipment Replacement - Electrical 2[2]																								
Small Equipment Replacement - Electrical 3[2]																								
Small Equipment Replacement - Cogen[2]																								
Site Work																								
Site Piping Replacements																								
Site Security																								
Storm water Site Improvements																								
Building																								
Laboratory HVAC Unit																								
New Chemical Storage Building[1]																								
Collection System Maintenance Building Rehabilitation[1]																								
Administration Building and Laboratory Rehabilitation[1]																								
Plant Control Center Building Rehabilitation																								
Maintenance Building Rehabilitation																								
Storage Warehouse Building																								
Rehab Grit Screening Building - Seismic Retrofit[2]																								
Plant Paving Resurfacing[2]																								
Solar or Alternative Energy Facility[2]																								
Seawall																								

Notes:
(1) Projects correspond to refinements and updates provided by City after Dec. 2015 publication date.
(2) Projects start year correspond to refinements and updates provided by City after Dec. 2015 publication date

RECOMMENDED WASTEWATER SYSTEM PROJECTS SCHEDULE

FIGURE 5.11B

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Table 5.14 Recommended Projects for Within Fence-Line Wastewater System
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[(1)]	2015 Project ID	Project	Driver	Start Year	Years to Implement
--		Accelerated design for renewal improvements (year 6 - 10)[(2)]		2018	6
Preliminary Treatment/Headworks					
T-1	WW-P-83	Headworks Odor Control System[(3)]	Small Equipment Replacement	2018	1
T-2	WW-P-67	Headworks Fiberglass Covers Replacement & Concrete Coating Repair[(3)]	R&R	2018	2
T-3	WW-P-66	Headworks Rehabilitation[(3)]	R&R	2020	2
	WW-P-84	Small Equipment Replacement - Headworks[(2)]	Small Equipment Replacement	2023[(4)]	3
T-4	WW-P-41	Non-hazardous Waste Receiving Station	Performance	2026	1
Primary Treatment					
T-5		Primary Clarifier Rehabilitation	R&R	2017	1
T-6		Primary Clarifier Abandonment	R&R	N/A	0
T-7	WW-P-23	Primary Clarifiers, Old Headworks Structure and Primary Building Demolition[(3)]	R&R	2025	1
Secondary Treatment					
T-8		Biotowers Rehabilitation	R&R	2017	1
T-10	WW-P-69	Activated Sludge Tank (AST) Rehabilitation[(3)]	R&R	2017	1
T-9	WW-P-20	Biotower Demolition[(3)]	R&R	2023	1

Table 5.14 Recommended Projects for Within Fence-Line Wastewater System
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[(1)]	2015 Project ID	Project	Driver	Start Year	Years to Implement
T-11	WW-P-72 WW-P-74 WW-P-76	Activated Sludge Tank (AST) Upgrades	R&R, Performance	2023	1
T-12	WW-P-72	Modify Activated Sludge Tank (AST) for MBR or other technology operation	Performance	2023	2
T-15		Remove existing Secondary Clarifiers and prepare for new Membrane Bioreactor (MBR) or other Technology	R&R	2023	2
T-16	WW-P-75 WW-P-97	New MBR or other technology Tanks	R&R, Resource Sustainability	2023	2
T-17	WW-P-97	MBR or other Technology Building	Resource Sustainability	2023	2
T-13	WW-P-68 WW-P-72	Convert Activated Sludge Tanks conversion to Flow Equalization Tank	R&R, Performance	2024	1
T-18		Convert Existing Secondary Clarifier to Screening & Transfer Pump Station	R&R	2024	1
T-19	WW-P-96 WW-P-80 WW-P-81	Disinfection and Effluent Pumping	Small Equipment Replacement, R&R	2024	1
T-20		Relocate Existing Primary Influent Piping	R&R	2024	1
T-14	WW-P-70 WW-P-73	Convert Secondary Clarifiers to Primary Clarifiers	R&R	2025	1
	WW-P-79	Small Equipment Replacement - wet weather storage[(2)]	Small Equipment Replacement	2026[(4)]	3

Table 5.14 Recommended Projects for Within Fence-Line Wastewater System
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[(1)]	2015 Project ID	Project	Driver	Start Year	Years to Implement
	WW-P-98	Add UV/AOP after MBR	Resource Sustainability	2026[(4)]	2
	WW-P-21	Add Baffle Walls in ASTs	R&R	2027[(4)]	1
	WW-P-95	Coating Replacement on Chlorine Contact Tanks	R&R	2028[(4)]	2
Solids Treatment					
T-24	WW-P-40	Replace Belt Filter Presses & Conveyor	R&R	2017	4
T-22	WW-P-43	Digester 2 Cover Replacement and Clean Digesters 1 & 3[(3)]	R&R	2019	3
T-23	WW-P-87 WW-P-89	Digesters 1 and 3 Rehabilitation[(3)]	R&R	2025	2
T-21	WW-P-44 WW-P-45 WW-P-51	Sludge Thickening Facility[(3)]	R&R, Performance	2026	1
T-25	WW-P-94	FOG Receiving Station[(3)]	Resource Sustainability	2026	1
	WW-P-46	Demolish Operations Center and Vac Filter Bld	R&R	2027[(4)]	1
	WW-P-90	New Digester Control Building	R&R	2029[(4)]	5
	WW-P-88	New Digester 2	R&R	2030[(4)]	3
	WW-P-47	Move Dewatering Facility and add New Centrifuges	Performance	2030[(4)]	3
	WW-P-48	Add Dewatering Capacity	Performance	2030[(4)]	3
	WW-P-50	Add Sludge Silos	Performance	2032[(4)]	3

Table 5.14 Recommended Projects for Within Fence-Line Wastewater System
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[(1)]	2015 Project ID	Project	Driver	Start Year	Years to Implement
Pump Station					
T-27		Effluent Pump Station Rehabilitation	R&R	2019	3
T-26	WW-P-22	Interstage Pump Station Rehabilitation[(3)]	R&R	2020	2
Electrical / Instrumentation					
T-28		Electrical Building ARC Flash Protection	Performance	2017	2
T-29	WW-P-93	Cogenerators Rehabilitation[(3)]	R&R	2017	3
T-30	WW-P-32	Electrical/Instrumentation Manhole Rehabilitation	R&R	2017	1
T-36	WW-P-39	Computerized Maintenance Management System (CMMS)	R&R	2017	1
T-37	WW-P-35	Supervisory Control and Data Acquisition and (SCADA) System	R&R	2017	1
T-31	WW-P-33	Emergency Standby Generator Replacement[(3)]	R&R	2020	2
T-32	WW-P-34	Plant Motor Control Center (MCC) Panel Replacement[(3)]	R&R	2020	2
T-33	WW-P-30 WW-P-31	New Main Electrical Building[(3)]	R&R	2020	2
T-38	WW-P-35	New SCADA System	R&R	2020	2
T-34	WW-P-59	New North Electrical Building	R&R	2024	2
T-35		Site Electrical Improvements	R&R	2024	3
T-39	WW-P-35	New Supervisory Control and Data Acquisition (SCADA) system	R&R	2024	2
	WW-P-92	Small Equipment Replacement - Cogen	Small Equipment Replacement	2026[(4)]	3

Table 5.14 Recommended Projects for Within Fence-Line Wastewater System
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[1]	2015 Project ID	Project	Driver	Start Year	Years to Implement
	WW-P-36	Small Equipment Replacement - Electrical 1	Small Equipment Replacement	2028[4]	2
	WW-P-91	New Cogen Building	R&R	2032[4]	3
	WW-P-37	Small Equipment Replacement - Electrical 2	Small Equipment Replacement	2032[4]	2
	WW-P-38	Small Equipment Replacement - Electrical 3	Small Equipment Replacement	2036[4]	2
Site Work					
T-41		Site Security	R&R	2019	2
T-42		Storm water Site Improvements	R&R	2019	3
T-40	WW-P-42	Site Piping Replacements	R&R	2020	5
Building					
T-43		Laboratory HVAC Unit		2017	1
T-46	WW-P-49	Administration Building and Laboratory Rehabilitation[3]	R&R	2025	1
T-47		Plant Control Center Building Rehabilitation	R&R	2025	1
T-44	WW-P-57	New Chemical Storage Building[3]	R&R	2026	1
T-45	WW-P-56	Collection System Maintenance Building Rehabilitation[3]	R&R	2026	1
T-48	WW-P-58	Maintenance Building Rehabilitation	R&R	2026	1
T-49	WW-P-27 WW-P-28	Storage Warehouse Building	R&R	2026	1
	WW-P-60	Rehab Grit Screening Building - Seismic Retrofit	R&R	2027[4]	2
	WW-P-99	Solar or Alternative Energy Facility	Resource Sustainability	2027[4]	10

Table 5.14 Recommended Projects for Within Fence-Line Wastewater System
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[1]	2015 Project ID	Project	Driver	Start Year	Years to Implement
	WW-P-65	Plant Paving Resurfacing	R&R	2030[4]	3
	WW-P-100	Seawall	Resource Sustainability	2033	5

Notes:
(1) 2017 Project ID's were arbitrarily assigned for Project ease. T = Treatment System Project. These are the projects from the approved Cost of Service Studies (Carollo, 2017).
(2) Cost added by City consultant after December 2015 publication during facilities pre-design/planning.
(3) Projects correspond to refinements and updates provided by City after December 2015 publication date.
(4) Project start year corresponds to refinements and updates provided by City after December 2015 publication date.

Table 5.15 Immediate CIP Projects Approved in Years 1 – 2[1]
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[2]	2015 Project ID	Unit Operation	Project	Driver	Start Year	Years to Implement
C-1	WW-P-6	Collection System	Central Trunk Manhole Rehabilitation Phase 1	R&R	2018	1
C-17	WW-P-5	Collection System	Meter Vault/Vortex Structure Coating Rehabilitation[3]	R&R	2018	1
T-1	WW-P-83	Preliminary Treatment/Headworks	Headworks Odor Control System[3]	Small Equipment Replacement	2018	1
T-2	WW-P-67	Preliminary Treatment/Headworks	Headworks Fiberglass Covers Replacement & Concrete Coating Repair[3]	R&R	2018	2

Table 5.15 Immediate CIP Projects Approved in Years 1 – 2[1]
Public Works Integrated Master Plan
City of Oxnard

2017 Project ID[2]	2015 Project ID	Unit Operation	Project	Driver	Start Year	Years to Implement
T-5		Primary Treatment	Primary Clarifier Rehabilitation	R&R	2017	1
T-6		Primary Treatment	Primary Clarifier Abandonment	R&R	N/A	0
T-8		Secondary Treatment	Biotowers Rehabilitation	R&R	2017	1
T-10	WW-P-69	Secondary Treatment	Activated Sludge Tank (AST) Rehabilitation[3]	R&R	2017	1
T-24	WW-P-40	Solids Treatment	Replace Belt Filter Presses & Conveyor	R&R	2017	4
T-28		Electrical/Instrumentation	Electrical Building ARC Flash Protection	Performance	2017	2
T-29	WW-P-93	Electrical/Instrumentation	Cogenerators Rehabilitation[3]	R&R	2017	3
T-30	WW-P-32	Electrical/Instrumentation	Electrical/Instrumentation Manhole Rehabilitation	R&R	2017	1
T-36	WW-P-39	Electrical/Instrumentation	Computerized Maintenance Management System (CMMS)	R&R	2017	1
T-37	WW-P-35	Electrical/Instrumentation	Supervisory Control and Data Acquisition and (SCADA) System	R&R	2017	1
T-43		Building	Laboratory HVAC Unit		2017	1

Notes:
(1) Approved by City Council based on Wastewater Cost of Service Study (Carollo.2017).
(2) 2017 Project ID's were arbitrarily assigned for Project ease. C = Collection System Project: T = Treatment System Project. These are the projects from the approved Cost of Service Studies (Carollo, 2017).
(3) Project corresponds to refinements and updates provided by City after December 2015 publication date.

At this time, the new plant location is assumed to be less space-limited than the existing site. Thus, to reduce costs, conventional activated sludge treatment and chlorine disinfection could be installed for secondary treatment instead of MBR and ultraviolet light (UV) facilities. All other new facilities recommended for the existing plant option, such as a FOG receiving station and Chemically Enhanced Primary Treatment (CEPT), are still recommended with this option.

Table 5.16 lists the details of these projects.

Table 5.16 List of Projects Needed with Relocated Wastewater Treatment Plant Option
Public Works Integrated Master Plan
City of Oxnard

Project Name	Driver	Start Year	Years to Implement
Phase 1 Projects			
New Primary Clarifiers	R&R	2023	5
CEPT	Performance	2023	2
New Digesters	R&R	2023	5
New DAFTs	Performance	2023	3
New Chemical Handling Facilities	R&R	2023	2
New Primary Sedimentation Building	R&R	2023	5
New Chemical Handling Building	R&R	2023	3
New Non Hazardous Liquid Receiving Station	Performance	2023	2
New FOG Receiving Station	Resource Sustainability	2023	2
New Digester Control Building	R&R	2023	5
New Polymer Building	R&R	2023	3
New Solids Processing Facility	Performance	2023	3
New Sludge Silos	Performance	2023	3
New Cogeneration Facility	R&R	2023	3
New Operations Center and Lab Building	R&R	2023	4
New Collection System Maintenance Building	R&R	2023	2
New Storage/Warehouse	R&R	2023	2
New Effluent Electrical Building	R&R	2023	3
New North Area Electrical Building	R&R	2023	3
New Main Electrical Building	R&R	2023	3
Solar Facilities	Resource Sustainability	2023	10

Table 5.16 List of Projects Needed with Relocated Wastewater Treatment Plant Option
Public Works Integrated Master Plan
City of Oxnard

Project Name	Driver	Start Year	Years to Implement
SCADA System Upgrade	R&R	2023	5
AST Blower and Diffuser Replacement	R&R	2017	3
Secondary Small Equipment Replacement	Small Equipment Replacement	2017	3
Secondary Sedimentation Tanks Replace Skimmers, Collectors, Drives and RAS Pumps	R&R	2017	3
EQ Basin Small Equipment Replacement	Small Equipment Replacement	2019	3
AST Concrete Rehabilitation	R&R	2017	11
SST Concrete Rehabilitation	R&R	2017	11
EQ Concrete Rehabilitation	R&R	2017	3
Chlorine Contact Tanks Rehabilitation	Small Equipment Replacement	2023	3
Chlorine Contact Tanks Coating	R&R	2025	2
Effluent Pump Station Rehabilitation	R&R	2017	3
CMMS	R&R	2017	3
Phase 2 Projects			
New Activated Sludge Tanks	R&R	2035	5
New Secondary Sedimentation Tanks	R&R	2035	5
New EQ Basin	R&R	2035	5
New Chlorine Contact Tanks	R&R	2035	5
New Effluent Pump Station	R&R	2035	5
Headworks Rehabilitation	R&R	2035	5

RECYCLED WATER SYSTEM MASTER PLAN

6.1 INTRODUCTION

The City is committed to providing recycled water with its Groundwater Recovery Enhancement and Treatment (GREAT) Program, which gives the City access to a reliable and sustainable supply of high quality water, thus decreasing the City's reliance on imported water. Key components of the GREAT program include the following:

Recycled Water (RW) System
Treating and distributing wastewater to the most stringent levels [via the Advanced Water Purification Facility (AWPF)].

Water Supply
Treating groundwater for total dissolved solids (TDS) and nitrate reduction through a desalter.

Indirect Potable Reuse (IPR) / Direct Potable Reuse (DPR) Through Groundwater Injection
Adding wells that allow recycled water to be injected into and extracted from the local groundwater aquifer.

Elements Related to the AWPF and Desalter:
Collecting and treating concentrate (brine) from both AWPF and desalters.

A major part of the GREAT program is the use of recycled water, which the City has studied and made plans for over many years. This chapter outlines the portion of the system already used to provide tertiary-treated recycled water for irrigation. The remainder of the planned systems is summarized as well.

The analysis and evaluations contained in this Summary Report are based on data and information available at the time of the original date of publication of the Project Memos (PMs), December 2015. After development of the December 2015 Final Draft PMs, the City continued to move forward on two concurrent aspects: 1) advancing the facilities planning for the water, wastewater, recycled water, and stormwater facilities; and 2) developing Updated Cost of Service (COS) Studies (Carollo, 2017) for the wastewater/collection system and the water/distribution system. The updated 2017 COS studies contain the most recent near-term Capital Improvement Projects (CIP). The complete updated CIP based on the near-term and long-term projects is contained in Appendix B.

6.1.1 GREAT Program Foundation & Evolution

When the GREAT program was formally established in 2002, its objectives were to:

- Increase the reliability of the water supply during drought.

- Reduce water supply costs.
- Secure the water supply's ability to meet a growing water demand.
- Enhance stewardship of the local water supply through recycling and reusing a substantial portion of the region's wastewater.
- Increase environmental benefits associated with developing and rehabilitating local saltwater wetlands.

Although the program has evolved over the years, it has generally maintained its support of water recycling and reuse, groundwater injection, storage and recovery, and groundwater desalination. Thus, the goal of this Integrated Master Plan is to build on the foundation already in place.

To build on this foundation, it's helpful to analyze past reports to understand the program's evolution. Two reports are of particular importance: *The 2002 Advanced Planning Study* and *The 2012 GREAT Program Update*. These reports are summarized below.

- 2002 – Advanced Planning Study (K/J, 2002) – This study recommended a series of projects aimed at providing a sustainable water supply for the City, including construction of tertiary and advanced recycled water treatment facilities, aquifer storage and recovery (both for IPR/DPR and seawater intrusion barrier), regional and local desalting to treat additional groundwater, and concentrate collection.
- 2012 – GREAT Program Update (City, 2012) – This report provided additional details for many of the projects established in 2002, updated the progress to date, and estimated costs for the program elements.

Over the years, utilities have shifted from using groundwater recharge for seawater intrusion barriers to using it for ASR. This is largely due to the high cost of the wells. In addition, because of recent pumping cutbacks from the Fox Canyon Groundwater Management Agency (FCGMA), access to more local groundwater through pump-back credits is not guaranteed and is therefore of little direct benefit to the City.

At the same time, the City began to look at IPR/DPR with renewed interest because of its benefit to the City and the impending regulatory acceptance for it. As a result, the Integrated Master Plan focuses on recycled water for irrigation use as well as for IPR/DPR.

6.2 DESCRIPTION OF EXISTING FACILITIES

Wastewater from the Oxnard Wastewater Treatment Plant (OWTP) provides secondary treated wastewater to the AWPF for recycled water treatment. In general, the collected flow is residential. About 75 percent of all wastewater is domestic, with the remaining 25 percent from industrial users. Average secondary effluent flows (2009- 2013) from the wastewater facility are 20.5 mgd at average dry weather flow (ADWF) conditions and 22.9 mgd for an

average day maximum month day flow (ADMMF). The OWTP is permitted at a capacity of 31.7 mgd ADWF.

6.2.1 AWPF

The recycled water system currently consists of an AWPF and distribution pumping and conveyance. The AWPF consists of microfiltration (MF), reverse osmosis (RO), and advanced oxidation processes (AOP), including ultraviolet light and hydrogen peroxide and the necessary ancillary equipment for a fully functional facility. Figure 6.1 illustrates a schematic of the AWPF process in its current configuration.

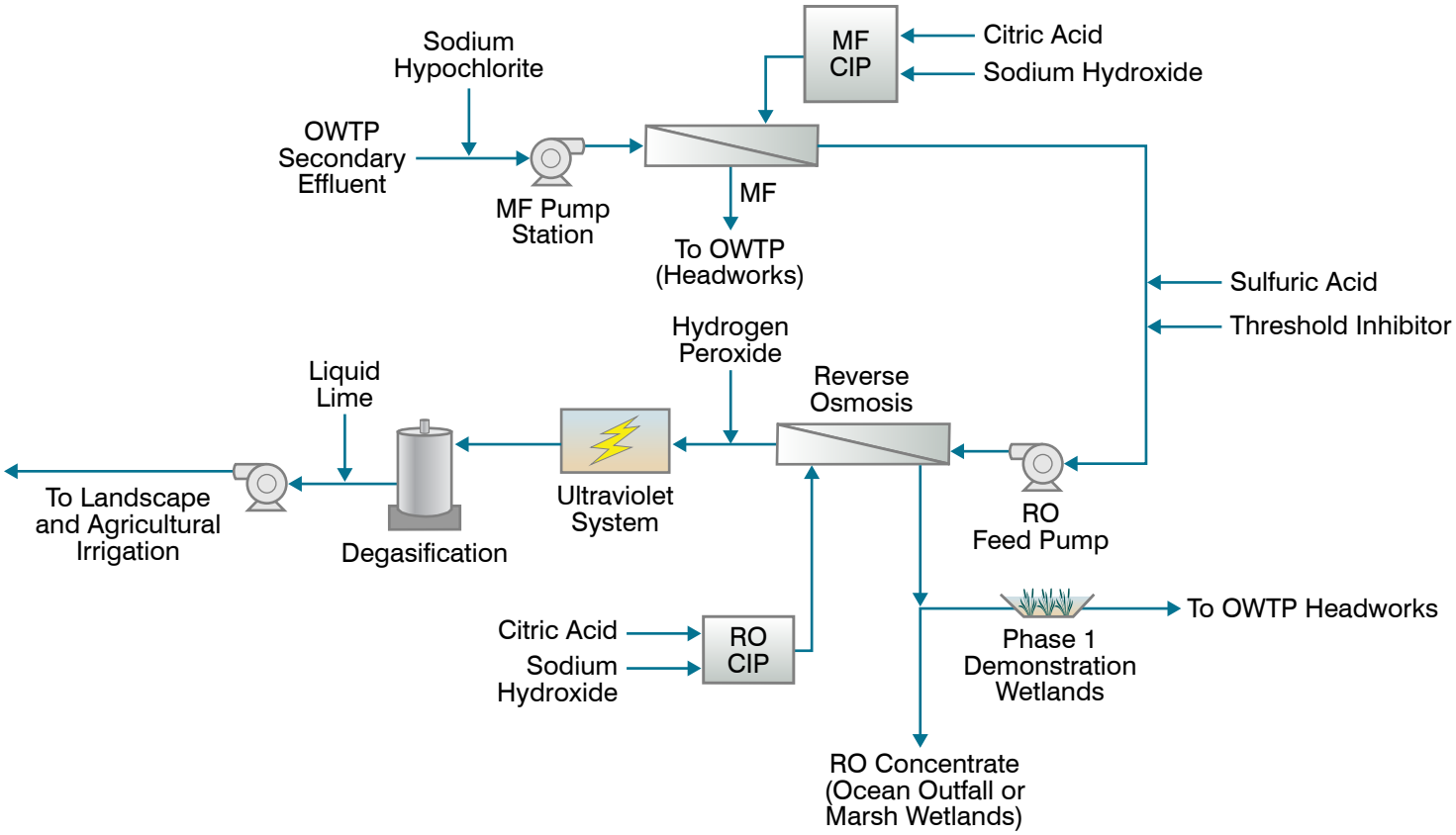
6.2.2 Recycled Water Distribution System

The main components of the existing recycled water distribution system include the following:

- Recycled Water Backbone System (RWBS)
  The constructed Phase 1 recycled water conveyance system is a combination of PVC and high-density polyethylene (HDPE) pipelines, with diameters ranging from 16 inches to 36 inches in the main transmission line and 6 to 8 inches in the distribution pipe to the River Park Development.
- Finished Recycled Water Pump Station
  The AWPF recycled water pump station contains two variable frequency drive (VFD) pumps, each with a design capacity of 4,000 gallons per minute (gpm) with an output pressure of about 150 psi.
- Hueneme Road – Phase 1

  A 42-inch diameter pipeline was recently installed from the existing 36-inch diameter connection to the AWPF at the intersection of Hueneme Road and Perkins Road. The 42-inch diameter section of this pipeline continues to the intersection of Hueneme Road and Edison Drive. From there, a 36-inch diameter recycled water pipeline continues down Hueneme Road until the intersection at Olds Road where it terminates. A Phase 2 Hueneme Road pipeline, beginning where Phase 1 left off, is in the planning stages.
- Temporary Salinity Management Pipeline (SMP) Line

  Because the Hueneme Road - Phase 2 pipeline will not be constructed and operational for several years, the City will temporarily deliver recycled water to the agricultural customers in the Oxnard Plain through the SMP. This is for two reasons: 1) the SMP's route runs parallel to the City's planned Hueneme Road pipeline, and 2) the SMP is underutilized at this time. For this to occur, the Los Angeles Regional Water Quality Control Board (LARWQCB) amended the City's Waste Discharge Requirements (WDRs), Order No. R4-2011-0079-A01 and Monitoring and Reporting Program, R4-2008-A01, in July of 2015 to allow the SMP to temporarily deliver AWPF effluent to farmers. Construction and planning for the temporary SMP connection are complete, with water delivery currently taking place.



AWPF SCHEMATIC

FIGURE 6.1

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- Ocean View Pump Station
  This Pump Station contains two VFD pumps, each with a design capacity of 2,210 gpm with an output pressure of about 50-psi. These pumps will be used to supply the SMP Line.

Currently, no storage tanks are in the distribution system, meaning peak demands must be met directly from the AWPF. A map of the existing recycled water distribution system is shown in Figure 6.2 along with major users.

6.2.3 ASR Demonstration Well (Under Construction)

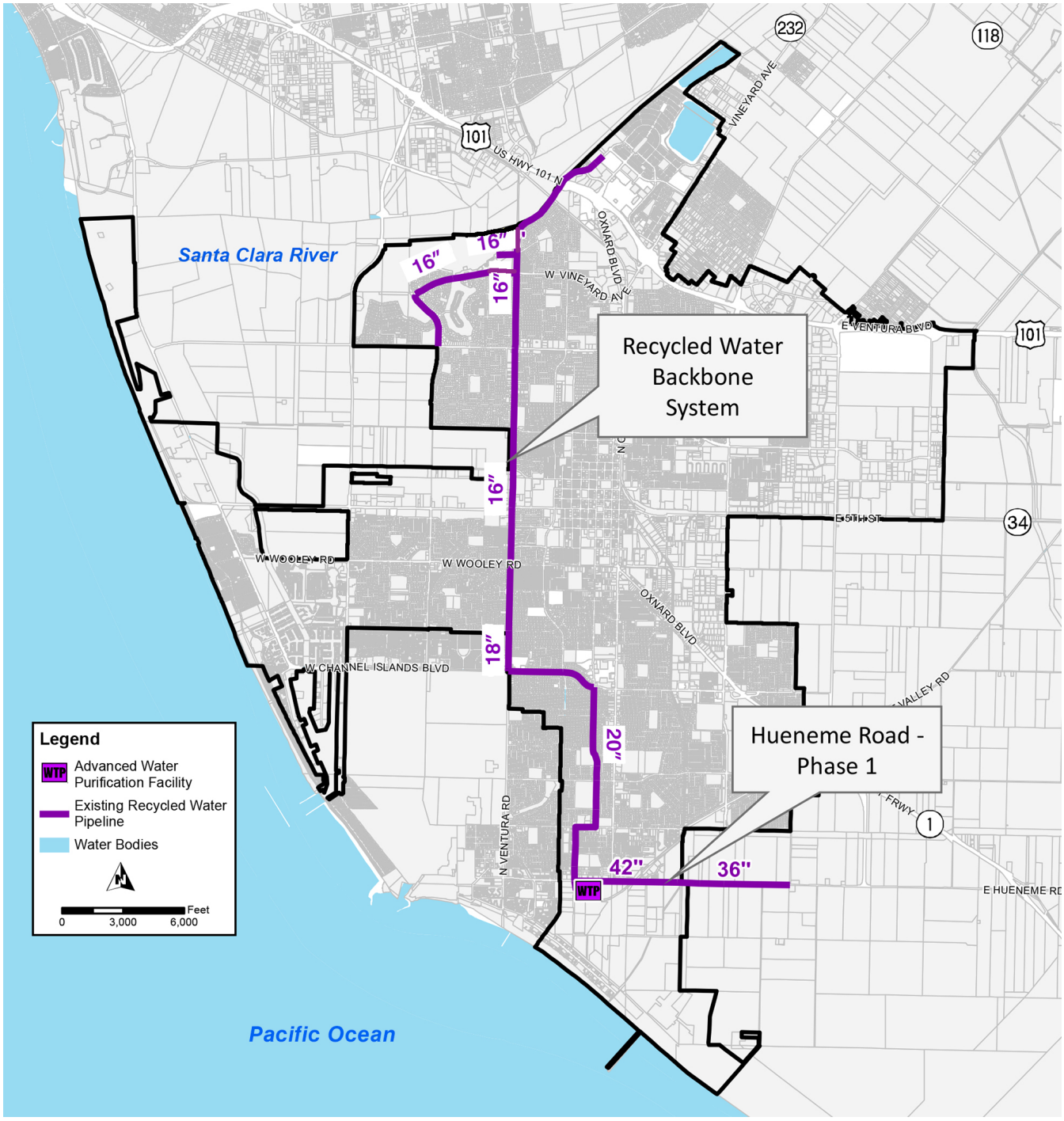
The City is currently constructing an ASR Demonstration well, which is expected to be completed in 2018. The construction of this well is grant funded and will serve as a test well for the City to understand how ASR/IPR will work moving forward.

Initially, the ASR Demonstration well will be used as an ASR well for the recycled water system. Recycled water from the AWPF will be injected into the ground and then extracted and put back into the City's RW system for irrigation use. Ultimately, once all of the required start-up testing and monitoring are complete, the well will switch to IPR operation, and the extracted water will be conveyed to the BS No. 1/6 nearby for disinfection and injection into the potable system.

Elements of this ASR Demonstration Well installation include the following:

- Constructing one IPR/ASR well at the Campus Park site.
- Constructing three monitoring wells (two shallow and one deep aquifer) for the one IPR/ASR well.
- Adding 2,000 linear feet (lf) of RW piping connecting the IPR/ASR well to the Recycled Water Backbone piping located in Ventura Road.
- Adding 4,000 lf of piping to convey IPR water from Campus Park to BS No. 1/6 for blending into the potable system, which will eventually be converted to a potable line when the IPR/ASR operation is fully approved.

A hydrogeological study was conducted (Hopkins, 2016) to assess the proposed location and capacity for this well at Campus Park. This study recommended an injection and extraction capacity of approximately 2,000 gpm and recommended operating the well on a 3-month rotation of recharge, retention, and recovery. Figure 6.3 illustrates the location of the proposed ASR well at Campus Park.



EXISTING RECYCLED WATER FACILITIES

FIGURE 6.2

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N

250 125 0 250

Feet

LEGEND

Proposed ASR Well Location

Proposed Monitoring Well Locations

DEMONSTRATION ASR WELL PROPOSED LOCATION

FIGURE 6-3

CITY OF OXNARD

SUMMARY REPORT

PUBLIC WORKS INTEGRATED MASTER PLAN

CITY OF OXNARD CALIFORNIA

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ox1115f30-9587(SumRepFIG6-3).ai

6.3 CURRENT RECYCLED WATER DEMANDS

The City projects that in the initial phases of the GREAT Program, approximately 7,000 AFY (acre-feet per year), or 6.25 mgd, of AWPF water will be produced. The City has an approved Full Advanced Treatment Recycled Water Management and Use Agreement, A-7651. Signatories to the Agreement include: United Water Conservation District (UWCD), Pleasant Valley County Water District (PVCWD), Houweling Nurseries Oxnard, Inc., Southland Sod, and Reiter Brothers, Inc. According to this agreement, the following significant demands are accounted for:

- The City has the right to the first 1,500 to 1,800 AFY, which will be delivered to existing customers in lieu of potable water and to the River Ridge Golf Club. In addition, the City will deliver RW water to River Park Development and New Indy Container Board for a total of approximately 2,800 AFY, or 2.5 mgd in Phase 1A. This RW will be used to offset potable water demand along the completed RWBS that would otherwise be served through the City's potable water system.
- For Phase 1B, an additional 2,000 AFY, or 1.8 mgd, of AWPF water is dedicated to agricultural users along the (future) Hueneme Road Pipeline.
- According to Agreement A-7651, using the remaining 7,000 AFY of RW available from the AWPF is to be determined by the City, UWCD, and PVCWD.

Table 6.1 summarizes the existing and future recycled water demands as they are currently known. The City is also planning to implement 40 to 50 small urban recycled water irrigation projects along the RWBS to offset further potable use. This implementation would be phased over several years. Figure 6.4 illustrates the locations of the existing and planned customers, as they are known that this time.

6.4 PROJECTED RECYCLED WATER DEMANDS

Under the GREAT Program, construction of the AWPF is planned in four phases that result in AWPF capacities of 7,000, 14,000, 21,000 and 28,000 AFY. As previously noted, the first phase of 7,000 AFY, which has been completed, is largely accounted for through urban and agricultural irrigation uses.

As subsequent phases of the AWPF come online, AWPF effluent will go first to recycled water users currently under contract, then to IPR/DPR, and then to additional agricultural users, which would benefit the City in the form of groundwater pump-back credits. Therefore, Phase 2 and 3 RW demands shown in Table 6.1 are shown as additional ASR capacity.

Table 6.1 Existing and Future Recycled Water Demands
Public Works Integrated Master Plan
City of Oxnard

Phase	Location	Recycled Water Use	Average Day Demand (gpm)	Delivery Pressure (psi)	Daily Demand Timing
1A	New Indy Paper Company	Irrigation	456	60	Constant
1A	River Park Development	Irrigation	651	60	10:00 a.m. - 6:00 p.m.
1A	River Ridge Golf Course	Irrigation	1,057	20(2)	Constant
1B	Houweling Nursery	Irrigation	1,000	60	6:00 p.m. - 6:00 a.m.
1B	Southland Sod	Irrigation	1,000	60	6:00 a.m. - 6:00 p.m.
1B	Reiter	Irrigation	1,400	60	6:00 a.m. - 6:00 p.m.
2	Blending Station (BS) 1/6	IPR	8,000(1)	20(3)	Constant
2	Campus Park	IPR	6,000(1)	20(3)	Constant
3	BS 3	IPR	8,000(1)	20(3)	Constant

Notes:
(1) There is no required amount for IPR; the required flow listed is equal to the maximum proposed capacity based on the recommended projects needed for water supply, per PM 2.5; IPR is to be maximized using excess flow after customer contracted flows are delivered.
(2) The customer pumps RW a lake onsite after delivery; therefore, lower delivery pressures are acceptable.
(3) RW is delivered for ASR; lower delivery pressures are acceptable.

6.5 RECYCLED WATER SUPPLY (SECONDARY EFFLUENT)

The AWPF's water supply source is secondary effluent from the OWTP. Therefore, it is necessary to assess whether enough OWTP effluent exists to feed into the AWPF as capacity increases. In general, the AWPF's capacity cannot be expanded beyond what the OWTP can supply.

Table 6.2 summarizes the amount of OWTP effluent needed for the planned capacity expansions at the AWPF. Based on the future wastewater flow projections outlined in Chapter 5, by 2040, ADWF to the OWTP is expected to reach only 27.4 mgd. Given this, it is unlikely that there would be sufficient supply to the AWPF for the Phase 4 expansion (see Table 6.2).

It is equally important to consider the diurnal variation of the average daily flow. While the AWPF is optimally operated at a constant (or relatively constant) flow, secondary effluent flow from the OWTP varies throughout the day. Therefore, storing secondary effluent may be required to allow the AWPF to draw a consistent supply. Table 6.2 summarizes the results of that analysis.

The OWTP currently has 5 MG of secondary effluent storage, which it uses for peak shaving of its effluent pumping. Based on the required storage noted in Table 6.2, it is believed that the existing secondary effluent storage will be sufficient to serve as both AWPF storage and peak shaving for effluent pumping.

AN1

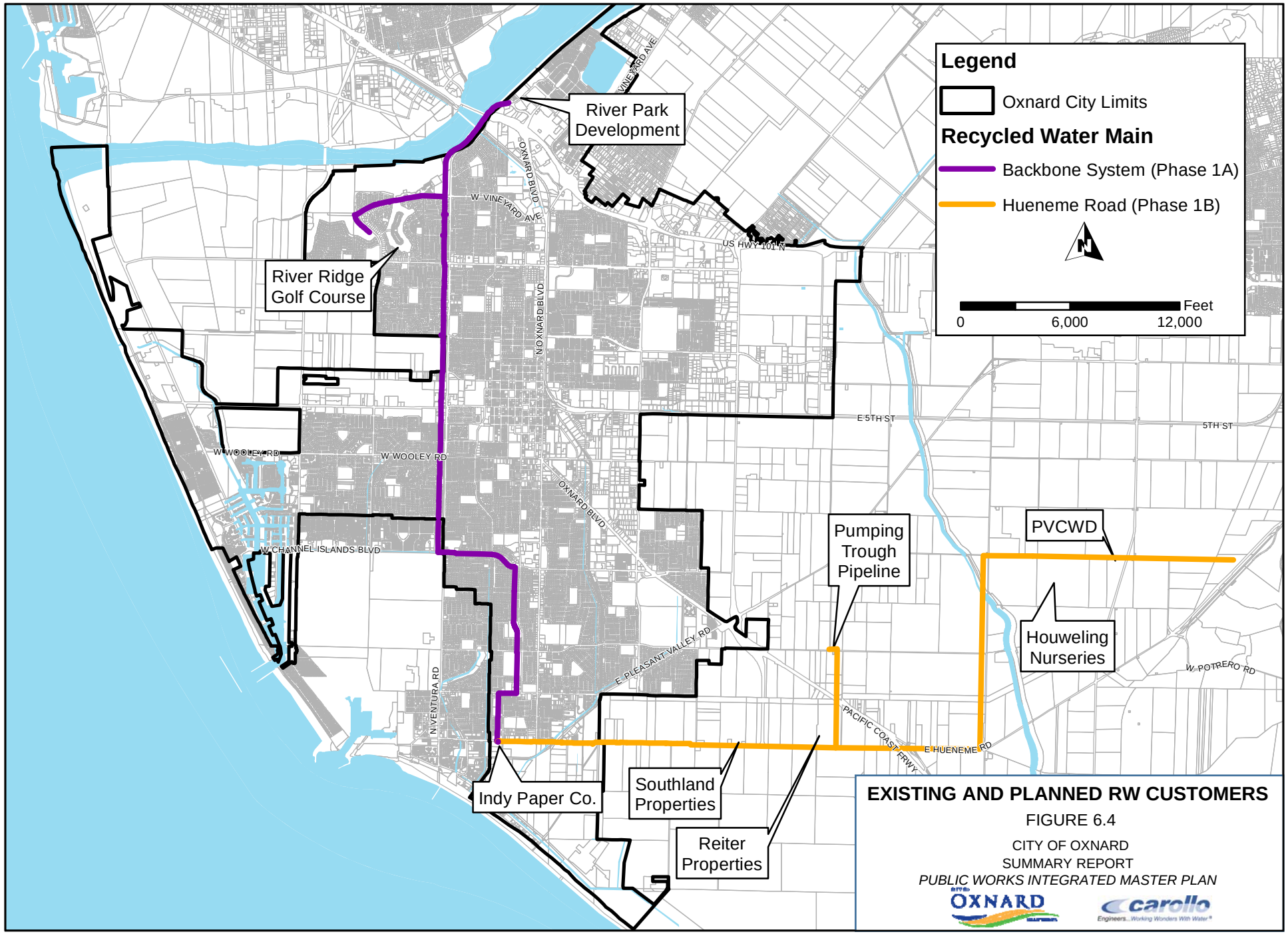
Legend
Oxnard City Limits
Recycled Water Main
Backbone System (Phase 1A)
Hueneme Road (Phase 1B)
N
Feet
0
6,000
12,000
River Park Development
River Ridge Golf Course
Pumping Trough Pipeline
PVCWD
Houweling Nurseries
Indy Paper Co.
Southland Properties
Reiter Properties
W VINEYARD AVE
OXNARD BLVD
US HWY 101 N
E 5TH ST
5TH ST
W WOOLEY RD
W CHANNEL ISLANDS BLVD
N VENTURA RD
E PLEASANT VALLEY RD
PACIFIC COAST FRWY
E HUENEME RD
W POTRERO RD
EXISTING AND PLANNED RW CUSTOMERS
FIGURE 6.4
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Table 6.2 Secondary Effluent Storage Needs Public Works Integrated Master Plan City of Oxnard			
AWPF Phase	**AWPF Capacity, mgd**	**Secondary Effluent Needed (Avg Day), mgd(1)**	**Secondary Effluent Storage Required, MG**
1	6.25	8.2	--
2	12.5	16.3	0.7
3	18.75	24.5	2.3
4	25	32.7	(2)

Notes:
(1) Estimated based on a MF recovery of 90% and RO recovery of 85%.
(2) Based upon wastewater flow projections for the PWIMP (by 2040, the average day flow is expected at 27.4 mgd), it is unlikely there will be enough secondary effluent flow to support an expansion of the AWPF up to 25 mgd.

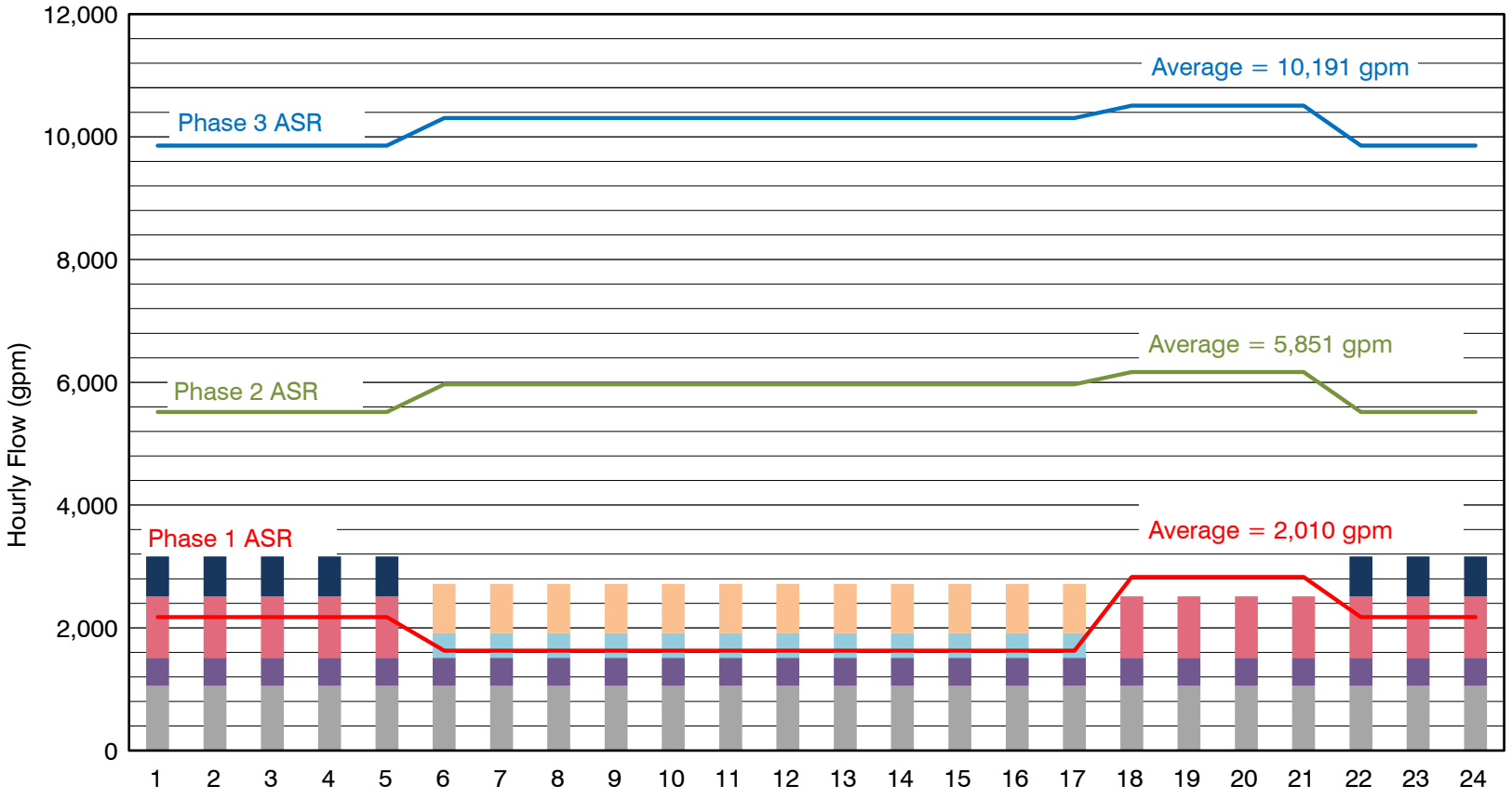
6.6 MASTER PLAN/DESIGN CRITERIA

Peaking conditions of particular importance to a hydraulic analysis of the distribution system include the following:

- Average Day Demand (ADD): the total annual production divided by number of days in the year.
- Maximum Day Demand (MDD): the greatest water demand during a 24-hour period of the year.
- Peak Hour Demand (PHD): the highest water demand during any 1-hour period of the year.

Recycled water demands are similar to water system demands in that water use above the ADD varies daily and seasonally. Irrigation demands vary from drinking water demands in that the peak use often occurs overnight so less irrigated water is lost from evapotranspiration.

For most of the customers shown in Table 6.1, water demand will be seasonal, peaking in the summer months. The only exceptions are the New Indy Paper Company, which has a year-round demand of 456 gpm, and the IPR operation, which is also expected to operate year-round. The RW customer demands are greater in the summer months but less in the winter, leaving more available water for IPR/ASR in the winter than in the summer. For Phases 1, 2 and 3, Figure 6.5 and Figure 6.6 display the projected diurnal demand curves for both the summer and winter demand conditions, respectively.



SUMMER RECYCLED WATER USE

FIGURE 6.5

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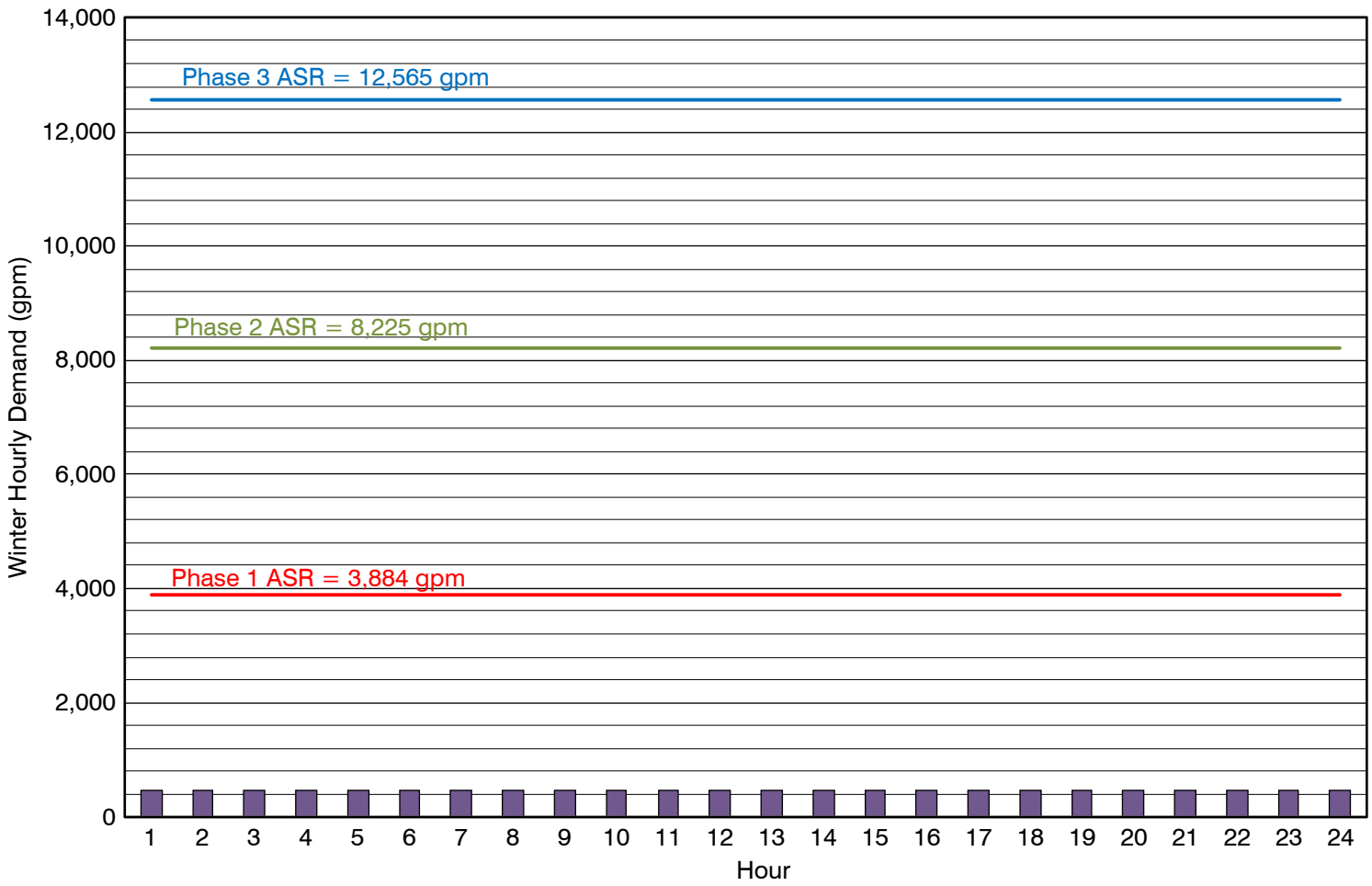

WINTER RECYCLED WATER USE

FIGURE 6.6

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CITY OF OXNARD CALIFORNIA

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6.6.1 Storage and Pumping

Currently, there are no operational storage tanks in the recycled water distribution system, although some small recycled water users maintain their own onsite storage, which reduces peak demand on the AWPF and the distribution system. Because of the lack of operational storage within the system, finished water storage was considered for the following RW operations:

- To provide operational storage for the IPR so the ASR well pumps can operate at a consistent rate while meeting peak demands out of storage.
- To provide a decoupling and monitoring step for future DPR, with each tank operating in one of three modes: filling, holding (for testing), or emptying.

If storage is installed, booster pumping capacity would be needed to pump from the distribution system's storage to meet PHD. For reliability, maintaining a firm pump station capacity equal to the PHD is desirable. Firm capacity is equal to the total capacity of the pump station minus the largest pump's capacity (in case one pump is out of service for maintenance).

In addition to the MDDs and PHDs discussed above, planning and design criteria were established for sizing the distribution system piping, storage, and pumping, and ASR operations. Table 6.3 summarizes all of the key planning criteria outlined for the RW system.

Table 6.3 RW System Master Planning/Design Criteria
Public Works Integrated Master Plan
City of Oxnard

Description	Value	Units
Design Capacity Criteria		
Treatment Facilities/Well Pumping	Max Day	--
Distribution System Piping/Pumping	Peak Hour	--
Aquifer Storage and Recovery Site		
Number of Wells per Site	6	--
Number of Monitoring Wells	3 per ASR Well	--
Well Capacity, each	2,000	gpm
Operational Storage(1)	1.0	MG
Booster Pumping(2)	500	HP
DPR Storage		
Number of Tanks	3	
Detention Time	12	hours
Tank Volume (per Tank)	3.1	MG

Table 6.3 RW System Master Planning/Design Criteria Public Works Integrated Master Plan City of Oxnard		
Description	**Value**	**Units**
Distribution System - Minimum Pressure		
Recycled Water Customers	60	psi
ASR Sites (Campus Park, BS No. 1/6, and BS No. 3)	20	psi
Customer Storage Tanks/Ponds	20	psi
Distribution System - Maximum Pressure		
Recycled Water Customers without Pressure Regulators	90	psi
Recycled Water Customers with Pressure Regulators	150	psi
Distribution Pipeline	150	psi
Distribution System - Pipeline Criteria		
Maximum Velocity at PHD	7	fps
Design Velocity for New Pipelines	5	fps
Hazen-Williams C-factor	130	n/a
Minimum Size for New Pipelines	8	inches
Head Loss for 1,000 feet of Pipeline	10	ft

Notes:

(1) Because the ASR wells are sized to supply a relatively constant supply (equal to the maximum day demand), operational storage provides additional capacity meet the peak demands (i.e., the difference between peak hour and maximum day demands) for the potable supply.

(2) Booster pumping designed to supply peak hour demands into the system for the potable supply.

6.7 FUTURE FACILITY NEEDS

The recycled water system's capacity and performance were compared with the above criteria to locate system shortfalls for both current and future conditions. In general, the existing system, which was newly constructed, will meet the demands of the current recycled water demands, as noted in Table 6.1, Phase 1A, and Phase 1B.

Since the AWPF was just completed and put online in 2015, the City is planning only minor adjustments for the facility, such as using sodium hypochlorite instead of hydrogen peroxide and modifying the A/V and security equipment. From a performance standpoint, the AWPF is operating as intended.

The WaterGems model was used to evaluate the existing water distribution system's performance for meeting current demands. The model was updated to reflect existing conditions of Oxnard’s recycled water system, including updated information on the AWPF, pump station, and pipelines. In general, under the established design criteria, the existing system was found to be adequately sized to meet the existing recycled water customer needs.

The treatment and distribution systems are currently sized to provide recycled water for the first phase of the GREAT program (up to 7,000 AFY) but not through the full 4 phases of the GREAT Program (up to 28,000 AFY). The WaterGems analysis was performed to reconfirm and refine the timing of those phases and the specific facilities needed to move recycled water throughout the City to provide a sustainable water supply for its customers. Since these two systems will work closely together moving forward, the analysis was done in close coordination with the potable water supply (summarized in Chapter 4).

6.8 APPROACH TO EXPANDING THE RECYCLED WATER SYSTEM AS A SUPPLEMENTAL WATER SUPPLY

Based on the alternatives analysis presented in Chapter 4, recycled water will be considered as a supplemental water supply to the City's current groundwater and imported water. Recycled water treated through the AWPF will be available for non-potable irrigation use (offsetting potable needs) for both agricultural and urban uses and for IPR and/or DPR. This approach adds flexibility and resiliency while maintaining significant local control of the water supply.

To implement this approach, the AWPF will need to be expanded (in the phases currently planned for with in the GREAT program) and facilities will need to be added to distribute recycled water to IPR/ASR wellfields. These facilities are in addition to already planned pipelines that will convey recycled water to agricultural uses for irrigation.

A review of the ultimate AWPF expansion capacity was presented in Chapter 4. Based solely on projected wastewater flows entering the OWTP, Phase 4 (up to 28,000 AFY) of the AWPF can be realized is uncertain. In addition, as discussed in Chapter 3, there are regulatory implications for the amount of secondary effluent that can be routed to the AWPF and not discharged to the outfall. At this time, based upon the data available (as noted in Chapter 3), it appears that Phase 3 (up to 21,000 AFY) may be the limit for AWPF expansion but further investigation of this implication will take place during subsequent phases of work.

To convey recycled water to various identified uses throughout the City, a closed recycled water loop will be built on the already constructed RWBS pipeline, which is intended to convey flows for the first phase (up to 6.25 mgd) along one north-south artery in the City (Ventura Road). The recycled water loop will provide access to a variety of geospatial points slated for IPR, including BS No. 1/6 and No. 3. Adding the loop will also eliminate any capacity issue the RWBS might have due to its size and construction.

In terms of the recycled water's end use/destination, irrigation uses make up the biggest component of Phase 1 capacity. For Phases 2 and 3, the largest use of the recycled water will be IPR/DPR. ASR wells will be used to inject recycled water into the underlying groundwater basin and to withdrawal the water for IPR use. Suitable sites for IPR operation are the Campus Park site, along with BS Nos. 1/6 and 3 because of the existing infrastructure already present.

Table 6.4 provides a high-level summary of the approach to expanding the recycled water system within the City.

Table 6.4 Recycled Water System Expansion Approach
Public Works Integrated Master Plan
City of Oxnard

Phase	AWPF Flow (mgd)	Recycled Water Distribution System[(1)]	ASR Well Capacity
Phase 1A	6.25	• Recycled Water Backbone System Pipeline (completed)	1 Demonstration Well
Phase 1B	6.25	• Hueneme Road Phase 2 Pipeline • Pipeline from RWBS to Campus Park • Pipeline from Campus Park to BS No. 1/6	1 Demonstration Well
Phase 2	12.50	• Complete Pipeline for RW Loop	4 duty + 4 standby
Phase 3	18.75	• N/A	6 duty + 3 standby

Note:
(1) Additions are to the existing recycled water described in Section 6.8; each additional phase includes the addition of previous phases.

6.9 RECOMMENDED PROJECTS

This section summarizes the recommended projects for the recycled water system based on the existing system capacity and performance needs for meeting projected future demands and water quality objectives. These projects cover needs through the Integrated Master Plan's planning period (2015-2040). The recommended projects are summarized in Table 6.5 and organized by project type. Figure 4.7 in Chapter 4 illustrates all of the water and recycled water projects recommended for water supply purposes. For further details, refer to that figure.

The projects were split into phases that loosely follow the projects' timing: Phase 1 – Immediate Needs (First 2 years), Phase 2 – Near-Term Needs (Years 2 to 10), and Phase 3 – Long-Term Needs (Beyond 10 years).

The phases presented here are what are recommended based upon the technical needs identified within this assessment. However, the actual timing of implementation may defer when compared and balanced against the financial considerations of total implementation of the Integrated Master Plan. Costs and timing for these projects is summarized under Chapter 9 as well as in the Cost of Service (COS) Rate Study (Carollo, 2015a).

Table 6.5 Recommended RW Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
Recycled Water Treatment					
AWPF	Phase 1 Improvements (Disinfection conversion, security, A/V upgrade)(1)	1	--		
AWPF	UV/AOP Brine Treatment	1	1	Unit	--
AWPF	Phase 2 Expansion to 12.5 mgd (including backup power)	2	1	ea	6.25 mgd
AWPF	Phase 3 Expansion to 18.75 mgd	3	1	ea	6.25 mgd
Recycled Water Distribution					
Various	Recycled Water Distribution System Retrofits(2)	1	--	--	--
Campus Park to RWBS	Connect Initial ASR Well to RWBS Line in Ventura Road - 20: pipe(1)	1	2,000	Lf	--
Campus Park to BS No. 1/6	Construct Dedicated IPR Pipeline along 2nd Street - 24" pipe(1)	1	4,000	lf	--
AWPF	Ag RW Storage	2	1	--	--
Hueneme Road - Phase 2 (to Ag Users)	24" pipe – Along Wood Road from Hueneme Road to Laguna Road and east on Laguna terminating before Lewis Road	2	20,700	Lf	--
Hueneme - Phase 2 (to Ag Users)	36" pipe – Along Hueneme Road from Olds Road to Wood Road	2	16,000	Lf	--
Recycled Water Loop (to ASR Sites)	24" pipe – Along 2nd St to N Rose Ave	2	9,000	Lf	--
Recycled Water Loop (to ASR Sites)	30" pipe – Along N Rose Ave from 2nd St to Hueneme Road	2	19,700	Lf	--
AWPF	DPR Storage Tanks	3	3	MG	3.1
Recycled Water Loop (to ASR Sites)	24" pipe – North along N Rose Avenue from 2nd St. to Camino Del Sol; then east on Camino Del Sol to N Rice Ave; North along N Rice Ave to Wankel Way	3	10,600	LF	--

Table 6.5 Recommended RW Projects to Meet Water Supply Needs through 2040
Public Works Integrated Master Plan
City of Oxnard

Facility/Location	Description	Phase	Quantity	Unit	Capacity
IPR/DPR					
Campus Park	Demonstration ASR Well(3)	1	1	Ea	2,000 gpm
BS No. 1/6 & BS No. 3	Land Acquisition and Improvements	1	10	Ac.	--
Campus Park	RW Pond for Off-Spec Water	1	1	MG	1.9
Campus Park	2 duty + 2 standby ASR wells(3)	2	4	Ea	2,000 gpm
BS No. 1/6	2 duty + 2 standby ASR Wells(3)	2	4	Ea.	2,000 gpm
BS No. 1/6	Chemical Feed Expansion	2	1	Ea.	--
BS No. 1/6	Operational Storage	2	1	MG	1
BS No. 1/6	Booster Pumping	2	1	HP	500
Well 18 @ Golf Course	Rehab to Groundwater Recharge Well	2	1	Ea.	3,000 gpm
BS No. 1/6	2 duty + 1 standby ASR Wells(3)	3	3	Ea.	2,000 gpm
BS No. 3	4 duty + 2 standby ASR Wells(3)	3	6	Ea.	2,000 gpm
BS No. 3	Chemical Feed Expansion	3	1	Ea.	--
BS No. 3	Operational Storage	3	1	MG	1
BS No. 3	Booster Pumping	3	1	HP	500

Notes:
*General Notes: Project costs, schedules, and phasing are based on data and information available at the time of the original publication of the Project Memos (PMs) – December 2015.
(1) As documented in the City's GREAT program CIP, February 18, 2015.
(2) Assumed 10 retrofits per year for 4 years.
(3) Each ASR well installed will have 3 associated monitoring wells installed.

6.9.1 Treatment

Phase 1 of the AWPF is already completed, with only minor improvements slated as immediate needs. A UV/AOP treatment system for the RO concentrate from the AWPF is recommended to address water quality-related issues.

Phase 2 will involve expanding the existing Phase 1 AWPF facility by an additional 6.25 mgd. The existing 6.25 mgd facility was constructed to allow for modular expansion of the MF, RO, and UV/AOP treatment trains without adding ancillary equipment (i.e., cleaning and support systems). Phase 3 will require adding more treatment and ancillary equipment to reach the 18.75 mgd capacity.

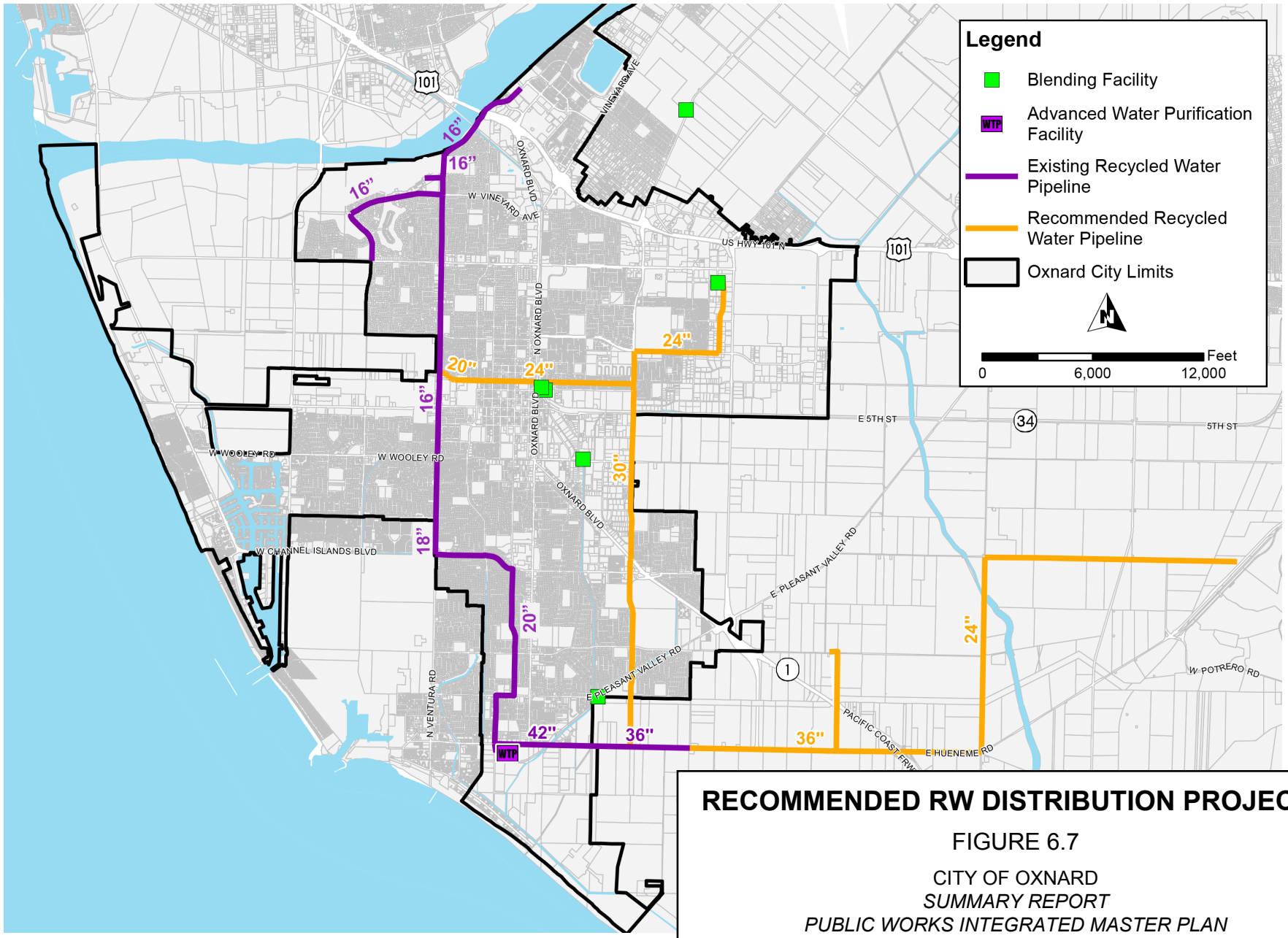
6.9.2 Distribution

Phase 1B of the recycled water distribution system expansion focuses on delivering recycled water to the agricultural users east of the City, which will be accomplished with Phase 2 of the Hueneme Road Pipeline. The pipeline's alignment will start at the end of the Hueneme Road Phase 1 Pipeline, at the intersection of Hueneme Road and Olds Road. The 36-inch diameter pipeline continues east down Hueneme Road to Wood Road and then transitions to a 24-inch pipeline, heading north on Wood Road until the intersection of Wood Road and Laguna Road. From there, it runs east on Laguna Road where it terminates just before Lewis Road. The Hueneme Road Phase 2 pipeline will supply an agricultural demand to the farmers of up to 5,200 AFY or 3,225 gpm depending on the RW supply available.

Phase 2 involves constructing the RW loop that will feed the proposed ASR locations at Campus Park and BS Nos. 1/6. The RW Loop tees off the existing 16-inch RWBS pipeline at the intersection of South Ventura Road and West Second Street. From this location, a 20-inch diameter pipeline continues east down West Second Street to the Campus Park ASR Facility where it increases to a 24-inch pipeline and continues past Campus Park and into BS No. 1/6. Once past BS No. 1/6, the 24-inch diameter pipeline continues east along East Second Street, intersecting at N Rose Avenue. There, it turns south on North Rose Ave, increasing to a 30-inch pipeline until it connects to the existing 36-inch Hueneme Road Pipeline.

Phase 3 involves constructing a 24-inch pipeline connecting BS No. 3 to the RW Loop. The pipeline starts from the RW Loop at the intersection of East Second Street and North Rose Avenue. This 24-inch pipeline continues north on N Rose Avenue, then east on Camino Del Sol, and then north on N Rice Avenue to Wankel Way where it terminates at BS No. 3.

Figure 6.7 shows the routings of these pipelines.



RECOMMENDED RW DISTRIBUTION PROJECTS

FIGURE 6.7

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6.9.3 IPR/DPR

Implementing IPR as a supplemental water supply will occur in steps. In Phase 1, the City will construct one demonstration ASR well (as noted in Section 6.2.3). With this demonstration well, the City can assess the feasibility of the IPR process in real time and refine the assumptions surrounding aquifer capacity and extracted water quality. In addition, the well will establish the process for regulatory approval for the IPR process. A Title 22 Engineer's Report (Carollo, 2016) and a Report of Waste Discharge (ROWD) (Carollo, 2016) were developed for this demonstration ASR well.

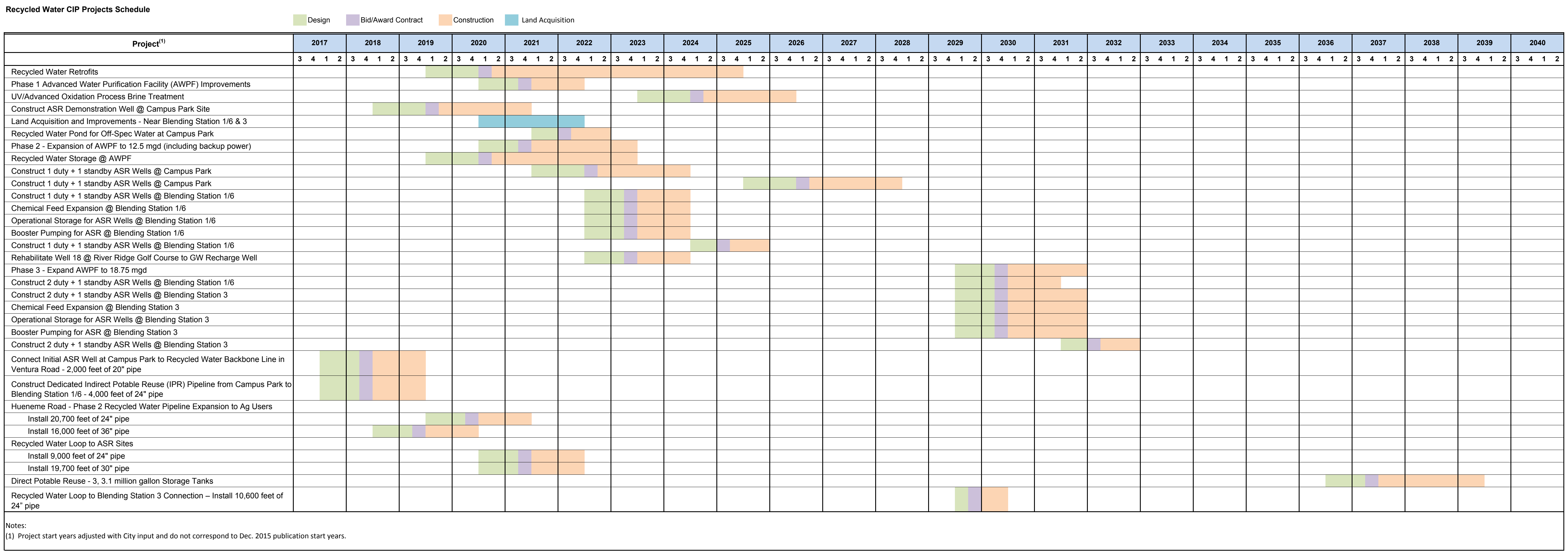
Phase 2 contains the majority of the ASR installations for supplemental water supply use, which will also happen in steps. First, the Campus Park site will be built-out. Four additional ASR wells will be added, each with their own set of monitoring wells (i.e., 3 per ASR well). Currently, a built-out ASR site will also consist of operational storage, sized to offset PHDs, booster pumping, and additional conditioning facilities (i.e., disinfection and fluoride addition). However, because the Campus Park site is near BS No. 1/6, it makes more sense to house the ancillary equipment at BS No. 1/6. Thus, extracted IPR water will be conveyed from Campus Park to BS No. 1/6 for storage and conditioning.

After build-out of the Campus Park ASR wells, four ASR wells will be added near the BS No. 1/6 site. Additional property near BS No. 1/6 will need to be acquired, which the City has already discussed with property owners. Adding these wells will correspond to the Phase 2 expansion of the AWPF and should help to meet potable water demands through approximately 2030.

Phase 3 will then continue to expand the City's ASR capacity and will correspond to expanding the AWPF to 18.75 mgd. Build-out of the BS No. 1/6 site with the addition of three ASR wells will occur next, followed by the construction of six ASR wells at BS No. 3. As with BS No. 1/6, additional property will need to be acquired near BS No. 3 to make this feasible. Operational storage, booster pumping, and conditioning facilities will need to be added to BS No. 3 as well.

6.9.4 Implementation Schedule

Implementing these recycled water projects will occur in conjunction with the water system master plan projects in Chapter 4. The proposed schedule for these improvements is included in **Error! Not a valid bookmark self-reference.**, and costs for the recommended recycled water projects are summarized in Chapter 9.



RECOMMENDED RECYCLED WATER SYSTEM PROJECTS SCHEDULE

FIGURE 6.8

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Chapter 7

STORMWATER SYSTEM MASTER PLAN

7.1 INTRODUCTION

The City's stormwater system serves the City and surrounding areas that drain into Oxnard, approximately 35 square miles in drainage area. Within this system, the City maintains a network of storm drains comprised of gravity pipes, force mains, lift stations, and additional infrastructure associated with a stormwater drainage system.

The Ventura County Watershed Protection District (VCWPD) has either partial or complete jurisdiction over each of the City's drainage channels. As such, the City's drainage facilities discharge either directly into the ocean or into the VCWPD facilities first and then into the ocean.

When evaluating improvements to the stormwater collection system, a number of goals were established to help develop scenarios. Consistent with the overall goals established in Chapter 1, the five main goals for improvements are as follows:

- Goal 1: Provide a compliant, reliable, resilient, and flexible system.
- Goal 2: Manage assets in a way that maximizes economic sustainability.
- Goal 3: Mitigate and adapt to the potential impacts of climate change.
- Goal 4: Protect and enhance environmental and resource sustainability.
- Goal 5: Investigate green and gray infrastructure with an emphasis on energy efficiency.

As shown, these goals aim for more than simply maintaining the existing system. Instead, they seek to produce stormwater projects that can enhance the quality of stormwater entering the environment and potentially harvest some of it as an additional water supply. In doing this, the City aims for a more robust, adaptable, and cost-efficient system overall.

This chapter provides an overview of the existing stormwater system, including its strengths and vulnerabilities, as well as the regulatory requirements and climate change issues the system might face. This chapter also defines the recommendations for meeting the defined goals.

The analysis and evaluations contained in this Summary Report are based on data and information available at the time of the original date of publication of the Project Memos (PMs), December 2015. After development of the December 2015 Final Draft PMs, the City continued to move forward on two concurrent aspects: 1) advancing the facilities planning for the water, wastewater, recycled water, and stormwater facilities; and 2) developing Updated Cost of Service (COS) Studies (Carollo, 2017) for the wastewater/collection system and the water/distribution system. The updated 2017 COS studies contain the most

recent near-term Capital Improvement Projects (CIP). The complete updated CIP based on the near-term and long-term projects is contained in Appendix B.

7.2 DESCRIPTION OF EXISTING FACILITIES

7.2.1 Stormwater Collection System

The City's existing storm drainage system collects and conveys stormwater runoff from developed and undeveloped areas throughout the City. The system includes circular pipelines from 4 to 96 inches in diameter, rectangular pipes up to 264-by-96 inches wide, open channels, 5 stormwater pump stations and associated force mains, and various valves and diversion structures throughout the system. The majority (approximately 63 percent) of the pipes were built using reinforced concrete pipes (RCP).

Figure 7.1 shows the existing storm drainage system, including storm drain diameters, detention/retention ponds, pump stations, canals, and outfall locations. In total, the City owns approximately 162 miles of storm drains and open channels, and VCWPD has jurisdiction over 28 miles of open channels.

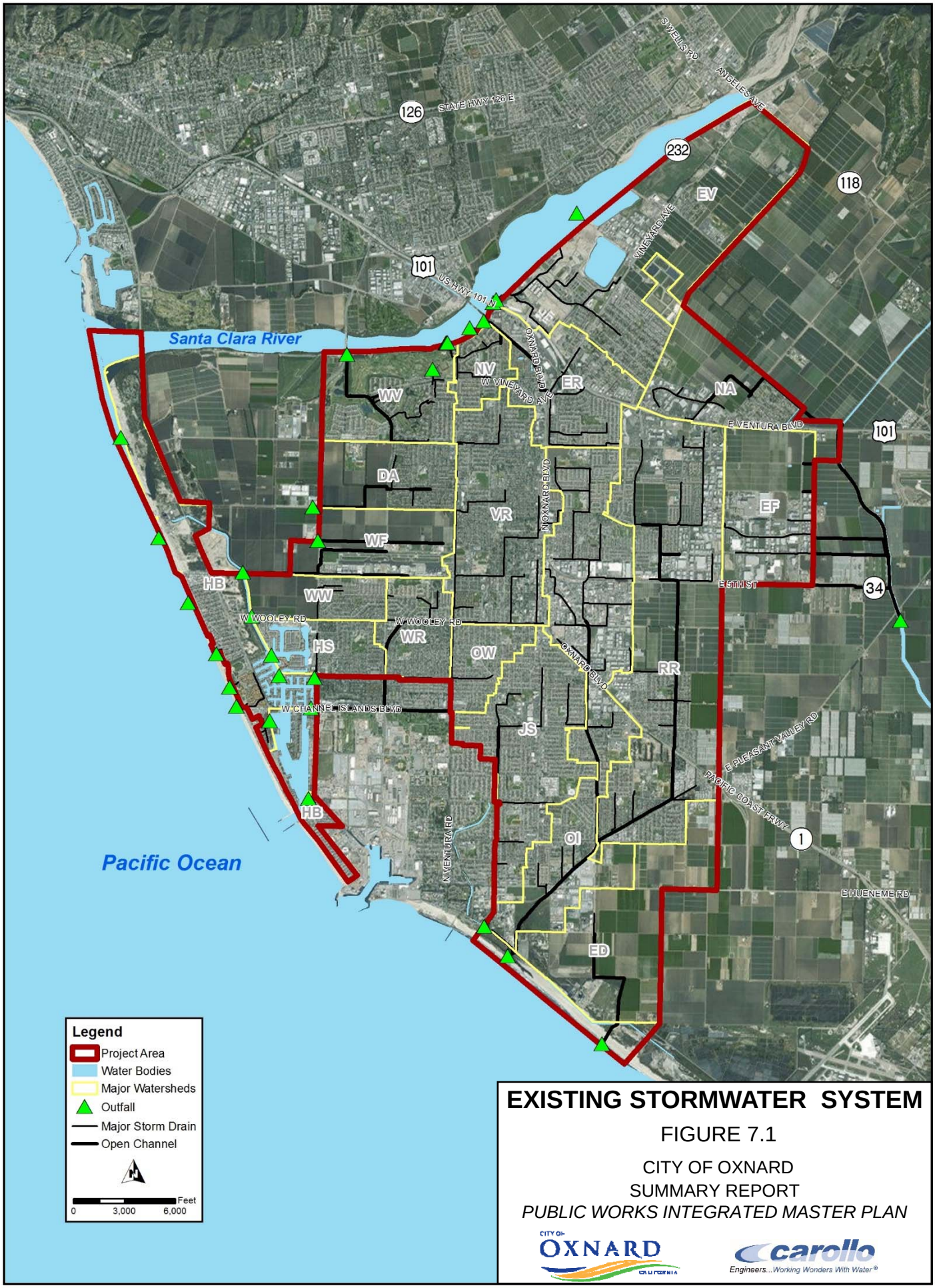
The VCWPD, previously called the Ventura County Flood Control District (VCFCD), was formed in 1944 to perform drainage services not readily performed by local agencies. The City resides in the VCWPD Flood Zone 2 and City drainage facilities discharge into the VCWPD channels whenever possible. Major drainage channels within Oxnard include Doris Avenue Drain, Fifth Street Drain, Wooley Road Drain, Oxnard West Drain, Ormond Lagoon Waterway, Rice Road Drain, Tsumas Creek, El Rio Drain, Camarillo Drain, and Nyeland Drain.

7.2.2 Condition Assessment

Between September 12, 2014, and September 18, 2014, a condition assessment was conducted of select storm drain facilities throughout the City. Assets for inspection were chosen based on age, slope, and proximity to areas prone to flooding. Groupings of old assets with small slopes located near flood-prone areas were assessed first.

This evaluation involved visually inspecting the topsides of 304 manholes, catch basins, pipes, channels, flood zones, and outfalls, as well as select areas that have flooded in the past. In total, 29 sites were assessed, representing 2 percent of the entire stormwater collection system.

Although the majority of the assets were in excellent condition, the assessment found that approximately 12 percent need immediate attention or attention within the next five years. Furthermore, although the majority of assets showed negligible amounts of sediment, sediment build-up is a concern in approximately 12 percent of the stormwater collection system assets. These assets had moderate to significant sediment buildup and should be cleaned within five years.



EXISTING STORMWATER SYSTEM

FIGURE 7.1

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Figure 7.2 illustrates the locations of assets in poor condition. Priority 4 assets in orange are in poor condition, and priority 5 assets in red require immediate attention.

7.3 MASTER PLAN/DESIGN CRITERIA

Key LOS criteria were used to evaluate the existing stormwater system's ability to meet the future needs summarized in Table 7.1. The criteria were used to evaluate the stormwater collection system and to plan for future system improvements.

Table 7.1 Level of Service Criteria
Public Works Integrated Master Plan
City of Oxnard

Design Storm	Facilities to be Evaluated	Maximum HGL Depth/Flooding Depth Criteria
10-year, 24-hour	Storm Conveyance Facilities and Basins	Surcharging allowed, but no flooding above surface elevation
100-year, 24-hour	Combined Capacity of Streets, Basins, and Pipes	Flooding allowed not higher than the building finish floor levels

7.4 FUTURE FACILITY NEEDS AND OPPORTUNITIES

The capacity and performance of the existing stormwater system were compared with the above LOS criteria to locate system shortfalls. In general, the system has adequate capacity to meet current and future demand conditions. However, some capacity deficits and R&R needs exist.

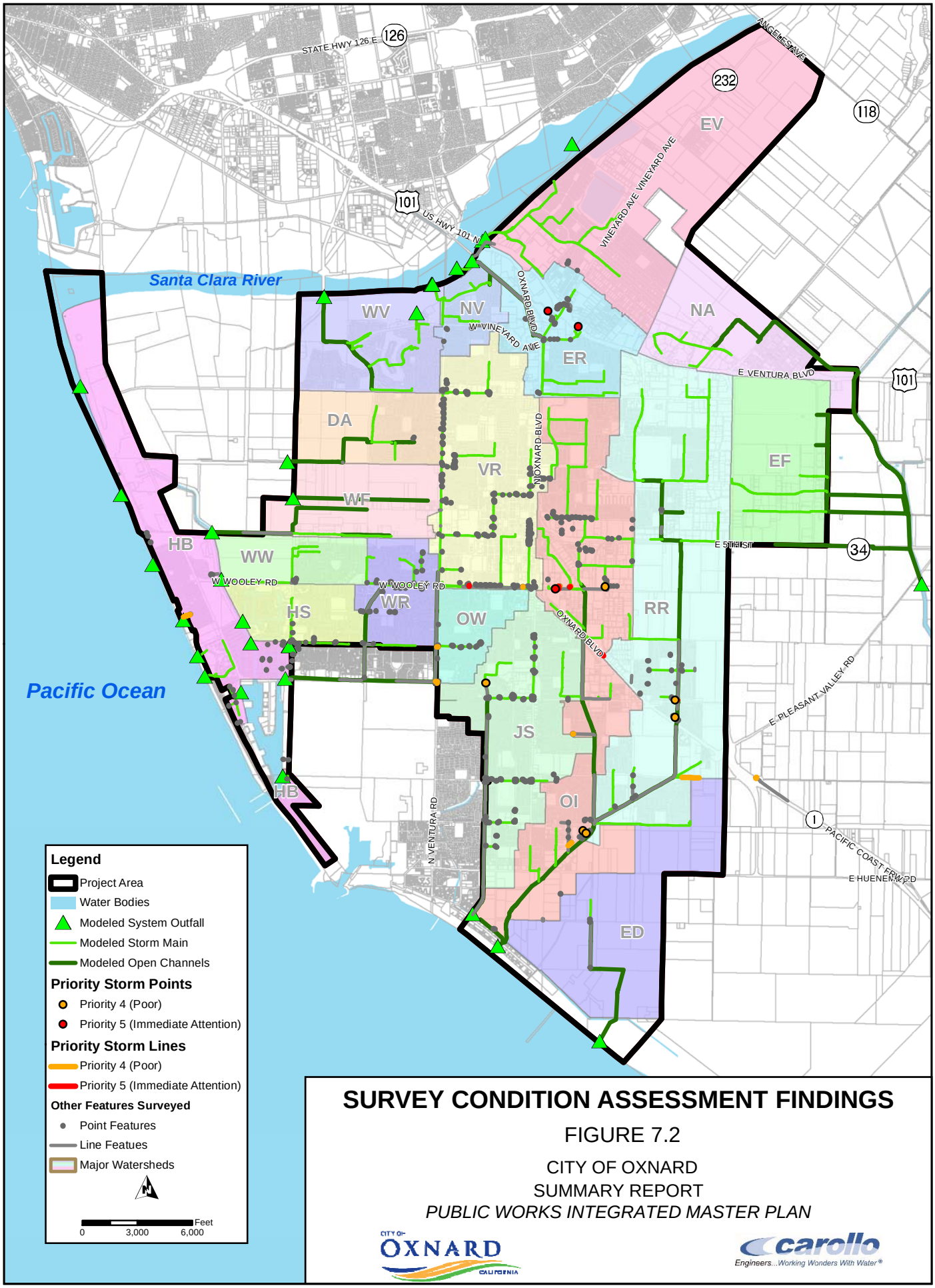
7.4.1 Stormwater Collection System

7.4.1.1 Capacity

As part of the planning effort, Carollo developed a storm drainage hydrologic and hydraulic model for the City in SewerGEMS. The model was used to identify existing system deficiencies, characterize infrastructure needs for future growth, and develop capital improvements to mitigate deficiencies and meet the City's planning criteria.

To develop the model, a capacity analysis was performed on pipelines 24 inches in diameter and larger as well as other critical facilities of all sizes. The first step in the capacity analysis was to divide the 22,709 acres within the service area into 418 individual subcatchments. In addition, appropriate outlet points (i.e., drainage inlets and catch basins in City Streets or nearby manholes) were defined. The resulting subcatchments range from 1.7 acres to 374.9 acres and average approximately 54.3 acres.

Rainfall data were used to generate the basis for stormwater evaluations. As shown in Figure 7.1, a 10-year 24-hour storm (total rainfall of 4 inches) and a 100-year 24-hour storm (total rainfall of 6.4 inches) were used for the capacity assessment.



SURVEY CONDITION ASSESSMENT FINDINGS

FIGURE 7.2

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Results from the modeling effort indicate that during the 10-year, 24-hour design storm, the hydraulic grade line (HGL) in the Ventura channels is elevated, which causes significant surcharging in the City's storm pipes that drain to the channels. However, because the Ventura channels have insufficient conveyance capacity and the City's pipes are not capacity deficient, no improvements to the City's drainage pipes are proposed. Instead, the recommendation is to improve the Ventura channel conveyance to lower the HGL and allow more stormwater to drain to the canals without being held upstream in the City's system.

The modeling effort also indicated that the majority of the surcharging and flooding problems under the 10-year design storm are located in Ventura Road, Tsumas Creek, Ormond Lagoon Waterway, and north of Rice Road Avenue watersheds, which correspond to the City's downtown core. The existing storm drain system also lacks sufficient capacity to convey the 100-year design runoff while meeting the flooding criteria. Figure 7.3 shows the location of this surcharging infrastructure.

The project team evaluated the reasonableness of the model results by comparing them with the City's observations. Based on staff observations during storm events, the model results confirmed areas around the City that typically experience flooding.

In addition to the sewerGEMS model, the City recently completed a Green Alleys Plan. This plan had two goals: to identify the City's alleys that are good candidates for green alley projects and to provide a framework for the future design and implementation of these projects.

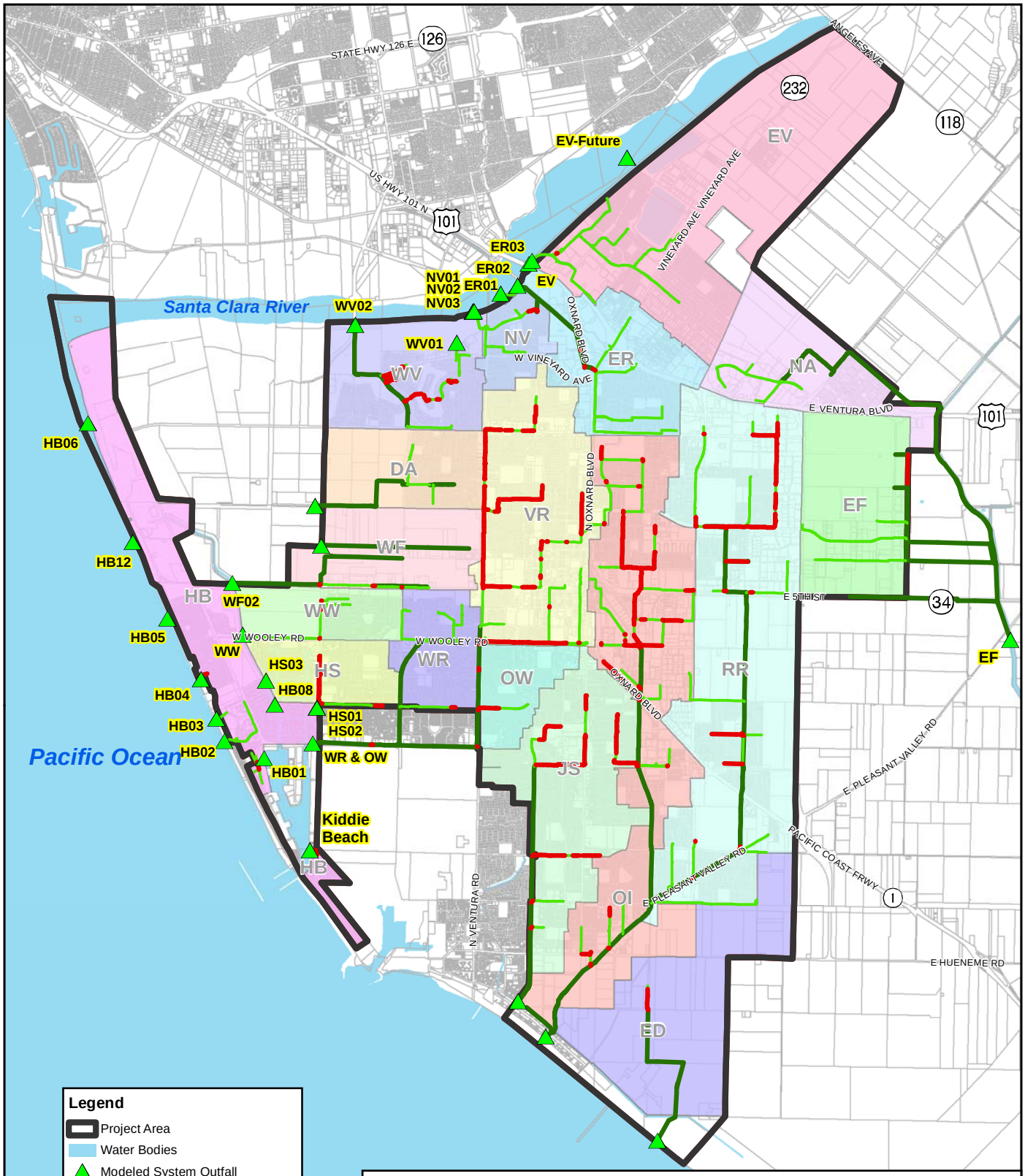
After comparing the environmental prioritization results performed in the Green Alley program, some of the high priority public alleys were noted to overlap with the observed areas of flooding. As a result, it is recommended, where appropriate, that the City incorporate bioswales, permeable paving, or rain barrels (for community gardens) to help decrease flooding in these locations. Figure 7.4 shows the areas of high priority for Green Alleys projects and the existing flooding areas.

7.4.1.2 R&R

As previously mentioned, approximately 12 percent of the assets need immediate attention or attention within the next five years. These assets are in poor or very poor condition. In addition, sediment build-up was a problem in approximately 12 percent of the assets.

7.4.2 New Stormwater Projects

A number of new stormwater projects were considered to achieve the goals outlined in the Integrated Master Plan. The goal of these projects is to improve stormwater quality so it can be harvested as an additional water source and meet regulatory requirements.



CAPACITY DEFICIENCIES FOR 10-YEAR STORM – YEAR 2040

FIGURE 7.3

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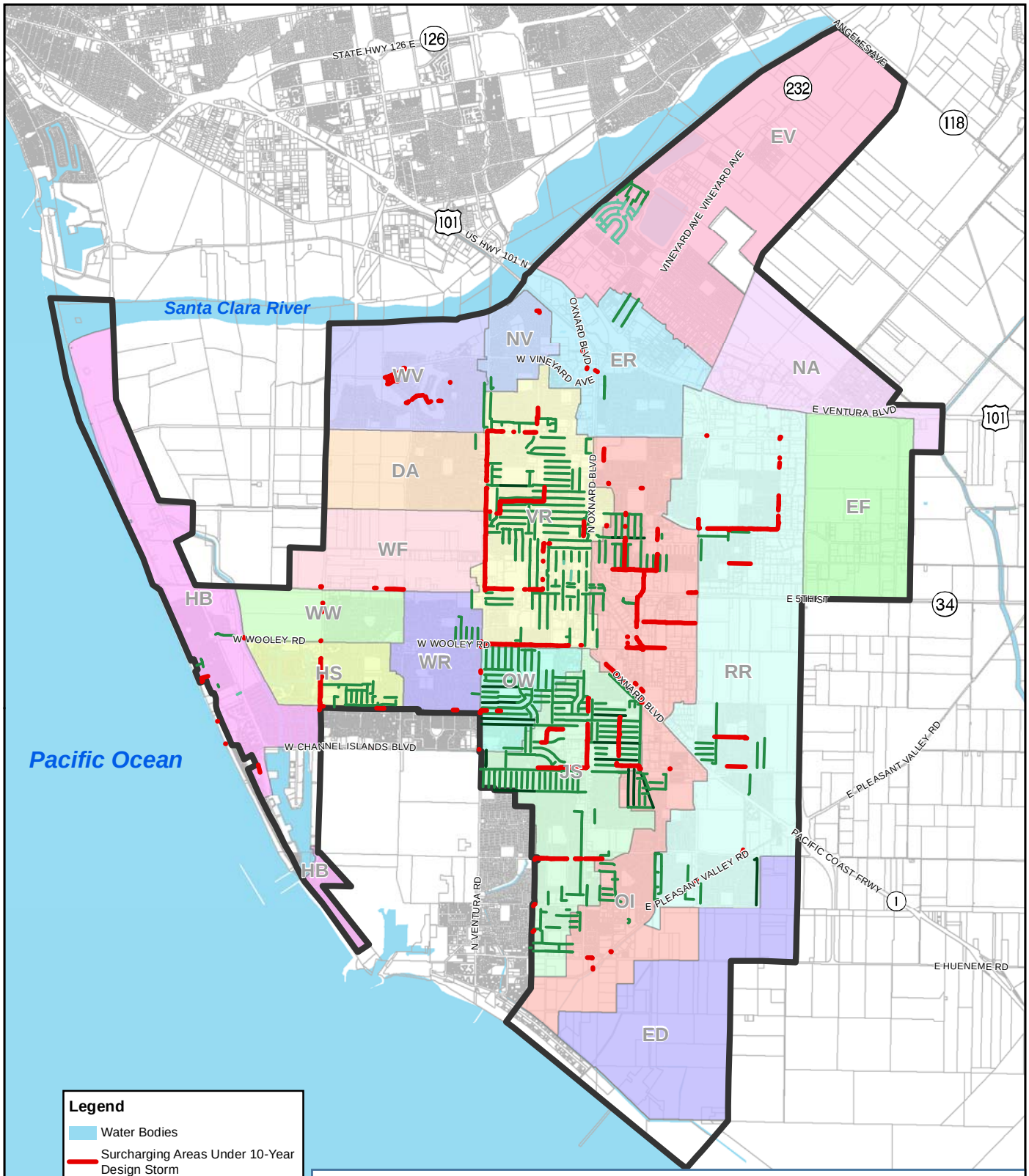

GREEN ALLEYS ENVIRONMENTAL IMPROVEMENTS AND FLOODING AREAS PRIORITIZATION

FIGURE 7.4

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Once an initial list of stormwater project options was identified, all options went through a fatal flaw screening to determine which were the most viable. From this screening, three new stormwater projects were selected: dry weather diversion, a citywide incentive program, and total maximum daily load (TMDL) compliance. Each project is described in the following sections.

7.4.2.1 Dry Weather Diversion

The first project would divert dry weather stormwater channel flows to the Oxnard Wastewater Treatment Plant (OWTP) to be treated and potentially reused at the Advanced Water Purification Facility (AWPF). Dry weather flows include flow from irrigation runoff, pool draining, washdown water, construction work, and other related activities. In Oxnard, shallow groundwater infiltration is likely another component of dry weather 'stormwater' flow.

Water could be diverted from the stormwater collection system in a number of ways. Typically, stormwater diversion structures in California are constructed by first screening water for trash and then pumping water from a stormwater pump station to a sanitary collection system. However, water can also be diverted in an open channel by installing an inflatable dam or mechanical gate. Water that builds up behind the dam or gate can then be pumped into the sanitary collection system. The diverted stormwater would be treated downstream at the OWTP and potentially the AWPF.

A dry weather diversion could be used only when the OWTP has excess capacity. In Oxnard's case, storage would not be required because dry weather flows in stormwater channels occur year-round. To prevent significant water quality degradation of OWTP influent, however, dry weather diversions should be kept small in proportion to OWTP influent.

Before this project could be implemented, the City should consider the effects removing this dry weather storm channel flow could have on downstream habitat. Additionally, water quality implications should be studied further.

7.4.2.2 Citywide Incentive Program

The second project is a citywide incentive program that would involve capturing stormwater to offset potable water use. A program like this would encourage new developers to invest in rainwater harvesting and onsite reuse. It would also give interested residents the opportunity to retrofit their homes with rain barrels or rain cisterns. These measures would lower the risk of flooding and would encourage residents and developers to take a proactive stance on stormwater.

The City could encourage such rainwater collection in several ways. It could provide discounted rain barrels and cisterns for purchase or offer a discount on water utilities bills. Such incentives could be provided for both existing land owners and developers. The cost for such an incentive program would depend entirely on its size and the amount the City is willing to offset.

Since the City is located on a shallow perched aquifer, the Integrated Master Plan recommends focusing any incentive program on onsite capture and use instead of infiltration. This focus will decrease customers' potable water use for landscape irrigation the most.

7.4.2.3 TMDL Compliance

The final project involves reaching a TMDL for indicator bacteria. The Los Angeles Regional Water Quality Control Board (LARWQCB) adopted a TMDL for indicator bacteria in the Santa Clara River Estuary. This TMDL requires participating agencies like the City to prepare an implementation plan outlining proposed activities to achieve a reduction in bacteria load.

In March 2015, a draft implementation plan was developed that located potential infiltration basins and subsurface infiltration basins for both dry and wet weather stormwater throughout the watershed. South Bank Park in Oxnard was one of the locations identified. This location, shown in Figure 7.5, is the proposed site for a subsurface infiltration basin.

This infiltration basin would be sized to treat the 85th percentile volume from the local drainage area and would require approximately 85,000 square feet. It would be approximately 2 feet deep and infiltrate at a rate of 0.5 inches per hour.

7.5 RECOMMENDED PROJECTS

7.5.1 Stormwater Collection System

Stormwater collection system improvements were focused on capacity and R&R needs and based on the capacity assessment and condition assessment, respectively. Through these assessments, 13 main capacity projects were identified. These projects are summarized in Table 7.2.

In addition, a total of 21 assets with a Level 4 rating were identified, as was an asset with a Level 5 rating that requires R&R. Costs for these R&R needs are also shown in Table 7.2, and an overall schedule can be found in Figure 7.6.

7.5.2 New Stormwater Projects

As outlined above, three new stormwater projects have been proposed for the Integrated Master Plan. The infiltration basin, recommended for TMDL compliance, should be implemented, since it is required to meet the Santa Clara River's indicator bacteria TMDL. The remaining two projects, a dry weather diversion and an incentive program, should be considered for future implementation. For more information about these projects, refer to Table 7.3. For an overall schedule, refer to Figure 7.6.

Table 7.2 Recommended Collection System Projects
Public Works Integrated Master Plan
City of Oxnard

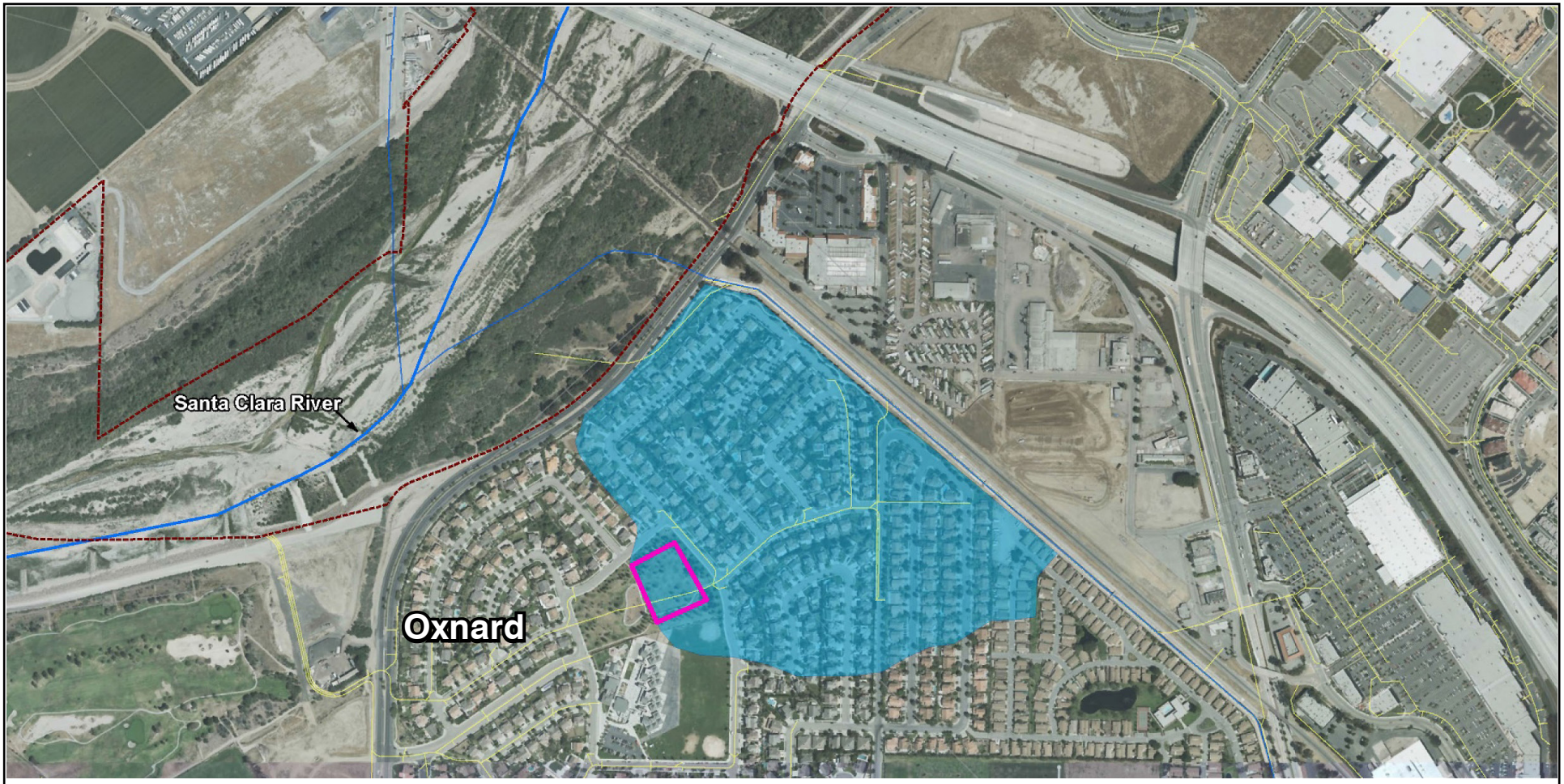
Project Name	Driver	Phase Ranking
Drainage Basin WV (444 ft)	Capacity	2
Drainage Basin WV (748 ft)	Capacity	4
Drainage Basin OI (607 ft)	Capacity	2
Drainage Basin RR (2,436 ft)	Capacity	3
Drainage Basin OI (2,388 ft)	Capacity	4
Drainage Basin VR (5,872 ft)	Capacity	1
Drainage Basin JS (1,421 ft)	Capacity	1
Drainage Basin JS (1,292 ft)	Capacity	2
Drainage Basin JS (426 ft)	Capacity	2
Drainage Basin JS (457 ft)	Capacity	2
Drainage Basin JS (655 ft)	Capacity	2
Drainage Basin JS (701 ft)	Capacity	2
Drainage Basin HS (1,552 ft)	Capacity	2
22 assets	R&R	1

General Note: For the pipeline replacement projects, see the hydraulic models developed as part of this integrated master plan to identify the exact pipeline locations. Project costs, schedule, and phasing are based on data and information available at the time of the original publication of the Project Memos (PMs) – December 2015.

Table 7.3 Recommended New Stormwater Projects
Public Works Integrated Master Plan
City of Oxnard

Project Name	Driver	Start Year	Phase Ranking
Dry Weather Diversion Structure	Resource Sustainability	2021	2
City-Wide Incentive Program	Resource Sustainability	2021	2
TMDL Infiltration Basin	Resource Sustainability	2023	2

General Note: Project costs, schedule, and phasing are based on data and information available at the time of the original publication of the Project Memos (PMs) – December 2015.



N

0.1 0.05 0 0.1 Miles

LEGEND

- Regional BMP Parcel
- BMP Drainage Area
- IP Area
- Santa Clara River
- Santa Clara River Watershed
- Tributaries to SCR
- Storm Drains

Source: "Draft Lower Santa Clara River TMDL Implementation Plan," Geosyntec, March 2015.

PROPOSED INFILTRATION BASIN FOR TMDL COMPLIANCE

FIGURE 7.5

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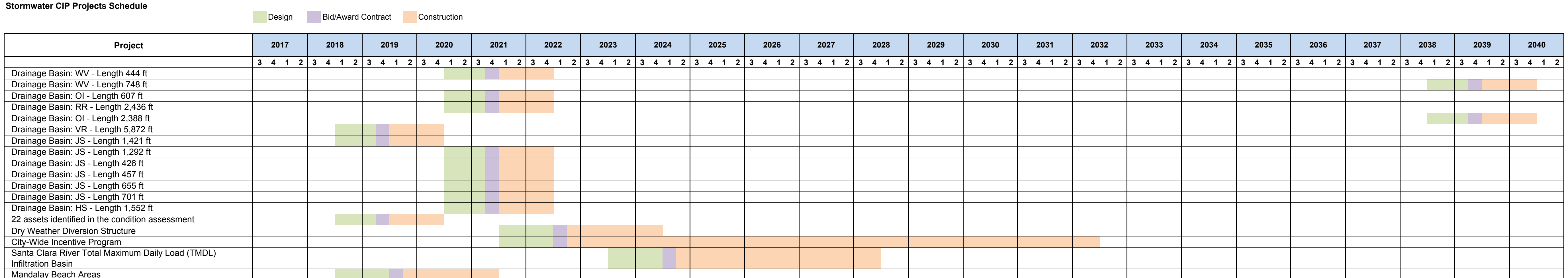
Stormwater CIP Projects Schedule



Notes:

(1) Project start year moved two years later compared to 2015 CIP.

(2) Project start year adjusted with City input and do not correspond to Dec. 2015 publication start year.

(3) Project added by City after December 2015 publication.

RECOMMENDED STORMWATER PROJECTS SCHEDULE

FIGURE 7.6

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Chapter 8

INTEGRATED AND COMMON SUPPORT ELEMENTS

8.1 INTRODUCTION

This chapter summarizes the studies conducted on common support elements (i.e., operation and data management systems, security, etc.) connecting the multiple utilities (water, wastewater, recycled water, and stormwater). An integrated approach was taken to analyze these support elements for greater efficiency and cost savings and to take a more a holistic approach to the overall system recommendations.

The analysis and evaluations contained in this Summary Report are based on data and information available at the time of the original date of publication of the Project Memos (PMs), December 2015. After development of the December 2015 Final Draft PMs, the City continued to move forward on two concurrent aspects: 1) advancing the facilities planning for the water, wastewater, recycled water, and stormwater facilities; and 2) developing Updated Cost of Service (COS) Studies (Carollo, 2017) for the wastewater/collection system and the water/distribution system. The updated 2017 COS studies contain the most recent near-term Capital Improvement Projects (CIP). The complete updated CIP based on the near-term and long-term projects is contained in Appendix B.

8.2 COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM (CMMS)

The Computerized Maintenance Management System (CMMS) assessment evaluated the City's water treatment and distribution, wastewater collection and treatment, recycled water treatment and distribution, and stormwater assets, taking into account the Public Works' Enterprise Asset Management needs, existing capabilities and tools, and possible improvements. In the near-term, the focus will be on evaluating its CMMS needs, selecting a CMMS suitable to the City's daily needs, and implementing a CMMS to support maintenance and capital planning specifically for the Public Works Department.

In the next phase of work, Carollo recommends that the City start requesting proposals from the shortlisted CMMS vendors described in the Integrated Master Plan. Based on a review of the proposals received and preliminary reference checks, Carollo recommends narrowing down the shortlist to two or three preferred CMMS vendors that it can invite for software demonstrations.

The proposals, reference checks, and software demonstrations will serve as a basis for selecting a CMMS vendor. Table 8.1 includes summary costs for Year 1 and Year 2 activities. These cost estimates include software and implementation costs for both vendor and consultant services. These costs are included in the overall CIP.

Table 8.1 Compiled Summary of Vendor CMMS Software Cost Estimates
Public Works Integrated Master Plan
City of Oxnard

Cost Component	Cost Estimate[(1)]	Description	Basis/Assumptions
Year 1 Projects			
Software Licensing (Vendor)	$40,000 - $200,000	• Provides core functionality for assets, service requests, work orders, and Project Memorandums (PMs) • Provides basic inventory management functionality • Provides mobile functionality	• 55 named users or 20 concurrent users • 120 total users for service requests • Low estimate for enterprise license agreement • High estimate for user and module-based licensing • No add-on integration
Software Implementation Services (Vendor)	$50,000 - $300,000	• Implements core functionality for assets, service requests, work orders, and PMs • Implements GIS fleet management, inventory management, and mobile functionality	• Software installation • Software configuration for core modules • Limited data conversion and population for core functionality • Software testing • Basic training
Estimated Total Cost for Year 1	**$90,000 - $500,000**		
Year 2 Projects			
Annual Software Maintenance/Support (Vendor)	$15,000 - $150,000	• Provides vendor support and software upgrades and patches • Starts in Year 2 • Recurs each year of use	• Low estimate of 20 percent of licensing fee • High estimate for enterprise license agreement • Annual cost incurred indefinitely
Software Integration Services (Vendor)	$75,000 - $300,000	• Provides integration software and implementation services for SCADA and Enterprise Resource Planning • Provides additional business process implementation and training • Starts in Year 2	• Varies widely based on specific integration points, data flows, and selected software capabilities • May require multiple phases and years of implementation
Estimated Total Cost for Year 2	**$90,000 - $450,000**		

Note:

(1) Cost estimates are preliminary and subject to change based on detailed evaluation of requirements and negotiation of specific software licensing and services with selected vendor applicable to this specific Owner. Cost estimates are based on an approximate accuracy range of -15% to -30% on the low side to +20% to +50% on the high side.

8.3 GIS

The City is significantly invested in ArcGIS (ESRI). In 2015, the IT department started significantly updating the Public Works Geodatabase to ESRI's new "Local Government Schema" (LGS) configuration. By adopting the LGS, the ESRI could provide a significant number of free or low cost extensions to manage the Public Work Department's projects.

ESRI offers a *CIP Planning Tool* that allows users to define projects within the GIS by selecting assets. The tool then groups these assets into a project, allowing the user to enter unit costs and calculate the total cost by project. The user can also enter a schedule for starting and completing each project and for assigning a project manager.

Although the *CIP Planning Tool* is fairly simplistic, it allows users to easily manage individual CIP projects and compare multiple projects. The information can also be easily exported to MS Excel to complete additional calculations. Ultimately, the schedule can be imported to MS Project or a similar program to comprehensively manage project schedules.

This *CIP Planning Tool* has been briefly demonstrated to select individuals in the Public Works Department with a positive response. However, in discussing and understanding the Public Works Geodatabase setup further, there is the potential that the LGS may be changed in the future. If the LGS is changed, or "customized," then the extension tools in the *CIP Planning Tool* may not work with the new database structure, therefore rendering it less effective.

Therefore, Carollo recommends that the City maintain the LGS structure so these tools can be applied in the future. Carollo and the City should meet to further discuss the Public Works Geodatabase structure.

The *CIP Planning Tool* will also help in coordinating projects from multiple departments. For example, water and sewer projects can be overlaid with street improvement projects. With this, the City can adjust project schedules so streets are impacted only once and all infrastructure can be completed as a single project. This will significantly streamline project construction and minimize costs and disruptions to City stakeholders.

Using the *CIP Planning Tool* will also allow Carollo to deliver the CIP in GIS format, permitting continual update of the projects as time progresses and factors change. Since the City now uses tablets with GIS, this planning tool could ultimately become a "dynamic living CIP," so that Public Works Department employees can access the most current CIP projects and track which are completed and which are being deferred because of changing conditions.

8.4 SECURITY

Summers Associates, LLC, was contracted to develop a basis of design for physical and electronic security for the City's water resources facilities and to identify existing deficiencies in the facilities' security. A set of guidelines for enhancing security during their design and construction was also developed. Threats to the facilities include common crime, terrorist attacks, other manmade hazards, and some natural hazards.

Cost-effective recommendations are within the CIP to enhance safety throughout a facility's lifetime. These recommendations apply to new facilities as well as additions and modifications to the existing facilities.

8.5 SCADA

For this Integrated Master Plan, the existing supervisory control and data acquisition (SCADA) systems for the City's water and wastewater system were assessed and capital improvement projects were recommended. Planning efforts focused on these two systems in particular based on need and age of the existing SCADA systems. These projects, shown in Table 8.2 for water and Table 8.3 for wastewater, are included in the overall CIP recommendations.

Table 8.2 Recommended SCADA Projects for Water
Public Works Integrated Master Plan
City of Oxnard

Project Name	Driver	Start Year	End Year	Un-escalated Project Cost ($)
Programmable Logic Controllers (PLC) Cabinet Replacements (6)	R&R	2015	2018	$2,050,000
SCADA Programming	Performance	2016	2021	$2,100,000
Asset Management Software Package Installation	Performance	2021	2022	$100,000
Network Upgrades (8)	Performance	2015	2022	$400,000
Control Room Upgrades	Performance	2016	2021	$300,000
			TOTAL:	**$5,000,000**

General Note: Project Costs, Schedules, and Phasing are based on data and information available at the time of the original publication of the Project Memos (PMs) - December 2015.

Table 8.3 Recommended SCADA Projects for Wastewater
Public Works Integrated Master Plan
City of Oxnard

Project Name	Driver	End Year	Start Year	Un-escalated Project Cost ($)
PLC Cabinet Replacements (12)	R&R	2018	2015	$4,601,000
SCADA Programming (12)	Performance	2021	2016	$4,989,000
Asset Management Software Package Installation	Performance	2022	2021	$104,000
Network Upgrades (12)	Performance	2022	2015	$776,000
Control Room Upgrades	Performance	2021	2016	$346,000
			TOTAL:	**$10,816,000**

General Note: Project Costs, Schedules, and Phasing are based on data and information available at the time of the original publication of the Project Memos (PMs) - December 2015.

RECOMMENDED CAPITAL IMPROVEMENT PLAN AND KEY OUTSTANDING PLANNING CONSIDERATIONS

9.1 INTRODUCTION

This chapter summarizes the key points of the four system master plans and presents a list of recommended projects for all water utilities. The Integrated Master Plan also integrated several other planning efforts such as data managements systems (e.g., SCADA, CMMS, GIS) and street planning efforts related to buried infrastructure and street upgrades such as repaving.

As with any planning effort, the Integrated Master Plan represents present and known conditions. Because of this, several key decisions and outcomes could dramatically affect the ultimate direction and phasing of implementation as the Plan progresses. Those key outstanding planning considerations and their potential impacts are summarized in this chapter.

Also summarized are the recommended costs for each project and an overall schedule for implementation. These recommended costs and schedules are based on a detailed evaluation of the existing water, wastewater, recycled water, and stormwater facilities, an assessment of likely future system needs, an analysis of master plan scenarios, and numerous meetings and workshops with City staff and management.

Until the environmental review and assessment for the Integrated Master Plan are complete, this Summary Report is considered a final draft. After those assessments are completed and approved by the City Council, the list of recommended projects may be revised based on a number of factors, such as the outcome of the environmental review process and the utility billing rates approved by the City Council.

9.2 APPROACH TO CIP DEVELOPMENT

As noted in Chapters 4 through 7, recommended projects were developed individually for each utility in 2014/2015. Also, as noted in the Brief History and Overview Section at the beginning of this report, the City continued to move forward with planning efforts and adoption of the Cost of Service (COS) studies (Carollo, 2017) from 2015 through 2017. Therefore, certain projects in these planning documents have been refined and updated since the original publication date in 2015/2016. It should be noted that the refinements were generally not capacity related, but instead related to improved financial strategies, technology updates, and climate change strategies. The updated 2017 COS studies contain the most recent near-term Capital Improvement Projects (CIP). The updated CIP list was combined with the December 2015 list to make a complete Integrated Master Plan CIP through 2040.

The costs and timing presented in this Integrated Master Plan represent Carollo's best professional judgment of the City's capital expenditure needs and timing to maintain a reliable and compliant system that can meet current and future water demands and wastewater generation needs.

Project timing was set to align with the seven master plan drivers, as noted earlier in Chapter 1: 1) repair & replacement (R&R), 2) regulatory requirements, 3) economic benefit, 4) performance benefit, 5) growth, 6) resource sustainability, and 7) policy decisions. Project timing is also based on input from City staff / management and the condition assessments performed as part of this planning project.

The projects were divided into three project timing phases: Immediate Needs (First 2 years); Near-Term Needs (years 3 to 5); and Long-Term Needs (Beyond 5 years).

9.3 SUMMARY OF THE PLANS

For each individual system, projects were developed based upon the system's most significant drivers and needs. For example, for water and wastewater systems, the facilities' ages and condition necessitate immediate R&R, whereas projects for the relatively new recycled water system involve maintaining and incorporating a reliable supply into the City's boundary. Given the complexity of each system and the systems' unique integration as a whole, a high-level summary of each of the four system plans is helpful. This summary is shown in Table 9.1.

9.4 OUTSTANDING PLANNING CONSIDERATIONS AFFECTING OVERALL CIP AND INDIVIDUAL PLANS

The projects/programs recommended within this Integrated Master Plan support the City's most current thinking, direction, and needs. However, the outcome, timing and phasing of the projects and programs could change depending on the outcome of several key outstanding planning considerations. Four key considerations include:

- The OWTP's eventual location – Two major options are being considered: continue treatment in the same location by repairing and replacing facilities, or relocate all or part of treatment to a completely new site.

  Continuing in the same location will require R&R of most of the major processes. Furthermore, future seawater intrusion due to rising sea levels is a concern and may require constructing a sea wall to mitigate and safeguard facilities.

  Conversely, relocating all of, or parts of, the OWTP to a new site reduces site issues, but implementation of the treatment plant can be challenging. Additionally, many of the existing OWTP facilities need to be upgraded immediately due to their age and condition. However, constructing them at a new site would require a longer lead time to acquire the land and to plan, design, and implement the facilities.

Table 9.1 Key Recommendations of Each Water System Plan
Public Works Integrated Master Plan
City of Oxnard

Timing	Water	Wastewater	Recycled Water	Stormwater
Years 1 - 2	R&R of pipelines and blending stations(1) Improve fire flow capability Separate system into 4 pressure zones for improved LOS Operations Optimization	Focus on R&R from minor to major projects on nearly every process within the OWTP R&R and Capacity improvements on several central trunk sewers	Minor R&R related to AWPF and conversion of recycled water customers	R&R of existing stormwater assets Limited capacity upgrades
Years 3 - 5	Add well and pipeline capacity to meet added demand Add desalter capacity to improve overall water quality of blended ground and surface water Add reliable water supply through ASR/IPR	Continued R&R on headworks and disinfection processes Energy efficiency improvements on digester / co-gen facilities	Add reliable water supply through AWPF Expansion and ASR/IPR	Capacity upgrades of existing assets Infiltration basin for TMDL compliance Dry weather diversion to capture dry weather flow in storm system Incentive program
Beyond 5 years	Continue to meet future demand through upgraded pipeline capacity Continue to bolster water supply through ASR/IPR integration	Focus on improved resource sustainability through process upgrades and alternative power	Continue to add reliable water supply, as needed, through AWPF Expansion and ASR/IPR facilities	Continues capacity upgrades (Phase 3 & 4)

Notes:
(1) Includes electrical and SCADA system upgrades and cathodic protection. Based on data and information available at the time of the original publication of the Project Memos (PMs) – December 2015.

- Regulatory considerations for the existing OWTP/AWPF outfall based on overall water infrastructure operation – Reusing water instead of discharging it to the ocean could have unintended consequences on the ocean outfall. Water reuse could limit the AWPF's ultimate capacity, require nitrification, and denitrification in the secondary effluent before discharge, and change local limits to industrial users. Preliminary mitigation measures have been explored through the Integrated Master Plan. However, conversations with regulators must continue until a cost-effective and reliable approach is determined.
- The FCGMA and future ground water 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 is closely tied to the drought conditions and the availability of natural supply. This Master Plan made certain assumptions about future allocations, trying to consider best- and worst-case conditions that provide flexibility for working within these parameters. However, at best, the future of FCGMA and groundwater are highly uncertain and must be monitored frequently to ensure that the City can plan for changes as they occur. Although changes are eminent, they are not fully defined at this time due to the recent passage of the 2015 Groundwater Management Act.
- Future of imported water from CMWD and Metropolitan Water District of Southern California – As the drought continues, regional authorities are exploring the best alternative water supplies to mitigate the drought's effects, including IPR and seawater desalination. In response, the City is staying abreast on the possibility of regional desalting and/or desalination facilities. These facilities could relieve some of the AWPF capacity for more potable offset or groundwater replenishment.

9.5 RECOMMENDED CIP/COST SUMMARY

An overall summary of the recommended CIP projects and their associated costs is presented in Table 9.2. The CIP costs are summarized for each system according to implementation phase. More detailed project costs and project drivers can be found in Appendix B.

The estimated near-term project costs shown in Table 9.2 and the associated operations and maintenance costs developed for the Integrated Master Plan are consistent with those developed for the Cost of Service (COS) Studies (Carollo, 2017). However, the timing of the costs presented may differ. This is partially because timing and implementing certain projects are based on assumptions with a range of uncertainty.

Uncertainties that can affect timing include the rate of population growth, the timing and performance standards of future regulatory requirements, the outstanding planning considerations mentioned above, and the development of new technologies and associated reliabilities. Therefore, while the overall investment and total CIP budget over the 25-year

planning horizon are consistent between the Integrated Master Plan and the COS, timing the implementation of some projects may differ with the range of variability in the underlying assumptions of the Integrated Master Plan drivers.

Table 9.2 CIP Costs by Phase
Public Works Integrated Master Plan
City of Oxnard

Projects		Cost[(1)]
Water		
Years 1-2		$3,175,000
Years 3-5		$61,839,333
Years 6-10		$62,527,333
Years 11-16		$19,238,333
Years 17-23		$80,600,000
	Subtotal:	**$227,380,000**
Wastewater[(1)]		
Years 1-2		$8,405,000
Years 3-5		$68,425,064
Years 6-10		$244,311,000
Years 11-16		$58,908,334
Years 17-23		$112,983,933
	Subtotal:	**$493,033,330**
Recycled Water		
Years 1-2		$11,166,667
Years 3-5		$81,033,333
Years 6-10		$57,500,000
Years 11-16		$80,500,000
Years 17-23		$22,200,000
	Subtotal:	**$252,400,000**
Stormwater		
Years 1-2		$8,363,333
Years 3-5		$18,118,000
Years 6-10		$2,936,667
Years 11-16		$1,338,000
Years 17-23		$1,930,000
	Subtotal:	**$32,686,000**
	Total:	**$1,005,499,330**

Notes:
(1) Project costs correspond to refinements and updates provided by City after December 2015 publication date.

9.6 IMPLEMENTATION TIMING

Appendix B presents the timing for the recommended CIP projects.

APPENDIX A – LISTING OF THE PWIMP PROJECT MEMORANDUMS

CITY OF OXNARD

PUBLIC WORKS INTEGRATED MASTER PLAN

INDEX

Section No.	PM No.	PM Description
		Brief History and Overview
1		**General Overview**
	1.1	Master Planning Process Overview
	1.2	Public Works Maintenance and Optimization Plan
	1.2.1	Staffing
	1.2.2	Computerized Maintenance Management System (CMMS)
	1.2.3	Agreements/Contract Database Development Summary
	1.3	Population and Land Use Estimates
	1.4	Basis of Costs
	1.5	Security of Utilities Facilities
2		**Water System**
	2.1	Background Summary
	2.2	Flow Projections
	2.3	Infrastructure Modeling and Alternatives
	2.4	Condition Assessment
	2.5	Supply and Treatment Alternatives
	2.6	Arc Flash Assessment
	2.7	Cathodic Protection Assessment - Phases 1 and 2
	2.8	SCADA Assessment
3		**Wastewater System**
	3.1	Background Summary
	3.2	Flow and Load Projections
	3.3	Infrastructure Modeling and Alternatives
	3.4	Treatment Plant Performance and Capacity
	3.5	Condition Assessment
	3.6	Seismic Assessment
	3.7	Treatment Alternatives
	3.7.1	Traditional OWTP Assessment - Upgrade in Place
	3.7.2	Alternative OWTP Assessment - Relocate OWTP
	3.8	Arc Flash Assessment
	3.9	Cathodic Protection Assessment - Phase 1
	3.1	SCADA Assessment
	3.11	Flow Monitoring
	3.12	Biosolids Management

Section No.	PM No.	PM Description
4		**Recycled Water System**
	4.1	Background Summary
	4.2	Infrastructure Modeling and Alternatives
	4.3	AWPF/OWTP Outfall Regulatory Considerations
	4.4	Arc Flash Assessment
	4.5	Envision Documentation & Certification Summary Assessment
	4.6	Pathogen Analysis for Direct Potable Reuse (DPR) Summary
	4.7	Salt and Nutrient Management Plan (SNMP) Summary
5		**Stormwater System**
	5.1	Background Summary
	5.2	Infrastructure Modeling and Alternatives
	5.3	Condition Assessment
	5.4	Treatment Alternatives
6		**Streets**
		Integration of Streets with Planned Public Works Infrastructure and Summary of Current Street Planning Efforts

APPENDIX B – MASTER CIP TABLE

Project ID 2017	Project ID 2015	Project	Description	Driver	Start Year	Years to Implement	Total	Years 1 to 2 (FY 2017/18 - 2018/19)	Years 3 to 5 (FY 2019/20 - 2021/22)	Years 6 to 10 (FY 2022/23 - 2026/27)	Years 11-16 (FY 2027/28 - 2032/33)	Years 17-23 (FY 2033/34 - 2039/40)
		Production Total					$47,590,000	$1,955,000	$13,705,000	$30,350,000	$1,580,000	$0
W-1	W-P-35	Existing desalter upgrades	Membrane replacement, CIP automation, electric valve actuator replacements, discharge piping reconfiguration	R&R	2017	5	$5,000,000	$930,000	$4,070,000	$0	$0	$0
W-2	W-P-28 W-P-40	Desalter, piping and permeate tank cathodic protection	Investigate requirements for electrical isolation and CP of buried piping and RO finished water, and design and install capital project as warranted; Replacement of CP system at WTP and steel permeate tank	R&R	2020	2	$110,000	$0	$110,000	$0	$0	$0
W-3	W-P-62 W-P-65	Expand water treatment facility and storage (incl. booster pump station)	Expand disinfection system at Blending Station 1/6. Install new 1.5 MG storage reservoir for finished water. Install new booster pump station for new storage tank	Water Supply	2021	8	$6,600,000	$0	$500,000	$5,100,000	$1,000,000	$0
W-4	W-P-19	Blending Station #2 upgrade	R&R of mechanical, electrical, and AUX equipment	R&R	2028	1	$430,000	$0	$0	$0	$430,000	$0
W-5	W-P-20	Blending Stations #1 and #6 upgrade	R&R of wells, mechanical, electrical, and AUX equipment	R&R	2018	4	$3,400,000	$850,000	$2,550,000	$0	$0	$0
W-6	W-P-21	Water System CMMS	Water CMMS System (City Works)	R&R	2017	3	$300,000	$175,000	$125,000	$0	$0	$0
W-7	W-P-22	Water System SCADA Improvements	Perform water SCADA system improvements (design and implementation plan year 1)	R&R	2020	5	$5,000,000	$0	$2,000,000	$3,000,000	$0	$0
W-8		Security Improvements at Water Yard and Blending stations	Access Control, Cameras		2020	5	$500,000	$0	$250,000	$250,000	$0	$0
W-9		Chemical Tank Replacements	Replacement of chemical tanks (required every 10 years)	R&R	2025	3	$450,000	$0	$0	$300,000	$150,000	$0
W-10	W-P-32	Blending Station #3 Rehabilitation	R&R of wells, mechanical, electrical, and AUX equipment, VFD replacement	R&R	2019	2	$2,500,000	$0	$2,500,000	$0	$0	$0
W-11	W-P-33	Blending Station #4 Rehabilitation	Pumps, mechanical, electrical, and AUX equipment, VFD	R&R	2019	2	$400,000	$0	$400,000	$0	$0	$0
W-12	W-P-34	Blending Station #5 Rehabilitation	Mechanical, electrical, and AUX equipment	R&R	2019	2	$200,000	$0	$200,000	$0	$0	$0
W-13	W-P-61	Construct 3 new potable wells at BS 1/6	Add potable water wells, land management	Water Supply	2020	7	$11,000,000	$0	$1,000,000	$10,000,000	$0	$0
W-14	W-P-66	Construct 2 new potable wells (BS 1/6) and 1 new stainless steel well at BS 3	Add potable water wells	Water Supply	2023	4	$11,700,000	$0	$0	$11,700,000	$0	$0
		Transmission Total					$2,405,000	$405,000	$1,620,000	$380,000	$0	$0
W-15	W-P-23 W-P-36 W-P-37	Del Norte Transmission Main Cathodic Protection (CP)	Install 20 missing test stations; Replace rectifiers and anodes and resurvey; Locate and repair discontinuity near the east end of the Del Norte Pl	R&R	2019	2	$450,000	$0	$450,000	$0	$0	$0
W-16	W-P-26	Gonzalez 36-inch Pipeline CP	Replace the seized test traffic box lids; test the CP system	R&R	2018	1	$5,000	$5,000	$0	$0	$0	$0
W-17	W-P-27 W-P-10 W-P-5 W-P-6	Oxnard Conduit CP	Excavate & install new test stations at BFV near Del Norte connection, 9+10, 39+10, 57+45, 69+50, 111+50, 165+20; Install new test stations in ex manhole at 284+80; Corrosion engineer to conduct Close Interval Survey (CIS); Replace deep anode beds at Rectifiers #1 , #2, & #3; Locate, excavate, and bond across approximately three (3) points of electrical isolation	R&R	2017	4	$890,000	$400,000	$490,000	$0	$0	$0
W-18	W-P-38 W-P-39	Wooley Road / United CP	Replace 5 test stations and add 2 new stations; Replace rectifier and anode; resurvey	R&R	2020	1	$160,000	$0	$160,000	$0	$0	$0
W-19	W-P-7 W-P-24	3rd Street Lateral CP	Replace rectifer and anode bed; resurvey; Replace all test stations at an interval of 1,000-ft minimum and 2,000-ft maximum; Locate & repair discontinuity between 27+88 and South Hayes WTP; Provide electrical isolation at the main treatment plant	R&R	2020	3	$360,000	$0	$310,000	$50,000	$0	$0
W-20	W-P-25 W-P-8	Industrial Lateral CP	Replace all test stations; resurvey	R&R	2020	3	$130,000	$0	$100,000	$30,000	$0	$0
W-21	W-P-11	3rd St 27" UWCD CP	Bond UWCD pipeline to Oxnard Extension at rectifier	R&R	2020	2	$110,000	$0	$110,000	$0	$0	$0
W-22		Condition assessment program	Physical condition assessment of mains program	R&R	2022	5	$300,000	$0	$0	$300,000	$0	$0
		Distribution Total					$58,965,000	$815,000	$24,551,000	$23,574,000	$10,025,000	$0
W-23	W-P-9	Replacement of AMR Devices	Design and construct a new Advance Metering Infrastructure (AMI) system (Cost is possibly reduced by 1/2 if shared with wastewater division)	R&R	2017	7	$22,000,000	$200,000	$13,000,000	$8,800,000	$0	$0
W-24	W-P-51 W-P-52 W-P-53 W-P-54 W-P-56 W-P-57 W-P-58 W-P-59 W-P-67 W-P-68 W-P-69 W-P-70 W-P-71 W-P-72	Pipe Capacity Improvements	Pipe capacity improvements for 8-inch to 24-inch pipe Upgrade 322 feet to 8" pipe Upgrade 238 feet to 12" pipe Upgrade 164 feet to 14" pipe Upgrade 3,804 feet to 30" pipe Upgrade 69 feet to 6" pipe Upgrade 391 feet to 8" pipe Upgrade 1,011 feet to 10" pipe Upgrade 2,447 feet to 12" pipe Upgrade 32 feet to 6" pipe Upgrade 233 feet to 8" pipe Upgrade 1,243 feet to 10" pipe Upgrade 997 feet to 12" pipe Upgrade 2,453 feet to 14" pipe Upgrade 937 feet to 24" pipe	Water Supply	2019	9	$13,040,000	$0	$5,620,000	$6,870,000	$550,000	$0
W-25	W-P-12 W-P-13 W-P-14 W-P-15	Neighborhood CIP Pipe Replacement*	Replace existing distribution pipes in La Colonia Neighborhood, Redwood Neighborhood, Fremont North Neighborhood, and Bryce Canyon South Neighborhood	R&R	2018	6	$10,500,000	$615,000	$5,931,000	$3,954,000	$0	$0
W-29		Large Valve Replacement Program	Replace valve 10-inch and larger	R&R	2022	10	$1,926,000	$0	$0	$926,000	$1,000,000	$0
W-30		Small Valve Replacement Program	Replace valves 8-inch and smaller	R&R	2022	10	$3,780,000	$0	$0	$1,780,000	$2,000,000	$0
W-31		Air / Vac Valve Replacement Program	Replace air and vacuum valves and covers	R&R	2022	10	$1,422,000	$0	$0	$672,000	$750,000	$0
W-32		Hydrant Replacement Program	Replace dry barrel hydrants to wet barrel	R&R	2022	10	$1,197,000	$0	$0	$572,000	$625,000	$0
W-33	W-P-74 W-P-75 W-P-76 W-P-77	North Zone Modifications	Install 1000 feet of 24-inch pipeline from BS#3 to the North Pressure Zone, Rehab 3 Pressure Reducing Stations (PRS), modify minor piping	Pressure Zone Separation	2027	4	$1,100,000	$0	$0	$0	$1,100,000	$0
W-34	W-P-78 W-P-79 W-P-80 W-P-81	Coast Zone Modifications	Install 3000 feet of 8-inch pipeline, construct 3 new Pressure Reducing Stations (PRS), modify minor piping	Pressure Zone Separation	2027	4	$1,600,000	$0	$0	$0	$1,600,000	$0
W-35	W-P-82 W-P-83 W-P-84 W-P-85	South Zone Modifications	Install 6000 feet of 8-inch pipeline, construct 3 new Pressure Reducing Stations (PRS), modify minor piping	Pressure Zone Separation	2027	3	$2,400,000	$0	$0	$0	$2,400,000	$0
						2017 Potable Water System CIP Subtotal	**$108,960,000**	**$3,175,000**	**$39,876,000**	**$54,304,000**	**$11,605,000**	**$0**

Project ID 2017	Project ID 2015	Project	Description	Driver	Start Year	Years to Implement	Total	Years 1 to 2 (FY 2017/18 - 2018/19)	Years 3 to 5 (FY 2019/20 - 2021/22)	Years 6 to 10 (FY 2022/23 - 2026/27)	Years 11-16 (FY 2027/28 - 2032/33)	Years 17-23 (FY 2033/34 - 2039/40)
Additional 2015 Projects												
	W-P-1	Electrical Rehabilitation - Well Nos. 30, 32, 33 & 34		Operations Optimization	2026	1.5	$1,000,000	$0	$0	$666,667	$333,333	$0
	W-P-2	Sodium Hypochlorite Piping Replacement		Operations Optimization	2022	1.5	$30,000	$0	$0	$30,000	$0	$0
	W-P-4	Generator and ATS Service		Operations Optimization	2019	1.5	$20,000	$0	$20,000	$0	$0	$0
	W-P-16	Fire Flow Improvements - Install/Replace 18,500 feet of 8" pipe		R&R	2020	2	$4,600,000	$0	$4,600,000	$0	$0	$0
	W-P-17	Fire Flow Improvements - Install/Replace 13,500 feet of 12" pipe		R&R	2020	2	$4,400,000	$0	$4,400,000	$0	$0	$0
	W-P-18	Fire Flow Improvements - Install 250 feet of 14" pipe		R&R	2020	1	$100,000	$0	$100,000	$0	$0	$0
	W-P-64	Blend Station Tie-In (@ Blending Station 1/6)		Water Supply	2022	1	$250,000	$0	$0	$250,000	$0	$0
	W-P-60	Construct new concentrate line from Oxnard Wastewater Treatment Plant (OWTP) to Blending Station 1/6		Water Supply	2020	3	$18,800,000	$0	$12,533,333	$6,266,667	$0	$0
	W-P-28	Blending Station 1/6 - Install electrical isolation at all steel and cast iron water risers		R&R	2022	2	$30,000	$0	$0	$30,000	$0	$0
	W-P-30	Well 23 & 31 Rehabilitation		R&R	2022	1.5	$210,000	$0	$0	$210,000	$0	$0
	W-P-31	Wells Electrical & Variable Frequency Drive (VFD) Replacement		R&R	2022	1.5	$770,000	$0	$0	$770,000	$0	$0
	W-P-41	Age Replacement - 109,100 feet of 6" pipe		R&R	2033	2	$25,500,000	$0	$0	$0	$0	$25,500,000
	W-P-42	Age Replacement - 47,000 feet of 8" pipe		R&R	2034	2	$11,700,000	$0	$0	$0	$0	$11,700,000
	W-P-43	Age Replacement - 55,000 feet of 10" pipe		R&R	2035	2	$17,100,000	$0	$0	$0	$0	$17,100,000
	W-P-44	Age Replacement - 24,000 feet of 12" pipe		R&R	2036	2	$7,900,000	$0	$0	$0	$0	$7,900,000
	W-P-45	Age Replacement - 2,300 feet of 14" pipe		R&R	2037	1	$900,000	$0	$0	$0	$0	$900,000
	W-P-46	Age Replacement - 4,000 feet of 16" pipe		R&R	2037	1	$1,700,000	$0	$0	$0	$0	$1,700,000
	W-P-47	Age Replacement - 3,700 feet of 24" pipe		R&R	2037	2	$2,300,000	$0	$0	$0	$0	$2,300,000
	W-P-48	Age Replacement - 5,000 feet of 36" pipe		R&R	2038	2	$3,900,000	$0	$0	$0	$0	$3,900,000
	W-P-49**	Age Replacement - 5,300 feet of 42" pipe		R&R	2038	2	$5,500,000	$0	$0	$0	$0	$5,500,000
	W-P-50**	Age Replacement - 3,800 feet of 48" pipe		R&R	2038	2	$4,100,000	$0	$0	$0	$0	$4,100,000
	W-P-55	Connection to OH / United pipeline		Water Supply	2020	1.5	$310,000	$0	$310,000	$0	$0	$0
	W-P-73	Expand desalter at Blending Station 1/6 to 15 mgd (3.75 mgd expansion)		Water Supply	2028	3	$7,300,000	$0	$0	$0	$7,300,000	$0
				Unmatched 2015 Water Projects Subtotal			**$118,420,000**	**$0**	**$21,963,333**	**$8,223,333**	**$7,633,333**	**$80,600,000**
						Overall Total	**$227,380,000**	**$3,175,000**	**$61,839,333**	**$62,527,333**	**$19,238,333**	**$80,600,000**

Note: * Projects W-25 through W-28 combined into single project ID'ed as W-25.
** Project start years correspond to refinements and updates provided by CIty after Dec. 2015 publication date.

2017 Project ID[1]	2015 Project ID	Unit Operation	Project	Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY 2017/18 - 2018/19)[3]	Years 3 to 5 (FY 2019/20 - 2021/22)[3]	Years 6 to 10 (FY 2022/23 - 2026/27)[4]	Years 11-16 (FY 2027/28 - 2032/33)[4]	Years 17-23 (FY 2033/34 - 2039/40)[4]
Wastewater Collection System Projects													
C-1	WW-P-6		Central Trunk Manhole Rehabilitation Phase 1	Rehabilitate 47 existing manholes	R&R	2018	1	$ 1,410,000	$ 1,410,000	$ -	$ -	$ -	$ -
C-2	WW-P-13		Central Trunk Manhole Rehabilitation Phase 2[2]	Rehabilitate 27 existing manholes	R&R	2020	1	$ 810,000	$ -	$ 810,000	$ -	$ -	$ -
C-3	WW-P-8		Harbor Blvd Manhole Rehabilitation	Rehabilitate 12 existing manholes	R&R	2019	1	$ 100,000	$ -	$ 100,000	$ -	$ -	$ -
C-4			Pleasant Valley Manhole Rehabilitation	Rehabilitate 14 existing manholes	R&R	2019	1	$ 200,000	$ -	$ 200,000	$ -	$ -	$ -
C-5	WW-P-9		Redwood Tributary Manhole Rehabilitation	Rehabilitate 38 existing manholes	R&R	2019	1	$ 300,000	$ -	$ 300,000	$ -	$ -	$ -
C-6			Annual Existing Manhole Rehabilitation	Various locations throughout the City based on sewer inspection	R&R	2022	5	$ 1,000,000	$ -	$ -	$ 1,000,000	$ -	$ -
C-7	WW-P-16		Rice Avenue Sewer Improvement	Install new 24-inch sewer from Latigo to Camino Del Sol to replace existing 18-inch sewer line.	R&R	2020	2	$ 1,300,000	$ -	$ 1,300,000	$ -	$ -	$ -
C-8	WW-P-1		Existing Sewer Deficient Capacity Replacement	Ventura Road from Doris Avenue to Oxnard Airport	Capacity	2020	2	$ 1,755,197	$ -	$ 1,755,197	$ -	$ -	$ -
C-9	WW-P-2		Existing Sewer Deficient Capacity Replacement	Third Street & Navarro Street	Capacity	2021	1	$ 364,869	$ -	$ 364,869	$ -	$ -	$ -
C-10	WW-P-7		Existing asbestos concrete pipe (ACP) Replacement	Various locations throughout the City	R&R	2019	8	$ 4,000,000	$ -	$ 1,500,000	$ 2,500,000	$ -	$ -
C-11			Annual Existing Pipe Repair	Various locations throughout the City based on sewer inspection	R&R	2019	8	$ 1,600,000	$ -	$ 600,000	$ 1,000,000	$ -	$ -
C-12			Collection System Chemical Addition	Construct 3 new magnesium hydroxide addition facilities to reduce nuisance odors and protect sewer infrastructure	Performance	2019	2	$ 4,400,000	$ -	$ 4,400,000	$ -	$ -	$ -
C-13	WW-P-10 WW-P-18		Devco Development Lift Station	Construct new lift station at Devco development & abandon existing lift station #23. The new lift station will accommodate sewer flows from existing lift station #23, Devco, Village (Wagon Wheel) developments. The lift station cost is $1,500,000 & the City cost is $500,000.	R&R, Performance	2019	1	$ 500,000	$ -	$ 500,000	$ -	$ -	$ -
C-14	WW-P-12		Existing Lift Station #4 (Mandalay & Wooley) Rehabilitation	Install new supervisory control and data acquisition (SCADA) & motor control center (MCC) panels. Install new valve vault door. Rehabilitate wet well coating.	R&R	2019	1	$ 500,000	$ -	$ 500,000	$ -	$ -	$ -
C-15	WW-P-11		Existing Lift Station #6 (Canal) Rehabilitation	Install new pumps. Replace MCC panel. Install new emergency standby generator.	R&R	2019	1	$ 500,000	$ -	$ 500,000	$ -	$ -	$ -
C-16			Existing Lift Station #20 (Beardsley) Rehabilitation	Install new MCC panel and concrete pad.	R&R	2019	1	$ 300,000	$ -	$ 300,000	$ -	$ -	$ -
C-17	WW-P-5		Meter Vault/Vortex Structure Coating Rehabilitation[2]	Rehabilitate coating in meter vault/vortex structure	R&R	2018	1	$ 280,000	$ 280,000	$ -	$ -	$ -	$ -
Additional Wastewater Collection System Projects from 2015 CIP									$ -	$ -	$ -	$ -	$ -
	WW-P-3		Project 3: S Victoria Ave and W Hemlock St - Sewers in the Channel Islands Neighborhood		Capacity	2027*	2	$ 1,112,267	$ -	$ -	$ -	$ 1,112,267	$ -
	WW-P-14		Phase 1 Central Trunk replacement		R&R	2033**	2	$ 36,500,000	$ -	$ -	$ -	$ -	$ 36,500,000
	WW-P-15		Phase 2 Central Trunk Replacement		R&R	2036**	2	$ 30,000,000	$ -	$ -	$ -	$ -	$ 30,000,000
Wastewater Collection System Total								$ 86,932,333	$ 1,690,000	$ 13,130,066	$ 4,500,000	$ 1,112,267	$ 66,500,000
Wastewater Treatment System Projects													
--			Accelerated design for renewal improvements (year 6 - 10)			2018	6	$ 15,130,000	$ 1,500,000	$ 8,630,000	$ 5,000,000		
		Preliminary Treatment / Headworks											
T-1	WW-P-83		Headworks Odor Control System[2]	Install new odor control dampers and fan. Repair existing foul air ductwork.	Small Equipment Replacement	2018	1	$ 220,000	$ 220,000	$ -	$ -	$ -	$ -
T-2	WW-P-67		Headworks Fiberglass Covers Replacement & Concrete Coating Repair[2]	Install new grit chamber & wet well fiberglass covers. Rehabilitate grit chamber & wet well concrete coating. Year 1 to 2: high foot traffic areas. Year 3 to 5: remaining areas.	R&R	2018	2	$ 499,100	$ 90,000	$ 409,100	$ -	$ -	$ -
T-3	WW-P-66		Headworks Rehabilitation[2]	Install new odor control system. Enclose bar screen & conveyor areas to minimize odor complaints. Install screen wall along north and west property areas. In 2011, City settled $4.6M lawsuit related to Headworks construction and nuisance odor complaints.	R&R	2020	2	$ 7,250,000	$ -	$ 7,250,000	$ -	$ -	$ -
T-4	WW-P-41		Non-hazardous Waste Receiving Station	New non-hazardous waste receiving station with metering and screening systems	Performance	2026	1	$ 2,100,000	$ -	$ -	$ 2,100,000	$ -	$ -
		Primary Treatment										$ -	$ -
T-5			Primary Clarifier Rehabilitation	Install new effluent launders. New primary clarifier #4 walkway. Install polymer addition system to improvement primary treatment efficiency.	R&R	2017	1	$ 655,000	$ 655,000	$ -	$ -	$ -	$ -
T-6			Primary Clarifier Abandonment	Abandon existing primary clarifiers. Repurpose a portion existing secondary sedimentation tanks as primary clarifiers. Convert remaining secondary sedimentation tanks to membrane bioreactors (MBR).	R&R	N/A	0	$ -	$ -	$ -	$ -	$ -	$ -
T-7	WW-P-23		Primary Clarifiers, Old Headworks Structure and Primary Building Demolition[2]	Remove equipment, concrete, piping and electrical systems in old headworks and primary tanks area. Reroute piping and electrical systems	R&R	2025	1	$ 7,300,000	$ -	$ -	$ 7,300,000	$ -	$ -
		Secondary Treatment										$ -	$ -
T-8			Biotowers Rehabilitation	Install wire wrap or mesh around biotowers to prevent block wall from falling.	R&R	2017	1	$ 630,000	$ 630,000	$ -	$ -	$ -	$ -

2017 Project ID[1]	2015 Project ID	Unit Operation	Project	Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY 2017/18 - 2018/19)[3]	Years 3 to 5 (FY 2019/20 - 2021/22)[3]	Years 6 to 10 (FY 2022/23 - 2026/27)[4]	Years 11-16 (FY 2027/28 - 2032/33)[4]	Years 17-23 (FY 2033/34 - 2039/40)[4]
T-9	WW-P-20		Biotower Demolition[2]	Remove superstructure, remove concrete below ground, reroute piping and electrical; restore grade	R&R	2023	1	$ 2,850,000	$ -	$ -	$ 2,850,000	$ -	$ -
T-10	WW-P-69		Activated Sludge Tank (AST) Rehabilitation[2]	Install new air flow meters, air control valves, and dissolved oxygen meters.	R&R	2017	1	$ 150,000	$ 150,000	$ -	$ -	$ -	$ -
T-11	WW-P-72 WW-P-74 WW-P-76		Activated Sludge Tank (AST) Upgrades	Replace diffusers and add return sludge piping, aeration piping, gates and controls	R&R, Performance	2023	1	$ 4,600,000	$ -	$ -	$ 4,600,000	$ -	$ -
T-12	WW-P-72		Modify Activated Sludge Tank (AST) for MBR or other technology operation	Partition Tanks, add internal recycle system	Performance	2023	2	$ 7,200,000	$ -	$ -	$ 7,200,000	$ -	$ -
T-13	WW-P-68 WW-P-72		Convert Activated Sludge Tanks conversion to Flow Equalization Tank	Convert existing AST 4 to 8. Remove diffusers and add flow equalization pumps. Concrete repair and seismic retrofit - EQ Tank	R&R, Performance	2024	1	$ 5,525,000	$ -	$ -	$ 5,525,000	$ -	$ -
T-14	WW-P-70 WW-P-73		Convert Secondary Clarifiers to Primary Clarifiers	Convert existing secondary clarifiers 6 to 12. Install clarifier mechanisms, replace primary sludge pumps, isolation gates and scum systems. Replace collectors, skimmers, and drives. Concrete repair and re-painting - SSTs.	R&R	2025	1	$ 8,300,000	$ -	$ -	$ 8,300,000	$ -	$ -
T-15			Remove existing Secondary Clarifiers and prepare for new Membrane Bioreactor (MBR) or other Technology	Demolish existing secondary clarifiers 13 to 18. Remove equipment, re-route piping and electrical, reinforce walls of aeration basin, modify inlet and outlet channels	R&R	2023	2	$ 7,150,000	$ -	$ -	$ 7,150,000	$ -	$ -
T-16	WW-P-75 WW-P-97		New MBR or other technology Tanks	Construct new tanks, channels, membranes and piping, pump gallery, pumps, cranes, roof and ventilation systems, aeration blowers	R&R, Resource Sustainability	2023	2	$ 57,200,000	$ -	$ -	$ 57,200,000	$ -	$ -
T-17	WW-P-97		MBR or other Technology Building	New Chemical systems, electrical room, SCADA system, effluent pumps	Resource Sustainability	2023	2	$ 12,350,000	$ -	$ -	$ 12,350,000	$ -	$ -
T-18			Convert Existing Secondary Clarifier to Screening & Transfer Pump Station	Install screen channels for primary effluent, convert to flow equalization basin, add transfer pumping and pipes	R&R	2024	1	$ 7,150,000	$ -	$ -	$ 7,150,000	$ -	$ -
T-19	WW-P-96 WW-P-80 WW-P-81		Disinfection and Effluent Pumping	New Disinfection system, effluent wet well and pumps	Small Equipment Replacement, R&R	2024	1	$ 7,215,000	$ -	$ -	$ 7,215,000	$ -	$ -
T-20			Relocate Existing Primary Influent Piping	Connect to main header and re-route to influent channel of clarifiers. Provide controls and valves	R&R	2024	1	$ 3,510,000	$ -	$ -	$ 3,510,000	$ -	$ -
		Solids Treatment										$ -	$ -
T-21	WW-P-44 WW-P-45 WW-P-51		Sludge Thickening Facility[2]	Demolish Dissolved Air Flotation Tank (DAFT) structures, gravity thickener tanks and chemical storage. New building with Rotating Drum Screens for primary sludge and Gravity Belt thickeners for waste secondary sludge	R&R, Performance	2026	1	$ 24,700,000	$ -	$ -	$ 24,700,000	$ -	$ -
T-22	WW-P-43		Digester 2 Cover Replacement and Clean Digesters 1 & 3[2]	Install digester 2 cover and clean digester 1 and 3.	R&R	2019	3	$ 3,700,000	$ -	$ 3,700,000	$ -	$ -	$ -
T-23	WW-P-87 WW-P-89		Digesters 1 and 3 Rehabilitation[2]	Replacement of mixing systems, roof and concrete walls repair; heat exchanger upgrades	R&R	2025	2	$ 8,500,000	$ -	$ -	$ 8,500,000	$ -	$ -
T-24	WW-P-40		Replace Belt Filter Presses & Conveyor	Year 1 to 2: Replace two existing belt filter presses. Year 3 to 5: Replace two existing belt filter presses and conveyor.	R&R	2017	4	$ 2,610,000	$ 1,180,000	$ 1,430,000	$ -	$ -	$ -
T-25	WW-P-94		FOG Receiving Station[2]	Fats Oils Grease receiving station with tank heaters and pumps, for transfer to digesters	Resource Sustainability	2026	1	$ 845,000	$ -	$ -	$ 845,000	$ -	$ -
		Pump Station										$ -	$ -
T-26	WW-P-22		Interstage Pump Station Rehabilitation[2]	Install new pumps, motors, variable frequency drives. Rehabilitate wet well concrete coating. Upgrade control facility to meet building seismic code.	R&R	2020	2	$ 2,087,199	$ -	$ 2,087,199	$ -	$ -	$ -
T-27			Effluent Pump Station Rehabilitation	Install new isolation valve, pumps, motors, variable frequency drives. Rehabilitate wet well concrete coating. Install bypass piping. Upgrade control facility to meet building seismic code.	R&R	2019	3	$ 8,900,000	$ -	$ 8,900,000	$ -	$ -	$ -
		Electrical / Instrumentation										$ -	$ -
T-28			Electrical Building ARC Flash Protection	Install temporary 25kV circuit breakers on each side of 16kV and 480 volt transformers.	Performance	2017	2	$ 575,000	$ 575,000	$ -	$ -	$ -	$ -
T-29	WW-P-93		Cogenerators Rehabilitation[2]	Year 1 to 2: Rebuild two existing cogenerators. Year 3 to 5: Rebuild one existing cogenerator.	R&R	2017	3	$ 1,215,000	$ 810,000	$ 405,000	$ -	$ -	$ -
T-30	WW-P-32		Electrical/Instrumentation Manhole Rehabilitation	Rehabilitate seven existing electrical and instrumentation manholes.	R&R	2017	1	$ 175,000	$ 175,000	$ -	$ -	$ -	$ -
T-31	WW-P-33		Emergency Standby Generator Replacement[2]	Install new emergency standby generator	R&R	2020	2	$ 5,000,000	$ -	$ 5,000,000	$ -	$ -	$ -
T-32	WW-P-34		Plant Motor Control Center (MCC) Panel Replacement[2]	Install new MCC panels	R&R	2020	2	$ 2,087,199	$ -	$ 2,087,199	$ -	$ -	$ -
T-33	WW-P-30 WW-P-31		New Main Electrical Building[2]	New Building; new transformers; reroute electrical duct banks and run new cabling; new Automatic transfer switches; demolish old electrical building and equipment, and restore grade.	R&R	2020	2	$ 6,000,000	$ -	$ 6,000,000	$ -	$ -	$ -
T-34	WW-P-59		New North Electrical Building	New Building; new Motor Control Centers	R&R	2024	2	$ 4,400,000	$ -	$ -	$ 4,400,000	$ -	$ -
T-35			Site Electrical Improvements	Install cables, duct banks, and wiring	R&R	2024	3	$ 10,920,000	$ -	$ -	$ 10,920,000	$ -	$ -
T-36	WW-P-39		Computerized Maintenance Management System (CMMS)	Install new CMMS system for plant maintenance record keeping, including work scheduling, equipment records keeping, labor hours, and costs.	R&R	2017	1	$ 300,000	$ 300,000	$ -	$ -	$ -	$ -

2017 Project ID[1]	2015 Project ID	Unit Operation	Project	Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY 2017/18 - 2018/19)[3]	Years 3 to 5 (FY 2019/20 - 2021/22)[3]	Years 6 to 10 (FY 2022/23 - 2026/27)[4]	Years 11-16 (FY 2027/28 - 2032/33)[4]	Years 17-23 (FY 2033/34 - 2039/40)[4]
T-37	WW-P-35		Supervisory Control and Data Acquisition and (SCADA) System	Temporary convert existing fiber network to Ethernet to prevent SCADA drop-out.	R&R	2017	1	$ 225,000	$ 225,000	$ -	$ -	$ -	$ -
T-38	WW-P-35		New SCADA System	Install new SCADA system	R&R	2020	2	$ 4,946,500	$ -	$ 4,946,500	$ -	$ -	$ -
T-39	WW-P-35		New Supervisory Control and Data Acquisition (SCADA) system	Replace plant-wide SCADA systems and PLCs with current technology. Reprogram all processes for new Plant Control System	R&R	2024	2	$ 9,620,000	$ -	$ -	$ 9,620,000	$ -	$ -
		Site Work										$ -	$ -
T-40	WW-P-42		Site Piping Replacements	Install new process water piping, buried valves, fire line.	R&R	2020	5	$ 23,970,000	$ -	$ 1,350,000	$ 22,620,000	$ -	$ -
T-41			Site Security	Install site cameras, security fencing, building locks	R&R	2019	2	$ 1,000,000	$ -	$ 1,000,000	$ -	$ -	$ -
T-42			Storm water Site Improvements		R&R	2019	3	$ 2,100,000	$ -	$ 2,100,000	$ -	$ -	$ -
		Building										$ -	$ -
T-43			Laboratory HVAC Unit	Install new 20-ton HVAC unit.		2017	1	$ 205,000	$ 205,000	$ -	$ -	$ -	$ -
T-44	WW-P-57		New Chemical Storage Building[2]	Demolish old structures, Centralized chemical storage, new storage tanks, pumps and piping to various processes	R&R	2026	1	$ 2,730,000	$ -	$ -	$ 2,730,000	$ -	$ -
T-45	WW-P-56		Collection System Maintenance Building Rehabilitation[2]	Rehabilitate existing building to meet building code requirements.	R&R	2026	1	$ 500,000	$ -	$ -	$ 500,000	$ -	$ -
T-46	WW-P-49		Administration Building and Laboratory Rehabilitation[2]	Rehabilitate existing building to meet building code requirements.	R&R	2025	1	$ 850,000	$ -	$ -	$ 850,000	$ -	$ -
T-47			Plant Control Center Building Rehabilitation	Rehabilitate existing building to meet building code requirements.	R&R	2025	1	$ 850,000	$ -	$ -	$ 850,000	$ -	$ -
T-48	WW-P-58		Maintenance Building Rehabilitation	Rehabilitate existing building to meet building code requirements.	R&R	2026	1	$ 500,000	$ -	$ -	$ 500,000	$ -	$ -
T-49	WW-P-27 WW-P-28		Storage Warehouse Building	New storage warehouse building	R&R	2026	1	$ 1,500,000	$ -	$ -	$ 1,500,000	$ -	$ -
Additional Wastewater Projects from 2015 CIP									$ -	$ -	$ -	$ -	$ -
	WW-P-84	Preliminary Treatment	Small Equipment Replacement - Headworks 2		Small Equipment Replacement	2023*	3	$ 6,306,000	$ -	$ -	$ 6,306,000	$ -	$ -
	WW-P-21	Secondary Treatment	Add Baffle Walls in ASTs		R&R	2027*	1	$ 380,000	$ -	$ -	$ -	$ 380,000	$ -
	WW-P-95	Secondary Treatment	Coating Replacement on Chlorine Contact Tanks		R&R	2028*	2	$ 1,359,000	$ -	$ -	$ -	$ 1,359,000	$ -
	WW-P-79	Secondary Treatment	Small Equipment Replacement - wet weather storage 2		Small Equipment Replacement	2026*	3	$ 527,000	$ -	$ -	$ 175,667	$ 351,333	$ -
	WW-P-98	Secondary Treatment	Add UV/AOP after MBR		Resource Sustainability	2026*	2	$ 13,200,000	$ -	$ -	$ 6,600,000	$ 6,600,000	$ -
	WW-P-46	Solids Treatment	Demolish Operations Center and Vac Filter Building		R&R	2027*	1	$ 448,000	$ -	$ -	$ -	$ 448,000	$ -
	WW-P-88	Solids Treatment	New Digester 2		R&R	2030*	3	$ 12,950,000	$ -	$ -	$ -	$ 12,950,000	$ -
	WW-P-90	Solids Treatment	New Digester Control Building		R&R	2029*	5	$ 1,543,000	$ -	$ -	$ -	$ 1,234,400	$ 308,600
	WW-P-47	Solids Treatment	Move Dewatering Facility and add New Centrifuges		Performance	2030*	3	$ 23,370,000	$ -	$ -	$ -	$ 23,370,000	$ -
	WW-P-48	Solids Treatment	Add Dewatering Capacity		Performance	2030*	3	$ 2,160,000	$ -	$ -	$ -	$ 2,160,000	$ -
	WW-P-50	Solids Treatment	Add Sludge Silos		Performance	2032*	3	$ 6,370,000	$ -	$ -	$ -	$ 2,123,333	$ 4,246,667
	WW-P-91	Electrical / Instrumentation	New Cogen Building		R&R	2032*	3	$ 4,630,000	$ -	$ -	$ -	$ 1,543,333	$ 3,086,667
	WW-P-36	Electrical / Instrumentation	Small Equipment Replacement - Electrical 1		Small Equipment Replacement	2028*	2	$ 275,000	$ -	$ -	$ -	$ 275,000	$ -
	WW-P-37	Electrical / Instrumentation	Small Equipment Replacement - Electrical 2		Small Equipment Replacement	2032*	2	$ 626,000	$ -	$ -	$ -	$ 313,000	$ 313,000
	WW-P-38	Electrical / Instrumentation	Small Equipment Replacement - Electrical 3		Small Equipment Replacement	2036*	2	$ 653,000	$ -	$ -	$ -	$ -	$ 653,000
	WW-P-92	Electrical / Instrumentation	Small Equipment Replacement - Cogen		Small Equipment Replacement	2026*	3	$ 2,233,000	$ -	$ -	$ 744,333	$ 1,488,667	$ -
	WW-P-60	Building	Rehab Grit Screening Building - Seismic Retrofit		R&R	2027*	2	$ 1,866,000	$ -	$ -	$ -	$ 1,866,000	$ -
	WW-P-65	Building	Plant Paving Resurfacing		R&R	2030*	3	$ 410,000	$ -	$ -	$ -	$ 410,000	$ -
	WW-P-99	Building	Solar or Alternative Energy Facility		Resource Sustainability	2027*	10	$ 1,540,000	$ -	$ -	$ -	$ 924,000	$ 616,000
	WW-P-100		Seawall		Resource Sustainability	2033	5	$ 37,260,000		$ -	$ -	$ -	$ 37,260,000
Wastewater Treatment Total								**$ 406,100,998**	**$ 6,715,000**	**$ 55,294,998**	**$ 239,811,000**	**$ 57,796,067**	**$ 46,483,933**
Wastewater Treatment System and Collection System Total								**$ 493,033,331**	**$ 8,405,000**	**$ 68,425,064**	**$ 244,311,000**	**$ 58,908,334**	**$ 112,983,933**

Notes:

(1) 2017 Project ID's were arbitrarily assigned for Project ease. C = Collection system project; T = Treatment system project

(2) Projects and costs correspond to refinements and updates provided by City after Dec. 2015 publication date. Costs may not correspond to project costs in PM 1.4 Basis of Cost.

(3) Projects approved by Council in 2017 Cost of Service/Rate studies

2017 Project ID[1]	2015 Project ID	Unit Operation	Project	Description	Driver	Start Year	Years to Implement	Total Un-escalated Project Cost	Years 1 to 2 (FY 2017/18 - 2018/19)[3]	Years 3 to 5 (FY 2019/20 - 2021/22)[3]	Years 6 to 10 (FY 2022/23 - 2026/27)[4]	Years 11-16 (FY 2027/28 - 2032/33)[4]	Years 17-23 (FY 2033/34 - 2039/40)[4]
(4) Costs were equally split between years to implement.													
* Projects start year correspond to refinements and updates provided by City after Dec. 2015 publication date.													
** Projects start year was adjusted by City at 8/7/17 meeting, based on recent CCT inspection.													

Project ID	Project	Driver	Start Year[1]	Years to Implement	Total	Years 1 to 2 (FY 2017/18 - 2018/19) [2]	Years 3 to 5 (FY 2019/20 - 2021/22) [2]	Years 6 to 10 (FY 2022/23 - 2026/27) [2]	Years 11-16 (FY 2027/28 - 2032/33) [2]	Years 17-23 (FY 2033/34 - 2039/40) [2]
RW-P-1	Recycled Water Retrofits	R&R	2019	6	$ 4,000,000	$0	$2,000,000	$2,000,000	$0	$0
RW-P-2	Phase 1 Advanced Water Purification Facility (AWPF) Improvements (Disinfection conversion, security, A/V upgrade)	R&R	2020	2	$ 1,000,000	$0	$1,000,000	$0	$0	$0
RW-P-3	UV/Advanced Oxidation Process Brine Treatment	Water Supply	2023	3	$ 5,700,000	$0	$0	$5,700,000	$0	$0
RW-P-4	Construct Aquifer Storage and Recovery (ASR) Demonstration Well @ Campus Park Site (and associated monitoring wells)	Water Supply	2018	3	$ 4,400,000	$1,466,667	$2,933,333	$0	$0	$0
RW-P-5	Land Acquisition and Improvements - Near Blending Station 1/6 & 3	Water Supply	2020	2	$ 10,000,000	$0	$10,000,000	$0	$0	$0
RW-P-6	Recycled Water Pond for Off-Spec Water at Campus Park	Water Supply	2021	1.5	$ 1,600,000	$0	$1,066,667	$533,333	$0	$0
RW-P-7	Phase 2 - Expansion of AWPF to 12.5 mgd (including backup power)	Water Supply	2020	3	$ 27,500,000	$0	$18,333,333	$9,166,667	$0	$0
RW-P-8	Recycled Water Storage @ AWPF	Water Supply	2019	4	$ 8,000,000	$0	$6,000,000	$2,000,000	$0	$0
RW-P-9	Construct 1 duty + 1 standby ASR Wells @ Campus Park	Water Supply	2021	3	$ 7,800,000	$0	$2,600,000	$5,200,000	$0	$0
RW-P-10	Construct 1 duty + 1 standby ASR Wells @ Campus Park	Water Supply	2025	3	$ 7,800,000	$0	$0	$5,200,000	$2,600,000	$0
RW-P-11	Construct 1 duty + 1 standby ASR Wells @ Blending Station 1/6	Water Supply	2022	2	$ 7,800,000	$0	$0	$7,800,000	$0	$0
RW-P-12	Chemical Feed Expansion @ Blending Station 1/6	Water Supply	2022	2	$ 300,000	$0	$0	$300,000	$0	$0
RW-P-13	Operational Storage for ASR Wells @ Blending Station 1/6	Water Supply	2022	2	$ 2,100,000	$0	$0	$2,100,000	$0	$0
RW-P-14	Booster Pumping for ASR @ Blending Station 1/6	Water Supply	2022	2	$ 7,200,000	$0	$0	$7,200,000	$0	$0
RW-P-15	Construct 1 duty + 1 standby ASR Wells @ Blending Station 1/6	Water Supply	2024	1.5	$ 7,800,000	$0	$0	$7,800,000	$0	$0
RW-P-16	Rehabilitate Well 18 @ River Ridge Golf Course to Groundwater Recharge Well	Water Supply	2022	2	$ 2,500,000	$0	$0	$2,500,000	$0	$0
RW-P-17	Phase 3 - Expand AWPF to 18.75 mgd	Water Supply	2029	2.5	$ 28,100,000	$0	$0	$0	$28,100,000	$0
RW-P-18	Construct 2 duty + 1 standby ASR Wells @ Blending Station 1/6	Water Supply	2029	2	$ 11,500,000	$0	$0	$0	$11,500,000	$0
RW-P-19	Construct 2 duty + 1 standby ASR Wells @ Blending Station 3	Water Supply	2029	2.5	$ 11,500,000	$0	$0	$0	$11,500,000	$0
RW-P-20	Chemical Feed Expansion @ Blending Station 3	Water Supply	2029	2.5	$ 500,000	$0	$0	$0	$500,000	$0
RW-P-21	Operational Storage for ASR Wells @ Blending Station 3	Water Supply	2029	2.5	$ 2,100,000	$0	$0	$0	$2,100,000	$0
RW-P-22	Booster Pumping for ASR @ Blending Station 3	Water Supply	2029	2.5	$ 7,200,000	$0	$0	$0	$7,200,000	$0
RW-P-23	Construct 2 duty + 1 standby ASR Wells @ Blending Station 3	Water Supply	2031	1.5	$ 11,500,000	$0	$0	$0	$11,500,000	$0
RW-P-24	Connect Initial ASR Well at Campus Park to Recycled Water Backbone Line in Ventura Road - 2,000 feet of 20" pipe	Water Supply	2017	2	$ 700,000	$700,000	$0	$0	$0	$0
RW-P-25	Construct Dedicated Indirect Potable Reuse (IPR) Pipeline from Campus Park to Blending Station 1/6 - 4,000 feet of 24" pipe	Water Supply	2017	2	$ 2,500,000	$2,500,000	$0	$0	$0	$0
	Hueneme Road - Phase 2 Recycled Water Pipeline Expansion to Ag Users					$0	$0	$0	$0	$0
RW-P-26	Install 20,700 feet of 24" pipe	Water Supply	2019	2	$ 12,900,000	$0	$12,900,000	$0	$0	$0
RW-P-27	Install 16,000 feet of 36" pipe	Water Supply	2018	2	$ 13,000,000	$6,500,000	$6,500,000	$0	$0	$0
	Recycled Water Loop to ASR Sites					$0	$0	$0	$0	$0
RW-P-28	Install 9,000 feet of 24" pipe	Water Supply	2020	2	$ 7,500,000	$0	$7,500,000	$0	$0	$0
RW-P-29	Install 19,700 feet of 30" pipe	Water Supply	2020	2	$ 10,200,000	$0	$10,200,000	$0	$0	$0
RW-P-30	Direct Potable Reuse - 3, 3.1 million gallon Storage Tanks	Water Supply	2036	3	$ 22,200,000	$0	$0	$0	$0	$22,200,000
RW-P-31	Recycled Water Loop to Blending Station 3 Connection – Install 10,600 feet of 24" pipe	Water Supply	2029	1	$ 5,500,000	$0	$0	$0	$5,500,000	$0
	Recycled Water CIP Projects Total				**$ 252,400,000**	$11,166,667	$81,033,333	$57,500,000	$80,500,000	$22,200,000

Notes:
(1) Project start years adjusted with City input and do not correspond to Dec. 2015 publication start years.
(2) Costs were equally split between years to implement.

Project ID	Project	Driver	Start Year	Years to Implement	Total	Years 1 to 2 (FY 2017/18 - 2018/19)[1]	Years 3 to 5 (FY 2019/20 - 2021/22)[1]	Years 6 to 10 (FY 2022/23 - 2026/27)[1]	Years 11-16 (FY 2027/28 - 2032/33)[1]	Years 17-23 (FY 2033/34 - 2039/40)[1]
SW-P-1	Drainage Basin: WV - Length 444 ft	Capacity	2020[2]	2	$ 173,000	$0	$173,000	$0	$0	$0
SW-P-2	Drainage Basin: WV - Length 748 ft	Capacity	2038	2	$ 439,000	$0	$0	$0	$0	$439,000
SW-P-3	Drainage Basin: OI - Length 607 ft	Capacity	2020[2]	2	$ 237,000	$0	$237,000	$0	$0	$0
SW-P-4	Drainage Basin: RR - Length 2,436 ft	Capacity	2020[3]	2	$ 2,621,000	$0	$2,621,000	$0	$0	$0
SW-P-5	Drainage Basin: OI - Length 2,388 ft	Capacity	2038	2	$ 1,491,000	$0	$0	$0	$0	$1,491,000
SW-P-6	Drainage Basin: VR - Length 5,872 ft	Capacity	2018[2]	2	$ 5,768,000	$2,884,000	$2,884,000	$0	$0	$0
SW-P-7	Drainage Basin: JS - Length 1,421 ft	Capacity	2018[2]	2	$ 968,000	$484,000	$484,000	$0	$0	$0
SW-P-8	Drainage Basin: JS - Length 1,292 ft	Capacity	2020[2]	2	$ 885,000	$0	$885,000	$0	$0	$0
SW-P-9	Drainage Basin: JS - Length 426 ft	Capacity	2020[2]	2	$ 292,000	$0	$292,000	$0	$0	$0
SW-P-10	Drainage Basin: JS - Length 457 ft	Capacity	2020[2]	2	$ 313,000	$0	$313,000	$0	$0	$0
SW-P-11	Drainage Basin: JS - Length 655 ft	Capacity	2020[2]	2	$ 449,000	$0	$449,000	$0	$0	$0
SW-P-12	Drainage Basin: JS - Length 701 ft	Capacity	2020[2]	2	$ 480,000	$0	$480,000	$0	$0	$0
SW-P-13	Drainage Basin: HS - Length 1,552 ft	Capacity	2020[2]	2	$ 606,000	$0	$606,000	$0	$0	$0
SW-P-14	22 assets identified in the condition assessment	R&R	2018[2]	2	$ 3,324,000	$1,662,000	$1,662,000	$0	$0	$0
SW-P-15	Dry Weather Diversion Structure	Resource Sustainability	2021	3	$ 370,000	$0	$123,333	$246,667	$0	$0
SW-P-16	City-Wide Incentive Program	Resource Sustainability	2021	10	$ 2,420,000	$0	$242,000	$1,210,000	$968,000	$0
SW-P-17	Santa Clara River Total Maximum Daily Load (TMDL) Infiltration Basin	Resource Sustainability	2023	5	$ 1,850,000	$0	$0	$1,480,000	$370,000	$0
SW-P-18	Mandalay Beach Areas	Capacity	2018	3	$ 10,000,000	$3,333,333	$6,666,667	$0	$0	$0
	Storm Water CIP Projects Total				**$ 32,686,000**	**$8,363,333**	**$18,118,000**	**$2,936,667**	**$1,338,000**	**$1,930,000**

(1) Costs were equally split between years to implement.
(2) Project start year moved two years later compared to 2015 CIP.
(3) Project start year adjusted with City input and do not correspond to Dec. 2015 publication start

CITY OF OXNARD CALIFORNIA

DECEMBER 2018

Engineering Report

Groundwater Replenishment Reuse Project

VOLUME 1 OF 2

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City of Oxnard

ENGINEERING REPORT

GROUNDWATER REPLENISHMENT REUSE PROJECT

December 2018

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Abbreviations

-A-	
ASR	Aquifer Storage and Recovery
AWPF	Advanced Water Purification Facility
-B-	
bgs	below ground surface
BOD	Biological Oxygen Demand
-C-	
CEC	Constituents of Emerging Concern
CEQA	California Environmental Quality Act
City	The City of Oxnard
CIUs	Categorical Industrial Users
CMWD	Calleguas Municipal Water District
CWC	California Water Code
-D-	
DDW	Division of Drinking Water
DIT	Direct Integrity Test
-E-	
EC	Electrical Conductivity
EDCs	Endocrine Disrupting Compounds
ELAP	Environmental Laboratory Accreditation Program
-F-	
FCGMA	Fox Canyon Groundwater Management Authority
-G-	
GRPs	Groundwater Recharge Projects
GRRP	Groundwater Replenishment Reuse Project
GWRS	Groundwater Replenishment System
-H-	
H_2O_2	Hydrogen Peroxide
-I-	
IPR	Indirect Potable Reuse
-L-	
LARWQCB	Los Angeles RWQCB
LAS	Lower Aquifer System
LASAN	LA Sanitation
LPHO	Low-Pressure High-Output
-M-	

MCLs	Maximum Contaminant Levels
MDL	Method Detection Limit
MF	Microfiltration
MRP	Monitoring and Reporting Program
MWDSC	Metropolitan Water District of Southern California
-N-	
ND	Non-Detected
NLs	Notification Levels
NOV	Notice of Violation
NWRI	National Water Research Institute
-O-	
OMMP	Operations, Maintenance, and Monitoring Plan
OOP	Operations Optimization Plan
ORP	Oxidation Reduction Potential
OVMWD	Ocean View Municipal Water District
OWTP	Oxnard Wastewater Treatment Plant
-P-	
PDT	Pressure Decay Test
PEIR	Program Environmental Impact Report
PHWA	Port Hueneme Water Authority
POTW	Publicly-Owned Treatment Works
PPCP(s)	Pharmaceuticals and Personal Care Products
-Q-	
QAPP	Quality Assurance Project Plan
-R-	
RO	Reverse Osmosis
ROP	RO Permeate
ROSA	Reverse Osmosis System Analysis
ROWD	Report of Waste Discharge
RRT	Response Retention Time
RWC	Recycled Water Contribution
RWQCB	Regional Water Quality Control Board
-S-	
SCVWD	Santa Clara Valley Water District
SIU(s)	Significant Industrial User(s)
SNMP(s)	Salt Nutrient Management Plan(s)
SWP	State Water Project
SWRCB	State Water Resources Control Board

-T-	
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TSP-SC	Technical Services Program – Source Control
TTO	Total Toxic Organics
-U-	
UAS	Upper Aquifer System
UV AOP	Ultraviolet Light and Hydrogen Peroxide
UVT	UV Transmittance
UWCD	United Water Conservation District's
-W-	
WDR(s)	Waste Discharge Requirement(s)
WRD	Water Replenishment District
WRR	Water Recycling Requirement

EXECUTIVE SUMMARY

Notes regarding revisions of prior versions of this report

This version of the Engineering Report reflects comments received from the State Water Resources Control Board Division of Drinking Water as follows:

- From letters dated December 5, 2016 and February 17, 2017. The letters were prepared in response to an October (2016) draft of this Engineering Report
- From a meeting in person in San Diego on December 22, 2017. The in-person meeting was held to clarify the UV advanced oxidation performance and recommended monitoring approach
- From a phone meeting dated May 29, 2018. The phone meeting was conducted to provide DDW a better understanding of ASR well operation.

This version of the report also reflects comments received from the State Water Resources Control Board Division of Drinking water, letter dated April 21, 2016. That letter was prepared in response to an October (2015) draft of this Engineering Report.

Included in this submittal are the results from extensive startup testing on the AWPF, demonstrating water quality in accordance with regulatory objectives, with the results presented within this report. Last, no public comments were submitted regarding this Engineer's Report, though substantial opportunity and time was provided for such public comments.

Section 1

PROJECT OVERVIEW

The City of Oxnard (City) owns and operates a regional publicly-owned treatment works (POTW) that serves the City, City of Port Hueneme, Naval Base Ventura County and several surrounding unincorporated communities. It is comprised of the Oxnard Wastewater Treatment Plant (OWTP) and its associated wastewater collection system and outfall line. The OWTP is a secondary treatment facility with a design flow of 31.7 million gallons per day (mgd) and an average daily flow of 20 to 22 mgd.

The City's Advanced Water Purification Facility (AWPF) can divert 8 to 9 mgd of biologically-treated secondary effluent for purification using three advanced treatment steps: microfiltration (MF), reverse osmosis (RO), and advanced oxidation with ultraviolet light and hydrogen peroxide (UV AOP). Because of reject streams, the 8 to 9 mgd of influent flow to the AWPF results in 6.25 mgd of advanced treated recycled water. For such an operation, the MF reject and backwash wastewater produced at the AWPF will be returned to the OWTP headworks. The RO concentrate waste produced at the AWPF will be commingled with the OWTP secondary treated effluent and discharged to the Pacific Ocean via an ocean outfall pipeline.

This Engineering Report is submitted to the State Water Resources Control Board Division of Drinking Water (DDW) for review and approval. This Report is intended to provide the necessary information to permit indirect potable reuse (IPR) of up to 6.25 mgd of purified AWPF-treated product water. For the complete use of 6.25 mgd of new water, there will be a number of aquifer

storage and recovery (ASR) wells needed for implementation. The initial injection project is for a portion of the 6.25 mgd of water (2,000 gpm = 2.9 mgd), referred to as Phase 1[1]. Phase 1 will be IPR through Aquifer Storage and Recovery (ASR) with a well (and future wells) screened in the Lower Aquifer System (LAS). All subsequent phases are also anticipated to be ASR with water injected into the LAS. For Phase 1, the City plans to inject the AWPF-treated recycled water into specific wells at the Campus Park location (at the corner of 5th and H Street in Oxnard), keep the water underground for a set period of time, then extract the water (from the same wells into which the water was injected) for potable and non-potable use.

This Engineer's Report focuses upon, and requests approval for, the ability to purify and use 6.25 mgd of new water for groundwater recharge, with initial injection of up to 2.9 mgd and expandable to the full plant capacity in the future. Table 1.1 summarizes the groundwater recharge and ASR wells identified in the Public Works Integrated Master Plan (PWIMP) for Phases 1, 2, and 3.

Table 1.1 Planned GRRP Wells

Project ID (from the PWIMP)	Project Phase	Well Type	No of Wells	Well Location[1]	Planned Implementation Year
RW-P-4	1	ASR Demonstration Well (Phase 1 well)	1	Campus Park	2018
RW-P-9	2	ASR Well	1 duty + 1 Standby	Campus Park	2021
RW-P-10	2	ASR Well	1 duty + 1 Standby	Campus Park	2025
RW-P-11	2	ASR Well	1 duty + 1 Standby	Blending Station 1/6	2022
RW-P-15	2	ASR Well	1 duty + 1 Standby	Blending Station 1/6	2024
RW-P-16	2	Recharge Well (rehab & convert existing City Well 18)	1	River Ridge Golf Course	2022
RW-P-18	3	ASR Well	2 Duty + 1 Standby	Blending Station 1/6	2029
RW-P-19	3	ASR Well	2 Duty + 1 Standby	Blending Station 3	2029
RW-P-23	3	ASR Well	2 Duty + 1 Standby	Blending Station 3	2031

Notes:
(1) Well locations include the required associated monitoring wells.

[1] It is worth noting that for an ASR operation with one well at 2,000 gpm, the amount of recharged water with one well in operation is less than 2,000 gpm averaged over a year. For example, if water is recharged for 4 months, then held for 4 months, then extracted for 4 months, only 667 gpm is recharged on an annual basis. Hence, the future need for a number of additional wells.

1.1 Water in Oxnard

The City's current water supply comes from surface and groundwater sources. Fifty percent of the City's water supply is from northern California rainfall and snowmelt pumped through the Sacramento–San Joaquin Delta and imported to southern California via the State Water Project (SWP). This water is delivered by the Calleguas Municipal Water District (CMWD). Twenty-five percent of the City's water is regional groundwater supplied by the United Water Conservation District's (UWCD) spreading and pumping operations on the Santa Clara River and Oxnard Plain. Local, City owned and operated wells account for the remaining twenty-five percent of the City's water.

1.1.1 CMWD

The City receives SWP water from CMWD's Springville Reservoir (supplied by Metropolitan Water District of Southern California [MWDSC]) through the City's Oxnard and Del Norte conduits that feed five of the City's six water blending stations. Existing agreements between the City and CMWD do not guarantee the quantity of water the City may purchase. The City has a current MWDSC Tier 1 entitlement. Tier 1 water corresponds to the amount "contracted for" by the City. It is in essence a capacity reservation and includes the water being delivered to the Port Hueneme Water Authority (PHWA). MWDSC Tier 2 water is normally available to the City; however, the cost per acre-foot is higher. There is less availability and reliability of Tier 2 water in periods of drought.

1.1.2 Fox Canyon Groundwater Management Authority (FCGMA)

The FCGMA was created at the direction of the State Water Resources Control Board (SWRCB) to address ongoing overdraft and seawater intrusion into the Oxnard Plain Pressure Basin. The purpose of the FCGMA is to manage the region's groundwater supply by protecting the quantity and quality of local groundwater resources and by balancing the supply and demand for groundwater resources.

The FCGMA governs all extractions from the groundwater basin and, thus, the City's use of UWCD water and its own local wells is governed by the "safe yield" extraction volumes set by FCGMA.

In 2016, the FCGMA issued a permit for the installation of the proposed Campus Park ASR well (letter dated June 24, 2016).

1.1.3 UWCD

UWCD currently provides a portion of the City's groundwater supply. This arrangement has been in place since 1954, and was formalized in the 1996 Water Supply Agreement for Delivery of Water through the O-H Pipeline. UWCD holds a pumping sub-allocation for all users of the O-H Pipeline, which includes the City, PHWA, and a number of small mutual water companies.

1.1.4 2002 Three-Party Agreement

The City, CMWD, and PHWA entered into a Three-Party Agreement in 2002, which provides PHWA with CMWD water through Oxnard's O-H pipeline. The City also supplied water to the Ocean View Municipal Water District (OVMWD) until 2008, when the OVMWD was dissolved and has since been managed and operated by the City. The OVMWD's distribution system is now referred to as the Ocean View System and the demand of the Ocean View customers is

accounted for as part of the City's total demand, with much of the demand categorized as agricultural water use.

The City does not sell water to any other agencies. However, with the completion of Blending Station Number 6 in 2011, the City can provide desalted groundwater to PHWA in the case that PHWA's O-H pipeline supply becomes temporarily unavailable.

1.1.5 Recycled Water Management and Use Agreement

Agreement No. A-7651, Full Advanced Treatment Recycled Water Management and Use Agreement was entered into on January 13, 2014 by the City of Oxnard, Pleasant Valley County Water District, Houweling Nurseries Oxnard Incorporated, Southland Sod, Reiter Brothers Incorporated, Southern Pacific Farming Incorporated, and Southern Pacific Farming II, LLC. United Water Conservation District entered into the Agreement on August 18, 2016 by their separate signatory page. They are collectively referred to as the Parties. In recognition of the need to protect, conserve, and replenish the underground water supplies of the region, the Parties desire to enter into this Agreement providing for the delivery of advanced treated recycled water to the Parties and other future customers located within the groundwater sub-basins in Ventura County, commonly known as the Oxnard Plain, Forebay, and Pleasant Valley.

1.2 GREAT Program

To ensure a future reliable and affordable supply of high-quality water, the City has developed the Groundwater Recharge Enhancement and Treatment or GREAT program to be implemented and operated in two phases. Phase 1 (6.25 mgd, or 7,000 AFY) treatment facilities are now in operation for non-potable water reuse, whereas additional treatment will be constructed in the near future to 12.5 mgd, with a future final capacity of 18.75 mgd. The objectives of the GREAT program are as follows:

- Increased reliability of water supply.
- Reduced cost of water supply.
- Improved dependability of water supply in accommodating existing needs and meeting planned growth and associated water demand.
- Enhanced stewardship of local water supply through recycling and reusing a substantial portion of the region's wastewater.

The GREAT program includes treating effluent from the OWTP and providing state-of-the-art MF, RO, and advanced oxidation with UV/H_2O_2 at the AWPF, schematically shown in Figure 1.1.

Elements of the GREAT program are summarized as follows:

- Recycled Water Delivery System - Distributes recycled water to agricultural users, golf courses, and an industrial customer.
- Aquifer Storage and Recovery - Intended to help alleviate groundwater overdraft conditions and associated water quality problems, including coastal seawater intrusion. Will allow seasonal storage of potable water supplies to maximize use of the existing potable water distribution system.

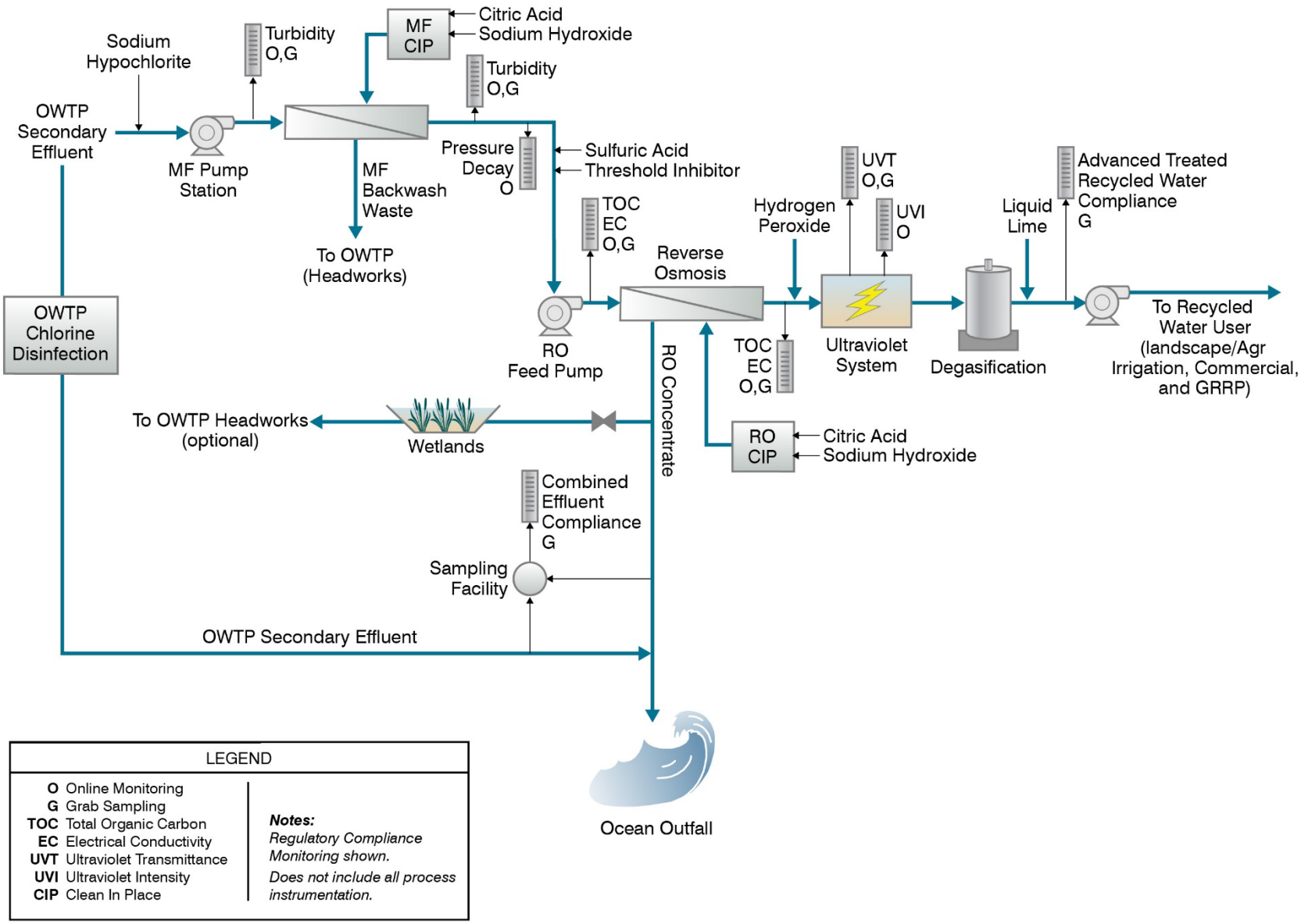

Figure 1.1 AWPF Process Schematic

- Regional Desalter - Membrane filter systems to remove dissolved minerals from groundwater, in order to reduce the levels of nitrates and total dissolved solids (TDS) in the groundwater basin.
- Blending Station No. 5 - Provides improved water supply infrastructure reliability, water quality, and hydraulic efficiencies. It also assists in meeting peak-hour and fire-flow water supply demands.
- Concentrate collection system from regional brine dischargers - Avoid discharge of high-salinity concentrate into City sanitary sewer system and Oxnard WWTP.
- Permeate Delivery System - Permeate delivery from regional desalter to industrial users.

All of the end uses (agricultural irrigation, landscape irrigation, injection into the aquifer, and industrial) will be served with a common water quality that meets the groundwater recharge (groundwater recharge) criteria for injection of purified recycled water. In exchange for the delivery of recycled water, agricultural customers would transfer their groundwater pumping allocations to the City on a one-for-one basis. The additional pumping by the City would be from the poor-quality Oxnard Aquifer, which would require additional treatment prior to delivery to the City's distribution system. The GREAT desalter constructed in 2007/2008 would provide this treatment. It does not increase the total water supply. It does, however, allow full use of the City's groundwater resources.

1.2.1 Project Site

The project site is Oxnard, California. The location of the AWPF and the Initial ASR location are shown in Figure 1.2.

1.2.2 Existing Facilities

The OWTP liquid processes include preliminary treatment, primary clarification, secondary treatment (biofiltration (trickling filters) followed by activated sludge), and chlorine disinfection in order to achieve an acceptable level of water quality for ocean discharge. The solids-handling processes include gravity thickening of primary sludge, dissolved air flotation thickening of secondary sludge, anaerobic digestion, and belt filter press dewatering.

The AWPF is a standard MF/RO/UV AOP system to purify secondary effluent. It includes the following processes: automatic strainers, MF system (detailed below), equalization tank, RO transfer pumps, Cartridge filter, High pressure RO feed pump, Two-stage RO train (detailed below), UV disinfection system (detailed below), Decarbonator, lime stabilization, product water pumps, and chemical storage. The AWPF is located adjacent to the OWTP (Figure 1.3).

The three primary advanced treatment processes (MF, RO, and UV AOP) are designed to meet DDW performance criteria for indirect potable water reuse. A summary of each process is provided in Table 1.2.

Figure 1.2 Project Location

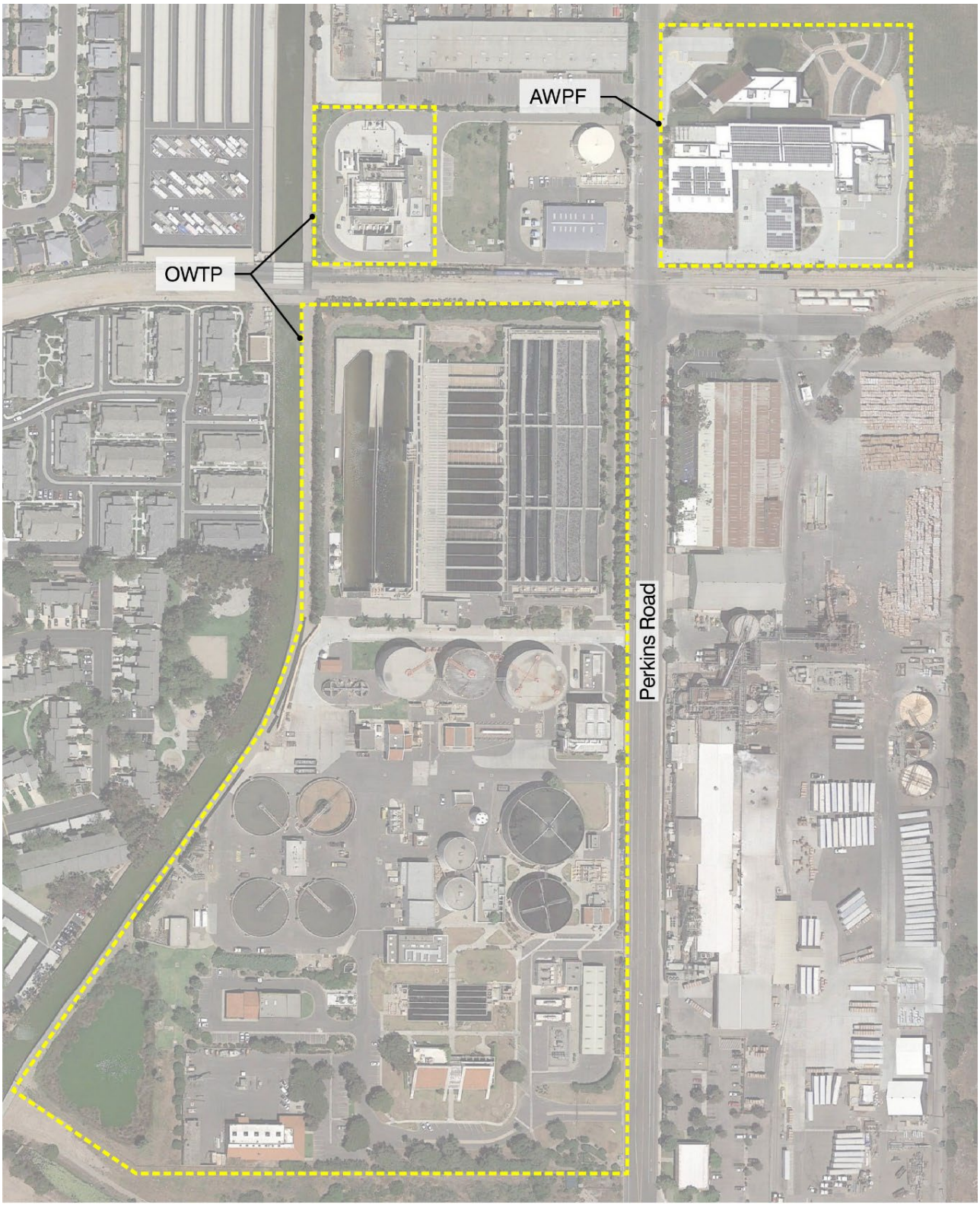

Figure 1.3 OWTP and AWPF

Table 1.2 Advanced Treatment Design Criteria

Process	Performance Goal	Performance Monitoring
MF	Filtrate Nephelometric Turbidity Unit (NTU)<0.2 NTU.	Maintaining turbidity values of <0.2 NTU indicates no gross membrane failure. However, insufficient research exists to correlate MF filtrate turbidity with pathogen removal.
	Pressure Decay Test (PDT, also called membrane integrity test (MIT)) <0.3 pounds per square inch per 5 minutes (psi/5min).	Daily testing demonstrates MF integrity, allowing for 4-log protozoa credit.
RO	Each membrane element must achieve ≥99% rejection of sodium chloride, and average rejection of ≥ 99.2% sodium chloride.	Track and trend electrical conductivity (EC) reduction through the RO membrane. Pathogen reduction credits for RO based upon this measured value.
	RO permeate must have a total organic carbon (TOC) ≤ 0.25 mg/L greater than 95% of the time at startup and through 20 weeks of operation. Subsequently, RO permeate TOC must be ≤0.5 mg/L.	No online TOC metering is currently installed, but online TOC metering will be installed prior to IPR operation. It remains to be determined TOC will be installed just after RO, or before and after RO.
UV AOP	≥0.5-log reduction of 1,4-dioxane; at least one continuously monitored surrogate or operational parameter shall be established to reflect that the minimum 1,4-dioxane criterion is being met.	Startup testing documents 1,4-dioxane removal and correlates such removal with an online surrogate (UVI/Q).
	6-log reduction of adenovirus.	UVI/Q values correlate with N-Nitrosodimethylamine (NDMA) destruction, which maintains continuous documentation of a UV dose well in excess of 235 mJ/cm^2; which is the dose for 6-log adenovirus. This minimum dose will be maintained at all times.

1.2.2.1 MF System

The MF system (Figure 1.4) is an outside-in MF system (PALL Microza) and consists of MF feed strainers, MF feed water ORP, pH, turbidity, and total chlorine residual analyzers. The MF is used to remove particulate and microbial contaminants, including turbidity, *Giardia,* and *Cryptosporidium* using a low-pressure filtration system. Upstream of RO, this system mitigates RO membrane fouling by reducing the level of particulates and larger colloids. MF also reduces the concentration of bacteria – particularly those that are particulate-associated. There are six treatment trains in parallel in the MF room with capacity for an additional six trains to be built if needed. One of the six trains can be out of service and the MF system will still maintain production of sufficient flow to result in 6.25 mgd of RO permeate.

Figure 1.4 MF Photos at the AWPF

1.2.2.2 RO System

RO units are furnished by H2O Innovation (Figure 1.5), and installed with Hydranautics ESPA2 membrane elements. The RO units are housed in their own room, with two identical skids running in parallel with individual production capacities of 3.125 mgd. Space for three additional RO skids of 6.25 mgd each is built into the room in for possible future needs. The RO system is monitored using online EC at the MF filtrate (RO feed) and several places on the RO. discharge; Stage 1, 2, and 3, total flow, and concentrate. These EC locations are at both trains. Currently there is no online TOC metering of this MF filtrate or RO permeate, though the City intends to install TOC monitors on the RO feed and RO permeate prior to operation.

1.2.2.3 UVOX System

Three Trojan UVPhox D72AL75 reactors are installed to provide additional treatment of the RO permeate (ROP) via AOP. These reactors operate with low-pressure high-output (LPHO) lamps and with dosed hydrogen peroxide (H_2O_2); based upon a target EEO sufficient for 0.5 log reduction of 1,4-dioxane. Startup testing, documented further on, demonstrates the dose capacity of this system and effective monitoring using a UVI/Q process. These three reactors each have two banks, for a total of six banks of UV lamps. Five of those banks are duty, and the sixth bank is redundant. Similar to the MF and RO systems, there is room to expand this UV system to meet future needs (Figure 1.6).

1.3 Public Outreach and Coordination Effort

The City has gone through the required notification processes for this project with the public and stakeholders.

Figure 1.5 RO Photos at the AWPF

Figure 1.6 Photo of Similar UV Phox

1.3.1 Stakeholders

Key regional stakeholders are aware of this IPR project. These stakeholders include the CMWD, the UWCD, the FCGMA, and the City of Ventura. CMWD, UWCD, and FCGMA are directly involved in water supply to the City. Other regional stakeholders include various regulatory and governmental bodies, and several environmental organizations. The Program Environmental Impact Report (PEIR), completed in 2004, included the required public notice and engagement regarding the various aspects of the GREAT program, including potable reuse (CH2MHill, 2004).

Once this Engineer's Report is approved by DDW and the Regional Water Quality Control Board (RWQCB), the City will further engage with project stakeholders.

1.3.2 System Startup Information

As outlined in subsequent sections of this Engineer's Report, extensive testing of the purification system has been completed to demonstrate compliance with DDW's groundwater recharge regulations. This testing was done during the normal operation of the GREAT system for non-potable reuse applications. These tests are detailed in the following Chapter 17.

After the construction of the proposed IPR ASR well, a series of tests will be done on the background groundwater quality. This information, once it is thoroughly reviewed, will be presented to the various stakeholders and for regulatory review.

1.3.3 Public Hearing and Notifications

The City has followed the public hearing requirements specified in the DDW groundwater recharge regulations (SWRCB, 2018a). Section 60320.202 includes a review of the necessary public and regulatory notice requirements of the proposed project. The City has completed the public hearing process, as follows:

- The technical aspects of the Engineer's Report have been reviewed and conceptually approved by DDW. Subsequent to that review, the City posted the Engineer's Report on its website and made it available at the City's office for at least 30-days prior to a public hearing. The report was posted on 12/21/2017.
- The City provided DDW and the RWQCB the information it intended to present at the public hearing regarding this IPR project in advance of the public hearing. Feedback from DDW and the RWQCB was obtained and used to modify the presentation material.
- The City notified the public about the availability of the information and the public hearing on May 17, 2018. The posting was done on the City's website and in the town newspaper. The posting included what the project was, where the Draft Engineering Report could be found, information on the Public Hearing, and how to provide comments to the City.
- The City held a public hearing regarding this project on 6/14/2018, six months after posting the Draft Engineer's Report on their City website. Presentations were made by the City, by Carollo Engineers, Inc., and by DDW. The RWQCB was invited by declined to attend due to other commitments.
- The City allowed 60 days of public comment on the presentation. Ending on 8/15/2018. The City received no public comments.
- As required, the City has notified the first downgradient potable water well owner and well, which happens to be the City of Oxnard.
- Further outreach will also occur once the draft tentative permit is issued. In accordance with California Water Code (CWC) Section 13167.5, the Los Angeles RWQCB (LARWQCB) must

provide notice and a period of at least 30 days for public comment prior to adoption of a Waste Discharge Requirement (WDR) and/or Water Recycling Requirement (WRR). This is accomplished by providing a draft of the amendment to anyone who has requested a copy or by posting the draft on the LARWQCB website and providing an electronic notice to interested parties. After posting on the consent calendar, the LARWQCB will hold a public hearing that provides opportunity for further public comment.

1.3.4 California Environmental Quality Act (CEQA)

The CEQA compliance is summarized below under the "Environmental Compliance" section.

1.4 Environmental Compliance

The CEQA process for the GREAT treatment facilities has already been completed (CH2MHill, 2004). This process provided an open forum for public comment on the project at the time of that work (2004).

An addendum to that EIR was completed in January of 2015 by Hollee King to address the ASR well and monitoring wells (King, 2015). In a letter dated January 21, 2016, the Governor's Office of Planning and Research State Clearinghouse and Planning Unit issued a letter of compliance to Oxnard for the ASR project, stating "that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act" (State of California, 2016).

1.5 Project Goal

The goal of the GREAT program is to ensure a future reliable and affordable supply of high-quality water. Phase 1 (6.25 mgd, or 7000 AFY) treatment facilities have been constructed and is now producing water for non-potable use. The City has plans to expand the production capability of this facility, and will provide details of this expansion at a future date.

1.6 Purpose of This Report

The purpose of this Title 22 Engineering Report is to provide detailed information on the design of the City's AWPF, describe the water reuse goals for the City, clearly indicate the means for compliance with DDW's groundwater recharge regulations and any other features specified by the RWQCB, and in total, gain approval for the City to implement an IPR groundwater recharge replenishment project (GRRP).

This Engineering Report is in compliance with the State of California Water Recycling Criteria (SWRCB. 2018a) that requires the submission of an Engineer's Report to the RWQCB and DDW prior to any modification to an existing project or implementation of a new project.

Section 2

PROJECT PARTICIPANTS

The City intends to recharge groundwater and extract groundwater from the same location, an ASR project. This operation, under the current plan, will not impact other utilities or entities. With that said, there are a number of key participants outside of the City that have had, and will have, a role in the successful implementation of IPR. The project participants, their role, and their contact information are listed below in Table 2.1.

Table 2.1 List of Key Project Participants

Organization	Name	Contact Information	Project Role
City of Oxnard	Jan Hauser, WW Division Manager	Desk: 805-271-2205 Cell: 805-844-5501 jan.hauser@oxnard.org	Responsible for Daily Production of Advanced treated recycled water and Operation of the IPR System.
City of Oxnard	Thien Ng, Assistant Public Works Director	(805) 432-3575 Thien.Ng@oxnard.ca.us	Oversee water and wastewater divisions.
City of Oxnard	Hoon Hahn, Project Manager	Hoon.hahn@oxnard.org	Assistant project manager for this potable reuse project
RWQCB	Elizabeth Erickson	(213)576-6665 Elizabeth.Erickson@waterboards.ca.gov	Lead RWQCB permitting authority for this project.
DDW	Jeff Densmore, District Engineer	(805)566-1326 Jeff.densmore@waterboards.ca.gov	Lead DDW permitting authority for this project.
DDW	Kurt Souza, Assistant Deputy Director	(805)566-1326 Kurt.souza@waterboards.ca.gov	Regional oversight and perspective on potable reuse.
DDW	Saeed Hafeznezami Water Resource Control Engineer	Saeedreza.Hafeznezami@Waterboards.ca.gov (818)551-2972	Technical specialist
DDW	Brian Bernados	brian.bernados@waterboards.ca.gov (619)525-4497)	Technical specialist
DDW	Randy Barnard, Recycled Water Unit Chief	Randy.Barnard@waterboards.ca.gov (619)525-4022	Project review
CalMWD	Kristine McCaffrey, Manager of Engineering	(805)579-7173	Regional Stakeholder.
UWCD	Tony Emmert, Deputy GM	(805)525-0621 (805)317-8961	Regional Stakeholder.
FCGWMA	Gerhardt Hubner	(805)654-5051	Regional Stakeholder.
City of Ventura	Gina Dorrington, Wastewater Utility Manager	(805)677-4131 gdorrington@venturawater.net	Adjacent City dealing with similar water supply concerns and potable reuse considerations.

Table 2.1 List of Key Project Participants (continued)

Organization	Name	Contact Information	Project Role
Consultant Team			**Project Role**
Carollo Engineers	Tracy Warriner, Project Manager	(925)932-1710 twarriner@carollo.com	Project Manager for Water Reuse Permitting and Implementation, working for the City.
Carollo Engineers	Andrew Salveson, Project Engineer	(925)932-1710 asalveson@carollo.com	Engineer of Record for this Engineer's Report.
Hopkins Groundwater Consultants	Curtis Hopkins, Principal Hydrogeologist	(805)653-5306 chopkins.hgc@sbcglobal.net	Groundwater hydrogeologist of record for this Engineer's Report & Well Monitoring Plan
HLK Planning	Hollee L. King	(805)901- 2261 hollee@hlkplanning.com	CEQA Permitting Lead.
MV Engineering LLC	Mary Vorissis	(805) 217-8494 mary.vorissis@gmail.com	Operations Optimization Plan (OOP) and ROWD report coordination

Section 3

REGULATORY REQUIREMENTS

The overarching regulatory requirements are summarized in this section. The specific parameters for monitoring and permit compliance are documented in Sections 9 and 15.

3.1 California Water Code (CWC)

The CWC stipulates that each RWQCB formulate and adopt Water Quality Control Plans (Basin Plans) for all areas governed by the board. These plans must contain water quality objectives for surface water and groundwater within the regions that provide reasonable protection of the beneficial uses of the waters. During the process of formulating such plans the RWQCBs must consult with and consider recommendations of affected state and local agencies. Such plans shall be periodically reviewed and may be revised (Section 13240).

In accordance with CWC Section 13260, all persons discharging waste within the region must file with the appropriate board, and provide information pertaining to their discharge. Within the region, it is not permitted for a person to construct, maintain, or use any waste well that interferes with a source for domestic water supply without proper permitting or exceptions (CWC Section 13540). "Recycling criteria" are the levels of constituents of recycled water, and means for assurance of reliability under the design concept which will result in recycled water safe from the standpoint of public health, for the uses to be made (CWC Section 13520). Section 13521 of the CWC states that the State Department of Public Health (now DDW) shall establish uniform statewide recycling criteria for each varying type of use of recycled water where the use involves the protection of public health.

Section 13522 stipulates that if a contamination occurs as a result of recycled water, then procedures for abating this contaminant must be followed in accordance with the Health and Safety Code. The use of recycled water must not cause, constitute, or contribute to, any form of contamination. In order to comply with contamination prevention with recycled water use, any person recycling or proposing to recycle water must file for appropriate permitting with the regional board (Section 13522.5).

If a master recycling permit is granted, it must include at a minimum (Section 13523.1): waste discharge requirements(WDRs), a permittee statewide recycling criteria compliance requirement, recycled water producer end user rule enforcement requirement, requirement for a recycled water use quarterly report, periodic facility inspection requirement, and additional requirements given by the regional board in permit. Recycled water may only be used for the permitted purpose, as specified by the regional board (Section 13524).

3.2 DDW Requirements

DDW (formerly CDPH) has developed criteria for both non-potable uses of recycled water and groundwater recharge for subsequent potable use, with the most recent version updated as of October 2018 (SWRCB. 2018a). This Engineering Report deals specifically groundwater recharge for potable reuse.

This project will meet the requirements specified in the Water Recycling Criteria (SWRCB. 2018a). Key items related to groundwater recharge are summarized in Table 3.1, a table that could be set aside for quick reference for the life of the project.

3.3 RWQCB Requirements

The OWTP discharges to the Pacific Ocean under NPDES permit (CA0054097) which was adopted by the RWQCB on October 11, 2018. The City's current discharge of RW from the AWPF is regulated under Water Recycling Requirements and Waste Discharge Requirements (WRR/WDR) Order No. R4-2011-0079, R4-2011-0079-A01, and R4-2011-0079-A02 (WRR/WDRs).

Table 3.1 List of Key Potable Reuse Regulatory Issues and Information for Groundwater Recharge

Issue	Value/Details	Location in This Report
Contact List of Key Personnel	Quick response related to water quality and permit compliance	Section 2, Table 3
Raw Wastewater Source Control for Potable Reuse	Details the industrial discharges, the City's Local Limits program, and the Enhanced Source Control Program for potable water reuse	Section 4 and Appendix A
Pathogen Removal for Potable Reuse	Defines the log reduction of pathogens across all treatment processes, resulting in compliance with the 12/10/10 standard	Section 5
Chemical Pollutant Removal by Advanced Treatment	Summarizes chemical water quality criteria for potable water reuse and the results of performance testing of the installed purification system	Section 5 (pertaining to NDMA and 1,4-dioxane) Section 9
Groundwater Recharge for Aquifer Storage and Recovery	Describes the use of Aquifer Storage and Recovery for recharge and subsequent recovery of purified water. Includes a description of groundwater modeling results.	Section 6
Water Quality Failure Decision Protocol	Details the actions to be taken in the event of a water quality failure	Section 7
Monitoring and Reporting Program	Details the required treatment process and water quality monitoring program for chemical constituents. Includes testing of finished water quality and water quality within the groundwater basin.	Section 15

This potable reuse project will require a reissuance of the WDR/WRR Order No. R4-2008-0083, including the Monitoring and Reporting Program No. 9456. A Report of Waste Discharge (ROWD) is required to initiate the permit application process. That ROWD is submitted under separate cover to the RWQCB (Oxnard, 2018).

The LARWQCB regulates groundwater recharge projects under numerous state laws and regulations, including the Water Quality Control Plan, Los Angeles Region (hereinafter, the Basin Plan) and SWRCB policies. The Basin Plan requirements include groundwater objectives for minerals and drinking water Maximum Contaminant Levels (MCLs). The Basin Plan also applies the state's Anti-degradation Policy, which has been further interpreted pursuant to the 2013 SWRCB Recycled Water Policy (SWRCB, 2013).

3.4 SWRCB Requirements

The SWRCB has two policies related to this proposed IPR project. They are the Anti-Degradation Policy and the Recycled Water Policy. While the full expectation for this IPR project is to improve groundwater quality through the injection of advanced-treated recycled water, the specific provisions of these two policies must be identified and met.

3.4.1 Anti-degradation Policy

Resolution 68-16 is the state's Anti-degradation policy, titled "Statement of Policy with Respect to Maintaining High Water Quality in California." The key components of this Resolution, listed here verbatim, are:

- "Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality water will be maintained until it has been demonstrated to the state that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies."
- "Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to ensure that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

3.4.2 Recycled Water Policy

The Recycled Water Policy was adopted by the SWRCB in 2009 and revised in 2013 (SWRCB, 2013). Relevant components of the Policy include Salt Nutrient Management Plans (SNMPs), Recycled Water Groundwater Recharge Projects (GRPs), anti-degradation, and monitoring constituents of emerging concern (CEC). Each of these is summarized below.

3.4.2.1 SNMPs

This element of the Recycled Water Policy requires SNMPs to be developed for every groundwater basin/sub-basin in California within five years of the Recycled Water Policy adoption (seven years with approved extensions). The objective of the SNMP is to manage salts and nutrients from all sources" on a basin-wide or watershed-wide basis in a manner that ensures attainment of water quality objectives and protection of beneficial uses." The SNMP includes the following tasks:

- Identify the SNMP work group and develop the SNMP work plan.
- Establish and manage a stakeholder process.
- Summarize/Characterize Water Management and Salt/Nutrient Management Goals and Objectives.
- Characterize Groundwater Basin Geology, Hydrology, and Hydrogeology.
- Summarize Existing Groundwater and Surface Water Monitoring Programs and Water Quality.
- Develop Salt and Nutrient Source Identification.
- Estimate Assimilative Capacity for Each Sub-Basin.

The City of Oxnard developed a preliminary draft SNMP for the Oxnard Plain (inclusive of the Oxnard Forebay) and Pleasant Valley groundwater basins (Carollo, 2016). The preliminary draft was submitted

to the LARWQCB and other stakeholders in July 22, 2016 for review and comment. The LARWQCB provided comments (email from Ginachi Amah, September 1, 2016). The United Water Conservation District provided comments regarding including potential use of advanced treated recycled water from the AWPF for recharge at UWCD facilities (personal communication, Dan Detmer UWCD). The City of Oxnard sent a response to comments to the LARWQCB in September 2016. The response to comments included the following request, related to allowing the City of Oxnard to obtain recycled water permits.

> *"The City of Oxnard respectfully requests that the RWQCB accept the Preliminary Draft Oxnard SNMP, as a draft document (with minor changes to accommodate TAG comments), with the understanding that the SNMP process is well underway, and that obtaining recycled water permits for the proposed projects identified in the Preliminary Draft Oxnard SNMP will not be impacted by delaying the development of a Final Oxnard SNMP. The City of Oxnard requests that the Final Oxnard SNMP be delayed to be coincident with the development of the Groundwater Sustainability Plan (GSP). It is envisioned that at that time, the involved stakeholders will determine the need for additional modeling and analysis based on the findings of the GSP."*

The Oxnard SNMP includes all of the required elements in the SNMP evaluation. Critical to the evaluation is the assessment of assimilative capacity and the evaluation of proposed projects.

The SNMP includes evaluation of existing groundwater quality and calculation of area weighted average TDS, chloride, and nitrate concentrations, by basin. Assimilative capacity for each constituent, which is a comparison of the existing groundwater quality with the target groundwater quality, summarized here. Note two things. First, the proposed ASR project is in the Oxnard Plain, which has assimilative capacity for chloride, TDS, and nitrate. Second, the advanced treated recycled water that will be used for groundwater recharge, will result in improved groundwater quality for all conditions.

- Oxnard Plain Excluding Coastal Saline Zone UAS (upper aquifer system)
  - Chloride Assimilative Capacity - YES
  - TDS Assimilative Capacity - YES
  - Nitrate Assimilative Capacity - YES
- Oxnard Plain Excluding Coastal Saline Zone LAS (lower aquifer system)
  - Chloride Assimilative Capacity - YES
  - TDS Assimilative Capacity - YES
  - Nitrate Assimilative Capacity - YES
- Oxnard Forebay
  - Chloride Assimilative Capacity - YES
  - TDS Assimilative Capacity - YES
  - Nitrate Assimilative Capacity - YES
- Pleasant Valley
  - Chloride Assimilative Capacity - YES - LIMITED
  - TDS Assimilative Capacity - NO
  - Nitrate Assimilative Capacity - YES

The City of Oxnard is planning to implement ASR in the Oxnard Plain. The purpose of the proposed ASR projects is to provide potable water supply. It is conservatively assumed that the proposed ASR project(s) would not necessarily lead to a reduction in groundwater pumping (via offsetting use of existing wells) or use of imported water, both of which would have potential groundwater quality

benefits. The intent of the ASR project is to inject recycled water into a groundwater aquifer, allow it to remain within the aquifer for a specified retention time, and then extract the water for potable use.

Agricultural irrigation with recycled water from the AWPF may be delivered directly to agricultural areas east of the City of Oxnard and/or delivered to PVCWD. Use of recycled water would likely offset existing water supplies for agricultural irrigation (groundwater or other). Recycled water delivered directly to agricultural areas east of the City of Oxnard would recharge the Oxnard Plain. If recycled water from the AWPF is sold to PVCWD, then it would be comingled with PVCWD existing water supplies and delivered for agricultural irrigation within the PVCWD service area. Recycled water delivered to PVCWD would recharge the Oxnard Plain and the Pleasant Valley Basin.

The AWPF treatment facility will produce purified recycled water and includes MF, RO, and UV AOP. It is anticipated that lime will be added to restore the alkalinity and calcium to the water to minimize the corrosivity of the recycled water. Prior estimates for TDS and chloride of the reverse osmosis permeate was projected as 201 mg/L and 70 mg/L, respectively (Jensen Design and Survey 2015). Approximately 30 m/L of additional TDS was attributed to lime addition. Therefore, the predicted TDS, chloride and nitrate concentrations were 230 mg/L, 70 mg/L, and 0.7 mg/L as N, respectively. More recent numbers for the AWPF reverse osmosis permeate water suggest values of approximately 51 mg/L TDS, 14 mg/L chloride, and 0.11 mg/L as N of nitrate. Accounting for the additional TDS of lime addition, and adding in conservatism (factor of 2) to the estimates, it is assumed for this analysis that the recycled water from the AWPF has 160 mg/L TDS, 30 mg/L chloride, and 0.2 mg/L nitrate as N. The predicted water AWPF recycled water quality is well below the objectives and existing water quality in all systems of all basins within the study area.

As discussed, the City of Oxnard's proposed recycled water projects include potable reuse via ASR. In an ASR configuration, the recycled water is injected into an aquifer and extracted for use after some specified residence time. The purpose of the ASR projects is to provide water to meet increasing demands, and it is conservatively assumed that the water from the ASR project(s) will not offset existing groundwater pumping.

Relative to the time scales that are important in groundwater fate and transport, the residence time in an ASR configuration is relatively short. ASR effectively provides a relatively small and temporary additional load to the basin. There may be localized mixing of the injected water (desalted) and the groundwater aquifer during the residence time in the aquifer. However, any mixing that would occur would provide a diluting effect on existing groundwater, due to the superior quality of the AWPF recycled water as compared to existing groundwater quality. Therefore, if there is any effect of the temporary injection of AWPF water into aquifers in the Oxnard Plain, then it would be a beneficial effect of dilution. From a salt and nutrient loading perspective, ASR generates a no-net change to the existing system. Since ASR will effectively provide no change to groundwater quality (or possibly a benefit to groundwater quality) then it is reasonable to conclude that the proposed ASR project(s) are allowable under the SNMP framework and should proceed, provided that other regulatory requirements are met.

The SNMP evaluation of the City's proposed recycled water projects concluded that these projects can be implemented provided that all other regulatory requirements are met. It should be noted, that the SNMP includes management measures and a monitoring plan, and that the City will likely share the responsibility for implementing management measures and monitoring as part of future management and evaluation of groundwater quality in the Oxnard Plain and Pleasant Valley Basins.

3.4.2.2 Recycled Water Groundwater Recharge Replenishment Projects

As listed in the Recycled Water Policy, approved GRRPs must meet the following criteria:

- Compliance with regulations adopted by DDW for groundwater recharge projects (SWRCB. 2018a).
- Implementation of a monitoring program for CECs and priority pollutants, consistent with recommendations from DDW.

Additionally, the Recycled Water Policy states that the "Regional Water Board" can implement "additional requirements for a proposed recharge project that has a substantial adverse effect on the fate and transport of a contaminant plume or changes the geochemistry of an aquifer thereby causing the dissolution of constituents, such as arsenic, from the geologic formation into groundwater."

3.4.2.3 Anti-degradation

As stated in the Recycled Water Policy, "the proponent of a groundwater recharge project must demonstrate compliance with Resolution No. 68-16. Until such time as the City's SNMP is completed, such compliance may be demonstrated as follows:

- A project that utilizes less than 10 percent of the available assimilative capacity in a basin/sub-basin (or multiple projects utilizing less than 20 percent of the available assimilative capacity in a basin/sub-basin) need only conduct an antidegradation analysis verifying the use of the assimilative capacity. For those basins/sub-basins where the Regional Water Boards have not determined the baseline assimilative capacity, the baseline assimilative capacity shall be calculated by the initial project proponent, with review and approval by the Regional Water Board, until such time as the salt/nutrient plan is approved by the Regional Water Board and is in effect. For compliance with this subparagraph, the available assimilative capacity shall be calculated by comparing the mineral water quality objective with the average concentration of the basin/sub-basin, either over the most recent five years of data available or using a data set approved by the Regional Water Board Executive Officer. In determining whether the available assimilative capacity will be exceeded by the project or projects, the Regional Water Board shall calculate the impacts of the project or projects over at least a ten-year time frame.
- In the event a project or multiple projects utilize more than the fraction of the assimilative capacity designated in subparagraph (1), then a Regional Water Board-deemed acceptable antidegradation analysis shall be performed to comply with Resolution No. 68-16. The project proponent shall provide sufficient information for the Regional Water Board to make this determination. An example of an approved method is the method used by the State Water Board in connection with Resolution No. 2004-0060 and the Regional Water Board in connection with Resolution No. R8-2004-0001. An integrated approach (using surface water, groundwater, recycled water, stormwater, pollution prevention, water conservation, etc.) to the implementation of Resolution No. 68-16 is encouraged."

The regional groundwater quality is presented in Section 12 of this report. A review of anti-degradation and assimilative capacity is included in Section 14 of this report.

3.4.2.4 CEC Monitoring

The Recycled Water Policy addresses CECs and acknowledges that the state of knowledge on CECs is incomplete. CEC concentrations in advanced treated recycled water should be minimized through effective source control and treatment programs. The monitoring of specific CECs is required for

GRRPs, and the CEC requirements for injection projects are reviewed in Section 9 of this Engineer's Report.

3.5 Recycled Water Conveyance Pipeline

The advanced treated recycled water is pumped from the AWPF north in an existing recycled water backbone line and to the east to serve farmers. These lines are feeding recycled water to several non-potable applications. Spurs from this line will be constructed to carry the recycled water to the West for the ASR application and to the North for future spreading operations.

3.6 Spreading Facilities

In addition to the proposed ASR application, the City has investigated potential potable reuse spreading applications at other locations within the City (Woolsey Pits, Ferro Pits). At this time, the City does not intend to pursue these alternatives.

3.7 ASR Facilities

3.7.1 ASR Well Head Operation

This ASR application will be operated to eliminate cross connections between injected water and extracted water, maintaining the minimum proposed RRT of 3.1 months at all times (unless a shorter time is approved in writing by the SWRCB). The cross connection control is best described graphically in Figure 3.1.

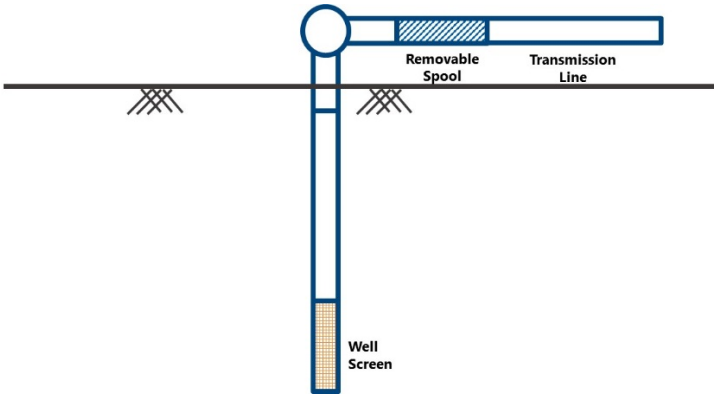

Figure 3.1a ASR Cross Connection Control (Side View)

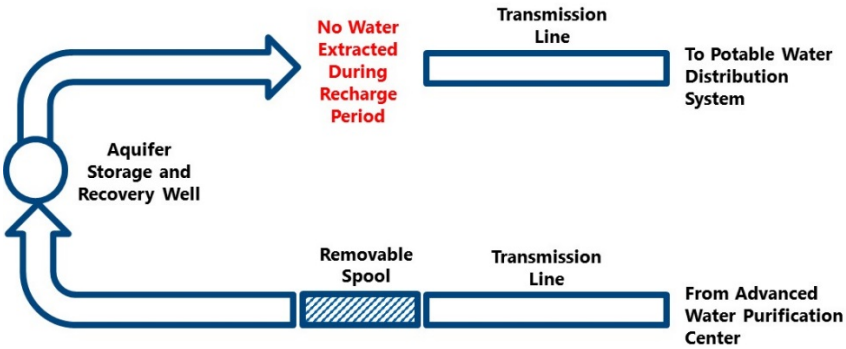

Figure 3.1b ASR Cross Connection Control (Plan View, Recharge with Purified Water Shown)

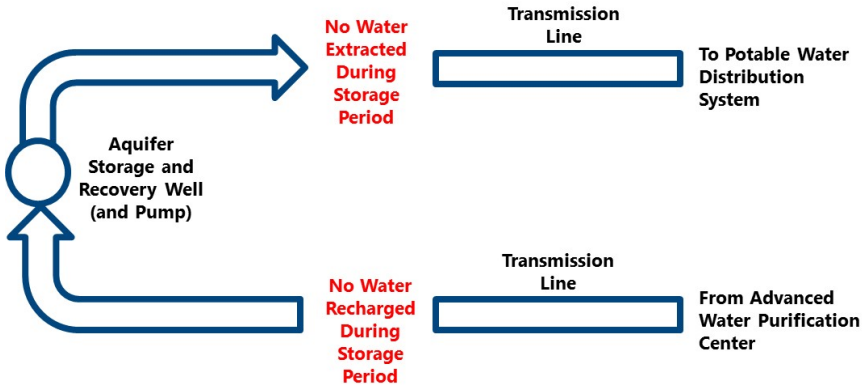

Figure 3.1c ASR Cross Connection Control (Plan View, No Recharge or Extraction during RRT Period)

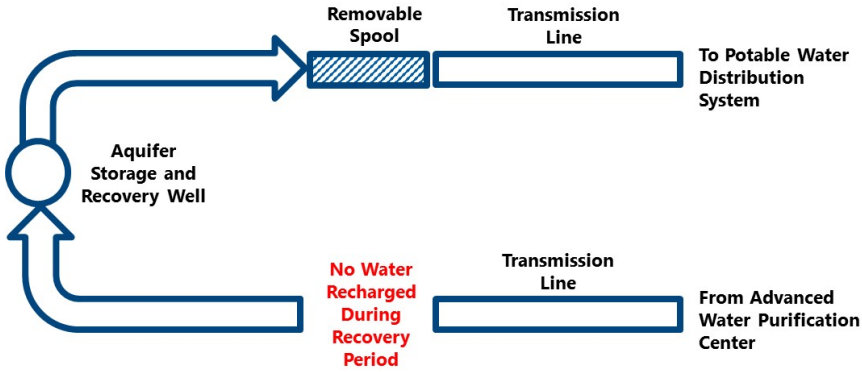

Figure 3.1d ASR Cross Connection Control (Plan View, Extraction of Groundwater Shown)

3.7.2 Injection and Monitoring

The injection and monitoring facilities must meet the criteria of DDW (SWRCB, 2018a), including section 60320.226. This section specifies:

- Prior to operating a GRRP, a project sponsor shall site and construct at least two monitoring wells downgradient of the GRRP such that:
  - At least one monitoring well is located no less than two weeks but no more than six months of travel time from the GRRP, and at least 30 days upgradient of the nearest drinking water well.
  - At least one monitoring well is located between the GRRP and the nearest drinking water well.

For this project, sufficient monitoring wells are proposed that meet DDW regulations (SWRCB, 2018a), as detailed in Section 11.

3.7.3 Chloramination

Extraced water from the ASR well will be pumped to Blending Station No. 1/6 (combined at the same location) where the supply will blend with other potable supplies and be chloraminated.

Section 4

SOURCE WATER FOR POTABLE REUSE

The production of advanced treated recycled water starts with an effective source control program and is followed by reliable primary and secondary treatment. Source water, and an Enhanced Source water Control Program (ESCP), are detailed in the following report, which is intended as a stand-alone document, but also vital to this Engineering Report: *Indirect Potable Reuse Enhanced Source Water Control and Collection System Monitoring Program* (Carollo, 2018); also attached here as Appendix A. Sections from that report are briefly summarized here.

The OWTP is permitted under Waste Discharge Requirements Order No. R4-2013-0094 (NPDES No. CA0054097), which was issued to the City in June 2013, and operates an EPA-approved industrial pretreatment program. That program is operating based upon an approved Local Limits program (from 1999). Oxnard is now updating that Local Limits program and has a Final Draft dated May 2018.

The regulatory requirements for wastewater source control are defined in Section 60320.206 of the regulations for groundwater recharge with recycled water (SWRCB. 2018a). For this project, the City must administer an industrial pretreatment and pollutant source control program that includes, at a minimum:

1. An assessment of the fate of Department-specified and RWQCB-specified chemicals and contaminants through the wastewater and recycled municipal wastewater treatment systems.
2. Chemical and contaminant source investigations and monitoring that focuses on Department-specified and RWQCB-specified chemicals and contaminants.
3. An outreach program to industrial, commercial, and residential communities within the portions of the sewage collection agency's service area that flows into the water reclamation plant subsequently supplying the GRRP, for the purpose of managing and minimizing the discharge of chemicals and contaminants at the source.
4. A current inventory of chemicals and contaminants identified pursuant to this section, including new chemicals and contaminants resulting from new sources or changes to existing sources, that may be discharged into the wastewater collection system.
5. Is compliant with the effluent limits established in the wastewater management agency's RWQCB permit.

The referenced report (*Indirect Potable Reuse Enhanced Source Water Control and Collection System Monitoring Program)*, included as Appendix A, is intended to address each of these items to the satisfaction of the Division of Drinking Water (DDW).

The Enhanced Source Control Monitoring Program (ESCMP) builds on the existing source control program already in place at the City of Oxnard; including:

- A source control program manager overseeing all data collection and regulatory issues relating to discharge from the first user to groundwater wells.
- More frequent sampling than required in the secondary effluent and AWPF advanced treated recycled water, including regulated, unregulated and industry-specific constituents.
- Use of historical and operationally collected online monitoring data required for operation to create baselines and predict trends in process performance.

- Heavily involved industrial outreach programs and residential outreach programs for potable reuse education and discharge initiatives.
- Mapping strategies for fast-acting collection system tracing of detected contaminants of health concern.
- Optional additions to discharge mapping, including hospitals.
- Ensure all SIUs report monthly and annual TTO monitoring results.
- Annual review of slug discharge control plans from SIUs.

Section 5

PATHOGEN MICROORGANISM CONTROL

DDW (SWRCB, 2018a) requires that potable reuse projects for groundwater recharge provide a combined level of treatment resulting in 12-log virus reduction, 10-log *Giardia* reduction, and 10-log *Cryptosporidium* reduction (12/10/10-log removal). No single process can receive more than 6-log reduction credit. DDW regulations (SWRCB, 2018a) also states that at least three processes must provide at least 1-log reduction. Beyond those three key processes, processes which provide <1-log reduction can be included within the analysis.

The step-by-step removal of pathogens, from raw wastewater to the production of potable water is reviewed below.

5.1 Primary and Secondary Treatment

Table 2-3 of USEPA (1986) lists less than 10 percent removal of total coliforms, 35 percent removal of fecal coliforms, and less than 10 percent removal of virus through primary treatment. Protozoa removal through primary treatment is not listed. The same Table (2-3) includes bacteria and virus removal percentages for secondary treatment (not including disinfection), indicating 90 to 99 percent removal of both total and fecal coliforms, and 76 to 99 percent removal of virus.

Francy *et al.* (2012) indicates 99 to 99.98 percent removal of bacteria and 88 to 99.9995 percent removal of various virus and coliphage. The single data set with any data below 90 percent removal, which was for adenovirus, showed removal ranging from 88 to 99.93 percent with a median removal of 99.8 percent.

One of the most recent DDW approval of pathogen removal credits for combined primary and secondary treatment, was obtained by the Water Replenishment District (WRD) (2013). That document relied upon risk analysis data presented in Olivieri *et al.* (2007) which was developed based upon Rose *et al.* (2004). Within Rose *et al.* (2004), the research team defined the range of bacteria, enterovirus, *Cryptosporidium*, and *Giardia* removal through six different full-scale wastewater treatment plants. The raw data from that work is reported in Olivieri *et al.* (2007). For WRD (2013), the pathogen removal credits for their secondary process were based upon the data from two of the six tested secondary process configurations. Specifically, two of the secondary process trains (Facilities C and D, with SRTs of 1.6-2.7 days and 3-5 days, respectively) had SRT values less than the secondary process feeding the WRD advanced treatment system (>9 days), and thus are presumed to be conservative estimates of performance. Per DDW request, WRD (2013) used the lower 10th percentile values calculated for each pathogen, resulting in 2.06-log reduction of enterovirus, 1.42-log reduction of *Cryptosporidium*, and 2.42-log reduction of *Giardia*. Note that analysis of the same data set by Carollo Engineers found one data translation error, but the overall impact on the log reduction credits is minimal.

Interpretations of the data set (Rose *et al.*, 2004) suggest that longer SRT values result in increased pathogen removal. While this may be the case, the raw data from Rose *et al.* (2004) does not show this clearly (Table 5.1). For example, Facility F from that research with the longer SRT has reduced protozoa reduction than most of the other facilities, but also shows the best virus removal compared to the other facilities. The lowest virus removal occurs at Facility A, which has an SRT of 6 to 8 days, similar to the TIWRP. This data set is limited and making projections based upon SRT is speculative. Without site-

specific data, our team recommends using the lower 10th percentile of the entire data set in Table 5.1, which results in 1.9-log reduction of virus, 1.2-log reduction of *Cryptosporidium*, and 0.8-log reduction of *Giardia*.

Table 5.1 Pathogen Reduction Values through Primary and Secondary Treatment (from Rose *et al.*, 2004)

Lower 10th Percentile Values		Log Reduction		
SRT	Facility	Enterovirus	*Giardia*	Crypto
1.6-2.7	C	1.8	2.6	1.25
3-5	D	2.05	1.35	1.4
3.5-6	B	1.95	2.45	1.6
6-8	A	1.65	0.8	0.7
8.7-13.3	E	1.75	2.6	1.9
8-16	F	2.6	0.9	0.25
1.6-16	**ALL**	**1.85**	**0.8**	**1.2**
7-8	***Projected for OWTP***	***1.9***	***0.8***	***1.2***
50th Percentile Values		Log Reduction		
SRT	Facility	Enterovirus	*Giardia*	Crypto
1.6-2.7	C	2.05	3.05	1.65
3-5	D	2.5	1.9	2.6
3.5-6	B	2.25	2.6	1.9
6-8	A	2.1	1.6	1.1
8.7-13.3	E	2.2	2.8	2.1
8-16	F	2.75	1.1	0.95
1.6-16	**ALL**	**2.3**	**2.6**	**1.6**
7-8	***Projected for OWTP***	***2.3***	***2.6***	***1.6***

As part of WateReuse Research Foundation Project 14-16, Oxnard has been researching the pathogen removal by the OWTP, in an effort to supplement, and potentially better understand, pathogen removal through the primary and secondary processes. The work, as of yet unpublished, examines a range of pathogens (*Giardia, Cryptosporidium*, norovirus, total culturable virus, *E. coli*), biological surrogates (enterococci, total coliform, male specific coliphage, somatic coliphage), chemical surrogates (UV Absorbance, TOC, DOC, BOD), and innovative monitoring (fluorescence). The laboratory work was done by Southern Nevada Water Authority (chemistry) and BioVir (biology). Spanning nearly 12 months, with sampling over 6 dates (four data sets are currently complete), the project team is developing an understanding of pathogen concentrations and removal (Figures 5.1, 5.2, and 5.3).

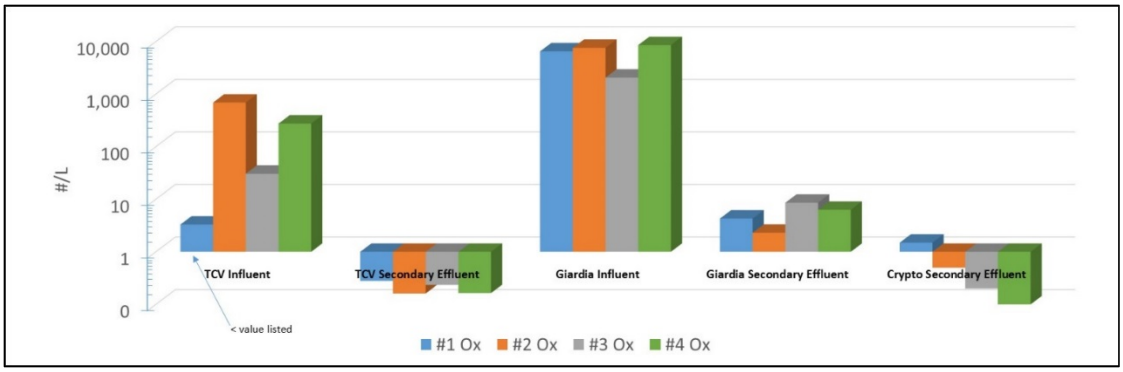

Figure 5.1 Total Culturable Virus, Giardia, and Cryptosporidium Concentrations in Raw Wastewater and Secondary Effluent for Oxnard

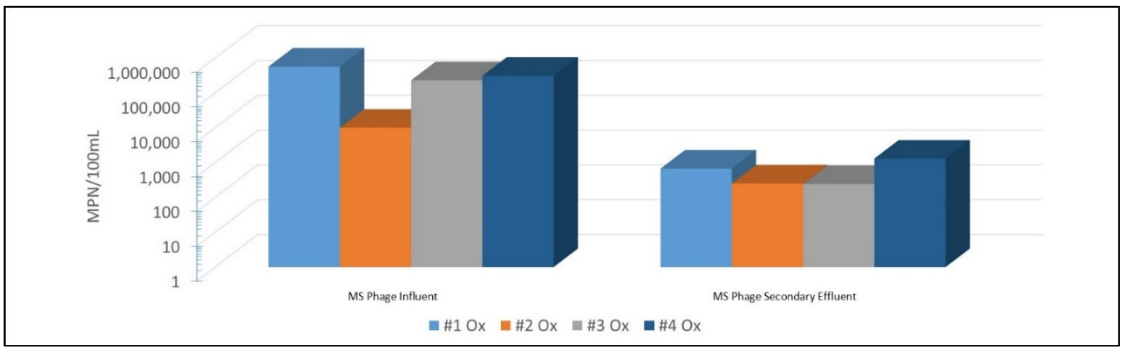

Figure 5.2 Male Specific Phage Concentrations in Raw Wastewater and Secondary Effluent for Oxnard

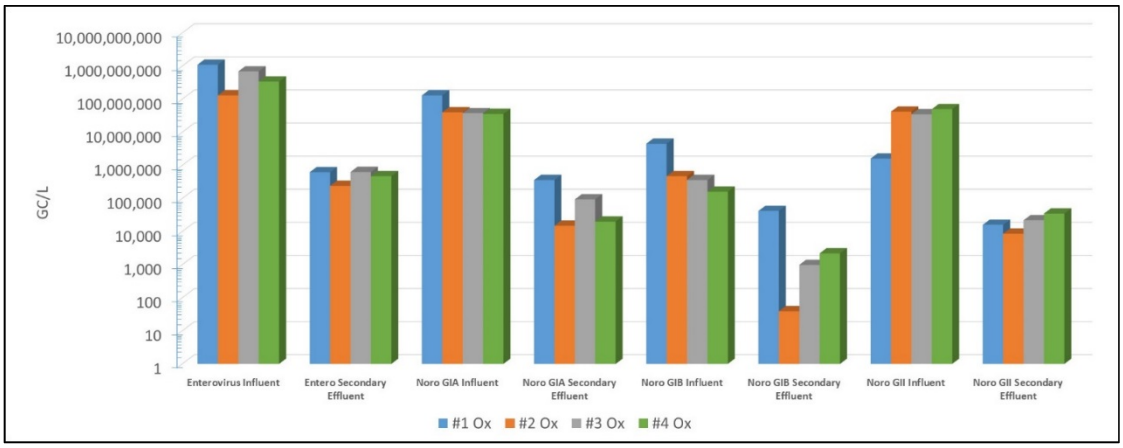

Figure 5.3 Enterovirus and Norovirus Concentrations in Raw Wastewater and Secondary Effluent for Oxnard

Analytical difficulty with *Cryptosporidium* enumeration inhibited calculation of log reduction for this organism. Log removal values (LRVs) for all other organisms were:

- Male Specific Phage - 1.6 to 2.98 LRV, with an average value of 2.47 LRV.
- Giardia - 2.38 to 3.52 LRV, with an average value of 3.05 LRV.

- Enterovirus - 2.7 to 3.2 LRV, with an average value of 2.97 LRV.
- Total Culturable Virus - 2.1 to 3.6 LRV, with an average value of 2.99 LRV.
- Norovirus Type GIA - 2.6 to 3.4 LRV, with an average value of 2.96 LRV.
- Norovirus Type GIB - 1.9 to 4.1 LRV, with an average value of 2.63 LRV.
- Norovirus Type GII - 2.0 to 3.7 LRV, with an average value of 3.01 LRV.

While raw wastewater and secondary effluent were sampled on the same day, the samples were not time-coupled, meaning that they do not necessarily represent the same drop of water and thus the average log reductions are likely more representative of performance compared to individual numbers. Using the lowest average value from all the virus data and the average for Giardia removal, reasonable LRVs for protozoa and virus are 3-log and 2.5 log, respectively. **If we were to assume accuracy in the individual sample events and use the lowest measured reductions for protozoa and virus (not coliphage), we would result in 2.4-log and 1.9-log, respectively.** DDW, in a letter dated December 5, 2016, acknowledged the value of this new research to the industry, but raises important concerns regarding the lack of a surrogate to monitor log removal performance. As a result, DDW has stated that they will only approve the lower log removal values from Rose et al (2004); 1.9-log reduction of virus, 1.2-log reduction of *Cryptosporidium*, and 0.8-log reduction of *Giardia*. It is Oxnard's position that these numbers from Rose et al (2004) are conservative. Oxnard intends to initiate a more detailed pathogen sampling and analysis plan and to submit that information to DDW at part of the future 5-Year Engineer's Report.

The concentrations of the organisms in the secondary effluent also allow for an analysis of risk. Water treatment regulations for pathogens are predicated on reducing the risk of infection to minimal levels. For this project, the team has targeted the concentration end goals for pathogens that correspond to a modeled, annual risk of infection of 1 in 10,000 or less (Trussell *et al.*, 2013). DDW used this risk level to develop their pathogen criteria (SWRCB, 2018a) and NWRI used this risk level to develop their pathogen criteria (NWRI, 2013). This risk level corresponds to the following potable water concentrations:

- *Giardia* - 6.80E-06 cysts/L.
- Cryptosporidium - 3.00E-05 oocysts/L.
- Enteric virus - 2.22E-07 MPN/L.

Giardia and *Cryptosporidium* results varied from 2.3 to 8.6 #/L and <0.1 to 1.5 #/L, respectively. Taking the highest count for each *Giardia* and *Cryptosporidium* results in a need for 6.1-log and 4.7-log of additional treatment following the secondary process to meet the risk-based levels above. Considering that subsequent MF treatment will provide 4-log protozoa removal, the subsequent RO will provide 1 to 2-log protozoa removal, and subsequent UV will provide 6-log protozoa removal, protozoa in the advanced treated recycled water does not represent a health concern.

For virus, there are many more data sets to evaluate. Total culturable virus concentrations in secondary effluent were 0.16 to 0.28 MPN/L. Taking the highest count results in a need for 6.1-log of additional treatment following the secondary process to meet the risk-based levels above. Considering that subsequent RO will provide 1 to 2-log virus removal and subsequent UV will provide 6-log virus removal, total culturable virus concentrations in the advanced treated recycled water does not represent a health concern.

Enterovirus, norovirus GIA, norovirus GIB, and norovirus GII had concentrations of 240,000 to 630,000, 15,000 to 360,000, 39 to 42,000, and 8,600 to 35,000 GC/L, respectively. ***An important difference***

between the total culturable virus test and the other tests is the use of a culture to measure viable organisms in the former, while the measurement of gene copies in the latter. Gene copy numbers do not necessarily correlate to viable pathogens and this is a current topic of research within our industry. A highly conservative approach would be to assume all gene copies to be viable pathogens. Following that approach and using the highest GC/L counts, an additional 11 to 12-log removal of virus would be needed through subsequent processes. Considering that subsequent RO will provide 1 to 2-log virus removal, subsequent UV will provide 6-log virus removal, and groundwater recharge can provide up to 6-log virus removal (depending upon travel/storage time), the advanced treated recycled water does not represent a health concern.

5.2 MF

Reardon *et al.* (2005) reported numerous studies showing bacteria rejection of 3 to 9 logs, protozoa rejection of 4 to 7 logs, and unreliable rejection of virus. The AWPF utilizes Pall Microza MF membranes, which are credited by DDW for 4-log protozoa removal and 0.5-log virus removal (95 percent of the time), as documented by DDW (CDPH, 2011). According to the Supplier's documentation, which cites USEPA (2003) and Sethi (2002) to calculate a maximum allowable pressure decay test (PDT) result that correlates to a specific protozoa log reduction.

Pall's approach is to use the maximum allowable TMP, the minimum feed water temperature, the maximum filtrate flow (27.2 gfd based upon the maximum flux in the Pall Operating Protocol and as measured in their 2011 Initial Performance Test), and a default VCF of 1.08. The result is that a PDT of 0.16 psi/min equates to a protozoa LRV of 4, which equates to a PDT of 0.80 psi/5min. Details on Pall's approach can be found in Appendix C.

Extensive SCADA data exists demonstrating compliance with this maximum PDT. As part of start-up demonstration testing of Oxnard's purification processes in April, May, and June of 2016, Carollo staff recorded a handful of PDTs and turbidity values, as shown below.

- **4/27/2016:** Rack 2 - 0.2, Rack 3 - 0.2, Rack 4 - 0.18, Rack 5 - 0.18, Rack 6 - 0.20
- **5/2/2016:** Rack 1 - 0.31, Rack 2 - 0.2, Rack 3 - 0.17
- **5/3/2016:** Rack 1 - 0.26, Rack 4 - 0.17, Rack 5 - 0.15, Rack 6 - 0.16
- **6/3/2016:** Rack 1 - 0.25, Rack 2 - 0.20, Rack 3 - 0.18, Rack 4 - 0.18, Rack 5 - 0.16, Rack 6 - 0.22
- **Influent Turbidity:** 3.48 to 5.09
- **Effluent Turbidity:** 0.04 to 0.10

During the May site visit and inspection, MF influent and effluent samples were also collected to analyze the particle size distribution (PSD). The analysis was done with Carollo's optical particle sizer/counter (PSS AccuSizer 780/SIS), with a sensitivity down to approximately 1 micron (Figure 5.4). The goal of the PSD testing was to set a baseline of performance for particle removal, focusing on the size range of protozoa (4 to 15 microns). The results demonstrate >3-log removal of particles in the 4 and 5 micron range, affirming the PDT performance shown above.

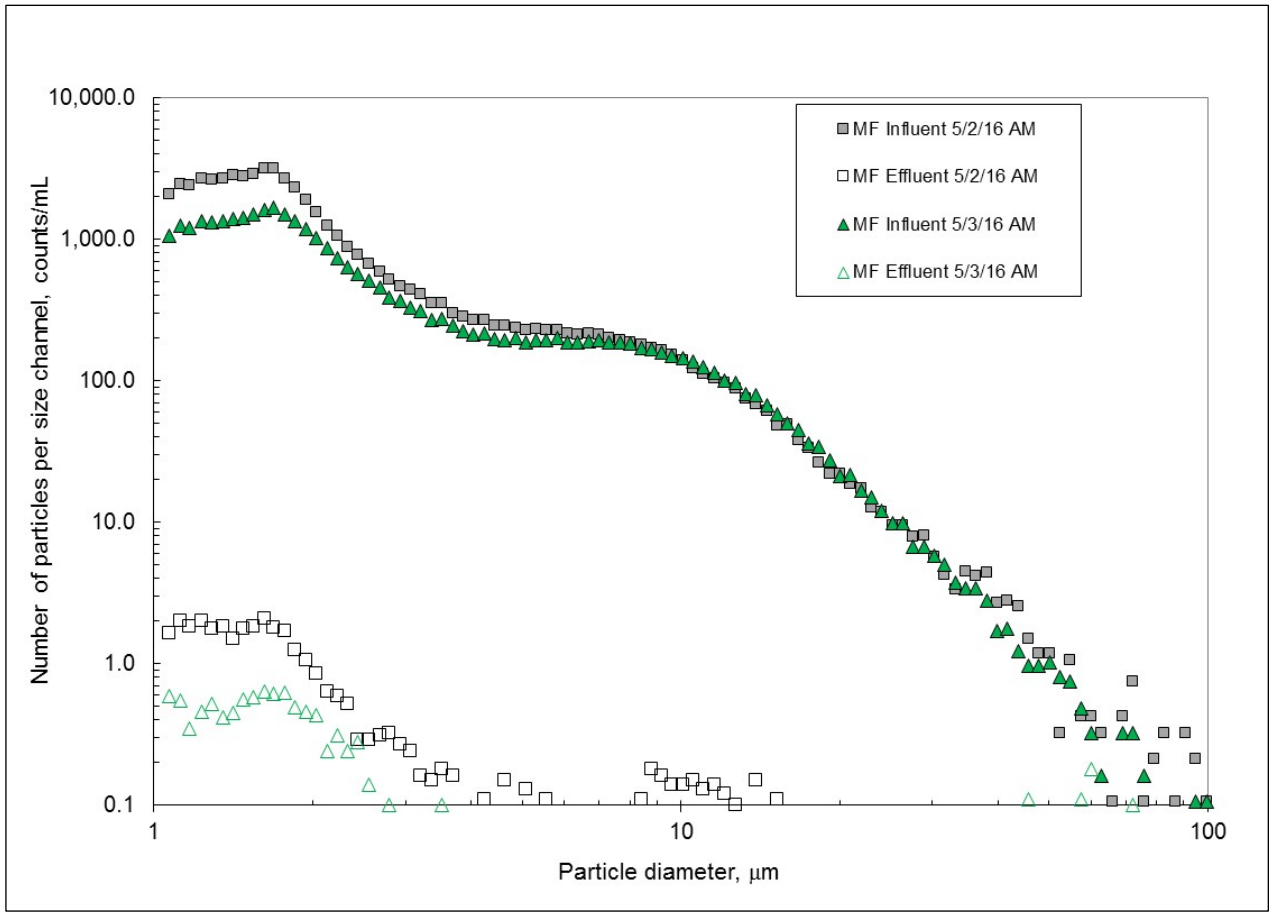

Figure 5.4 Particle Size Distribution for MF Influent and Effluent (5/2/16 and 5/3/16)

Online turbidity and PDT measurements for December 2014 through June 2016 are shown as Figures 5.5 and 5.6, respectively. The online results back demonstration results previously presented, showing the MF in normal operation at Oxnard is able to consistently achieve the PDT target. Online microfiltration filtrate turbidity measurements confirm a required effluent turbidity limit of <0.2 NTU is consistently met. Exceedances of 0.2 NTU in the MF filtrate were seen when 1) the online turbidimeter requires cleaning and calibration or 2) when the plant is cycling through a startup period and flow has not yet stabilized. Influent turbidity concentrations from secondary effluent, typically range between 1 - 6 NTU. Benchtop and online turbidimeter measurements during testing showed consistency when compared.

Overall, the City proposes to use 0-log virus reduction credit and 4-log protozoa reduction credit for this Pall membrane. No virus credit is sought because PDTs do not have sufficient resolution to measure virus removal performance.

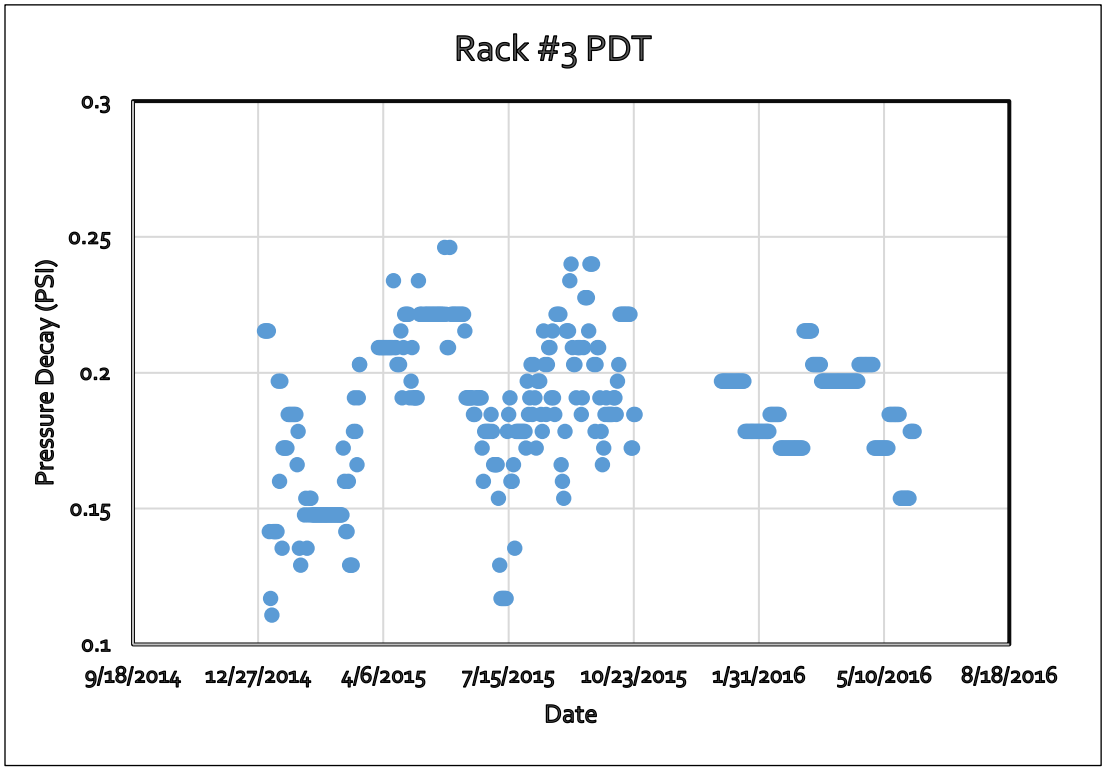

Figure 5.5 MF Online PDT Results for December 2014 through June 2016

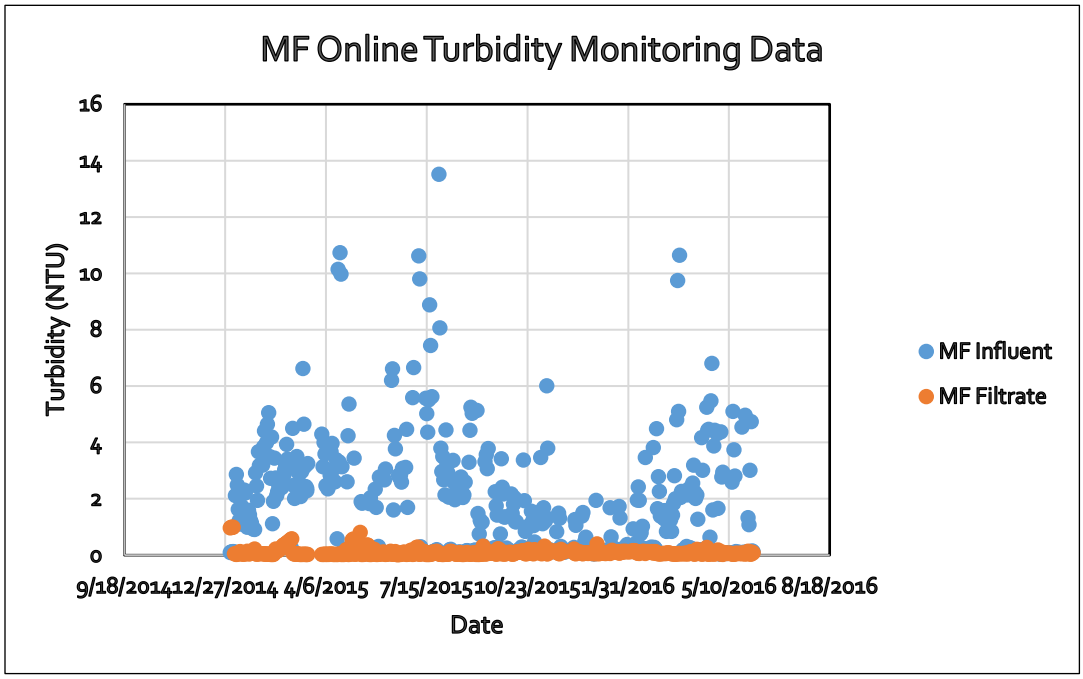

Figure 5.6 MF Influent and Filtrate Online Turbidity Data for December 2014 through June 2016

5.3 Reverse Osmosis

RO process performance for pathogen rejection is not governed by the ability of an intact membrane to reject pathogens but by the ability to monitor process integrity (Reardon *et al.* (2005) and Schäfer *et al.* (2005)). The monitoring tools currently used, electrical conductivity meters and total organic carbon (TOC) meters, can measure 99 percent or less removal of both parameters through the RO process. Recently, the DDW granted 1.5-log reduction credit for all pathogens (i.e., virus, *Giardia*, and *Cryptosporidium*) for RO (WRD, 2013), based upon a requirement to continuously monitor TOC reduction across RO.

Currently, the City only measures EC across the RO membranes. During the Carollo performance demonstration testing and site audit, our team collected EC data.

- **5/2/2016:** Influent EC 2693 to 2787 µS/cm, Effluent EC 107 to 134 µS/cm.
- **EC LRV is 1.3 to 1.4.**

Monitoring and performance data showing online EC measurements of the RO system from March - May 2016 are displayed in Figure 5.7, with the average, minimum and maximum LRV results by train shown in Table 5.2 and Figure 5.8. The online data confirms the site inspection results from Carollo, showing an average of 1.47 LRV from a 3 month period, with a minimum LRV of ~1.29. These online results indicate consistent and reliable LRV of EC that can be confidently correlated to pathogen removal credits.

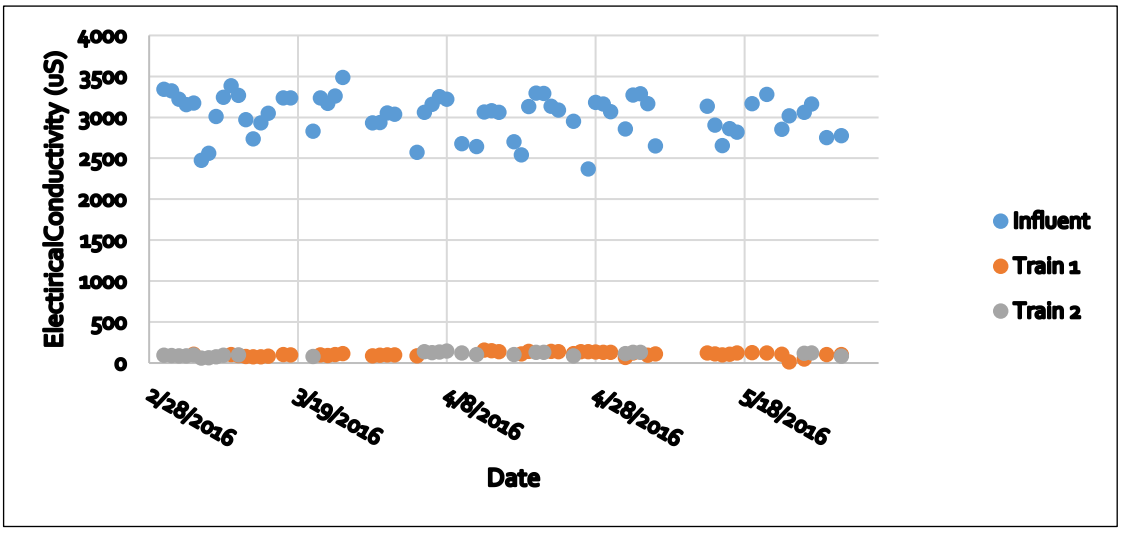

Figure 5.7 MF Influent and Filtrate Online Turbidity Data for December 2014 through June 2016

Table 5.2 Average, Minimum, and Maximum EC LRV through RO treatment (March 2016-May 2016)

	Train 1 LRV	Train 2 LRV	Total Perm LRV
Average	1.47	1.47	1.47
Min	1.23	1.34	1.29
Max	2.44	1.62	2.03

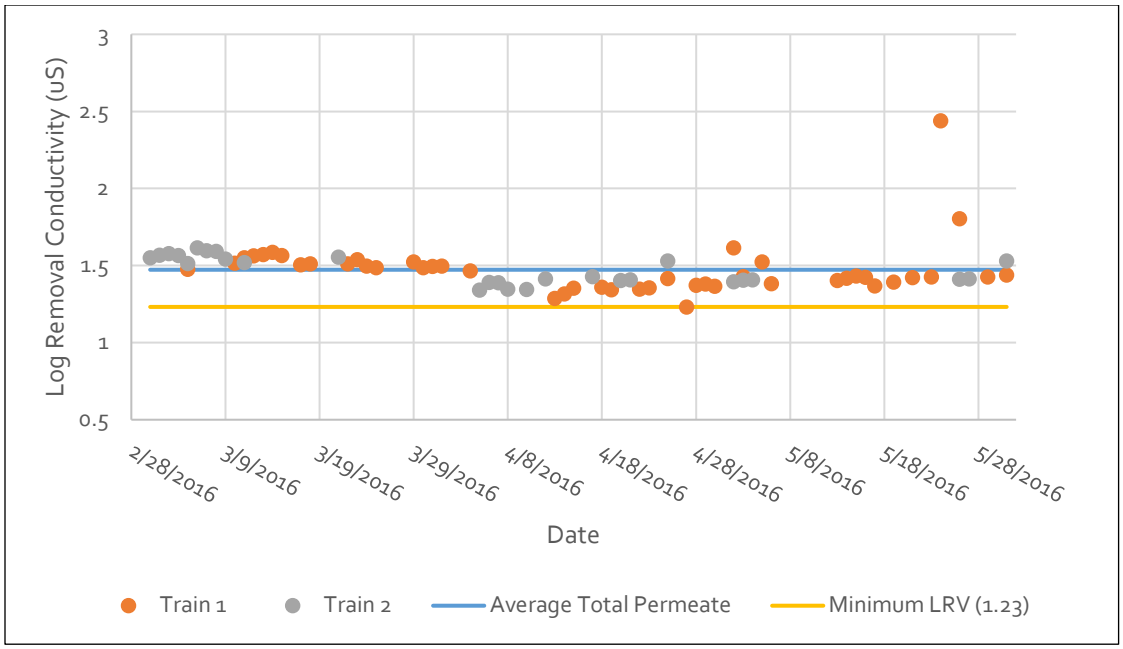

Figure 5.8 EC LRV Online Monitoring Data March 2016 - May 2016

The AWPF does not have online TOC meters, though intends to install them in the near future prior to operation. Grab samples were taken during the May Carollo inspection to document TOC removal across the RO process. TOC concentrations in the RO feed was 16 mg/L (on both 5/2 and 5/3), whereas RO permeate TOC concentrations were at the detection limit of 0.3 mg/L or below detection (again on 5/2 and 5/3). The LRV for this limited TOC data set is 1.7, suggesting that TOC reduction may be a more sensitive monitoring tool for RO performance and RO LRV credits.

In the April 2016 letter from DDW to the City, DDW stated that "online EC can show log reduction value (LRV) of approximately 0.5 to 1.0". The data collected here demonstrates a higher level of performance monitoring, with a minimum of 1.3 LRV. The City proposed to use the 1.3-log reduction value for all pathogens for RO at this time and use EC to monitor the performance of the system. DDW, in a letter dated December 5, 2016, approved a credit of 1-log based upon EC monitoring. *In the future, the AWPF intends to install TOC meters and potentially demonstrate higher LRV credits using this or other advanced monitoring (such as online fluorescence) resulting higher pathogen removal credit.*

5.4 UV Advanced Oxidation

The UV advanced oxidation process (AOP) provides three primary values:

- Disinfection.
- NDMA Destruction by Photolysis.
- Trace Chemical Destruction Through Advanced Oxidation (1,4-dioxane).

Following RO treatment, advanced oxidation is accomplished through the use of UV and hydrogen peroxide (H_2O_2), with an H_2O_2 dose of up to 6 mg/L. The UV system is the D72AL75, which has gone through extensive validation for non-potable water reuse applications and is the same reactor as the ones used at the OCWD for the Groundwater Replenishment System. For the AWPF, there are three D72AL75 reactors in series (stacked). The "D" in "D72AL75 means "dual", as each reactor actually has

two banks of 72 lamps within it. This system is designed with redundancy, with five banks of lamps required for operation and the sixth bank of lamps for redundancy.

Note: The discussion here, which is in the disinfection section of this report, focuses upon all three components of performance, disinfection, NDMA destruction, and 1,4-dioxane destruction; as each of the three data sets are necessary to fully understand UV AOP performance and the recommended controls.

5.4.1 Current UV System Controls

Historically, UV AOP systems have been controlled to provide a target EEO, or electrical energy use per order of magnitude destruction of a target pollutant. UVI and a pure "dose" based control has yet to be implemented for the various installed UV AOP systems for potable water reuse in California (e.g., OCWD, WBMWD, WRD), but will soon be operational for the City of Los Angeles' Terminal Island facility (early 2018).

The target of the City's UV AOP control system is to provide sufficient power to achieve a required level of treatment (removal) of the target chemical, NDMA. The control system calculates the target power for a UV system via the EE/O metric. EE/O as a function of flow rate and UVT is computed by the system, and adjusted for a Lamp Efficiency Factor (LEF), based on the target contaminant removal setpoint. The power modulation can be described as:

Power = a x f(flow, UVT, LEF*), where

a = Trojan-specific empirical factor, and

LEF = f(lamp age, temperature, power level efficiency)

The actual total power (summation of all power output by the system at any timepoint) is then compared to the target power (based on a LRV contaminant setpoint), to allow for power reduction in times of low flow or high UVT.

The current target NDMA LRV setpoint for Oxnard is 1.0. As part of startup testing, the Carollo/Oxnard team obtained SCADA data to document the performance of the existing control system to meet the 1.0 NDMA LRV metric. System NDMA LRV and UVT values are recorded by plant staff directly from the UV system monitoring screen every 4 hours. Data provided by plant staff from 9/27/16 and 9/28/16 show the system's response to changes in UVT in terms of LRV achieved (Figure 5.9).

Additional data was collected showing the system's response to UVT and flow for the same 9/27/16 - 9/28/2016 dates, Figure 5.10. This result confirms the system's control philosophy is functioning as intended. All LRV values were above the setpoint of 1.0, showing the system was meeting the target setpoint at all times during the two days analyzed.

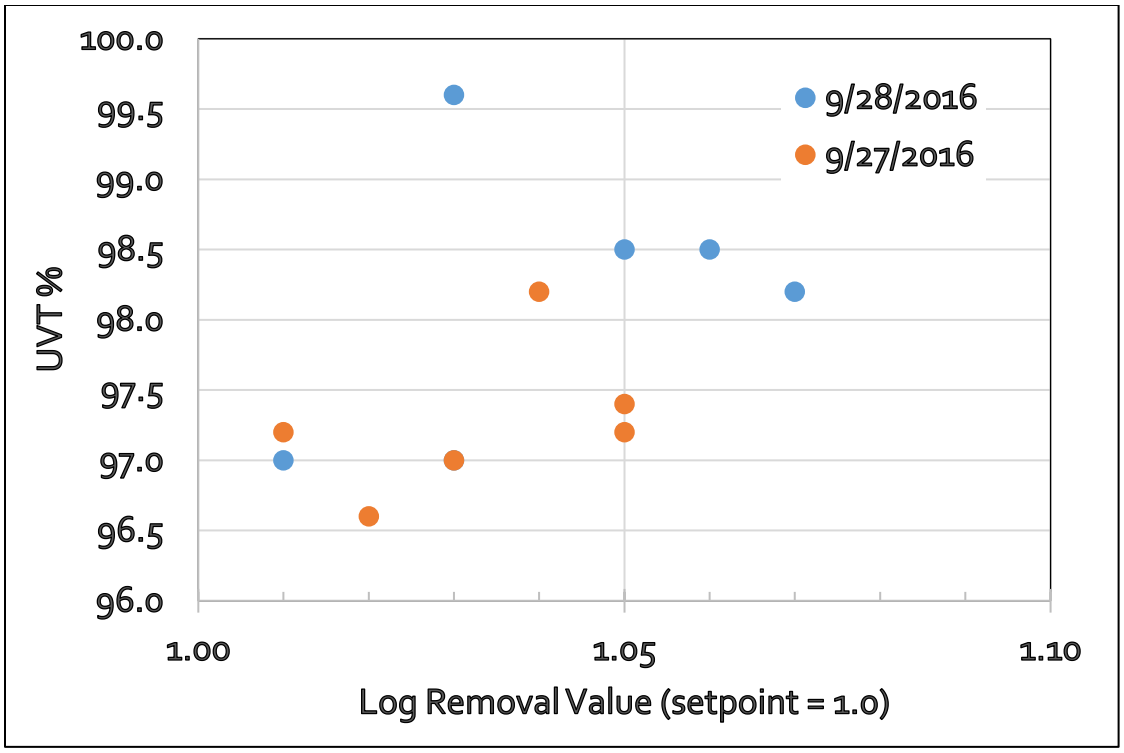

Figure 5.9 Percent UVT and corresponding Log Removal Values for 9/27 and 9/28/2016

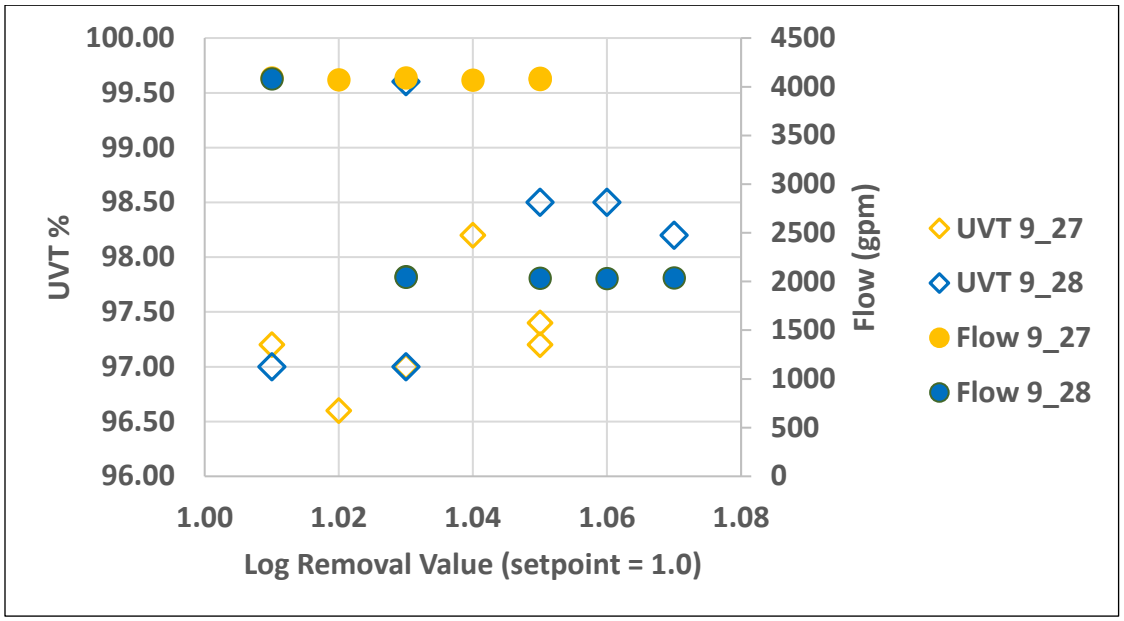

Figure 5.10 UV Log Removal Value as a Function of UVT and Flow

Power modulation is the final step in the UV AOP control strategy. The apparent power and target power across the UV system was analyzed for consistency across 9/27/16 and 9/28/16 operation (Figure 5.11). This consistency shows the UV system's ability to modulate the power to limit the energy input to the system to only what is necessary to meet the target power at any given time based on the UVT and flow.

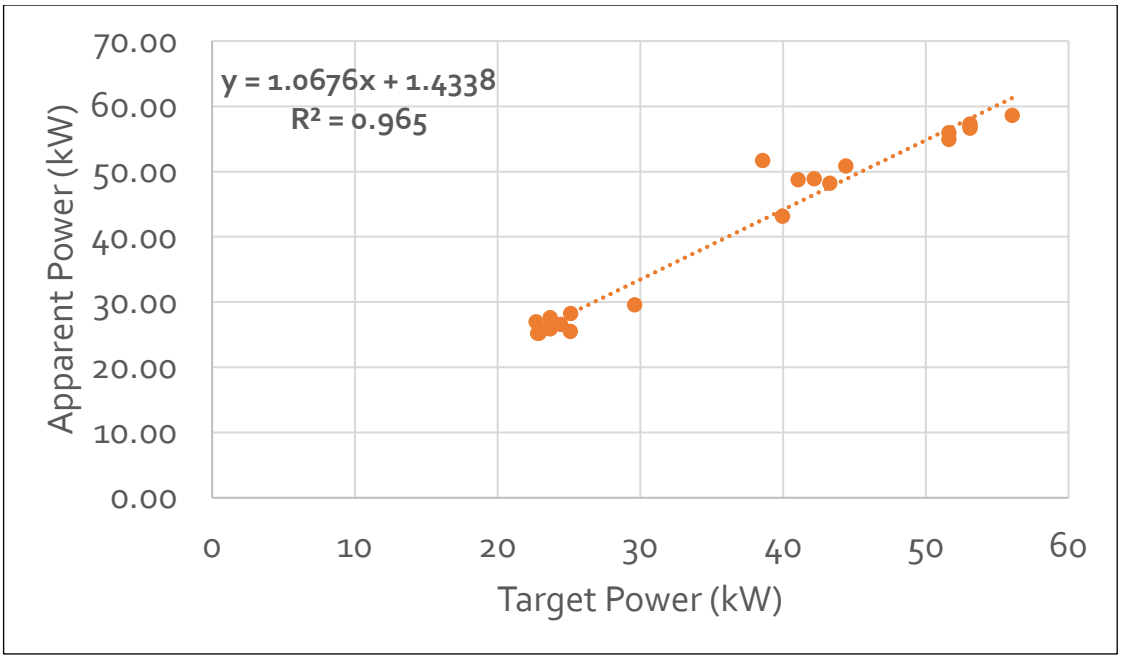

Figure 5.11 Apparent Power vs. Target Power (data collected 9/25/16 - 9/28/16)

The sections and analysis that follows evaluates the capacity of the installed UV AOP to destroy NDMA, pathogens, and 1,4-dioxane; then determines if the existing control system (as defined above) is sufficient or if it needs some level of adjustment.

5.4.2 UV Sensor Performance

Though UVI is not an active control within the UV system (at this time), the Carollo project team did a preliminary analysis of sensors for the installed 6-bank UV system. The orientation of the reactor sets the naming of the reactors and the corresponding UVI sensors, as shown in Figure 5.12 below; LWR LFT (lower left), MID RHT (middle right), and HGH LFT (high left) are three naming examples. Note that in the figure below, the terms "left" and "right" refer to the direction of flow (with flow going from left to right), not the visual location of the banks.

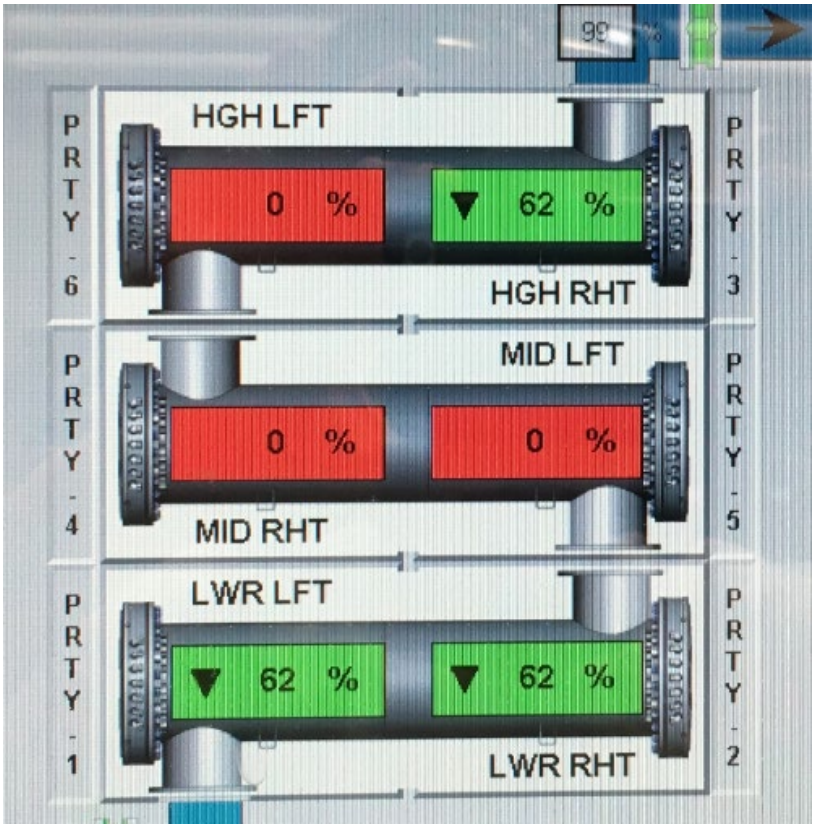

Figure 5.12 Screenshot of Trojan HMI at Oxnard

Through twenty-two different tests, different flow, different UVT, different # of reactors, and different reactor power settings were used. UVT transmittance readings were taken from an online meter, from a calibrated bench-top meter, and with laboratory grab sampling with subsequent analysis. Samples were taken before and after UV. For this analysis, only samples from the influent side of the UV were used, and only the results from the calibrated bench-top meter were used. The logic of this approach is based upon our team's confidence in the accuracy of the bench-top meter coupled with the future method of system monitoring, which is UVT on the influent to the UV system.

The sensor results are shown in Figure 5.13. Substantial sensor variability was shown. At a basic level, the sensors did track changes in UVT and power.

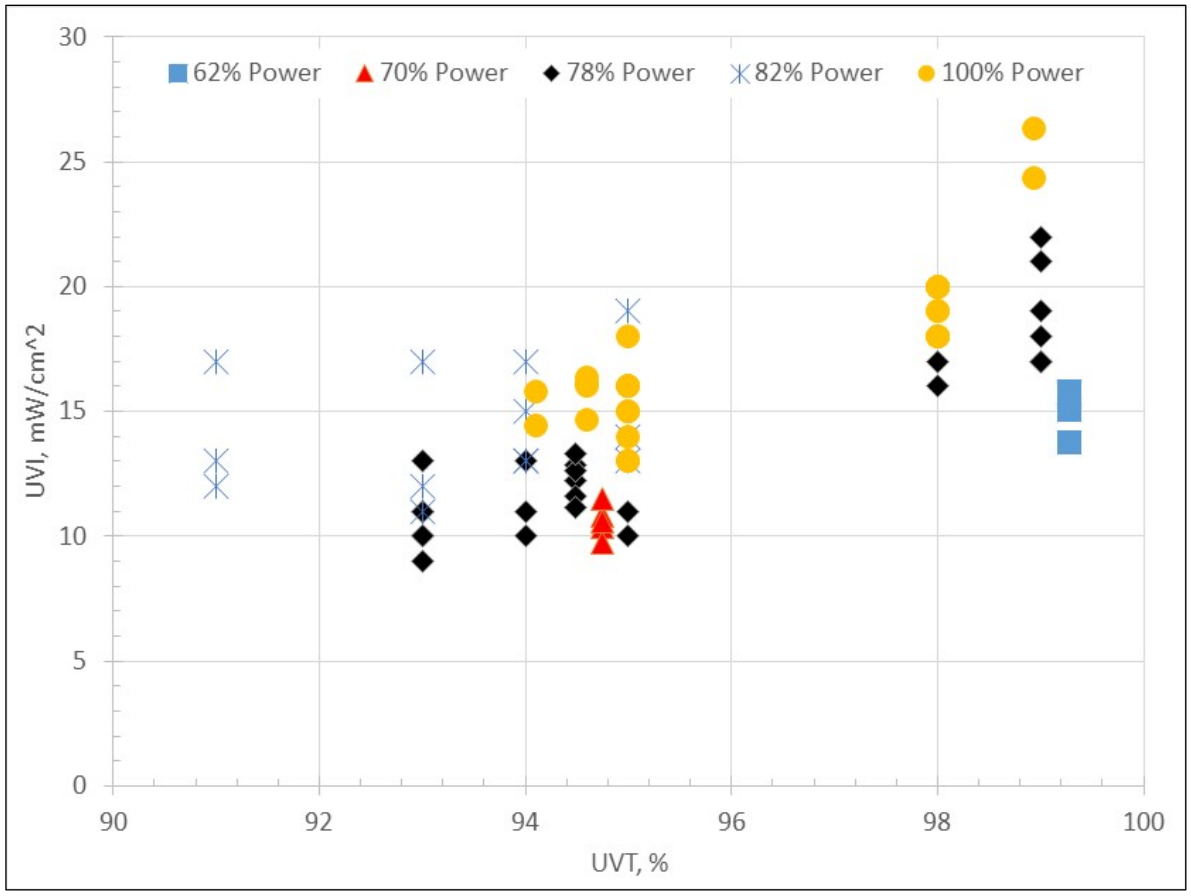

Figure 5.13 Sensor Values for Different UVT and Power Values

Using the sensor data points, a predictive formula was developed for the sensors. Sensor intensity is a function of UV absorbance (UVA) and ballast power (BP), as follows:

$$S = 10^{A} \times UVA^{B} \times BP^{C}$$

Where:

A = -1.27979

B = -0.25179

C = 1.02881

This formula results in an R^2 value of 0.92, which indicates a good measure of data variability. The prediction residuals are shown in Figure 5.14, demonstrating the accuracy of the predictive formula to be plus or minus 20 percent, and the general ability of the UV sensors to track UV intensity.

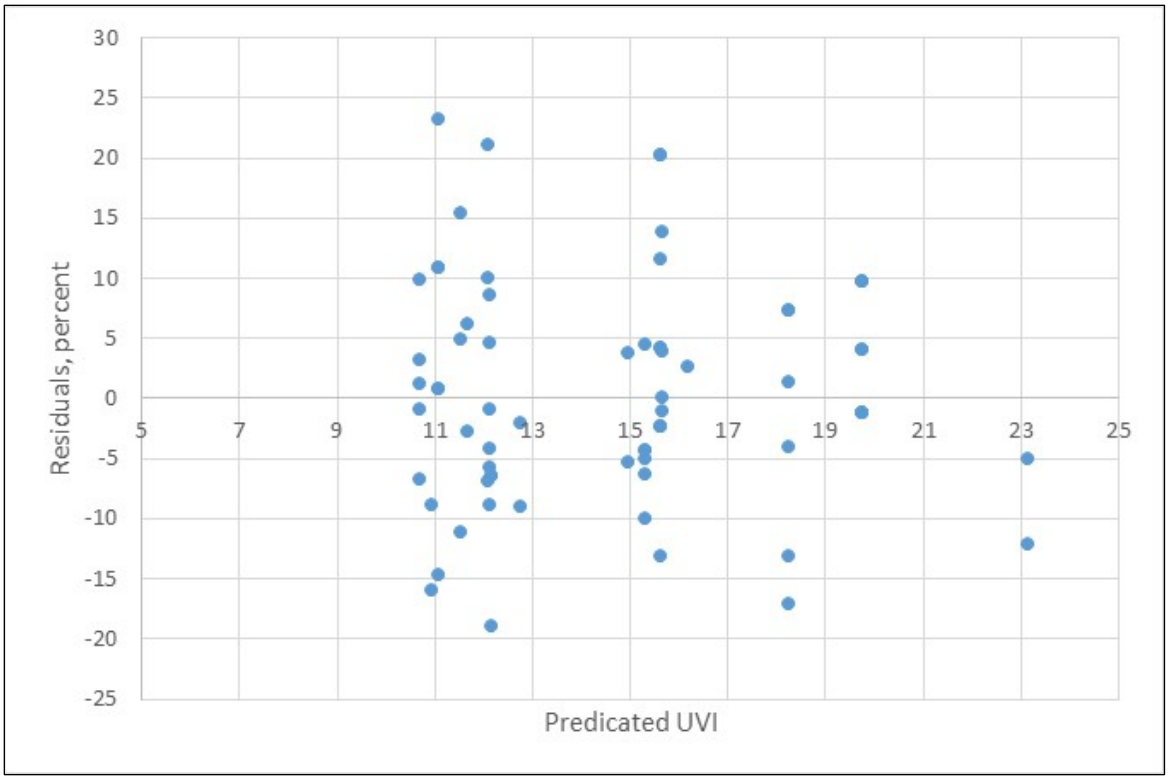

Figure 5.14 Sensor Residuals

5.4.3 Disinfection Performance

The D72AL75 validation is documented in Carollo (2009). That work documented reactor performance over a range of flow (1.05 to 7.3 mgd) and over a range of UV transmittance (UVT) (41.4 to 80.8 percent), with the data analyzed in accordance with National Water Research Institute Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (NWRI, 2003) but not NWRI (2012). The validation of the D72AL75 is based upon the dose delivery per reactor, recognizing that there are two 72 lamp banks within each reactor. Note that the Oxnard UV AOP system is controlled based upon the use of each bank, so three reactors results in a total of 6 banks of UV light. For this application at the AWPF, the flow per reactor is 6.25 mgd (as all three reactors are in series). As the UVT in ROP is greater than 95 percent, the validation formula from Carollo (2009) is conservative. Using the maximum validated UVT of 80.8 percent the dose of five banks of lamps from the three D72AL75 reactors (leaving one bank in standby) is >250 mJ/cm^2.

As this is a potable reuse application, disinfection credit for UV should be based upon adenovirus disinfection. Adenoviruses comprise a large group of serologically different viruses that can cause a broad spectrum of diseases with varying severity (USEPA, 2010). Research on the dose-response relationship of Adenoviruses, using Low Pressure (LP) UV radiation on a bench-scale collimated beam setup, is mainly limited to Adenovirus types 2, 40, and 41. The dose response relationship at high UV doses (>200 mJ/cm^2) is more widely published for Adenovirus type 2 (Ad2), and shows that 6-log reduction of Ad2 may be obtained at a dose of 235 mJ/cm^2 (Gerba *et al.*, 2002). The dose response relationship of Ad2 as well as other viruses is shown in Figure 5.15, demonstrating that Ad2 is a conservative surrogate for a wider range of virus.

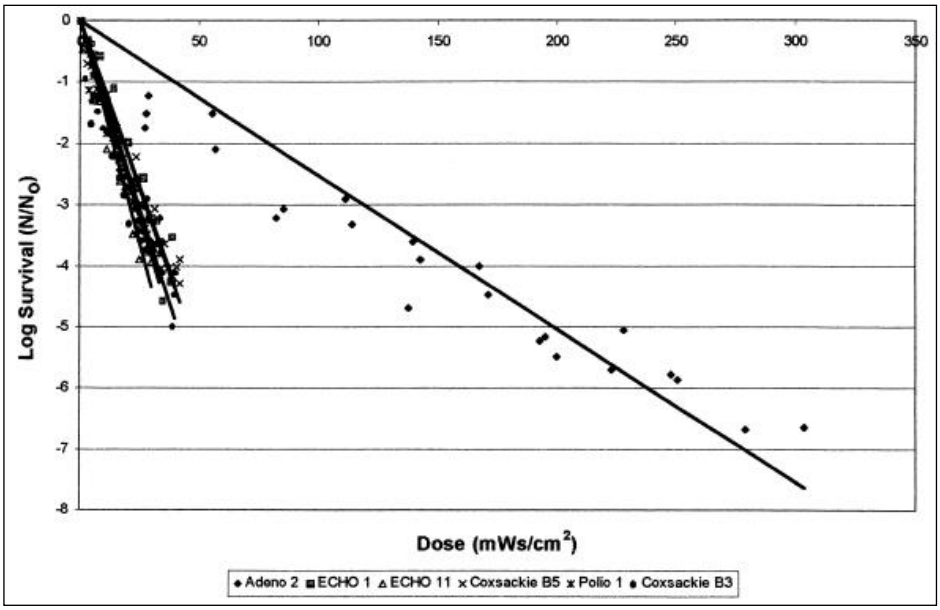

Figure 5.15 LP UV Dose Response Relationship of Ad2

USEPA (2010) published a dose-response equation for Ad2 of:

$$\text{Log Reduction} = 0.0262 * \text{UV Dose} + 0.2774$$

This dose response relationship is based on a dose range between 20 and 160 mJ/cm^2 (USEPA, 2010). Other studies have shown similar dose responses, consistently indicating that a 6-log reduction of Ad2 is met with a LP UV dose of up to 235 mJ/cm^2.

Pertaining directly to Oxnard and their Trojan D72AL75, the following can be said:

- The system, with five banks in series, results in a predicted UV dose of >250 mJ/cm^2 at a UVT of 80.8 percent. For a UVT of 95 percent or higher, as is the case for potable reuse projects using RO permeate, the UV dose will be substantially higher.
- 6-log adenovirus can be obtained based upon a UV dose of 235 mJ/cm2. Because MS2 is more sensitive to UV light than adenovirus, using an MS2-based validation conservatively estimates dose for adenovirus. The underlying concept for this conclusion is found in the discussion of RED bias in USEPA (2006).
- USEPA (2006) (Table 5.3 below) provides data on the dose required for up to 4-log reduction, but did not go further as such higher reductions are not required for drinking water disinfection applications.
- In total, the UV system, operating at a UV dose in excess of 250 mJ/cm^2, installed at the AWPF is sufficient to provide 6-log reduction of both virus and protozoa.

Table 5.3 UV Dose Targets for Log Inactivation Credit, mJ/cm^2 (USEPA, 2006)

Target	0.5-log	1.0-log	1.5-log	2.0-log	2.5-log	3.0-log	3.5-log	4.0-log
Crypto	1.6	2.5	3.9	5.8	8.5	12	15	22
Giardia	1.5	2.1	3	5.2	7.7	11	15	22
Adenovirus	39	58	79	100	121	143	163	186

5.4.4 NDMA Destruction Performance and Correlation to Disinfection Performance

While this section of the report is focused on disinfection credits, the destruction of NDMA provides a clear documentation of high UV dose delivery, and thus a high level of disinfection.

NDMA destruction is required to reduce RO permeate NDMA concentrations to below the DDW notification level of 10 ng/L (ppt). NDMA destruction has a proven correlation with UV dose, as shown in Figure 5.16, below. Using the information below, 1-log reduction of NDMA correlates to a UV dose in the range of ~700 to ~1100 mJ/cm^2. Such a wide variation does require further refinement by the industry. However, remembering that our disinfection target dose is 235 mJ/cm^2, there is a margin of comfort that dose sufficient to meet NDMA targets will also be sufficient to provide disinfection. Using the NDMA destruction dose/response from Sharpless and Linden (2003), the results of 22 NDMA destruction test runs at Oxnard can be evaluated for dose delivery and accuracy of system control, as shown in Figures 5.17 and 5.18, below.

Note: The NDMA data was collected over four different days, and the influent concentrations to the UV AOP system was consistent on each specific day, but varied from one day to the next. Thus, the NDMA destruction analysis utilized the average of influent NDMA concentrations for each day. Daily influent numbers, in ng/L, are shown below:

- 5/4/2016 - 32, 23, 29, 25, 23, 28.
- 6/20/2016 - 28, 32.
- 6/21/2016 - 24, 22, 19, 23, 20.
- 6/22/2016 - 11, 12, 13, 12.

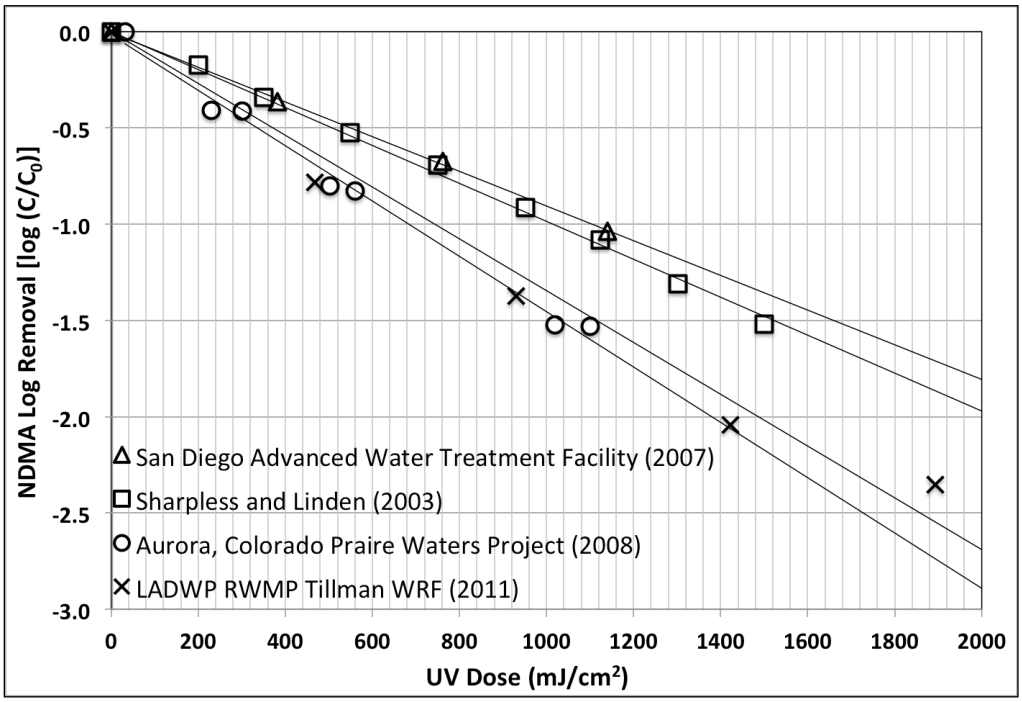

Figure 5.16 Collimated Beam Bench Testing Results for NDMA Collected in different Studies

(Sources of Data: City of San Diego, 2007; Sharpless and Linden, 2003; Swaim et al., 2008; Hokanson et al., 2011). The Colorado Prairie Waters Project in Aurora, Colorado is the only reference study that used hydrogen peroxide (5 mg/L). The results shown for the other three studies used UV photolysis (graphic credit: Trussell Technologies).

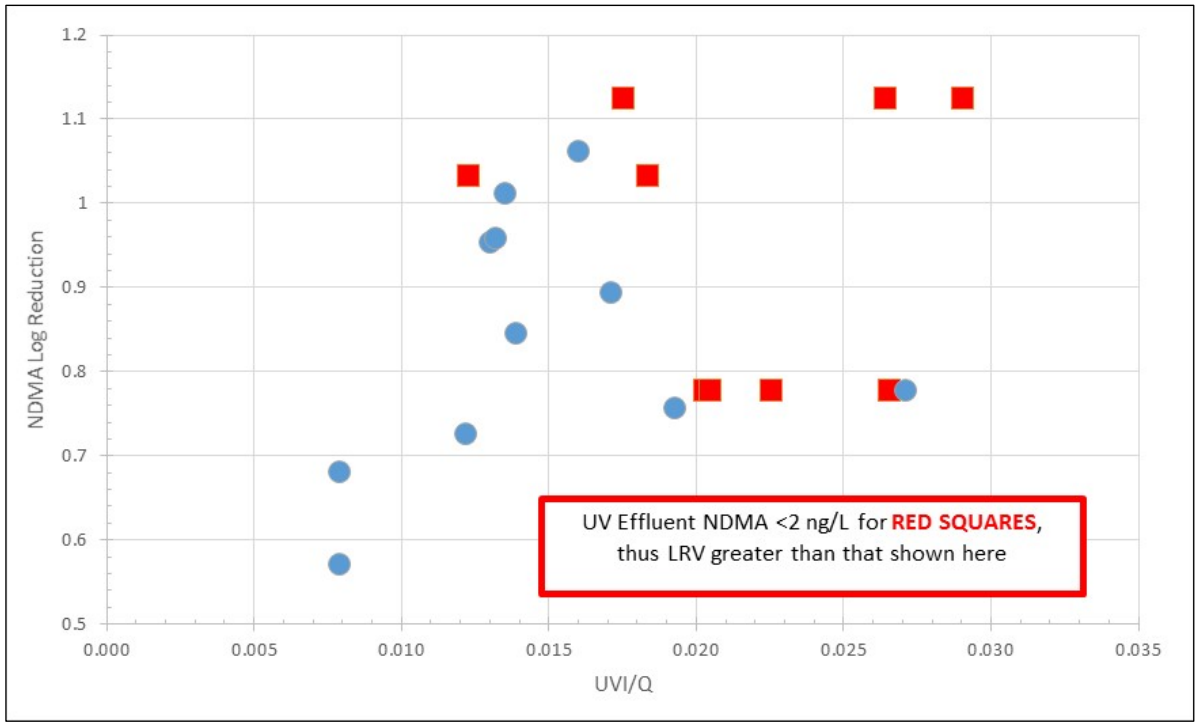

Figure 5.17 NDMA Destruction as a Function of UVI/Q

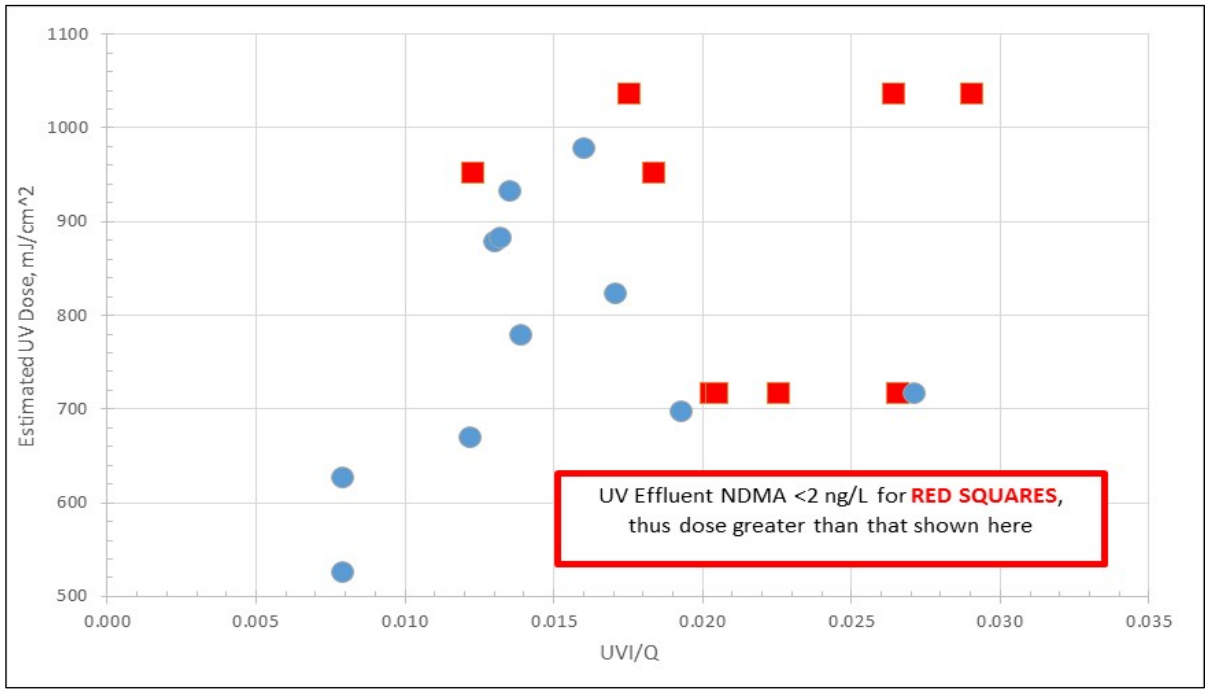

Figure 5.18 UV Dose as a Function of UVI/Q

The data in the figure above cannot be trended because a large number of the test events had NDMA below detection (<2 ng/L) in the UV effluent. However, this information can be used as a set-point

control or alarm system for both disinfection and NDMA destruction based upon the following approach:

- NDMA concentrations in the RO permeate, through limited testing, have been in the range of 11 to 32 ng/L. Using the highest measured influent concentration (32 ng/L), and targeting the NDMA notification level of 10 ng/L, a minimum NDMA destruction of 0.5 is appropriate.
  - Assuming that NDMA levels in the RO permeate will vary from the measured numbers, and understanding that some level of operational safety factor is warranted to meet the 10 ng/L target, an advanced treated recycled water NDMA target of 5 ng/L is recommended, resulting in a need for an NDMA reduction target of 0.8-log.
  - 0.8-log NDMA destruction, based upon the collected data, can be obtained at a UVI/Q of 0.014 (with UVI being the sum of all UVI for operational reactors and Q being the total flow to the system in gpm).
- Regarding UV dose, the UVI/Q of 0.014 correlates to a UV dose of >800 mJ/cm2, well in excess of the dose needed for 6-log reduction of all known pathogens.

An important question thus exists on the capacity of the UV system under reduced UVT conditions, as detailed in Table 5.4 below, which predicts the UVI based upon the sensor equation and data detailed previously. As shown, even at a much reduced UVT of 95 percent, the UV system is projected to attain a UVI/Q of 0.018, which is greater than the minimum desired value of 0.014.

Table 5.4 UV Capacity to Meet NDMA Target of 5 ng/L

UVT	Q, mgd (gpm)	UVI for One Bank, mW/cm^2	# Banks in Operation at 100% Power	Combined UVI, mW/cm^2	UVI/Q
Ambient (~99%)	6.25 (4,340)	23.6	5	118	0.027
Reduced (95%)	6.25 (4,340)	15.6	5	78	0.018

5.4.5 1,4-Dioxane Destruction Performance

The UV AOP system, per DDW regulations (SWRCB, 2018a) must demonstrate 0.5-log reduction of 1,4-dioxane, or demonstrate destruction of a wider range of trace pollutants. Similar to ongoing and recently completed work for the City of LA (LA Sanitation, LASAN) and the Santa Clara Valley Water District (SCVWD), Seeding and destruction of 1,4-dioxane is the most precise method for such performance demonstration. Testing was completed over a range of H_2O_2 (hydrogen peroxide, peroxide) doses to demonstration 0.5-log reduction of 1,4-dioxane. Values for UVT, UV intensity, and UV reactor power were recorded. Testing was performed in triplicate, with all seeding and sampling done over a two-day period, with results shown in Figures 5.19 and 5.20.

Figure 5.19 indicates that a minimum Peroxide Weighted Dose (peroxide dose * UVI/Q) should be in the range of 0.072 to 0.088. Assuming the more conservative peroxide weighted dose of 0.088, the following target UVI/Q values are recommended:

- Peroxide dose of 3 mg/L - *Minimum* UVI/Q = 0.029;
- Peroxide dose of 4 mg/L - *Minimum* UVI/Q = 0.022;
- Peroxide dose of 5 mg/L - *Minimum* UVI/Q = 0.018.

Understanding that the installed system is controlled based upon an NDMA LRV and not a UVI based control, the recommended approach is to adjust the NDMA LRV setpoint to attain, on average, a UVI/Q value of 0.018 or higher, then provide for a constant peroxide dose of 6 mg/L, thus consistently

providing for a Peroxide Weighted Dose of 0.108 (greater than the conservative value of 0.088 documented above).

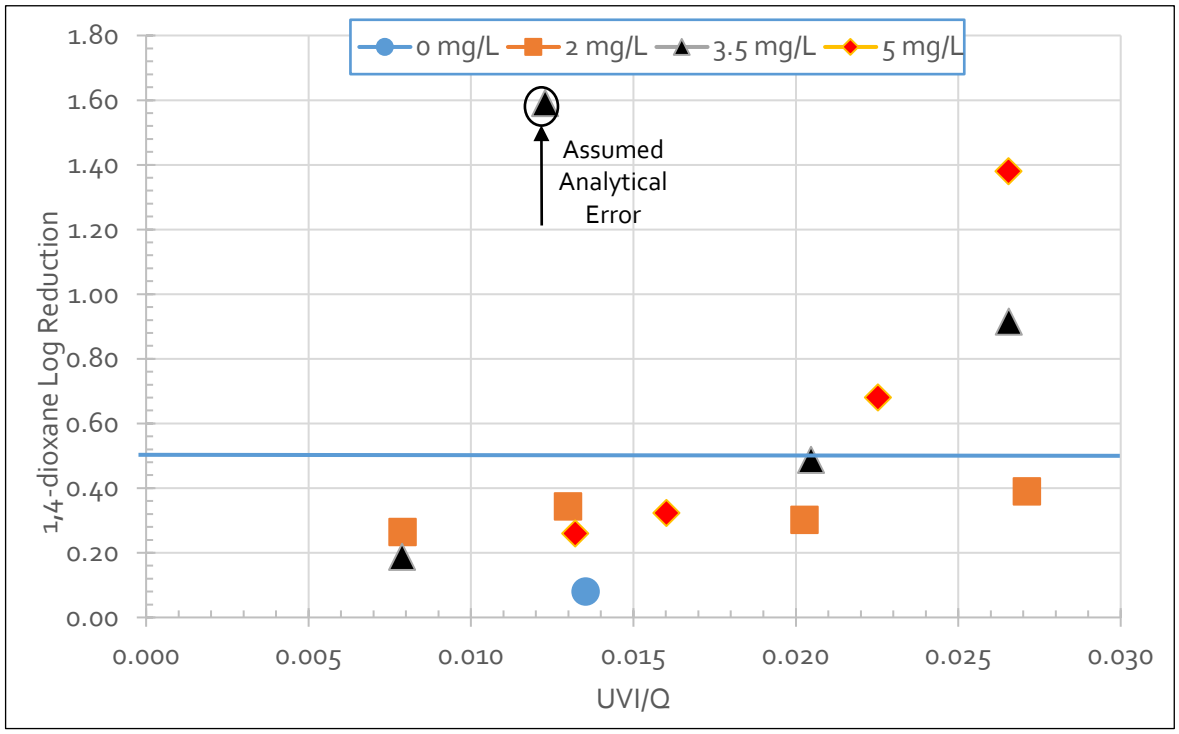

Figure 5.19 1,4-dioxane Destruction as a Function of UVI/Q and Peroxide Dose

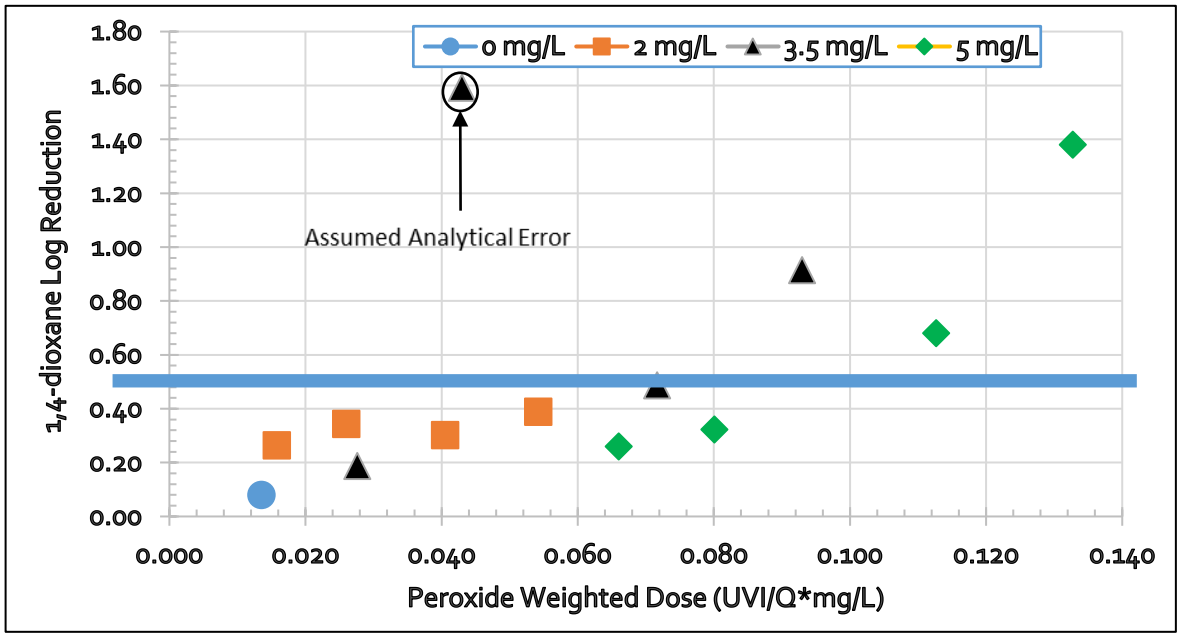

Figure 5.20 1,4-dioxane Destruction as a Function of Peroxide Weighted Dose

5.4.6 UV AOP Setpoint and Control for Disinfection, NDMA Reduction, and 1,4-Dioxane Reduction

The following conclusions can be made regarding system setpoints, control, and monitoring to meet disinfection, NDMA destruction, and 1,4-dioxane destruction for potable water reuse:

- The recommended UVI/Q to reliably below the 10 ng/L NDMA notification level is 0.014. This correlates to a minimum NDMA log reduction of 0.8, which also correlates to a UV dose well in excess of 235 mJ/cm^2 (the minimum UV dose for 6-log adenovirus disinfection).
- The use of 6 mg/L peroxide allows for the use of a minimum UVI/Q of 0.018 for 1,4-dioxane destruction.
- As shown in Table 8 (above), at a UVT of 95 percent, with 5 of 6 reactors in service, the installed system is projected to be able to attain the target 0.018 UVI/Q value; while still allowing for maintaining one UV reactor as redundant.
- **Thus, the key conclusion is that the installed system has sufficient capacity to meet disinfection, NDMA destruction, and 1,4-dioxane destruction at peak flow (6.25 mgd) and at a reduced UVT (95 percent).**

The remaining focus is the determination of what NDMA LRV setpoint is necessary to maintain the target UVI/Q of 0.018, and what level of additional monitoring is necessary to provide confidence in the maintenance of UVI readings over the lifetime of operation; as follows:

- As part of startup testing, the project team collected the necessary data to compare UVI/Q with the NDMA LRV setpoint, as shown in Figure 5.21. With one exception, the existing control system maintained a UVI/Q at or above ~0.013, which is noticeably below the recommended target of 0.018. **Accordingly, our recommendation is to adjust the NDMA LRV setpoint from 1.0 to 1.0*0.018/0.013, which results in a NDMA LRV setpoint of 1.4.**
- UVI/Q is not within the existing control system. On a daily basis at a minimum, AWPF staff shall hand record the UVI readings of all operational UV reactors, the flow through the UV reactors, the predicted NDMA LRV value, and calculate the UVI/Q. Should the UVI/Q value drop below 0.018 on a 30-day running average, the NDMA LRV setpoint shall be increased as needed to bring the 30-day running average above 0.018.
- On a quarterly basis, a reference set (6) of calibrated UVI sensors will be installed into the entire UV reactor and UVI readings will be compared to readings with the duty UVI sensors[2]. Readings for both the duty and reference sensors will be compared under similar operational conditions (hand control, all banks on at full power). Should the reference and duty UVI values be roughly equivalent (~20 percent), the reference sensors will be removed and replaced with the duty sensors. Any duty sensor that varies by more than 20 percent from the reference sensor will be replaced by the reference sensor and the duty sensor will be sent back to Trojan for calibration.

[2] The sensors are located under the end cover, which will de-energize the system when removed (a safety feature). Therefore the reference sensor check would involve recording the sensor value, shutting down and swapping sensors, and then starting/warming up the system again to check the second sensor response. The sensor is held in a quartz sensor sleeve so the reactor would not have to be drained.

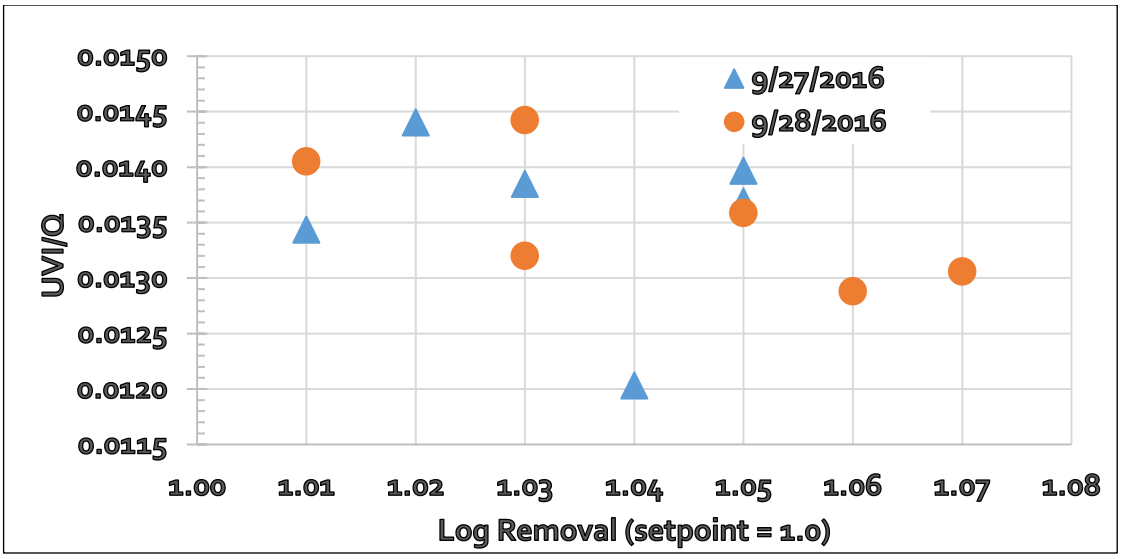

Figure 5.21 UVI/Q and NDMA LRV Control System Comparison

As a final point of comparison, DDW has become accustomed to the EEO concept for system control and permitting. Figure 5.22 plots the calculated EEO as a function of UVI/Q, presented here for information only. This data suggests that an EEO target would be in excess of 0.230 for Oxnard's particular application.

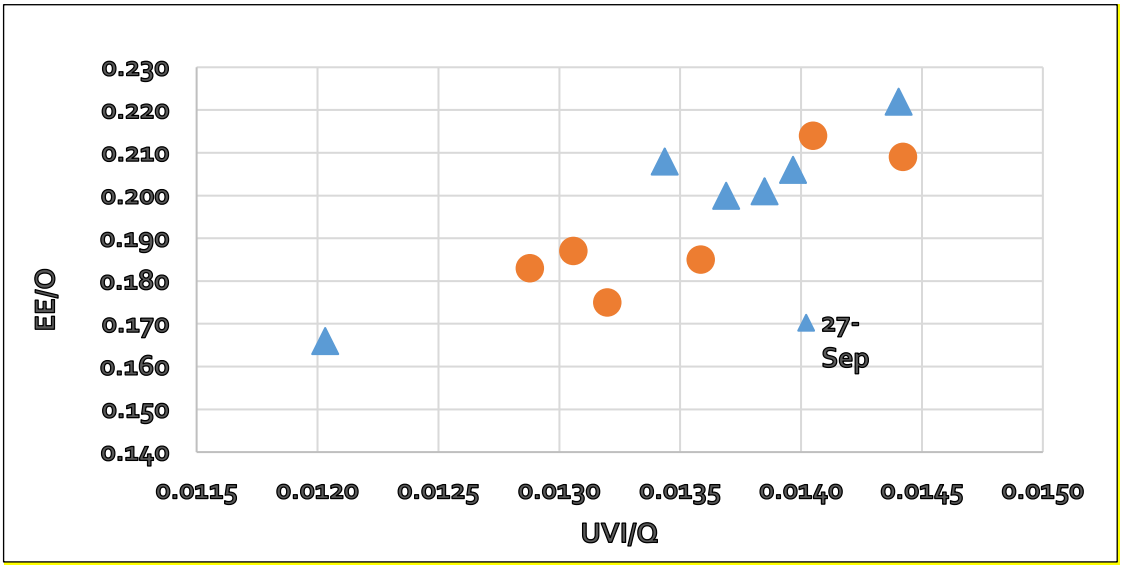

Figure 5.22 UVI/Q and EEO Comparisons

5.5 Subsurface Pathogen Removal Credit

Per DDW regulations (SWRCB, 2018a), utilities employing groundwater injection are granted 1-log virus removal credit per month of subsurface travel time, but are currently not granted credit for protozoa removal. Recent work by the WateReuse Research Foundation (led by Jorg Drewes) has documented the subsurface die-off rate of *Cryptosporidium* at 0.025 to 0.072-log reduction per day, with a mean of 0.039-log reduction per day (Drewes *et al.*, 2014). For 6-months of underground storage, the work by Drewes suggests 7-logs of die-off. Peng *et al.* (2008) reported 85 to 268 days of

time to result in 1-log die-off of *Cryptosporidium* in sterile water at 4 degrees C. For 6-months of underground storage, the work by Peng suggests 0.7 to 2.1-log die-off. Per the April 2016 letter from DDW to the City, the DDW is not ready to allow protozoa removal credits based upon the referenced literature.

For the proposed groundwater recharge projects the water will be in the subsurface for a minimum subsurface retention time of 2 months, though longer periods may be required to attain the full 12-log virus credit requirement. Based upon current virus credits documented in Table 5.5, the minimum subsurface time is 3.1 months.

Table 5.5 Total Pathogen Log Reduction Credits

Process	Virus	*Giardia*	*Crypto*
Primary/Secondary Treatment	1.9	0.8	1.2
MF	0.0	4.0	4.0
RO	1.0	1.0	1.0
UV Advanced Oxidation	6	6	6
Groundwater Retention Time	3.1	0.0	0.0
Totals	***12.0***	***11.8***	***12.2***
DDW Requirements	***12***	***10***	***10***

5.6 Findings for Disinfection Credit

When taken together, the treatment processes discussed in Section 5.1 have the ability to meet (and exceed) the 12/10/10 pathogen log reduction requirements specified in the groundwater recharge regulations, as shown in Table 9. The total pathogen log reduction credits are 12.0/11.8/12.2 for a groundwater recharge project with 3.1 months of subsurface storage time.

Oxnard will be installing online TOC meters before and after RO, which is anticipated to provide greater pathogen credit through RO. Oxnard also intends to conduct a more detailed pathogen removal study through primary and secondary treatment. These results are, based upon the limited work already done, result in higher pathogen log removal through primary and secondary treatment. The anticipated most important result of the greater pathogen removal by RO and by primary and secondary treatment is greater virus reduction, which will allow for less reliance on groundwater time for virus credit. As such, **Oxnard requests flexibility from DDW and the RWQCB to adjust the time underground of the purified water, the RRT, based upon the collection of the aforementioned new data and the submittal of that new data to DDW and the RWQCB as part of monthly reporting.**

Section 6

GROUNDWATER RECHARGE OPERATIONAL STRATEGY

As mentioned previously, the City proposes one groundwater recharge operation (one ASR well) at this time with a capacity of ~2.9 mgd, and with future addition of wells to maximize the use of up to 6.25 mgd of water from the AWPF. This operation is proposed with 100 percent recycled water (i.e., no blending with diluent water). The City plans to inject the advanced treated recycled water into specific wells at the Campus Park location into aquifer zones within the Lower Aquifer System (LAS), keep the water underground for a minimum of 3.1 months (or the required response retention time [RRT]), then extract the water from the same ASR well for potable and non-potable use. In the future, should the City implement more advanced monitoring for the RO system and gain greater credits, the minimum time of 3.1 months may be reduced to 2 months.

This summary is based upon Hopkins (2016) study, which is included as Appendix B – Hydrogeological Study Report. The Hopkins report is provided to comply with regulations pursuant to section 60320.200(h), with a short summary provided here. **The first single ASR well has been installed at the Campus Park location, with an anticipated capacity of 2,000 gpm (2.9 mgd), with future wells and capacity to be added at Campus Park and other locations, as summarized in Table 1.** A pair of wells is anticipated to be necessary to fully utilize the operational capacity of each aquifer zone available for replenishment and reuse at the Campus Park site. This first well (and future wells) will inject advanced treated recycled water into a discrete aquifer zone(s) in the LAS and subsequently facilitate groundwater extraction after the required RRT is achieved and regulatory approval is granted.

The Campus Park location is ideal, as the ASR wells and monitoring wells can all be placed on City property, thus firmly controlling the use of groundwater in this area. Further, the proposed injection is into the LAS, whereas nearby potable wells are all in the Upper Aquifer System (UAS), and thus hydraulically isolated from the LAS. The closest well to the ASR location that is constructed within the LAS is located nearly 1 mile to the east and is owned and operated by the City.

The construction of ASR well facilities in discrete aquifer zones uses the isolation of natural clay layers to allow simultaneous operation of replenishment, retention, and reuse without mutual interference. Wells located in Aquifer 1 are by design isolated from wells located in Aquifer 2 and 3. Utilization of the confined aquifer system in this manner will allow optimization of a continual ASR operation and full utilization of the wellfield location. Utilization of discrete aquifer zones also serves to preservation of the replenished water quality and minimizes mixing with native groundwater. This type of operation will require validation that the minimum time requirement is in compliance prior to the distribution of recycled water.

The ASR operation, upon full execution, will involve recharge of some wells concurrent with extraction of water from other wells. This process is intended to be flexible to allow the City to maximize recharge of the groundwater. One potential example of operation is as follows:

- Recharge ASR Well No. 1 in confined Aquifer 1 at flows up to 2,000 gpm. The period of recharge time must be sufficient so that recharged water does not migrate to off-site potable water wells. The duration of injection may range from 3.1 months to 6 months or greater.
- After the allocated time, stop recharge of ASR Well No. 1. Hold water in Aquifer 1 for a minimum of 3.1 months or the required RRT starting from the time the last drop of water entered the ASR well.
- Extract Water from ASR Well 1 at a rate of up to 3,000 gpm.
- Repeat the three steps described above in rotation for all operational ASR wells to allow a continual IPR operation.
- Methods to prevent a cross connection during injection, during the necessary 3.1 months of hold time (RRT), and during extraction are presented previously in Chapter 3.

Though this operation is fully intended as an ASR operation, in the event that some recharged water is not extracted and migrates toward drinking water wells, the time to the nearest downstream potable water supply well must be determined and documented to be more than 3.1 months of time for this project, though regulations allow for as little as 2 months of travel time as long as all pathogen reduction criteria are met.

Utilizing a conservative estimation of soil porosity (15 percent), an average hydraulic conductivity value of (125 feet /day), and the range of groundwater gradients calculated from available data, Hopkins (2016) used the average linear flow velocity equation to predict the subsurface travel time caused by the seasonal gradients in the aquifer system.

During normal to wet years, the groundwater gradient is toward the southwest away from the Oxnard Forebay, the primary area of aquifer recharge (Hopkins, 2016). During dry years, the groundwater gradient is predominantly westward toward the area of greatest agricultural use (Hopkins, 2016). During a drought with repeated dry years where the groundwater levels in the aquifer system fall below sea level, the groundwater gradient migrates to the north toward inland pumping and away from the ocean where offshore storage is located in the aquifer system. The movement of groundwater caused by the regional gradient is slow and results in very little movement of the injected advanced treated recycled water plume, with an estimated travel time of between 0.17 and 0.92 feet per day.

The injection of advanced treated recycled water at 2,000 gpm results in a purified plume at a ~1,000 foot radius and ~1,500 foot radius after 3 months and 6 months of continuous injection, respectively (Hopkins, 2016). Using the 0.17 to 0.92 ft/day travel time, the advanced treated recycled water will move 30 to 165 feet in the direction of groundwater flow (to the Southwest or to the North) over a period of six months (during 3 months of injection and 3 months of retention). DDW regulations (SWRCB. 2018a) require a safety factor of 4 times the distance for groundwater calculations using Darcy's law methods (0.25 log credit for virus and 0.25-month response time credit per month of transport using Darcy's law methods). This results in a

projected movement of 120 to 660 feet after the completion of a 180-day injection and retention period. This distance is significantly short of the distance to the nearest potable wells, both municipal and private wells.

After the 2-year injection period at 2,000 gpm, the area of the displaced volume is predicted by Hopkins (2016) to not reach the nearest potable supply well (City Well No. 20, located in the LAS). **Note: until tracer studies document otherwise, the maximum proposed injection period is 90 days.**

The proposed monitoring well locations and related hydrogeology are also documented by Hopkins (2016). These well locations are intended to track the travel time of the injected water (greater than 2 weeks and less than 6 months, in accordance with DDW regulations (SWRCB, 2018a). As proposed, the three monitoring wells will sufficiently define the groundwater gradient in Aquifer 1. The location of Monitoring Well No. 2 is between the proposed ASR well and the City municipal supply Well No. 20. The differential well spacing will generate data through tracer testing to confirm the displacement rate of native groundwater. As detailed by Hopkins (2016), Monitoring Well No. 1 is anticipated to see the recharge bubble within 2 weeks while Monitoring Well No. 2 should see the recharge bubble at around 60 days. If our estimates are accurate, Monitoring Well No. 3 will not see the recharge bubble prior to the end of 90 days of recharge.

Section 7

MONITORING AND RESPONSE RETENTION TIME

Over time, detection of trace pollutants in the monitoring wells and reduced treatment performance may occur. Depending upon the issue, the City may handle the issue internally, or, in the event of a regulatory exceedance, the City must provide the appropriate notification to DDW and RWQCB staff. These meetings and discussions will determine if the produced water remains protective of public health or if some form of mitigation is required. The need for and magnitude of response from the City will be based upon the following analysis:

- **Analytical detection of a pollutant above a regulated value.** The City will resample the groundwater and concurrently evaluate the AWPF performance. Should resampling still demonstrate non-compliance, appropriate remediation measures will be taken, which may include shutting down production wells or installation of well-head treatment for wells that may extract inadequately treated water. For the ASR operation, the ASR wells can be put into extraction mode and water can be pumped and used for non-potable applications.
- **Analytical detection of a pollutant below a regulated value.** The City will evaluate the occurrence, cause, and significance of the trace pollutant at the AWPF and may take corrective measures to reduce the concentration of the pollutant, either through source control or through treatment process modification.
- **Process failures or online metering/process monitoring failures above regulated values.** The City will evaluate the potential impact on treatment performance, both in terms of pathogen reduction and trace pollutant reduction.
- Included in the analysis by City and regulatory staff is the potential impact of dilution and attenuation of the pollutant of concern in the groundwater basin. Because the ASR operation is intended to be a fill and draw operation with minimal loss of injected water, dilution is not anticipated to be significant.

For the purpose of the RRT, the City anticipates a time period of 4 to 6 weeks for resampling, analysis of treatment processes, and regulatory consultation, as detailed below. This time value is less than the proposed minimum RRT of 3.1 months, as reviewed below.

7.1 Proposed Response retention Time (RRT) Concept

The ASR operations will follow the requirements of DDW regulations (SWRCB, 2018a), Sections 60320.200(b) and 60320.224. For the ASR project, the RRT is based entirely upon City operation of the well. The minimum time of storage for this ASR operation will be 3.1 months to meet the pathogen credits for potable reuse. In the event of a stoppage in ASR operation, the travel distance to the nearest potable water well (City Well #20) is ~4,000 feet. As shown by Hopkins (2016), two years of continuous recharge does not reach City Well #20. As only a 3-month to 6-month recharge period is originally proposed, and as DDW requires a 4X safety factor for Darcy's Law estimations, a 6-month RRT is readily achieved without having the advanced treated recycled water reach a potable well.

For this project, a RRT of three months is more than sufficient to:

- Gain 3-log virus credit through subsurface storage time.
- Identify a treatment failure or detect an inadequately-treated constituent.
- Consider appropriate actions to protect public health.
- Implement corrective measures.

7.1.1 Online Process Control Monitoring

The AWPF controls are designed to maintain water quality that is protective of public health. The AWPF will have both continuous online monitoring and periodic monitoring of treatment performance. Production of water for IPR applications may cease based upon the process monitoring approaches listed in Table 7.1. The RRT for each of these monitoring approaches is also included within Table 7.1.

The original Operations and Maintenance Management Plant (OMMP, KEH, 2015)[3], has been updated based upon the work documented herein into the Draft Operations Optimization Plan (OOP, MV Engineering, 2018). The Draft OOP provides further details on the operations and control concepts for the production of water for non-potable and potable reuse.

7.1.2 Offline Analytical Monitoring

Details on the required water quality monitoring and the proposed sampling plan are included in Sections 9 and 17, respectively. This section provides information on the RRT for sampling, analytical monitoring, and response.

The monitoring and control of the MF, RO, and UV AOP systems focuses on process performance to maximize pathogen reduction, plus additional monitoring of trace constituent removal or destruction. The offline monitoring program focuses on chemicals that could present a chronic risk. Most of the monitored constituents are regulated based on conservative estimates of the lifetime health risk associated with chronic exposure. Accordingly, the RRT must be sufficient to respond to acute health concerns such as pathogens as well as several specific chemicals (e.g., nitrate, nitrite), but need not necessarily account for the response time for constituents with long term chronic concerns.

With the above context, the project team examined the RRT for different analytical parameters that represent a chronic concern (Table 7.2). Because the groundwater storage time for this ASR project is at least 3.1 months, there is more than sufficient RRT to address any potential issues related to regulated and non-regulated constituents.

[3] This document, which has previously been reviewed by DDW, can be provided upon request.

Table 7.1 RRT Values for Online and Periodic Treatment Process Control

Process	Monitoring	Regulatory Requirement	Issue	Evaluation Approach	Operational Response	*RRT*
MF	Online filtrate turbidity	0.2 NTU.	A properly functioning MF should produce a filtrate with a turbidity of <0.2 NTU.	• Calibrate online meter using bench-scale results. • Examine trend turbidity with time, watch for increasing filtrate turbidity with time, indicative of loss of membrane performance.	• Shut down out of compliance train. Bring on redundant MF train if turbidity continues to exceed 0.2 NTU. • Reduce or shut down water production if insufficient MF capacity to meet turbidity standards. • Perform DIT and repair membranes.	Minutes to Hours
MF	Daily pressure decay testing (also called DIT)	Performance requirement of <0.8 psi/5min.	DIT failure suggests breach in MF, resulting in reduced a removal of particulates (including protozoa) by MF.	No evaluation, see Operational Response.	• Shut down out of compliance train. Bring on redundant train. • Reduce or shut down water production if insufficient MF capacity exists. • Repair membranes.	One day if DIT done daily. Shorter RRTs if DITs done more frequently.
RO	Online EC	• Either EC or TOC online monitoring required to document performance. • Log reduction of EC across RO can be used to prove pathogen credits.	Log reduction of EC across RO is trending down, indicating RO membrane decay or some other leak.	• Verify/calibrate online EC meters with bench-scale testing. • Profile RO vessels to find damaged membrane or seal.	Replace damaged RO membranes or seals.	Hours to Days
RO	Online or periodic TOC	• For the first 20 weeks of operation, ROP TOC must be ≤0.25 mg/L 95% of the time based upon weekly or more frequent sampling. • Subsequent to 20 weeks, ROP TOC must be ≤0.5 mg/L. • Log reduction of TOC can be used to continuously measure RO performance.	• High TOC in ROP suggests either a breach in the RO membrane or the existence of low molecular weight compounds that can pass through RO. • Log reduction of TOC across RO is trending down, indicating RO membrane decay or some other leak.	• Verify/calibrate online TOC meters with bench-scale testing. • Sample RO influent and ROP for analysis of a wide range of trace organic and regulated compounds. • Profile RO vessels to find damaged membrane or seal. Profile to be done using EC, as above.	Depending upon the results of the evaluation: • Replace damaged RO membranes or seals. • Implement a source control solution.	Days to Weeks
UV AOP	Online F	No set value. ROP typically has a UVT of 98 to 99%. The UV system is designed to provide a target dose based upon an assumed UVT value of 95%.	• Trending of UVT down suggests either the passage of low molecular weight organics through the RO or suggests damage to the RO process. • Reduced UVT will impact the ability of the existing UV system to deliver the proper UV dose.	• Verify/calibrate online UVT meter with bench-scale testing. • Sample RO influent and ROP for analysis of a wide range of trace organic and regulated compounds. • Profile RO vessels to find damaged membrane or seal. Profile to be done using EC, as above.	Depending upon the results of the evaluation: • Replace damaged RO membranes or seals. • Implement a source control solution.	Days to Weeks
UV AOP	NDMA LRV Based Upon a Target UVI/Q	UV intensity is used to measure the combined impact of lamp output decay and sleeve fouling. UV intensity can also be used as part of UV reactor dose control. For this project, the UVI/Q is recommended as a daily verification of performance to support the NDMA LRV-based operation.	Reduced UV intensity suggests one of several issues: • Aged lamps that must be replaced. • Fouled sleeves that must be cleaned. • Reduced UVT.	• Verify accuracy of online UVT meter (above). • Verify that UV intensity sensor is properly seated in sensor port. • Check UV intensity sensor accuracy with reference sensor(s). • Remove and replace UV intensity sensor with a standby sensor. • Pull representative quartz sleeve, clean, and replace. Alternatively, clean all sleeves. Recheck sensor intensity.	Depending upon the results of the evaluation: • Replace sensor. • Clean all sleeves. • Replace lamp(s). • Calibrate UVT meter.	Hours to Days

Table 7.2 RRT Examples for Analytical Monitoring of AWPF and Monitoring Wells

Location	Parameter	Frequency	Performance Requirement	Issue	Evaluation Approach	Operational Response	RRT
Monitoring Wells	Primary MCLs	Quarterly	Varies	Primary MCLs are typically met in secondary effluent. Detection of pollutants near, at, or above the MCLs suggests a high pollutant load at the OWTP and a lack of performance through the AWPF.	• Resample compliance point in question. • If detection was at the monitoring well, sample advanced treated recycled water at the AWPF. • Profile OWTP and AWPF systems as needed.	• Repair process components. • Evaluate other sources of pollutant that may be contributing to the pollutant at the monitoring well.	Sampling is quarterly. Response time, including repeat samples and analysis is a minimum of two weeks. Reasonable RRT is 16 weeks.
Monitoring Wells	Total Coliform	Quarterly (wells)	≤2 MPN/100mL	Total coliform detection at the AWPF is likely sample contamination or sampling from a line with regrowth. Legitimate breakthrough of total coliform suggests a large performance failure.	• Resample compliance point in question. • Concurrently sampling for fecal coliform. • Evaluate treatment processes for compliance with various operating criteria.	• Repair process components. • Evaluate other sources of pollutant that may be contributing to the pollutant at the monitoring well.	Sampling is quarterly for the monitoring wells. Response time, including repeat samples and analysis is a few days. Reasonable RRT is 13 weeks.
AWPF Advanced treated recycled water	NDMA	Quarterly	≤10 ng/L	Values in excess of 10 ng/L suggest either reduced UV performance or increased levels of NDMA in the secondary effluent.	• Sample advanced treated recycled water at the AWPF. • Sample RO influent and RO permeate. • Determine if the problem is UV performance or increased NDMA at the OWTP.	Depending upon the results of the evaluation: • Shut down water production or bring redundant treatment processes online. • Evaluate NDMA formation in the OWTP or increased NDMA loadings in the collection system.	Sampling is quarterly. Response time, including repeat samples and analysis is a minimum of two weeks. Reasonable RRT is 16 weeks.
AWPF Advanced treated recycled water	Total Coliform	Daily	ND-≤2.2 MPN/100mL	Total coliform should be removed after RO and after UV AOP. Existence of total coliform at the monitoring well suggests sample contamination or a much larger treatment process failure.	• Resample monitoring well. • Sample advanced treated recycled water at the AWPF. • Sample RO influent and RO permeate. • Concurrently sampling for fecal coliform.	Depending upon the results of the evaluation: • Shut down water production or bring redundant treatment processes online. • Evaluate other methods for total coliform contamination of the monitoring well.	Days
AWPF Advanced treated recycled water	Total Nitrogen	Weekly	<10 mg/L	Maintaining TN <10 mg/L assures that nitrate levels are also <10 mg/L. Nitrate is an acute health concern.	• Resample monitoring well. • Sample advanced treated recycled water at the AWPF. • Sample RO influent and RO permeate.	• Shut down water production until TN<10 mg/L.	Sampling is twice weekly, no more than 3 days between sampling events. Response time, including repeat samples and analysis is a minimum of three weeks. Reasonable RRT is four weeks.

7.2 Water Quality Failure Decision Protocol

This water quality failure decision protocol is intended to address a suspected water quality failure detected either at the AWPF (e.g., a process failure or an unknown chemical pollutant that passes through the AWPF) or within the groundwater monitoring system. For treatment plant failures that are detected at the AWPF, the advanced treated recycled water would be diverted to effluent discharge and not sent into the distribution system for water reuse applications.

For this analysis, two scenarios are assumed. First, a control system and/or alarm system failure is assumed at the AWPF, resulting in the noncompliant water being continuously produced and recharged into the groundwater basin. Second, non-compliant water quality is detected in the groundwater monitoring wells. In either of these cases, City staff will follow a detailed decision protocol to evaluate the situation and determine if the advanced treated recycled water quality presents a risk to public health.

The objectives of the decision protocol are as follows:

- Provide a mechanism to verify water quality in a rigorous and measured way. Effort also will minimize questions and concerns from City stakeholders and interested parties through effective communication of the sampling results and their implications.
- Have the City openly communicate water quality information with a single voice to deliver a clear and consistent message.
- Provide an organized process for data evaluation and reporting.

The first step in such a water quality situation is to shut down all water production for potable reuse (non-potable reuse would remain in operation as long as non-potable water quality standards are met). Figure 30 illustrates an example protocol that would follow cessation of production for potable water reuse[4]. Central to this protocol are two teams:

- The "Engineering/Operations Staff."
- The "Decision Committee."

Once a water quality problem is verified, non-compliant water will be extracted from the system and used for non-potable water reuse applications. As shown in Figure 7.1, proper notifications (e.g., public, regulators) will be completed, detailing the water quality challenge(s) and the implemented solution(s). Regulatory notifications will be done in accordance with Order No. 2011-0079-A02 (VII)(10) from the RWQCB. ***This protocol will be adopted by the City prior for the production of recycled water for potable reuse***.

7.3 Proposed RRT

The proposed RRT here is based upon responding to acute concerns, which are those associated with pathogens and a few chemical constituents (e.g., nitrate, nitrite). Thus, the proposed RRT can be calculated as follows:

RRT = Sample Collection (daily to twice per week[5]), Analysis and Regulatory Consultation Time (4 weeks) + Time to Provide Relief Measure or Alternative Source of Water (4 weeks) = 9 weeks.

[4] Modeled after the Santa Clara Valley Water District's (SCVWD's) Water Quality Response Protocol. The City and Carollo appreciates the use of this information.
[5] DDW requirements for TN (which provides a conservative measure for nitrate) is twice per week.

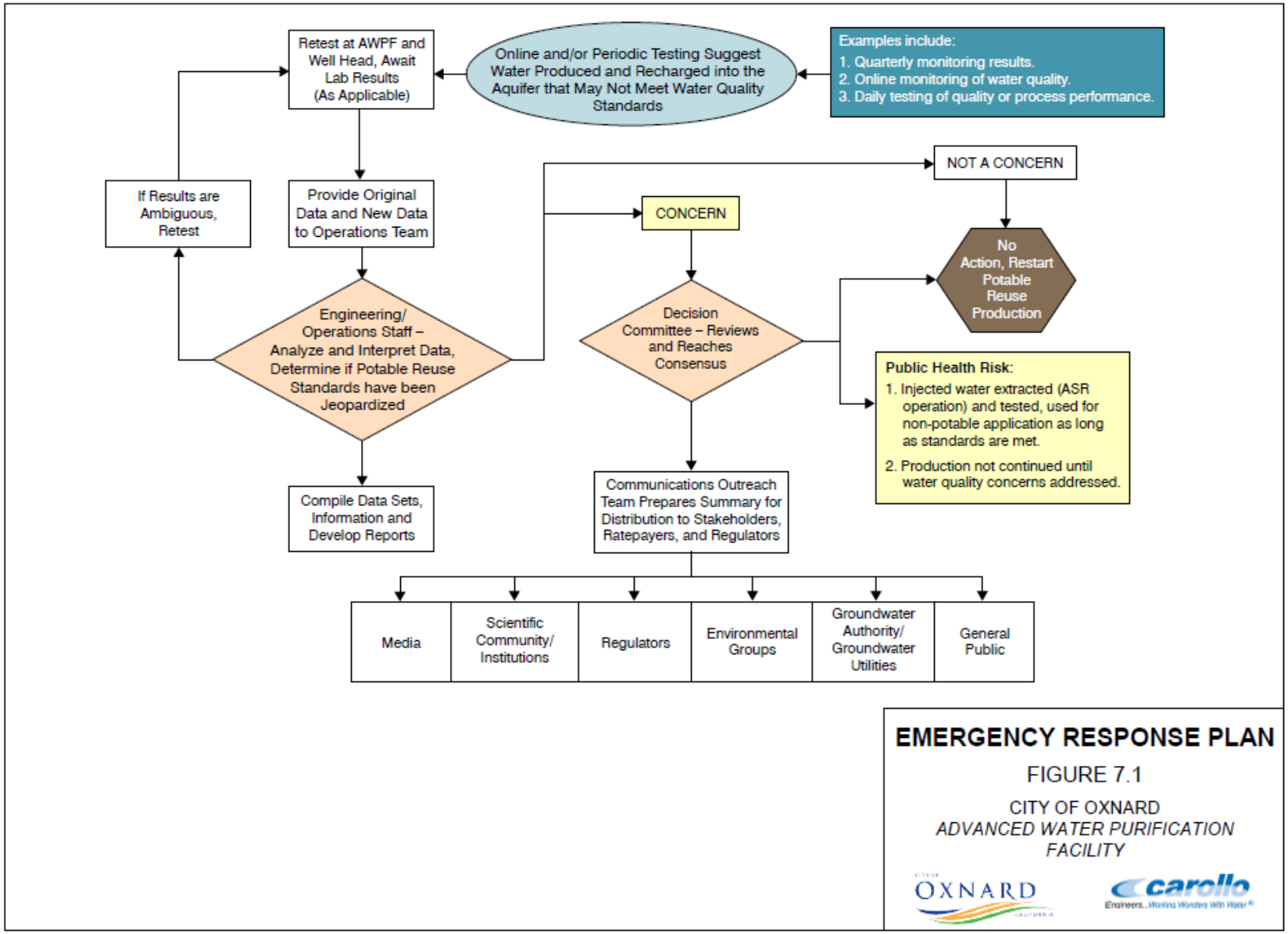

Figure 7.1 Emergency Response Plan

As detailed in Hopkins (2016) and in accordance with DDW regulations (SWRCB, 2018a) Section 60320.224, groundwater residence/travel times to the nearest potable well are estimated at more than 2 years for the ASR application. As the ASR fill and draw times are controlled, and the proposed project will leave the water in the ground for a minimum of 3.1 months, the RRT of 9 weeks will be reliably met.

Upon commencement of the project, these travel and residence times will be demonstrated through the use of intrinsic or added tracers, potentially TDS, chloride, and sulfate. Further details on startup testing, which includes the groundwater residence time demonstrations, is included in Section 17 of this report.

Section 8

NEED FOR ALTERNATIVE SOURCES OF WATER

Long-term sustainable capture and reuse of water supplies is the goal of the City. However, the City's short term water supply remains reliable and interruptions in the production of water from potable reuse do not constitute an emergency or short term problem. Thus, for failures in monitoring or process performance, or detection of pollutants in the groundwater monitoring network, the AWPF can be simply shut down and not produce water.

For ASR operations, if improperly treated water is injected into the aquifer, or if groundwater monitoring results do not meet regulatory limits, the water will be extracted from the ASR location, and one of the following will occur.

- If the water quality meets the requirements for non-potable reuse, the water will be sent off-site for non-potable reuse operations.
- If the water quality does not meet the requirements for non-potable reuse, well-head treatment will be employed to bring the non-compliant water to non-potable water reuse standards.

As the ASR wells are intended to extract the majority of injected water, and as the current groundwater analysis shows limited groundwater migration at the proposed ASR site, migration of injected water to off-site potable wells is not anticipated. With that said, DDW has requested that this report address such off-site migration. As illustrated in Hopkins (2016), the nearest potable water well to the proposed ASR location is City Well No. 20. In the event of contamination of that well, well-head treatment would be initiated, with the treatment based upon the type of contaminant. For pathogens, installation of a UV system and/or free chlorination could be employed. For trace pollutants, the use of activated carbon or advanced oxidation (which could be a UV-based process) could be employed. For nitrate contamination, ion exchange treatment would be employed.

Section 9

POTABLE REUSE WATER QUALITY

There are no federal regulations pertaining to water reuse, and water reuse regulations are developed at the state level. The main regulatory agency for water reuse in the State of California is the SWRCB. The SWRCB is separated into nine different RWQCBs that regulate water reuse projects in conformance with the regulations adopted by the DDW. The City is located within the jurisdiction of the LARWQCB.

The water quality limits for groundwater recharge with recycled water and the projected water quality for the AWPF are reviewed below. ***The proposed monitoring and reporting program, based upon the regulatory requirements, is detailed in Chapter 15.***

9.1 Water Quality Requirements

Tables 9.1 through 9.6 constitute the required water quality performance, consistent with DDW regulations (SWRCB, 2017). Within each table is a specific reference to the table within the regulation (e.g., Primary MCLs are listed in a table below and also found in Table 64431-A of SWRCB (2018b)). In addition to the DDW (SWRCB, 2017) water quality requirements provided in the following tables, the advanced treated recycled water from the AWPF facility will be required to satisfy the discharge limits included in the revised GREAT permit (R4-2011-0079-A01 and R4-2008-0083-A01) prior to injection.

Table 9.1 Inorganics with Primary MCLs[1]

Constituents	Primary MCL (in mg/L)	Constituents	Primary MCL (in mg/L)
Aluminum	1.0	Fluoride	2
Antimony	0.2	Lead	0.015[4]
Arsenic	0.006	Mercury	0.002
Asbestos	7 (MFL)[2]	Nickel	0.1
Barium	1	Nitrate (as NO_3)	45
Beryllium	0.004	Nitrite (as N)	1
Cadmium	0.005	Total Nitrate/Nitrite (as N)	10
Hexavalent Chromium	0.010	Selenium	0.05
Copper	1.3[3]	Thallium	0.02
Cyanide	0.15		

Notes:
(1) Based on Table 64431-A.
(2) MFL = Million fibers per liter, with fiber lengths > 10 microns.
(3) Regulatory Action Level; if system exceeds, it must take certain actions such as additional monitoring, corrosion control studies and treatment, and for lead, a public education program; replaces MCL.
(4) The MCL for lead was rescinded with the adoption of the regulatory action level. The action level is like a MCL except it also requires additional testing. If more than 10 percent of samples collected at the point of delivery exceed the action level, the water distributor must take steps to reduce the corrosivity and/or lead concentrations of the delivered water and notify the public about steps they should take to protect their health.

Table 9.2 Constituents/Parameters with Secondary MCLs

Constituents[1]	MCL (in mg/L)	Constituents[2]	MCL (in mg/L)
Aluminum	0.2	TDS	500
Color	15 (units)	Specific Conductance	900 uS/cm
Copper	1	Chloride	250
Foaming Agents (MBAS)	0.5	Sulfate	250
Iron	0.3		
Manganese	0.05		
Methyl-tert-butyl-ether (MBTE)	0.005		
Odor Threshold	3 (units)		
Silver	0.1		
Thiobencarb	0.001		
Turbidity	5 (NTU)		
Zinc	5		

Notes:
(1) Based on Table 64449-A.
(2) Based on **Table 6449-B**

Table 9.3 Radioactivity[1]

Constituents	MCL (in pCi/L)	Constituents	MCL (in pCi/L)
Uranium	20	Gross Beta particle activity	50(2)
Combined radium-226 & 228	5	Strontium-90	8(2)
Gross alpha particle activity	15	Tritium	20,000(2)

Notes:
(1) Based on Tables 64442 and 64443.
(2) 50 pCi/L is used for regulatory purposes to ensure that exposure above 4 millirem/yr does not occur. If 50 pCi/L is exceeded, than the water is deemed "vulnerable" and in need of potential future monitoring of specific radionuclides.

Table 9.4 Regulated Organics[1]

Constituents	MCL (in mg/L)	Constituents	MCL (in mg/L)
Volatile Organic Compounds			
Benzene	0.001	Monochlorobenzene	0.07
Carbon Tetrachloride	0.0005	Styrene	0.1
1,2-Dichlorobenzene	0.6	1,1,2,2-Tetrachloroethane	0.001
1,4-Dichlorobenzene	0.005	Tetrachloroethylene	0.005
1,1-Dichloroethane	0.005	Toluene	0.15
1,2-Dichloroethane	0.0005	1,2,4 Trichlorobenzene	0.005
1,1-Dichloroethylene	0.006	1,1,1-Trichloroethane	0.2
cis-1,2-Dichloroethylene	0.006	1,1,2-Trichloroethane	0.005
trans-1,2-Dichloroethylene	0.01	Trichloroethylene	0.005
Dichloromethane	0.005	Trichlorofluoromethane	0.15
1,3-Dichloropropene	0.0005	1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2
1,2-Dichloropropane	0.005	Vinyl chloride	0.0005
Ethylbenzene	0.3	Xylenes	1.75
Methyl-tert-butyl ether (MTBE)	0.013		
SVOCs			
Alachlor	0.002	Hexachlorobenzene	0.001
Atrazine	0.001	Hexachlorocyclopentadiene	0.05
Bentazon	0.018	Lindane	0.0002
Benzo(a) Pyrene	0.0002	Methoxychlor	0.03
Carbofuran	0.018	Molinate	0.02
Chlordane	0.0001	Oxamyl	0.05
Dalapon	0.2	Pentachlorophenol	0.001
Dibromochloropropane	0.0002	Picloram	0.5
Di(2-ethylhexyl)adipate	0.4	Polychlorinated Biphenyls	0.0005
Di(2-ethylhexyl)phthalate	0.004	Pentachlorophenol	0.001
2,4-D	0.07	Picloram	0.5
Dinoseb	0.007	Polychlorinated Biphenyls	0.0005
Diquat	0.02	Simazine	0.004
Endothall	0.1	Thiobencarb	0.07/0.001[2]
Endrin	0.002	Toxaphene	0.003
Ethylene Dibromide	0.00005	2,3,7.8-TCDD (Dioxin)	$3x10^{-8}$
Glyphosate	0.7	2,4,5-TP (Silvex)	0.05
Heptachlor	0.00001		

Notes:
(1) Based on **Table 64444-A.**
(2) Second value is listed as a Secondary MCL.

Table 9.5 Disinfection By-Products[1]

Constituents	MCL (in mg/L)	Constituents	MCL (in mg/L)
Total Trihalomethanes	0.080	Bromate	0.010
Total haloacetic acids	0.060	Chlorite	1.0

Notes:
(1) Based on **Table 64533-A.**

Table 9.6 Constituents with Notification Levels [1,2]

Constituents	NL (in µg/L)	Constituents	NL (in µg/L)
Boron	1000	Manganese	500
n-Butylbenzene	260	Methyl isobutyl ketone (MIBK)	120
sec-Butylbenzene	260	Naphthalene	17
tert-Butylbenzene	260	N-Nitrosodiethylamine (NDEA)	0.01
Carbon disulfide	160	N-Nitrosodimethylamine (NDMA)	0.01
Chlorate	800	N-Nitrosodi-n-propylamine (NDPA)	0.01
2-Chlorotoluene	140	Propachlor**	90
4-Chlorotoluene	140	n-Propylbenzene	260
Diazinon	1.2	RDX	0.3
Dichlorodifluoromethane (Freon 12)	1000	Tertiary butyl alcohol (TBA)	12
1,4-Dioxane	1	1,2,3-Trichloropropane (1,2,3-TCP)	0.005
Ethylene glycol	14000	1,2,4-Trimethylbenzene	330
Formaldehyde	100	1,3,5-Trimethylbenzene	330
HMX	350	2,4,6-Trinitrotoluene (TNT)	1
Isopropylbenzene	770	Vanadium	50
Perfluorooctanoic acid (PFOA)	**0.014**	**Perfluorooctanesulfonic acid (PFOS)**	**0.013**

Notes:
(1) The Oxnard facility analysis within this Engineering Report was based upon a prior version of the State's Notification Levels, as found on: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/notificationlevels/notificationlevels.pdf. The web link above also contains the levels of the pollutants in this table that must result in a removal of the water source from service.
(2) As this Engineer's Report was being finalized, the State of California released a new Notification Level document (2018), adding PFOA and PFOS, which are shown in red within this table and found on: *https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/notificationlevels/notification_levels_response_levels_overview.pdf*

9.2 CEC Monitoring

The Recycled Water Policy (SWRCB, 2013) lists specific compounds for monitoring for groundwater injection projects (Table 9.7). In 2018 a scientific advisory panel funded by the State of California published recommendations regarding CECs (SCCWRP, 2018), with recommendations entirely in-line with Table 9.7.

Table 9.7 Monitoring Trigger Levels for Groundwater Recharge, as Listed in SCCWRP (2018)

Constituents	Relevance/ Indicator Type/ Surrogate	Monitoring Trigger Level (in µg/L)	Removal Percentages (%)
17B-estradiol(1)	Health	0.0009	--
Caffeine(1)	Health & Performance	0.35	>90
NDMA(1)	Health & Performance	0.01	25-50, >80(3)
Triclosan(1)	Health	0.35	--
DEET(1)	Performance	--	>90
Sucralose(1)	Performance	--	>90
Electrical Conductivity(1)	Surrogate	--	>90
TOC(2)	Surrogate	--	>90

Notes:
(1) Monitored quarterly, per SCCWRP (2018).
(2) Continuously monitored.
(3) 25 to 50 percent removal by RO, >80 percent removal by RO followed by UV, depending upon the UV dose.

The LARWQCB requires specific monitoring for CECs. In communication with Elizabeth Erickson to the project team on 10/29/2014, the following CECs for monitoring: 17-alpha-estradiol, caffeine, DEET, Iodinated Contrast Media (Iopromide), Triclosan, NDMA, and Sucralose. There is overlap with the list in Table 9.7, essentially adding Iopromide and 17-alpha-estradiol to the sampling list for this project.

9.3 Basin Plan

The Basin Plan Objectives for ground water quality for the LA region are divided into five groups: bacteria, chemical constituents and radionuclides, minerals, nitrogen, and taste and odor. Excluding the chemical constituents and radionuclides, the objectives are summarized as follows:

- **Bacteria -** Concentration of coliform organisms shall be < 1.1/100 mL over any 7-day period.
- **Minerals:** TDS - (1200 mg/L (confined aquifers), 3000 mg/L (unconfined aquifers), Sulfate (600 mg/L (confined aquifers), 1000 mg/L (unconfined aquifers), Chloride (150 mg/L (confined aquifers), 500 mg/l (unconfined aquifers), Boron (1 mg/L).
- **Nitrogen –** 10 mg/L (NO_3-N + NO_2-N), 45 mg/L (NO_3), 10 mg/L (NO_3-N), 1 mg/L (NO_2-N).
- **Taste and Odor -** Ground waters shall not contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

Additionally, the Basin Plan specifies compliance with Table 64431-A, Table 6444-A, and Tables 64442 and 64443 of DDW regulations (SWRCB, 2018b). The constituents in these tables are provided in the regulatory tables shown previously in this report.

9.4 Current Water Quality

The City's AWPF is now in operation, producing high quality water for non-potable reuse. Detailed water quality and performance testing has been completed and is documented here. Secondary Effluent, RO permeate, and UV AOP final effluent were sampled for MCLs, NLs, Secondary MCLs and CECs, results are show in Tables 9.8 through 9.15. Consistent contaminant removal was seen throughout the MF/RO/UVAOP process, with the AWPF treatment train advanced treated recycled

water meeting all health goals (MCLs, secondary MCLs, and NLs). CEC concentrations were either ND or below the recommended health levels according to literature sources. ***Of important note, only 8 chemicals tested for were detected above the health-based goal/limit in the secondary effluent.*** All 8 constituents were fully removed to below the detection level or health target/limit in the advanced treated recycled water, and most were removed prior to UV AOP treatment, as demonstrated both by the RO effluent sampling, and the RO concentrate contaminant concentrations.

9.4.1 TOC

The DDW regulatory (SWRCB, 2018a) requirement for total organic carbon (TOC) is a maximum of 0.5 mg/L, and new membranes are required to meet a value of 0.25 mg/L. Grab samples taken as part of the startup testing all resulted in RO permeate TOC levels below detection at <0.3 mg/L. Prior to operation, online TOC meters will be installed before and after RO for continuous monitoring.

9.4.2 Total Nitrogen

The DDW groundwater recharge requirement for total nitrogen (TN) is ≤10 mg/L. As listed in the tables below, the advanced treated recycled water has low nitrate + nitrite (as N) of <0.2 mg/L. Recent (6/22/2016) ammonia concentrations (RO feed = 33 mg/L, UV AOP feed = 2.8 mg/L, Advanced treated recycled water = 2.1 mg/L) coupled with the low nitrate and nitrite numbers indicate a low TN result of ~3 mg/L.

Table 9.8 MF/RO/UV AOP Advanced treated recycled water Quality for MCLs- Inorganic Chemicals per Table 64431-A and Table 64432-A (SWRCB, 2018b)

Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
Aluminum	ug/L	ND	87	ND	ND	200	20
Antimony	ug/L	ND	3.9	ND	ND	6	1
Arsenic	ug/L	1	8.1	ND	ND	10	1
Asbestos	MFL(2)	ND	ND	ND	ND	7	0.2
Barium	ug/L	18	120	ND	ND	1,000	2
Beryllium	ug/L	ND	ND	ND	ND	4	1
Cadmium	ug/L	ND	ND	ND	ND	5	0.5
Chromium	ug/L	1.2	5.9	ND	ND	50	1
Copper	ug/L	5.4	36	ND	ND	1,300 *(Action Level)*	2
Cyanide	mg/L	0.04	0.18	ND	ND	150	0.025
Fluoride	mg/L	0.78	3.6	ND	ND	2	0.05
Hexavalent Chromium(1)	ug/L	--	--	--	--	10	0.5
Lead	ug/L	ND	ND	ND	ND	15 *(Action Level)*	0.5
Mercury	ug/L	ND	ND	ND	ND	2	0.2
Nickel	ug/L	6.2	46	ND	ND	100	5
Nitrate (as NO_3)	mg/L	ND	ND	ND	0.12	45	0.013
Nitrite (as N)	mg/L	ND	ND	ND	0.072	1	0.013
Perchlorate	ug/L	32	200	ND	ND	6	2
Nitrate + Nitrite (as N)	mg/L	ND	ND	ND	0.192	10	0.055
Selenium	ug/L	5.7	28	ND	ND	50	5
Thallium	ug/L	ND	ND	ND	ND	2	1

Notes:
(1) Laboratory error, hexavalent chromium not analyzed for.
(2) MFL = million fibers per liter longer than 10 um.
(3) Hexavalent chromium was not tested due to a sampling error, however, total chromium was analyzed.

Table 9.9 MF/RO/UV AOP Advanced treated recycled water Quality for MCLs- Radionuclides per Table 64442 AND 64443 (SWRCB, 2018B)

Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
Gross Alpha (including Radium-226 but not Radon and Uranium)	pCi/L	5.7	29.1		ND	15	1.5
Radium-226	pCi/L	<0.889	0.354	<0.733	ND	-	0.889
Radium-228	pCi/L	<0.661	<0.593	<0.804	ND	-	0.661
Combined Radium-226 and Radium-228 (*226 + 228*)	pCi/L	ND	0.354	ND	ND	5	
Strontium-90	pCi/L	<0.968	<1.92	<0.908	<0.654	8	0.968
Uranium	pCi/L	5.2	37	ND	ND	20	0.7
Tritium	pCi/L	<267	<265	<264	<279	20,000	267
Beta/Photon emitters (gross beta tested)	pCi/L	38	210	5.3	<1.80	50(1)	2.42

Notes:
(1) 50 pCi/L is used for regulatory purposes to ensure that exposure above 4 millirem/yr does not occur. If 50 pCi/L is exceeded, than the water is deemed "vulnerable" and in need of potential future monitoring of specific radionuclides.

Table 9.10 MF/RO/UV AOP Advanced treated recycled water Quality for MCLs- Synthetic Organic Chemicals - SVOCS per Table 64444-A (SWRCB, 2018B)

Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
Alachlor	ug/L	ND	ND	ND	ND	2	0.05
Atrazine	ng/L	ND	9.3	ND	ND	1	5
Benzo(a)pyrene	ug/L	ND	ND	ND	ND	0.2	0.02
Carbofuran	ug/L	ND	ND	ND	ND	40	0.5
Chlordane	ug/L	ND	ND	ND	ND	2	0.1
Dalapon	ug/L	ND	1.1	ND	ND	200	1
Dibromochloropropane	ug/L	ND	ND	ND	ND	0.2	0.01
Dinoseb	ug/L	ND	ND	ND	ND	7	0.2
Dioxin(2,3,7,8-TCDD)	pg/L	ND	ND	ND	ND	3.00E-08	5
Diquat	ug/L	ND	0.65	ND	ND	20	0.4
Di(2-ethylhexyl) adipate	ug/L	ND	ND	ND	ND	400	0.6
Di(2-ethylhexyl) phthalate	ug/L	ND	ND	ND	ND	6	0.6
Endothall	ug/L	ND	ND	ND	ND	100	5
Endrin	ug/L	ND	ND	ND	ND	2	0.2
Ethylene Dibromide	ug/L	ND	ND	ND	ND	0.05	0.01
Glyphosate	ug/L	ND	ND	ND	ND	700	6
Heptachlor	ug/L	ND	0.033	ND	ND	0.04	0.01
Heptachlor epoxide	ug/L	ND	ND	ND	ND	0.02	0.01
Hexachlorobenzene	ug/L	ND	ND	ND	ND	1	0.05
Hexachlorocyclopentadiene	ug/L	ND	ND	ND	ND	50	0.05
Lindane	ug/L	ND	ND	ND	ND	0.2	0.04
Methoxychlor	ug/L	ND	ND	ND	ND	40	0.1
Oxamyl(Vydate)	ug/L	ND	ND	ND	ND	200	0.5
Picloram	ug/L	ND	ND	ND	ND	500	0.1

Table 9.10 MF/RO/UV AOP Advanced treated recycled water Quality for MCLs- Synthetic Organic Chemicals - SVOCS per Table 64444-A (SWRCB, 2018B) (continued)

Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
Polychlorinated Biphenyls (TOTAL)(1)	ug/L	ND	ND	ND	ND	0.5	0.0005
Pentachlorophenol	ug/L	ND	ND	ND	ND	1	0.04
Simazine	ng/L	20	76	ND	ND	4	5
Toxaphene	ug/L	ND	ND	ND	ND	3	0.5
2,4-D	ug/L	0.25	2.3	ND	ND	70	0.1
2,4,5-TP Silvex	ug/L	ND	ND	ND	ND	50	0.2
Bentazon	ug/L	ND	0.78	ND	ND	18	0.5
Molinate	ug/L	ND	ND	ND	ND	20	0.1
Thiobencarb	ug/L	ND	ND	ND	ND	1	0.2

Notes:
(1) Polychlorinated Biphenyls (TOTAL) includes: PCB 1016, PCB 1221, PCB 1232, PCB 1242, PCB 1248, PCB 1254 and PCB 1260.

Table 9.11 MF/RO/UV AOP Advanced treated recycled water Quality for MCLs- Volatile Organic Chemicals - VOCS per Table 64444-A (SWRCB, 2018B)

Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
Benzene	ug/L	ND	ND	ND	ND	1	0.5
Carbon tetrachloride	ug/L	ND	ND	ND	ND	0.5	0.5
cis-1,2-Dichloroethylene	ug/L	ND	ND	ND	ND	6	0.5
Dichloromethane	ug/L	ND	ND	ND	ND	5	0.5
Ethylbenzene	ug/L	ND	ND	ND	ND	300	0.5
Monochlorobenzene (Chlorobenzene)	ug/L	ND	ND	ND	ND	70	0.5

Table 9.11 MF/RO/UV AOP Advanced treated recycled water Quality for MCLs- Volatile Organic Chemicals - VOCS per Table 64444-A (SWRCB, 2018B) (continued)

Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
o-Dichlorobenzene	ug/L	ND	ND	ND	ND	600	0.5
p-Dichlorobenzene	ug/L	ND	ND	ND	ND	5	0.5
Styrene	ug/L	ND	ND	ND	ND	100	0.5
Tetrachloroethylene(PCE)	ug/L	ND	ND	ND	ND	5	0.5
Toluene	ug/L	ND	ND	ND	ND	150	0.5
trans-1,2-Dichloroethylene	ug/L	ND	ND	ND	ND	10	0.5
Trichloroethylene (TCE)	ug/L	ND	ND	ND	ND	5	0.5
Vinyl chloride	ug/L	ND	ND	ND	ND	0.5	0.3
Xylenes (total)	ug/L	ND	ND	ND	ND	1,750	0.5
1,1-Dichloroethylene	ug/L	ND	ND	ND	ND	6	0.5
1,1,1-Trichloroethane	ug/L	ND	ND	ND	ND	200	0.5
1,1,2-Trichloroethane	ug/L	ND	ND	ND	ND	5	0.5
1,2-Dichloroethane	ug/L	ND	ND	ND	ND	0.5	0.5
1,2-Dichloropropane	ug/L	ND	ND	ND	ND	5	0.5
1,2,4-Trichlorobenzene	ug/L	ND	ND	ND	ND	5	0.5
1,1-Dichloroethane	ug/L	ND	ND	ND	ND	5	0.5
1,3-Dichloropropene	ug/L	ND	ND	ND	ND	0.5	0.5
Methyl-tert-butyl ether (MTBE)	ug/L	ND	ND	ND	ND	135 (Secondary MCL)	0.5
1,1,2,2-Tetrachloroethane	ug/L	ND	ND	ND	ND	1,200	0.5
Trichlorofluoromethane	ug/L	ND	ND	ND	ND	150	0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L	ND	ND	ND	ND	1,200	0.5

Table 9.12 MF/RO/UV AOP Advanced treated recycled water Quality for MCLs- Disinfection Byproducts per Table 64533-A (SWRCB, 2018B)

Disinfection Byproduct	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
Total Trihalomethanes (TTHM)	ug/L	2.3	11	1.5	0.89	80	0.5
Haloacetic acids (five) (HAA5)(1)	ug/L	20	85	ND	ND	60	2
Bromate	ug/L	ND	1.8	ND	ND	10	1
Chlorite	mg/L	ND	ND	ND	ND	1.0	0.01
Chlorate	ug/L	350	1600	16	ND	800	10

Notes:
(1) Haloacetic acids (five) includes: Bromoacetic Acid, Chloroacetic Acid, Dibromoacetic Acid, Dichloroacetic Acid and Trichloroacetic Acid.

Table 9.13 MF/RO/UV AOP Advanced treated recycled water Quality for Secondary MCLs per Tables 64449-A and 64449-B (SWRCB, 2018B)

Secondary Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
Color	ACU	40	300	ND	5	15 color units	3
Corrosivity (below)*:						Non-corrosive	
Langelier Index - 20 degrees C	-	-3	-4.9	-2.4	5.4	Non-corrosive	-
Langelier Index at 60 degrees C	-	NA	NA	NA	NA	Non-corrosive	-
Aggressiveness Index-Calculated	-	8.7	6.8	9.3	7.4	Non-corrosive	-
pH of CaCO3 saturation(25C)	Units	6.6	5	10	10	Non-corrosive	0.1

Table 9.13 MF/RO/UV AOP Advanced treated recycled water Quality for Secondary MCLs per Tables 64449-A and 64449-B (SWRCB, 2018B) (continued)

Secondary Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
pH of CaCO3 saturation(60C)	Units	6.2	4.6	9.9	9.9	Non-corrosive	0.1
Bicarb. Alkalinity as HCO3, calc	mg/L	650	4200	ND	ND	Non-corrosive	3
Foaming agents (Surfactants)	mg/L	0.2	0.89	ND	ND	0.5	0.1
pH	Units	8	7.8	6.7	6.5	6.5-8.5	0.1
Hardness (as CaCO3)	mg/L	650	4,200	ND	ND	250	3
Odor (SM 2150B - Odor at 60 C (TON))	TON	200	200	3	ND	3 (Threshold Odor Number)	1
Total dissolved solids(TDS)	mg/L	2,000	11,000	68	64	500	10
Aluminum	ug/L	ND	87	ND	ND	50-200	20
Chloride	mg/L	610	3,700	26	17	250	1
Copper	ug/L	5.4	36	ND	ND	1,000	2
Fluoride	mg/L	0.78	3.6	ND	ND	2	0.05
Iron	mg/L	0.13	0.87	ND	ND	0.3	0.02
Manganese	ug/L	95	680	ND	ND	50	2
Silver	ug/L	ND	ND	ND	ND	100	0.5
Sulfate	mg/L	510	3400	ND	0.55	250	0.5
Turbidity	NTU	0.17	0.5	ND	0.14	5	0.1
Specific Conductance	umho/cm	3400	18,000	140	110	900	2
Zinc	ug/L	21	140	ND	ND	5,000	20

Table 9.14 MF/RO/UV AOP Advanced treated recycled water Quality for Drinking Water NLs per DDW (2017) [1]

Secondary Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
Boron	mg/L	1.1	2.1	0.82	0.77	1	0.05
n-Butylbenzene	ug/L	ND	ND	ND	ND	260	0.5
sec-Butylbenzene	ug/L	ND	ND	ND	ND	260	0.5
tert-Butylbenzene	ug/L	ND	ND	ND	ND	206	0.5
Carbon disulfide	ug/L	ND	ND	ND	ND	160	0.5
Chlorate	ug/L	350	1,600	16	ND	800	10
2-Chlorotoluene	ug/L	ND	ND	ND	ND	140	0.5
4-Chlorotoluene	ug/L	ND	ND	ND	ND	140	0.5
Diazinon	ug/L	ND	ND	ND	ND	1.2	0.1
Dichlorodifluoromethane (Freon 12)	ug/L	ND	ND	ND	ND	1,000	0.5
1,4-Dioxane	ug/L	1.4	7	ND	ND	1	1
Ethylene glycol	mg/L	ND	ND	ND	ND	14	10
Formaldehyde	ug/L	36	100	20	17	100	5
HMX	ug/L	ND	ND	ND	ND	350	0.1
Isopropylbenzene	ug/L	ND	ND	ND	ND	770	0.5
Manganese	ug/L	95	680	ND	ND	500	2
Methyl isobutyl ketone (MIBK)	ug/L	ND	ND	ND	ND	120	5
Naphthalene	ug/L	ND	ND	ND	ND	17	0.5
N-Nitrosodiethylamine (NDEA)	ng/L	2.9	25	ND	ND	10	2
N-Nitrosodimethylamine (NDMA)	ng/L	33	90	32	5	10	2

Table 9.14 MF/RO/UV AOP Advanced treated recycled water Quality for Drinking Water NLs per DDW (2017) [(1)] (Continued)

		RO INF	RO CONC	UV INF	Advanced treated recycled water	MCL/Action Level	MRL (units shown at far left)
Secondary Constituent	Unit	5/2/16	5/2/16	6/20/16	6/20/16		
N-Nitrosodi-n-propylamine (NDPA)	ng/L	ND	ND	ND	ND	10	2
Propachlor**	ug/L	ND	ND	ND	ND	90	0.05
n-Propylbenzene 0.26	ug/L	ND	ND	ND	ND	260	0.5
RDX	ug/L	ND	ND	ND	ND	0.3	0.1
Tertiary butyl alcohol (TBA)	ug/L	2.1	19	ND	ND	12	2
1,2,3-Trichloropropane (1,2,3-TCP)	ug/L	ND	0.017	ND	ND	0.005	0.005
1,2,4-Trimethylbenzene	ug/L	ND	ND	ND	ND	330	0.5
1,3,5-Trimethylbenzene	ug/L	ND	ND	ND	ND	330	0.5
2,4,6-Trinitrotoluene (TNT)	ug/L	ND	ND	ND	ND	1	0.1
Vanadium	ug/L	ND	11	ND	ND	50	3

Table 9.15 MF/RO/UV AOP Advanced treated recycled water Quality for CECs

Secondary Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 6/20/16	Advanced treated recycled water 6/20/16	MCL/Action Level	MRL (units shown at far left)
Gemfibrozil	ng/L	1200	16000	ND	ND	5	Gemfibrozil
Naproxen	ng/L	130	230	ND	ND	10	Naproxen
Triclosan	ng/L	230	2000	12	ND	10	Triclosan
Ibuprofen	ng/L	ND	5200	ND	ND	10	Ibuprofen
Acetaminophen	ng/L	150	240	45	ND	5	Acetaminophen
Sucralose	ng/L	47,000	310,000	ND	ND	100	Sucralose
Triclocarban	ng/L	ND	ND	ND	ND	5	Triclocarban
Sulfamethoxazole	ng/L	1,600	15,000	ND	ND	5	Sulfamethoxazole
Atenolol	ng/L	320	3700	5.5	ND	5	Atenolol
Trimethoprim	ng/L	320	3500	ND	ND	5	Trimethoprim
Caffeine	ng/L	3500	31000	23	21	5	Caffeine
Fluoxetine	ng/L	35	220	ND	ND	10	Fluoxetine
Meprobamate	ng/L	ND	930	ND	ND	5	Meprobamate
Carbamazepine	ng/L	140	1000	ND	ND	5	Carbamazepine
Primidone	ng/L	94	260	ND	ND	5	Primidone
DEET	ng/L	94	260	ND	ND	5	DEET
TCEP	ng/L	200	1100	ND	ND	10	TCEP
PFOA	ug/L	0.0057	0.035	ND	0.0051	0.0025	PFOA
PFOS	ug/L	0.0042	0.035	ND	ND	0.0025	PFOS
Estrone	ng/L	9.4	51	ND	ND	0.002	Estrone
Estradiol	ng/L	ND	ND	ND	ND	5	Estradiol
Ethynylestradiol	ug/L	ND	0.0052	ND	ND	0.0009	Ethynylestradiol
Testosterone	ug/L	0.0019	0.0090	ND	ND	0.0001	Testosterone
Progesterone	ng/L	ND	ND	ND	ND	5	Progesterone

Section 10

DILUENT WATER

No diluent water is proposed for the ASR project. The water that will be used for recharge will be 100 percent recycled water that has received advanced treatment (MF/RO/UV AOP). Any dilution in the subsurface (due to groundwater underflow) will not be counted toward TOC credits or for meeting pollutant or pathogen levels.

Section 11

ASR FACILITIES

The proposed ASR concept is to inject highly-treated recycled water for a minimum period of 3.1 months and possibly for up to 6 months, hold the water in the designated aquifer for 3.1 months, and then withdraw the water from the same wells into which the water was injected for potable and/or non-potable use. The proposed ASR operation is summarized in Section 6 and detailed by Hopkins (2016).

Section 12

GROUNDWATER BASINS

12.1 Existing Water Quality

The project team has extensive groundwater data provided by the UWCD for the "Lower Aquifer System," or LAS (shown in Figure 12.1). The LAS extends throughout the area and groundwater quality is anticipated to be similar underneath the proposed ASR location. Table 12.1 is lists local groundwater quality data obtained from UWCD.

Table 12.1 List of UWCD Groundwater Quality

Constituent (mg/L unless otherwise stated)	Comparative Groundwater Quality Well IDs			Nearest Well to Proposed ASR Location (1N22W04F04)(1
	01N22W03F05S	02N22W30F03S	02N22W20L03S	
Alk as CaCO3	213	484	608	520
Temperature (C)				
pH	7.38	7.40	7.46	7.6
TDS	996			958
Turbidity (NTUs)	0.04		0.42	
Nitrate-N				4.3
Potassium	5	7	5	6
Sodium	102	93	140	93
Magnesium	47	37	54	44
Calcium	141	135	155	135
Bicarbonate	239	255	286	249
Sulfate	470	435	594	418
Boron (µg/L)	700	600	620	600
Chloride	50	54	66	49
Fluoride	0.62	0.50	0.60	0.7

Notes:
(1) Data from 1960 to 1989.

12.2 Groundwater Model

No groundwater model exists for the project area.

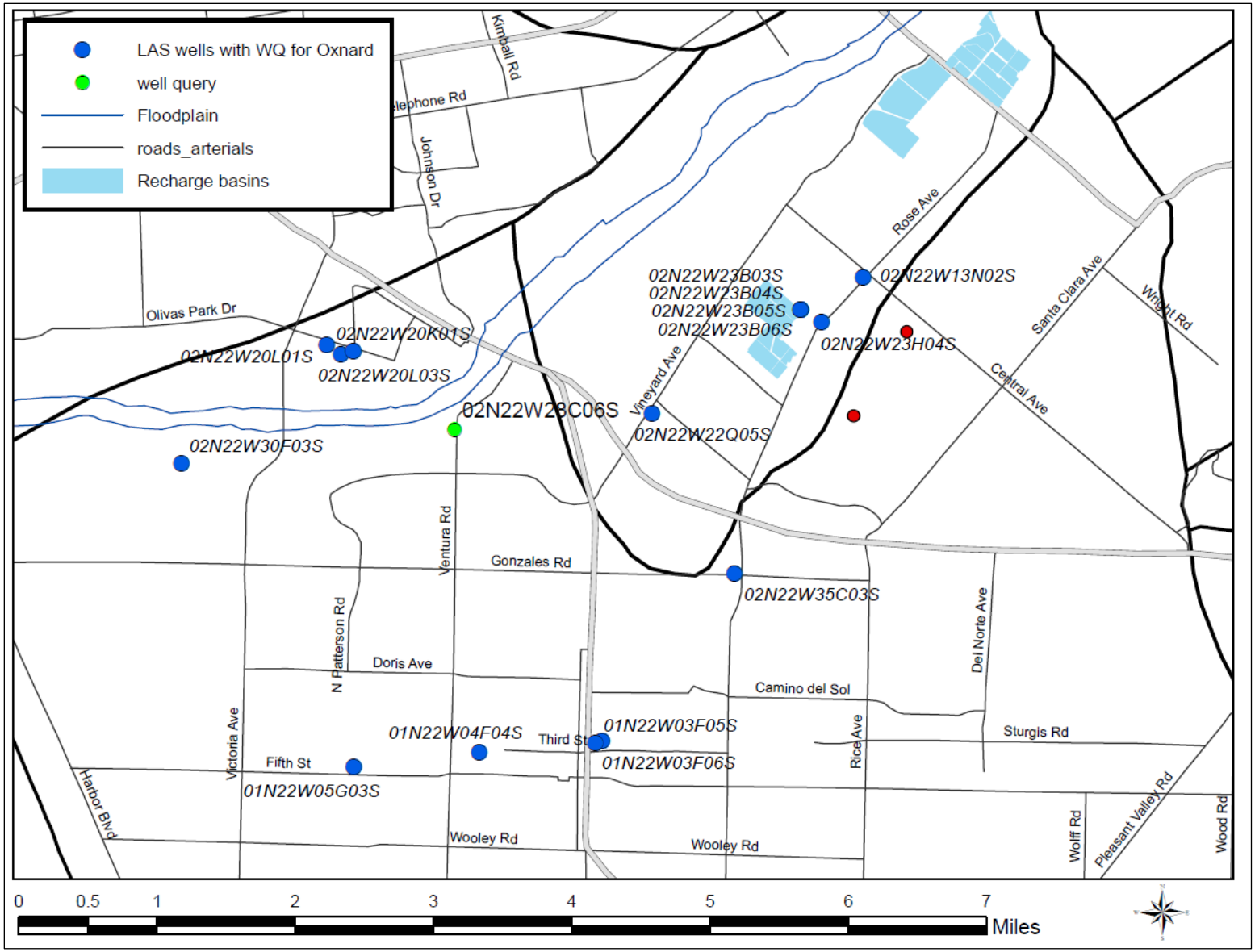

Figure 12.1 Oxnard Map of UWCD Well Locations (provided by UWCD)

Section 13

DOMESTIC WATER SUPPLY PRODUCTION WELLS

13.1 Production Wells Near the Project

The Campus Park site is located within the City where all potable water is provided by the City municipal supply system. The nearest production well to the project is a domestic well located southeast of the site that is used for off-site irrigation. The next closest production wells are domestic wells located to the northwest of the site in the County. These wells, ***all in the UAS***, supply residential uses, noting that this ASR project with purified water will be into the LAS not the UAS. The next closest wells are located to the east at City Blending Station No. 1. See Hopkins (2016) for more details. The City of Oxnard potable water system will provide a backup supply if or when needed.

13.2 Closest Domestic Supply Well

The closest existing domestic supply wells are located over 2,000 feet northwest of the site and are constructed in the Oxnard Aquifer, the uppermost member of the upper aquifer system. See Hopkins (2016) for more details.

13.3 Domestic Water Supply Production Wells – Water Quality

The water quality in regional water supply wells is summarized in Section 12.

Section 14

GROUNDWATER RECHARGE IMPACTS

14.1 Regional Geologic and Hydrogeologic Framework

The subsurface geology that controls groundwater flow in the study area is differentiated into two primary geologic units that include; the Holocene and late Pleistocene alluvium, and the San Pedro Formation. The first unit is comprised largely of unconsolidated sedimentary deposits and includes all older and recent alluvial deposits. These shallower units are coarse-grained sand and gravel layers that form the Oxnard and Mugu Aquifers and comprise the UAS in the Oxnard Plain Basin (see Hopkins (2016), Appendix B, Plates 3, and 4). The San Pedro Formation consists of consolidated marine and nonmarine clay, silt, sand, and gravel deposits that comprise the Hueneme and Fox Canyon Aquifers that are designated as the LAS. The low permeability geologic formations underlying the San Pedro Formation are generally considered to be non-water-bearing and effectively define the base of fresh water.

The groundwater in the Oxnard Plain Basin LAS is isolated from overlying land uses by the laterally extensive aquitard (silt and clay) layers that separate and confine the Hueneme and Fox Canyon Aquifer zones. The conceptual subsurface profile uses the geophysical survey (electric log) from the proximate (destroyed) City Well No. 13 to show the anticipated geology and aquifer zones beneath the Campus Park GRRP site. The aquifer zones are discretely separated by clay layers that are laterally continuous and appear as marker beds in other well logs shown by Hopkins (2016) in Appendix B, Plates 3 and 4. The significance of the highly confined condition that results from the discretely layered aquifer system is that wells located in close proximity (50 feet apart) but producing from different aquifer layers, do not have hydraulic connectivity with each other (no interference).

Recharge into the LAS will store water in aquifer zones that receive significantly less groundwater recharge than the UAS because of the regional confined aquifer conditions. The UAS readily receives groundwater recharge derived from natural percolation of rainwater and Santa Clara River flows in the Oxnard Forebay Basin, as well as from river flow diversions into the engineered recharge facilities operated by UWCD.

14.1.1 Other Existing or Proposed GWRS Project that Could Impact the ASR

There are no other planned groundwater recharge projects in the vicinity.

14.1.2 Cumulative Impact on Water Quantity and Quality With and Without the Proposed GWRS Project

The water quality in the aquifer zones that will be used for replenishment in the LAS was previously described in Chapter 12. The groundwater is typically a calcium sulfate-barcarbonate chemical character with a TDS concentration of approximately 1,000 mg/l. Water quality degradation has been occurring in the overdrafted basin and results from poorer quality groundwater seeping out of the fine-grained silt and clay layers that are interbedded with the

sand and gravel aquifer zones along with seawater intrusion. Without the project, regional groundwater quality will continue to degrade largely as a result of these 2 mechanisms.

With the project, the regional and local water quality impacts are beneficial. The regional benefit occurs when the aquifer is replenished and the groundwater levels rise. The rising water levels lessen any landward gradient and effectively slow the rate of seawater intrusion in the aquifer zones used for storage. This regional benefit remains until the stored volume is entirely removed. After removal there is no impact, in that the groundwater levels return to pre-recharge conditions.

The localized benefit to water quality will occur from flushing and mixing with the superior water quality of the advanced treated recycled water. Any water left behind will blend with the local native groundwater and improve its quality for downgradient users.

14.2 Predicted Recycled Water Retention Time

As detailed previously, the retention time is fully controlled by the City because of the ASR operation. The minimum retention time will be 3.1 months but can vary specifically as chosen by the City as long as all pathogen credit requirements are met.

14.3 Recycled Water Contribution

As there is no proposed dilution, the recycled water contribution (RWC) is 1.0, or 100 percent.

14.4 Antidegradation Assessment – Predicted Groundwater Quality Post Recharge and Utilization of Available Assimilative Capacity of Basin

14.4.1 MCLs, Secondary MCLs, NLs, and CECs

As detailed in WRD (2013), the purified recycled water from an AWPF is expected to improve groundwater quality and thus improve the assimilative capacity. Demonstration of such improved water quality, comparing the water quality at the proposed recharge locations with the water quality of the advanced treated recycled water from the AWPF, has not yet been done. Such work will be done as detailed in Section 17.

14.4.2 Recharge of Advanced treated recycled water and Groundwater Chemistry Concerns

The LARWQCB has requested more information regarding the change in groundwater chemistry that can result from injection of an advanced treated recycled water. The following perspective comes from OCWD (2014).

- The advanced treated recycled water from Groundwater Replenishment System (GWRS) is stabilized prior to injection via decarbonation and lime addition. Initially the target pH was set at 9.0, but this has been progressively reduced to 8.0 in an effort to mitigate arsenic mobilization while also maintaining pipeline integrity. Ambient groundwater pH is approximately 7.5, and previous literature indicates elevated pH in laboratory experiments can mobilize certain arsenic species. More recent laboratory experiments conducted by Stanford University on behalf of OCWD have shown pH to be

a secondary factor in mobilization behavior, with the relatively poorly-buffered finished GWRS water rapidly taking on the pH of the soil column. The effect of reducing the GWRS advanced treated recycled water pH on field-observed arsenic mobilization has been inconclusive to date.

- The literature indicates that low alkalinity and low ionic strength of the advanced treated recycled water may alter the surface charge of aquifer mineral surfaces, affecting arsenic sorption. However, recent laboratory experiments conducted by Stanford University on behalf of OCWD have indicated that neither of these parameters is of significant importance in shallow unconfined aquifer sediments collected near OCWDs recharge area; instead the concentration of divalent cations, primarily magnesium and secondarily calcium, have been the most important inorganic controls on arsenic desorption.
- The high oxidation reduction potential (ORP) of the advanced treated recycled water may affect the oxidation state of arsenic and increase its solubility or release it via the oxidation of host minerals (e.g., iron sulfides) in the aquifer. This phenomena has been observed at some ASR project sites. In a second phase of work, Stanford University is currently conducting laboratory experiments on the addition of GWRS advanced treated recycled water to deep aquifer sediments collected from a geochemically reducing environment targeted for potential future injection.
- Field observations indicate a complex, non-linear relationship between the proportional GWRS water in the subsurface and resulting arsenic mobilization, governed by significant spatial and temporal variability. The majority of monitoring wells showing GWRS arrival demonstrate little or no mobilization of arsenic. A majority of those wells showing mobilization behavior have resulting arsenic concentrations below levels of regulatory concern (i.e., the 10 ug/L MCL) and/or have shown declining trends after an initial increase.

As part of this project, it is proposed to pilot test the ASR system and measure the impacts. The pilot test would include detailed monitoring of intrinsic tracers (dissolved minerals) as summarized in Section 17.

Because of the ASR operation, injected water will be extracted for both potable and non-potable reuse applications. If there are groundwater chemistry changes that are of public health significance for drinking water, the extracted water can be used exclusively for non-potable applications.

14.5 Impact of Groundwater Recharge Project on Contaminant Plumes

Groundwater recharge projects that utilize surface water spreading or injection in an unconfined groundwater basin can potentially effect the movement or cause movement of existing groundwater contamination. A preliminary search of the State operated GeoTracker web site indicated that there are 4 leaky underground storage tank sites located within 2,000 feet of the Campus Park site. The contamination was either contained in the soil or found in the shallow semi-perched aquifer zone which is isolated from the underlying Oxnard Aquifer by an extensive clay layer. The aquifer zones targeted by the ASR recharge project are isolated by multiple clay layers and aquifer zones beneath the semi-perched aquifer and prevent the project from having a potential impact on shallow groundwater contamination. Furthermore, all 4 sites have been remediated and are closed.

Section 15

MONITORING AND REPORTING

This proposed monitoring and reporting program (MRP) was developed to conform to the DDW groundwater recharge regulations (SWRCB. 2018a).

15.1 General Monitoring Provisions

The following are general monitoring provisions:

- The City proposes to monitor the following according to the manner and frequency specified in this MRP:
  - Influent flow rate and quality to the AWPF.
  - AWPF advanced treated recycled water flow rate and quality.
  - Receiving groundwater quality, both background monitoring and monitoring after start of recharge project.
  - Production well (ASR wells) flow rate and quality.
- Compliance with the requirements of the LARWQCB WDRs will be evaluated based on the analytical monitoring data. Monitoring reports will include, but not be limited to, the following:
  - Analytical results.
  - Location of each sampling station where representative samples can be obtained, including a map that clearly identifies the locations of all injection wells, monitoring wells, and production wells (detailed in Hopkins, 2016).
  - Analytical test methods used and the corresponding method reporting limits (MRLs).
  - Name(s) of the laboratory that conducted the analyses.
  - Copy of the laboratory certifications by the DDW's Environmental Laboratory Accreditation Program (ELAP).
  - Quality assurance and control information.

15.1.1 Sampling and Analytical Protocols

Though not required to be included in the monitoring reports unless specifically requested by DDW or the LARWQCB, the City will have in place sampling protocols including procedures for handling, storing, testing, and disposing of purge and decontamination waters generated from sampling events.

For groundwater monitoring, the sampling protocols will outline the methods and procedures for: measuring water levels; purging wells; collecting samples; decontaminating equipment; containing, preserving, and shipping samples; and maintaining appropriate documentation.

The samples will be analyzed using analytical methods described in 40 CFR Part 141; or where no methods are specified for a given pollutant, by methods approved by the DDW, LARWQCB, and/or SWRCB. The City will select the analytical methods that provide MRLs lower than the limits prescribed in the WDR or as low as possible that will provide reliable data.

The City will instruct its contract laboratories to establish calibration standards so that the MRLs (or its equivalent if there is a different treatment of samples relative to the calibration standards)

are the lowest calibration standard. At no time will analytical data derived from extrapolation beyond the lowest point of the calibration curve be used.

For all bacterial analyses, sample dilutions will be performed so the range of values extends from 1 to 800. The detection methods used for each analysis will be reported with the results of the analyses.

15.1.2 QA/QC Procedures

The LARWCB, DDW and the SWRCB Quality Assurance Program, may establish MRLs in any of the following situations:

- When the pollutant has no established method under 40 CFR 141.
- When the method under 40 CFR 141 for the pollutant has a MRL higher than the limit specified in the WDR.
- When the City proposes to use a test method that is more sensitive than those specified in 40 CFR Part 141.

For regulated constituents, the laboratory conducting the analyses will be certified by ELAP or approved by the DDW, LARWQCB, and/or SWRCB for a particular pollutant or parameter.

Samples will be analyzed within allowable holding time limits as specified in 40 CFR Part 141. All QA/QC analyses will be run on the same dates that samples are actually analyzed. The City will retain the QA/QC documentation in its files and make those files available for inspection and/or submit them when requested by the LARWQCB or the DDW. Proper chain of custody procedures will be followed and a copy of this documentation will be submitted with the quarterly report.

15.1.3 Unregulated Chemical Procedures

For unregulated chemical analyses, the City will select methods according to the following approach:

- Use drinking water methods, if available.
- Use DDW-recommended methods for unregulated chemicals, if available.
- If there is no DDW-recommended drinking water method for a chemical, then City staff will utilize the method that results in the lowest MRL for that chemical.
- If there is more than a single USEPA-approved method available, use the most sensitive of the USEPA-approved methods.
- If there is no USEPA-approved method for a chemical, and more than one method is available from the scientific literature and commercial laboratory, after consultation with DDW, use the most sensitive method.
- If no approved method is available for a specific chemical, the City's laboratory (or contract laboratory) may develop methods or use its own methods and will provide the analytical methods to DDW for review. Those methods may be used until DDW-recommended or USEPA-approved methods are available.

15.2 AWPF Influent Monitoring Requirements

OWTP effluent is the feed to the AWPF. Monitoring of OWTP quality allows for a better understanding of AWPF performance. OWTP effluent will be monitored in accordance with the current NPDES permit and based upon the Enhanced Source Control Program (Appendix A).

For this potable reuse project, recommended additional monitoring of OWTP effluent is shown below in Table 15.1.

Table 15.1 OWTF Effluent Monitoring Requirements

Constituents	Units	Type of Sample	Minimum Frequency of Analysis
Total Flow	mgd	Online Recorder	Continuous(1)
pH	--	Online Recorder	Continuous(1)
Turbidity	NTU	Online Recorder	Continuous(1,2)
TSS	mg/L	24-hour comp	Daily
TDS	mg/L	24-hour comp	Daily
BOD_5, 20°C	mg/L	24-hour comp	Weekly
TOC	mg/L	24-hour comp	Continuous(1,2)
EC	µS/cm	Online Recorder	Continuous(1,2)
NDMA	ng/L	Grab	Monthly

Notes:
(1) For those constituents that are continuously monitored, the City will report the monthly minimum, maximum, and daily average values.
(2) Turbidity values will be monitored in the feed to MF. EC and TOC values will be monitored in the feed to RO, which is MF effluent.

15.3 RO Permeate and AWPF Advanced Treated Recycled Water Monitoring Requirements

DDW (SWRCB, 2018a) outlines a number of monitoring requirements for various process parameters and constituents that can determine performance of the system and compliance of the AWPF advanced treated recycled water in relation to the WDR. Section 60320.201 of DDW regulations (SWRCB, 2018a) states the following general requirements by process:

RO:

- On-going performance monitoring (EC or TOC) that indicates when the process has been compromised.
  - Online monitoring of EC in the RO feed and the RO permeate is currently in operation and will be used to measure RO performance at the AWPF.
  - DDW has requested that TOC monitoring also be used to determine TOC reduction across RO. Oxnard will install TOC metering upstream and downstream of the RO process and will be used to monitor RO performance at the AWPF.
- Minimum of one (1) form of continuous monitoring as well as associated surrogate and/or operational parameter limits and alarm settings that indicate when the integrity has been compromised.
  - As listed above, the RO feed and permeate EC and log removal of EC across RO will be continuously monitored. The log removal of EC is a conservative surrogate for pathogen removal. Once the initial background log reduction of EC is established, a level below the background noise will be alarmed to indicate a reduction in RO performance. DDW, in a letter dated 12/5/2016, recommended setting alarm points similar to OCWD, with a blended EC target of 95 uS/cm and an individual train EC

target of 110 uS/cm. As noted above, the baseline EC in the RO permeate will first be monitored before settling on specific EC targets.
  - As listed above, DDW has recommended the use of TOC as an additional monitoring method for RO performance. TOC meter(s) will be installed by the City.

Advanced Oxidation:

- Perform an occurrence study on municipal wastewater that includes indicator compounds and select a total of at least nine indicator compounds, with at least one from each of the functional groups. Or, as an alternative, demonstrate 0.5-log reduction of 1,4-dioxane by the AOP (in this case, UV AOP).
  - Demonstration testing of 1,4-dioxane destruction by AOP was performed at startup and was documented previously in this report.
- Occurrence study protocol, as well as subsequent results and chosen indicator compounds should be submitted for DDW review and approval.
  - 1,4-dioxane demonstration work was done in lieu of this requirement.
- During full-scale operation, the surrogate and or/operational parameter identified should be continuously monitored.
  - As detailed here, demonstration testing was done to show a correlation between the existing control philosophy (NDMA LRV) and 1,4-dioxane destruction.
  - The existing EEO-based control system would be modified based upon an NDMA LRV setpoint of 1.4 (instead of 1.0). The result of this modification would be to increase the UVI/Q to a minimum value of 0.018. Because UVI/Q is not part of the proposed system control, the UVI/Q values would be recorded daily and reported on a quarterly basis, with a requirement for the running average 30-day UVI/Q value to be 0.018 or higher. Should the UVI/Q value average be below this target, the NDMA LRV setpoint would need to be increased to a value greater than 1.4.
- Monthly (grab or composite) samples representative of the advanced treated recycled water of the advanced treatment process will be analyzed for contaminants having MCLs and notification levels (NLs). After 12-consecutive months with no results exceeding MCL or NL, a reduction in monitoring frequency can be applied for (minimum quarterly). Monitoring conducted in this subsection can be used in lieu of monitoring (for the same contaminants) in DDW regulations (SWRCB, 2018a), Sections 60320.212 and 60320.220.

Table 15.2 provides more detail on the key analytical monitoring requirements specified in the DDW regulations (SWRCB. 2015a) as they pertain to the direct injection of advanced treated recycled water. This summary will serve as the basis for the monitoring and testing recommendations set forth within this MRP.

Table 15.2 Master Table for Analytical Monitoring Requirements Required by DDW (SWRCB, 2018a)

Sample Location	Parameter	Monitoring Requirements				
		Frequency	Results	Future Performance	Maintenance Plan	DDW (SWRCB 2018a) Reference
RO	Electrical Conductivity	Continuous monitoring pre and post RO	>1 Log Removal Value (LRV).	Stable performance or a gradual increase in effluent EC and decrease in LRV	Calibrate online probes, replace membranes, inspect seals and o-rings as needed to maintain LRV performance	60320.201 (b)
	Total Organic Carbon	Continuous monitoring pre and post RO (once installed)	>1 Log Removal Value (LRV). RO permeate TOC <0.5 mg/L, based upon a 20 week running average	Stable performance or a gradual increase in effluent TOC and decrease in LRV	Calibrate online probes, replace membranes, inspect seals and o-rings as needed to maintain LRV performance	60320.218 (a)
After UV AOP	1,4-dioxane	One-Time. Work completed. No further work needed.	0.5 LRV proven during startup testing	No further performance demonstration needed	≥ 0.5-log proven based upon recommended setpoints for NDMA LRV, UVI/Q, and peroxide dose.	60320.201 (d)
	NDMA LRV control with UVI/Q inspections	Continuous control based upon NDMA LRV setpoint of 1.4, supported by daily UVI/Q calculation (reported quarterly)	Proven during startup	The NDMA LRV based control must be set to achieve a 30-day running average UVI/Q of 0.018. The proposed NDMA LRV setpoint of 1.4 is anticipated to be sufficient	A reference set (6) of calibrated UVI sensors will be installed into the entire UV reactor and UVI readings will be compared to readings with the duty UVI sensors[6]. Readings for both the duty and reference sensors will be compared under similar operational conditions (hand control, all banks on at full power). Should the reference and duty UVI values be roughly equivalent (~20%), the reference sensors will be removed and replaced with the duty sensors. Any duty sensor that varies by more than 20% from the reference sensor will be replaced by the reference sensor and the duty sensor will be sent back to Trojan for calibration.	60320.201 (e)
	MCLs & NLs (Inorganics, Radionuclides, Organics, Disinfection By-Products, Lead and Copper). See Chapter 9, Tables 9.1, 9.3, 9.4, 9.5, 9.6	Monthly for 12 months, then transition to Quarterly	Initial results meet all standards, see Chapter 9.	Continued compliance anticipated.	Exceedance of MCLs and NLs suggest a source control issue coupled with process performance failures. Detailed source control and process audit required to define the extent and magnitude of the problem.	60320.201 (i) / 60320.212 (a) / 60320.220 (b)
						Moni
	Secondary MCLs, See Chapter 9 Table 9.2	Yearly[2,3]	Initial results meet all standards, see Chapter 9.	Continued compliance anticipated.	Exceedance of Secondary MCLs suggest a source control issue coupled with process performance failures. Detailed source control and process audit required to define the extent and magnitude of the problem.	60320.212 (c)
	CECs, See Chapter 9 Table 9.7 (caffeine, NDMA, triclosan, DEET, sucralose, plus 17-alpha-estradiol and iopromide)	Annually	Robust CEC reduction demonstrated in Chapter 9 of this report.	Removal of the vast majority of CECs to below or near the detection level anticipated for the life of the project.	Increased levels of CECs in the finished water suggest a breach or degradation in the RO system.	60320.220 (d)

[6] The sensors are located under the end cover, which will de-energize the system when removed (a safety feature). Therefore the reference sensor check would involve recording the sensor value, shutting down and swapping sensors, and then starting/warming up the system again to check the second sensor response. The sensor is held in a quartz sensor sleeve so the reactor would not have to be drained.

Table 15.2 Master Table for Analytical Monitoring Requirements Required by DDW (SWRCB, 2018a) (continued)

Sample Location	Parameter	Monitoring Requirements				
		Frequency	Results	Future Performance	Maintenance Plan	DDW (SWRCB 2018a) Reference
	Nitrogen Compounds (total nitrogen)	2 x week, 3 days apart	Initial results meet all standards, see Chapter 9.	Continued removal of TN to below 10 mg/L	Monitor ammonia, nitrite, nitrate, and TN. Gradual rise or trends should be examined in the context of OWTF performance and RO performance. Sampling can be reduced after 12 months of low level TN. Ammonia sampling (not regulated), along with nitrite, nitrate, and TN, will assist in troubleshooting.	60320.210 (a)
	Priority Toxic Pollutants, see Table 15.3 below	Quarterly for two years, transition to annual pending results			Chemicals listed in 40 CFR Part 131.38.	60320.220 (a)
	Chemicals analyzed as part of Source Control	Annually			See Appendix A for the ESCP and related recommended sampling.	60320.206
Monitoring Wells, all wells as defined by 60320.226 (a)(1) and (a)(2)	Priority Toxic Pollutants, see Table 15.3 below	Quarterly for two years, reduction to annual pending results	TBD, background sampling not performed	Purified water will be stabilized. Compliance anticipated.		60320.220 (a)
	Additional chemicals named by DDW	Quarterly for two years, reduction to annual pending results	TBD, background sampling not performed	Purified water will be stabilized. Compliance anticipated.		60320.220 (a)
	Secondary MCLs, See Chapter 9 Table 9.2	2 background samples before operation followed by quarterly samples	TBD, background sampling not performed	Purified water will be stabilized. Compliance anticipated.		60320.226 (b)
	Nitrogen (Total nitrogen, nitrate, nitrite)	2 background samples before operation followed by quarterly samples	TBD, background sampling not performed	Purified water will be stabilized. Compliance anticipated.		60320.226 (b)

15.4 Groundwater Monitoring

The proposed ASR Well Monitoring and Reporting Plan defined briefly herein is for the Phase 1 ASR well. See the Report of Waste Discharge (2018) for this project to get greater detail. The proposed monitoring well locations and related hydrogeology are shown in Hopkins (2016). These well locations are intended to track the travel time and water quality of the injected water (greater than 2 weeks and less than 6 months, in accordance with DDW (2016)). Additionally, the locations of the monitoring wells are designed to accomplish three things:

- Be far enough apart to collect water levels that will define the site specific groundwater gradient.
- Be close enough to comply with DDW regulated monitoring well requirements including a travel time of greater than 2 weeks and less than 6 months.
- Utilize the City owned parcel and minimize impacts to airport operations and future park development to be planned.

As proposed, the three monitoring wells will sufficiently define the groundwater gradient in Aquifer 1 of the LAS. The location of the Phase 1 Monitoring Well No. 1 is between the proposed ASR well and the City Well No. 20, which is a municipal supply well. The differential well spacing will generate data through tracer testing to confirm the displacement rate of native groundwater. The Phase 1 Monitoring Well No. 2 is anticipated to see the recharge bubble within 2 weeks while Monitoring Well No. 1 should see the recharge bubble at around 60 days. If estimates are accurate, the Phase 1 Monitoring Well No. 3 will not see the recharge bubble at all.

15.5 Advanced Treatment Online Monitoring

Online monitoring of process performance is critical to maintain the proper barrier to pathogens and trace pollutants. Table 9.1, presented earlier in this report provides information on the proposed monitoring and response procedures to produce high quality water and the necessary response retention time.

15.6 Reporting Requirements

The reporting requirements included in this section are proposed requirements and not the final requirements. The final reporting requirements for IPR will be specified in the revised Order.

Priority Toxic Pollutants from the California Toxics Rule (CTR) are required to be monitored and reported (SWRCB, 2015), but are not regulated on a concentration basis. Thus, the important issue for Oxnard is to properly define the full list of PTPs for monitoring and to clearly note which of these PTPs are not listed in previous tables of regulated chemical pollutants. Thus, Oxnard can readily add in the additional chemical constituents for sampling.

Table 15.3 Priority Toxic Pollutants from California Toxics Rule

Monitored PTPs[1]	Add Chemical to Other Monitoring Efforts?
Antimony	
Copper	
Mercury	
Nickel	
Thallium	

Table 15.3 Priority Toxic Pollutants from California Toxics Rule (continued)

Monitored PTPs[1]	Add Chemical to Other Monitoring Efforts?
Cyanide	
Asbestos	
2,3,7,8-TCDD (Dioxin)	
Acrolein	YES
Acrylonitrile	YES
Benzene	
Bromoform	YES
Carbon Tetrachloride	
Chlorobenzene	YES
Chlorodibromomethane	YES
Dichlorobromomethane	YES
1,2-Dichloroethane	
1,1-Dichloroethylene	
1,2-Dichloropropane	
1,3-Dichloropropylene	YES
Ethylbenzene	
Methyl Bromide	YES
Methylene Chloride	YES
1,1,2,2-Tetrachloroethane	
Tetrachloroethylene	
Toluene	
1,2-Trans-Dichloroethylene	
1,1,2-Trichloroethane	
Trichloroethylene	
Vinyl Chloride	
2-Chlorophenol	YES
2,4-Dichlorophenol	YES
2,4-Dimethylphenol	YES
2-Methyl-4,6-Dinitrophenol	YES
2,4-Dinitrophenol	YES
Pentachlorophenol	
Phenol	YES
2,4,6-Trichlorophenol	YES
Acenaphthene	YES
Anthracene	YES
Benzidine	YES
Benzo(a)Anthracene	YES

Table 15.3 Priority Toxic Pollutants from California Toxics Rule (continued)

Monitored PTPs[1]	Add Chemical to Other Monitoring Efforts?
Benzo(a)Pyrene	
Benzo(a)Fluoranthene	YES
Benzo(k)Fluoranthene	YES
Bis(2-Chloroethly)Ether	YES
Bis(2-Chloroisopropyl)Ether	YES
Bis(2-Ethylhexyl)Phthalate	YES
Butylbenzyl Phthalate	YES
2-Chloronaphthalene	YES
Chrysene	YES
Dibenzo(a,h)Anthracene	YES
1,2 Dichlorobenzene	
1,3 Dichlorobenzene	YES
1,4 Dichlorobenzene	
3,3'-Dichlorobenzidine	YES
Diethyl Phthalate	YES
Dimethyl Phthalate	YES
Di-n-Butyl Phthalate	YES
2,4-Dinitrotoluene	YES
1,2-Diphenylhydrazine	YES
Fluoranthene	YES
Fluorene	YES
Hexachlorobenzene	YES
Hexachlorobutadiene	YES
1,1,2,2-Tetrachloroethane	
Tetrachloroethylene	
Toluene	
1,2-Trans-Dichloroethylene	
1,1,2-Trichloroethane	
Trichloroethylene	
Vinyl Chloride	
2-Chlorophenol	YES
2,4-Dichlorophenol	YES
2,4-Dimethylphenol	YES
2-Methyl-4,6-Dinitrophenol	YES
2,4-Dinitrophenol	YES
Pentachlorophenol	
Phenol	YES

Table 15.3 Priority Toxic Pollutants from California Toxics Rule (continued)

Monitored PTPs[1]	Add Chemical to Other Monitoring Efforts?
2,4,6-Trichlorophenol	YES
Acenaphthene	YES
Anthracene	YES
Benzidine	YES
Benzo(a)Anthracene	YES
Benzo(a)Pyrene	
Benzo(a)Fluoranthene	YES
Benzo(k)Fluoranthene	YES
Bis(2-Chloroethly)Ether	YES
Bis(2-Chloroisopropyl)Ether	YES
Bis(2-Ethylhexyl)Phthalate	YES
Butylbenzyl Phthalate	YES
2-Chloronaphthalene	YES
Chrysene	YES
Dibenzo(a,h)Anthracene	YES
1,2 Dichlorobenzene	
1,3 Dichlorobenzene	YES
1,4 Dichlorobenzene	
3,3′-Dichlorobenzidine	YES
Diethyl Phthalate	YES
Dimethyl Phthalate	YES
Di-n-Butyl Phthalate	YES
2,4-Dinitrotoluene	YES
1,2-Diphenylhydrazine	YES
Fluoranthene	YES
Fluorene	YES
Hexachlorobenzene	YES
Hexachlorobutadiene	YES
Hexachlorocyclopentadiene	
Hexachloroethane	YES
Indeneo(1,2,3-cd) Pyrene	YES
Isophorone	YES
Nitrobenzene	YES
N-Nitrosodimethylamine	
N-Nitrosodi-n-Propylamine	
N-Nitrosodiphenylamine	
Pyrene	YES

Table 15.3 Priority Toxic Pollutants from California Toxics Rule (continued)

Monitored PTPs(1)	Add Chemical to Other Monitoring Efforts?
Aldrin	YES
alpha-BHC	YES
beta-BHC	YES
gamma-BHC (lindane)	
Chlordane	
4,4'-DDT	YES
4,4'-DDE	YES
4,4'-DDD	YES
Dieldrin	YES
alpha-Endosulfan	YES
beta-Endosulfan	YES
Endosulfan Sulfate	YES
Endrin	
Endrin Aldehyde	YES
Heptachlor	
Heptachlor Epoxide	
Polychlorinated biphenyls (PCBs)	
Toxaphene	

Notes:
(1) California Toxics Rule (CTR) as defined by: https://www.gpo.gov/fdsys/pkg/FR-2000-05-18/pdf/00-11106.pdf & https://www.gpo.gov/fdsys/pkg/FR-2001-02-13/pdf/01-3617.pdf.

15.6.1 Report Submittals

The City will submit the required compliance monitoring reports, as outlined in the following paragraphs to the SWRCB's GeoTracker database and to the DDW by the dates listed in Table 15.4.

Table 15.4 Summary of Compliance Report Submittals and their Due Dates

Report	Description	Due
Occurrence / Surrogate Study Report	Provide summary of occurrence study and subsequent surrogate monitoring effectiveness.	60 days after initial 12-months of monitoring during full-scale operation.
Quarterly Monitoring Reports	Provide discussion of previous quarter's analytical results and graphical and tabular summaries of monitoring data (see detailed description below).	May 15 (for Jan – Mar) Aug 15 (for Apr – Jun) Nov 15 (for Jul – Sep) Feb 15 (for Oct – Dec)
Annual Summary Report	Provide discussion of previous year's analytical results and graphical and tabular summaries of monitoring data (see detailed description below).	April 15 (for previous year).
Operations, Maintenance and Monitoring Plan	Description of operation, maintenance, and monitoring activities related to the AWPF.	Initial prior to operation Amended: After 6 months of operation.
Five-year Engineering Report	Provide and update to the Engineer's Report.	Every 5th year from date of approval of this Engineer's Report.

Notes:
(1) All reports will be submitted to SWRCB's GeoTracker as well as to the DDW.

15.6.2 Requirements for Reports

15.6.2.1 Analytical Reporting Details

For the purposes of reporting compliance with numerical limitations, analytical data will be reported using the following reporting protocols:

- Sample results greater than or equal to the MRL must be reported 'as measured' by the laboratory (i.e., the measured chemical concentration in the sample).
- Sample results less than the MRL, but greater than or equal to the laboratory's method detection limit (MDL), will be reported as "Detected, but not Quantified", "DNQ", or "J". The laboratory will write the estimated chemical concentration of the sample next to "DNQ" or "J."
- Sample results less than the laboratory's MDL will be reported as "Non-Detected," or ND.

If the City (or their consultants/contractors) samples and performs analyses (other than for process/operational control, startup, research or equipment testing) on any sample more frequently than required in this MRP using approved analytical methods, the results of those analyses will be included in the report. The results will be reflected in the calculation of the average used in the demonstrating compliance with average effluent limitations.

The quarterly report will be prepared by an engineer licensed in the State of California and experienced in the fields of wastewater treatment and public water supply.

The LARWQCB may request supporting documentation, such as daily logs of operations.

15.6.2.2 Occurrence / Surrogate Study Report

As detailed in Section 17, the performance of the system will be documented at startup, including the use of online surrogates for performance monitoring.

Within 60-days after completing the initial 12-months of monitoring during the full-scale operation, the City will submit a report to the DDW and LARWQCB that includes:

- The results of combined chlorine destruction monitoring across the UV AOP.
- The results on online EC reduction across RO.
- The results on online measurements of UV intensity and UVT.
- The results of MF DIT results and turbidity compliance.
- A description of actions taken, or those that would be taken, if the indicator compound removal did not meet the associated design criteria, the continuous surrogate monitoring failed to correspond to the indicator compound removal percentage, or the surrogate and/or operation parameter established was not met.

15.6.2.3 Quarterly Report

The quarterly compliance monitoring reports will, at a minimum, include the following information:

- The volume of recycled water used for non-potable and potable reuse applications. If no recycled water was used/spread/injected, the report shall so state.
- The date and time of all sampling and analyses.
- All analytical results of samples collected during the monitoring period, as listed in previously in this Section.
- UVI/Q values (max, min, and average).
- Records of any operational problems, plant upset, and equipment breakdowns or malfunctions and any diversion(s) of off-specification recycled water and the location(s) of final disposal.
- Discussion of compliance, non-compliance, or violation of requirements.
- All corrective or preventative action(s) taken or planned with schedule of implementation, if any.
- Certification by the City that no groundwater for drinking water purposes has been pumped from wells within the boundary representing the greatest of the horizontal and vertical distances reflecting 3.1 months of RRT.
- Verification of compliance with the 20-week running average TOC in numerical graphic formats.
- Monitoring results associated with the evaluation of pathogenic microorganism removal as described in Section 5 of this Engineering Report.

15.6.2.4 Annual Report

The annual compliance monitoring reports will, at a minimum, include the following information:

- The volume of advanced treated recycled water used for non-potable and potable reuse applications. If no recycled water was used/spread/injected, the report shall so state.
- Tabular and graphical summaries of the monitoring data (influent, recycled water, and groundwater) obtained during the previous calendar year.

- A summary of compliance status, and for any non-compliance, a description of:
  - The date, duration, and nature of the violation.
  - A summary of any corrective actions and/or suspensions of surface and sub-surface application of recycled water resulting from a violation.
  - If uncorrected, a schedule for and summary of all remedial actions.
- Information pertaining to the vertical and horizontal migration of the recharge water plume.
- Observed trends in the monitoring wells.
- DDW drinking water quality data for the nearest domestic water supply well.
- A description of any changes in the operation of any unit processes or facilities.
- A description of any anticipated changes, along with an evaluation of the expected impacts of those changes on subsequent unit processes or facilities.
- A list of the analytical methods used for each test and associated laboratory quality assurance/quality control procedures; the report will identify the laboratories used by the City to monitor compliance with the WDR, their status of certification and provide a summary of proficiency test.
- A summary of measures taken by the City to comply with wastewater source control program and the effectiveness of the implementation measures.
- Evaluation of the ability of the City to comply with all regulations and provisions.
- List of current operating personnel, their responsibilities, and their corresponding grade of certification.

The annual report will be prepared by an engineer licensed in the State of California and experienced in the fields of wastewater treatment and public water supply.

15.6.2.5 Operation Optimization Plan

The operation and maintenance requirements of the AWPF and its initial recycled water uses were addressed in the *Operations Maintenance Management Plan (OMMP),* KEH and Associates, Inc., 2015 (OMMP). This OMMP has been updated as an *Operation Optimization Plan (OOP)* in accordance with the California Code of Regulations (CCR), Title 22 for groundwater Replenishment Reuse Projects (GRRPs). The Draft OOP, prepared under separate cover by MV Engineering (2018), describes:

- Operation and control methodologies of the facility.
- Routine maintenance procedures.
- The monitoring and reporting plan (as included herein).
- Analytical methods for constituent analysis.

The Draft OOP will be submitted separately. Looking forward, after 6-months of optimizing treatment processes during actual operation, the OOP may be further updated and amended and will be submitted to the SWRCB's GeoTracker.

15.6.2.6 Five-Year Report

A five-year Engineering Report update will address any project changes and will include, but not be limited to:

- Evidence that the requirements associated with retention time in Section 60320.108, if applicable, and Section 60320.124 of DDW regulations (SWRCB, 2018a) have been met.

- A detailed analysis of pathogen removal through primary and secondary treatment. This work will better develop the already completed four rounds of pathogen information with another 16 to 20 data points. The type of pathogens and analytical methods are to be determined.
- A description of any inconsistencies between previous groundwater model predictions and the observed and/or measured values. For this requirement, the City will summarize the groundwater flow and transport including injection and extraction operations for the project during the previous five calendar years. This summary will also use the most current data for the evaluation of the transport of recycled water; such evaluations will include, at a minimum, the following information:
  - Total quantity of water injected into each major aquifer.
  - Estimates of the rate and path of flow of the injected water within each major aquifer.
  - Projections of the arrival time of the recycled water at the closest extraction well and the percent of recycled water at the wellheads.
  - Clear presentation on any assumptions and/or calculations used for determining the rates of flow and for projecting arrival times.
  - A discussion of the underground retention time of recycled water, a numerical model, or other methods used to determine the recycled water contribution to each aquifer.
  - A revised flow and transport model to match actual flow patterns observed within the aquifer if the flow paths have significantly changed.
  - Revised estimates, if applicable, on hydrogeologic conditions including the retention time and the amount of the recycled water in the aquifers and at the production well field at the end of that calendar year. The revised estimates will be based upon actual data collected during that year on recharge rates (including recycled water, native water, and potable water), hydrostatic head values, groundwater production rates, basin storage changes and any other data needed to revise the estimates of the retention time and the amount of the recycled water in the aquifers and at the production well field. Significant differences, and the reasons for such differences, between the original estimates presented in the Engineer's Report, and the revised estimates, will be clearly presented. Additionally, the City will use the most recently available data to predict the retention time of recycled water in the substance.

The 5-year report will be prepared by an engineer licensed in the State of California and experienced in the fields of wastewater treatment and public water supply.

Section 16

GENERAL OPERATIONS PLAN

Details of the AWPF operation, including chemical use and complimentary process details are provided in the Draft OOP (MV Engineering, 2018).

The DDW commented on the OMMP on February 19, 2015 (SWRCB, 2015); providing the following important comments, followed by responses from the City on April 14, 2015 (Oxnard, 2015). Prior to operational for potable water reuse, the OMMP (now the Draft OOP) has been updated to reflect these comments and recommended changes to system operation and monitoring (e.g., TOC implementation as one example) have been incorporated in the Draft OOP.

- **DDW Comment (General)** - DDW "strongly encourages OWD to train additional staff on the operation of the AWPF to allow more flexibility in staffing…OWD shall not put an unnecessary strain on existing drinking water operations staffing…DDW requests more detail on the recycled water distribution staffing." **City Response:** The City is cross-training OWTP staff to assist the two current AWPF operators. The City also intends to limit AWPF operation, at this time, "to daytime hours when dedicated operators are manning the facility." The City intends to "add another position for a dedicated AWPF operator as well as increase Water Quality and Cross Connection staffing, by two."
- **DDW Comment (on IPR) -** "Conductivity will have a water quality trigger level at greater than 60 umho/cm. Will there be an alarm triggered instantly if this level is sustained for a period of time? What is the response time for the confirmation sample? Are operators able to respond afterhours quickly? What would their response time be?" **City Response:** "The SCADA system will be programmed to have a water quality conductivity levels above 60 umho/cm trigger an alarm after a sustained period of 10 minutes. If the AWPF is unmanned when an alarm is triggered, operators at the OWTP would respond. The OWTP has operates 24-hours per day that will be trained to respond to AWPF alarms. The response times would be less than 30 minutes. **Additional Comments based upon this Engineer's Report:** The recommended approach has been incorporated into the Draft OOP.
- **DDW Comment -** "The UV system is expected to achieve 0.9-log NDMA destruction. DDW comments on previous studies which show this corresponds to an EEO of approximately 0.20 kWhr/kgal." **City Response: Comment Noted. Additional Comments based upon this Engineer's Report:** Extensive startup work has been performed and documented in this report which illustrate the proper UV system control to meet NDMA targets with a high degree of reliability. The recommended approach has been incorporated into the Draft OOP. In particular, the NDMA LRV setpoint needs to be adjusted to 1.4 and daily UVI/Q calculations must be done. UVI/Q is not within the existing control system. On a daily basis at a minimum, AWPF staff shall hand record the UVI readings of all operational UV reactors, the flow through the UV reactors, the predicted NDMA LRV value, and calculate the UVI/Q. Should the UVI/Q value drop below 0.018 on a 30-day running average, the NDMA LRV setpoint shall be increased as needed to bring the 30-day running average above 0.018.

Further, on a quarterly basis, a reference set (6) of calibrated UVI sensors will be installed into the entire UV reactor and UVI readings will be compared to readings with the duty UVI sensors[7]. Readings for both the duty and reference sensors will be compared under similar operational conditions (hand control, all banks on at full power). Should the reference and duty UVI values be roughly equivalent (~20 percent), the reference sensors will be removed and replaced with the duty sensors. Any duty sensor that varies by more than 20 percent from the reference sensor will be replaced by the reference sensor and the duty sensor will be sent back to Trojan for calibration.

- **DDW Comment -** "Number four on the list of parameters monitored by SCADA is conductivity monitoring of the RO permeate. For IPR applications, DDW strongly encourages OWD to use an online TOC analyzer." **City Response:** "An online TOC analyzer will be added to the AWPF." **Additional Comments based upon this Engineer's Report:** At this time, no TOC analyzer has been added to the AWPF. The City intends to install TOC meter(s), and the Draft OOP has been amended to include TOC monitoring and calibration.
- **DDW Comment -** "Please explain what is meant by dose and how this set point is calculated. OMWD should propose a minimum EED." **City Response:** "A minimum EED will be identified…" **Additional Comments based upon this Engineer's Report:** See comment above regarding startup testing of the UV system. The recommended approach has been incorporated into the Draft OOP.
- **DDW Comment -** "The set point for the UV system should be…set [to] a level to always achieve 0.9-log NDMA destruction, which in previous studies corresponds to an EED of approximately 0.2 kWhr/kgal." **City Response:** Comment Noted. **Additional Comments based upon this Engineer's Report:** See comment above regarding startup testing of the UV system. The recommended approach has been incorporated into the Draft OOP.
- **DDW Comment** - OWD shall submit more details on tracer studies, monitoring wells, etc. as they become available. Additionally, please propose a detailed procedure for monitoring leakage between aquifers." **City Response:** Comment noted, the City will provide requested information to DDW. **Additional Comments based upon this Engineer's Report:** No further information in this Engineer's Report.

In the event of a process failure that impacts water quality (potentially or confirmed), the decision making process for protection of public health, detailed in Section 7, will be followed.

[7] The sensors are located under the end cover, which will de-energize the system when removed (a safety feature). Therefore the reference sensor check would involve recording the sensor value, shutting down and swapping sensors, and then starting/warming up the system again to check the second sensor response. The sensor is held in a quartz sensor sleeve so the reactor would not have to be drained.

Section 17
STARTUP TESTING

17.1 DDW Testing Requirements

In discussions with DDW, the City's engineering team reviewed how this project will not use dilution water and will use 100 percent recycled water for recharge. Additionally, the groundwater hydrogeology analyzed within this report is basic, with no tracer work yet performed. Extensive testing has been done on the AWPF, as detailed in Sections 5 and 9. These results demonstrate the ability of the AWPF to meet all regulated water quality standards, including for chemical pollutants and for pathogen log reduction. As such, the City proposes to use purified water for demonstrating the groundwater transport characteristics of the groundwater basin.

The critical missing information that still must be gathered is the travel time of injected water as it pertains to nearby drinking water wells (detailed in Hopkins, 2016). While the analysis methods are conservative, demonstration of groundwater movement (speed and direction) is required. For the ASR project, the ASR well will be put into temporary operation to track the movement of the injected water. Advanced treated recycled water and water from all monitoring wells will be sampled weekly (at a minimum) for TDS, chloride, and sulfate. The time of transport with these intrinsic tracers will be compared to the estimated values and the necessary RRT documented within this report.

The results from the testing above will be submitted to DDW and the RWQCB for review and approval prior to IPR operation.

17.2 LARWQCB Testing Requirements

Several key items must be demonstrated in advance of potable reuse:

- **Background Groundwater Quality –** Upon completion of the monitoring wells, the City will perform sampling required for regulated drinking water projects and the requirements in the Basin Plan for bacteria, minerals, nitrogen, and taste and odor. This testing will be done twice for each groundwater monitoring location. Results will be compared to the AWPF advanced treated recycled water quality detailed in Section 9.
- **Groundwater Chemistry Impacts –** The LARWQCB is concerned about changes in groundwater chemistry that may occur due to the addition of advanced treated recycled water into the groundwater basin. The primary example of this concern is the release of bound arsenic as a result of changes in groundwater chemistry (as reviewed in Section 14 of this report). Upon completion of the initial recharge demonstration period and the response retention, the groundwater will be recovered and placed into the recycled water system for irrigation uses. Groundwater will be sampled weekly for laboratory testing for potential contaminants of concern including for pH, alkalinity, arsenic, magnesium, calcium, and iron sulfides. In addition, water analyses for general minerals, metals, and radionuclides will be conducted on the recovered groundwater toward the beginning, the middle, and the end of the recovery period to assess its suitability as a potable supply.

Section 18

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DECEMBER 2018

Engineering Report

Groundwater Replenishment Reuse Project Appendices

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Groundwater Replenishment Reuse Project

Supplemental Report

INDIRECT POTABLE REUSE ENHANCED SOURCE CONTROL AND COLLECTION SYSTEM MONITORING PROGRAM

December 2018

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Abbreviations

-A-	
ASR	Aquifer Storage and Recovery
AWPF	Advanced Water Purification Facility
-B-	
bgs	below ground surface
BOD	Biological Oxygen Demand
-C-	
CEC	Constituents of Emerging Concern
CEQA	California Environmental Quality Act
City	The City of Oxnard
CIUs	Categorical Industrial Users
CMWD	Calleguas Municipal Water District
CWC	California Water Code
-D-	
DDW	Division of Drinking Water
DIT	Direct Integrity Test
-E-	
EC	Electrical Conductivity
EDCs	Endocrine Disrupting Compounds
ELAP	Environmental Laboratory Accreditation Program
-F-	
FCGMA	Fox Canyon Groundwater Management Authority
-G-	
GRPs	Groundwater Recharge Projects
GRRP	Groundwater Replenishment Reuse Project
GWRS	Groundwater Replenishment System
-H-	
H_2O_2	Hydrogen Peroxide
-I-	
IPR	Indirect Potable Reuse
-L-	
LARWQCB	Los Angeles RWQCB
LAS	Lower Aquifer System
LASAN	LA Sanitation
LPHO	Low-Pressure High-Output
LRV	Log-Removal Value

-M-	
MCLs	Maximum Contaminant Levels
MDL	Method Detection Limit
MF	Microfiltration
MRP	Monitoring and Reporting Program
MWDSC	Metropolitan Water District of Southern California
-N-	
ND	Non-Detected
NLs	Notification Levels
NOV	Notice of Violation
NWRI	National Water Research Institute
-O-	
OMMP	Operations, Maintenance, and Monitoring Plan
ORP	Oxidation Reduction Potential
OVMWD	Ocean View Municipal Water District
OWTP	Oxnard Wastewater Treatment Plant
-P-	
PDT	Pressure Decay Test
PEIR	Program Environmental Impact Report
PHWA	Port Hueneme Water Authority
POTW	Publicly-Owned Treatment Works
PPCP(s)	Pharmaceuticals and Personal Care Products
-Q-	
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
-R-	
RO	Reverse Osmosis
ROP	RO Permeate
ROSA	Reverse Osmosis System Analysis
ROWD	Report of Waste Discharge
RRT	Response Retention Time
RWC	Recycled Water Contribution
RWQCB	Regional Water Quality Control Board
-S-	
SCPM	Source Control Program Manager
SCVWD	Santa Clara Valley Water District
SIU(s)	Significant Industrial User(s)
SNMP(s)	Salt Nutrient Management Plan(s)

SWP	State Water Project
SWRCB	State Water Resources Control Board
-T-	
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TSP-SC	Technical Services Program – Source Control
TTO	Total Toxic Organics
-U-	
UAS	Upper Aquifer System
UV AOP	Ultraviolet Light and Hydrogen Peroxide
UVT	UV Transmittance
UWCD	United Water Conservation District's
-W-	
WDR(s)	Waste Discharge Requirement(s)
WRD	Water Replenishment District
WRR	Water Recycling Requirement

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Appendix A

INDIRECT POTABLE REUSE ENHANCED SOURCE WATER CONTROL AND COLLECTION SYSTEM MONITORING PROGRAM

City of Oxnard

Groundwater Replenishment Reuse Project

Supplemental Report

INDIRECT POTABLE REUSE ENHANCED SOURCE CONTROL AND COLLECTION SYSTEM MONITORING PROGRAM

December 2018

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Abbreviations

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CWC	California Water Code
-D-	
DDW	Division of Drinking Water
DIT	Direct Integrity Test
-E-	
EC	Electrical Conductivity
EDCs	Endocrine Disrupting Compounds
ELAP	Environmental Laboratory Accreditation Program
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FCGMA	Fox Canyon Groundwater Management Authority
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GRPs	Groundwater Recharge Projects
GRRP	Groundwater Replenishment Reuse Project
GWRS	Groundwater Replenishment System
-H-	
H_2O_2	Hydrogen Peroxide
-I-	
IPR	Indirect Potable Reuse
-L-	
LARWQCB	Los Angeles RWQCB
LAS	Lower Aquifer System
LASAN	LA Sanitation
LPHO	Low-Pressure High-Output
LRV	Log-Removal Value

-M-	
MCLs	Maximum Contaminant Levels
MDL	Method Detection Limit
MF	Microfiltration
MRP	Monitoring and Reporting Program
MWDSC	Metropolitan Water District of Southern California
-N-	
ND	Non-Detected
NLs	Notification Levels
NOV	Notice of Violation
NWRI	National Water Research Institute
-O-	
OMMP	Operations, Maintenance, and Monitoring Plan
ORP	Oxidation Reduction Potential
OVMWD	Ocean View Municipal Water District
OWTP	Oxnard Wastewater Treatment Plant
-P-	
PDT	Pressure Decay Test
PEIR	Program Environmental Impact Report
PHWA	Port Hueneme Water Authority
POTW	Publicly-Owned Treatment Works
PPCP(s)	Pharmaceuticals and Personal Care Products
-Q-	
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
-R-	
RO	Reverse Osmosis
ROP	RO Permeate
ROSA	Reverse Osmosis System Analysis
ROWD	Report of Waste Discharge
RRT	Response Retention Time
RWC	Recycled Water Contribution
RWQCB	Regional Water Quality Control Board
-S-	
SCPM	Source Control Program Manager
SCVWD	Santa Clara Valley Water District
SIU(s)	Significant Industrial User(s)
SNMP(s)	Salt Nutrient Management Plan(s)

SWP	State Water Project
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-T-	
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TSP-SC	Technical Services Program – Source Control
TTO	Total Toxic Organics
-U-	
UAS	Upper Aquifer System
UV AOP	Ultraviolet Light and Hydrogen Peroxide
UVT	UV Transmittance
UWCD	United Water Conservation District's
-W-	
WDR(s)	Waste Discharge Requirement(s)
WRD	Water Replenishment District
WRR	Water Recycling Requirement

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Acknowledgements: At the onset of this effort, Carollo and City of Oxnard staff reached out to the Orange County Sanitation District and the Los Angeles County Sanitation Districts for initial guidance on source control for potable water reuse. Their assistance was substantial and is appreciated.

Section 1

INTRODUCTION

The City of Oxnard (Oxnard, City) is in the process of permitting an Advanced Water Purification Facility (AWPF) for the purposes of implementing potable reuse. The production of purified water starts with an effective enhanced source control program (ESCP), which goes beyond the existing approved source control program for the City. This ESCP details the planned program to effectively monitor the industrial and municipal contributions to the Oxnard Wastewater Treatment Plant (OWTP) as it pertains to the forthcoming potable water reuse project. This document is intended as guidance to the City with proposed methods to monitor in numerous locations and proposed methods to trace pollutants to their source. Some changes to the monitoring and response recommendations will occur as the City gains more experience and moves forward with their forthcoming project.

Much of this ESCP details sampling efforts currently employed as part of the existing source control program and sampling efforts that are already required by State of California Division of Drinking Water (DDW) for finished water quality monitoring for potable reuse. This document is not recommending duplication of those efforts, but instead presents the overall collection and use of data to optimize source control.

Section 2

BACKGROUND

This section includes an overview the National Pretreatment program, an overview of enhanced source control, and the DDW regulatory requirements for groundwater recharge with recycled water.

2.1 National Pretreatment Program

The National Pretreatment Program was established as part of the Clean Water Act to control and regulate the discharge of pollutants from commercial and industrial dischargers of wastewater to publicly owned treatment works (POTWs).

The National Pretreatment Program affords agencies implementing potable reuse the foundational elements needed to implement enhanced source control. The program was promulgated by the United States Environmental Protection Agency (USEPA) in 1983 to control the discharge of pollutants to POTWs. The General Pretreatment Regulations are contained in the Code of Federal Regulations, 40 CFR 403. They establish responsibilities of federal, state, and local government, as well as industrial dischargers, to implement pretreatment standards to control pollutants discharged from nondomestic sources. Since its inception, the National Pretreatment Program has been notably successful in reducing the discharge of pollutants into POTWs nationwide. The objectives of the program are to:

- Prevent the introduction of pollutants into a POTW that will interfere with the operation of the POTW, including interference with its use or disposal of municipal biosolids.
- Prevent the introduction of pollutants into a POTW that will pass through the treatment facility and exit the POTW and cause effluent or biosolids permit violations.
- Improve opportunities to recycle and reclaim municipal and industrial wastewaters and biosolids.

The City operates a USEPA-approved industrial pretreatment program in accordance with 40 CFR 403. Permitted industrial dischargers are subject to national pretreatment standards, which are prohibited discharge standards, categorical pretreatment standards, and local limits. Industrial dischargers are also required to follow permit requirements for discharge monitoring and reporting.

While not designed for potable reuse, Oxnard's pretreatment program can be leveraged with other enhancements to create an enhanced source control program tailored towards potable reuse. The six main elements of the National Pretreatment Program are listed below.

EPA's Six Main Pretreatment Program Elements

1. Legal Authority

The POTW must operate pursuant to legal authority enforceable in federal, state, or local courts, which authorizes or enables the POTW to apply and enforce any pretreatment requirements developed pursuant to the Clean Water Act (CWA) and implementing regulations.

2. Enforcement Response Plan (ERP)

The POTW must develop and implement an ERP that contains detailed procedures indicating how the POTW will investigate and respond to instances of IU noncompliance.

3. Local Limits

The POTW must develop local limits in defined circumstances or demonstrate why these limits are not necessary. They are custom-designed by each POTW for site-specific protection.

4. Industrial Waste Survey

The POTW must prepare, update, and submit to the Approval Authority a list of all Significant Industrial Users (SIUs).

5. Procedures

The POTW must develop and implement procedures to ensure compliance with pretreatment requirements, including identifying industrial users, sampling, monitoring, reporting, investigating instances of noncompliance, and public notification.

6. Funding and Other Resources

The POTW must demonstrate that they have sufficient resources and qualified personnel to carry out the authorities and procedures specified in its pretreatment program.

Pollutant monitoring is one of the foundations of the National Pretreatment Program, and proper use of the requirements and procedures provide defensible characterization of wastewater. Sampling is regularly conducted at the industrial user discharge points to verify compliance with pretreatment standards and local limits. Sampling is conducted at the POTW for local limits development.

2.2 Role of Enhanced Source Control

The latest research and information regarding enhanced source control was reviewed to determine the proposed ESCP strategies described in this document. Enhanced source control builds upon the existing source control and pre-treatment program already implemented by the City, with potable reuse in mind. The goals of an ESCP for potable reuse include (Tchobanoglous, 2015):

- Minimize the discharge of potentially harmful or difficult-to-treat chemical constituents to the wastewater collection system from industries, health care facilities, commercial businesses, and homes.
- Improve wastewater effluent quality and advanced water treatment performance.
- Provide the public with confidence that the wastewater collection system is being managed with potable reuse in mind.

The principal elements of enhanced source control for potable reuse are listed below (NRWI 2016). The elements build on the foundational pretreatment program elements described in Section 2.

- Regulatory authority.
- Monitoring and assessment of the sewershed.
- Source investigations.

- Updated inventory of chemicals and constituents.
- Public outreach.
- Response plan.

An ESCP is not designed to remove all unwanted constituents but rather to reduce the likelihood that problematic constituents will be introduced into the influent to the advanced water purification facility (AWPF). A risk-based approach to source control is recommended by the Australian Sewage Quality Management Guidelines (WSAA 2012) and encompasses an understanding of baseline sewage quality, the identification of hazardous events, and the control/mitigation of hazards based on risk level.

2.3 DDW Regulations

The regulatory requirements for wastewater source control are defined in the California Code of Regulations Section 60320.206 of the regulations for groundwater recharge with recycled water (California Division of Drinking Water (DDW), 2018b). For this project, the City must administer an industrial pretreatment and pollutant source control program. The City must implement and maintain a program that includes, at a minimum:

1. An assessment of the fate of chemicals and contaminants that are specified by the Department of Drinking Water (Department) and Regional Water Quality Control Board, Los Angeles Region (RWQCB) through the wastewater and recycled municipal wastewater treatment systems (addressed in Section 8).
2. Chemical and contaminant source investigations and monitoring that focuses on Department-specified and RWQCB-specified chemicals and contaminants (addressed in Sections 4 – 6).
3. An outreach program to industrial, commercial, and residential communities within the portions of the sewage collection agency's service area that flows into the water reclamation plant subsequently supplying the groundwater replenishment reuse project (GRRP), for the purpose of managing and minimizing the discharge of chemicals and contaminants at the source (addressed in Sections 6 and 7).
4. A current inventory of chemicals and contaminants identified pursuant to this section, including new chemicals and contaminants resulting from new sources or changes to existing sources, that may be discharged into the wastewater collection system (addressed in Section 6).
5. Is compliant with the effluent limits established in the wastewater management agency's Regional Water Quality Control Board (RWQCB) permit (addressed in Sections 5 and 8).

This document is intended to address each of these items to the satisfaction of DDW.

Section 3

COLLECTION SYSTEM AND SECONDARY EFFLUENT SOURCE MONITORING PROGRAMS

While collection system pre-treatment programs and monitoring are important, secondary effluent is the source water to be used for potable reuse. The proposed ESCP includes a specific contaminant inventory to be monitored in the secondary effluent as well as in the purified water. An action plan detailing when and how to trace contaminants back through the wastewater treatment plant (WWTP) and potentially into the collection system can be found in Section 6.

A generic example of how to trace industrial discharges from their source to the AWPF, based upon different constituent groups, is shown in Figure 3.1. Monitoring parameters vary by location, with more constituents being tested in the secondary effluent and purified water.

An effective enhanced source control program will have a monitoring and data analysis plan that starts with the first discharge of wastewater into the collection system all the way through to the final purification step at the AWPF. Key to this success is having a dedicated staff member heading up the program as the Source Control Program Manager (SCPM). A further job description for the SCPM is provided later in this document.

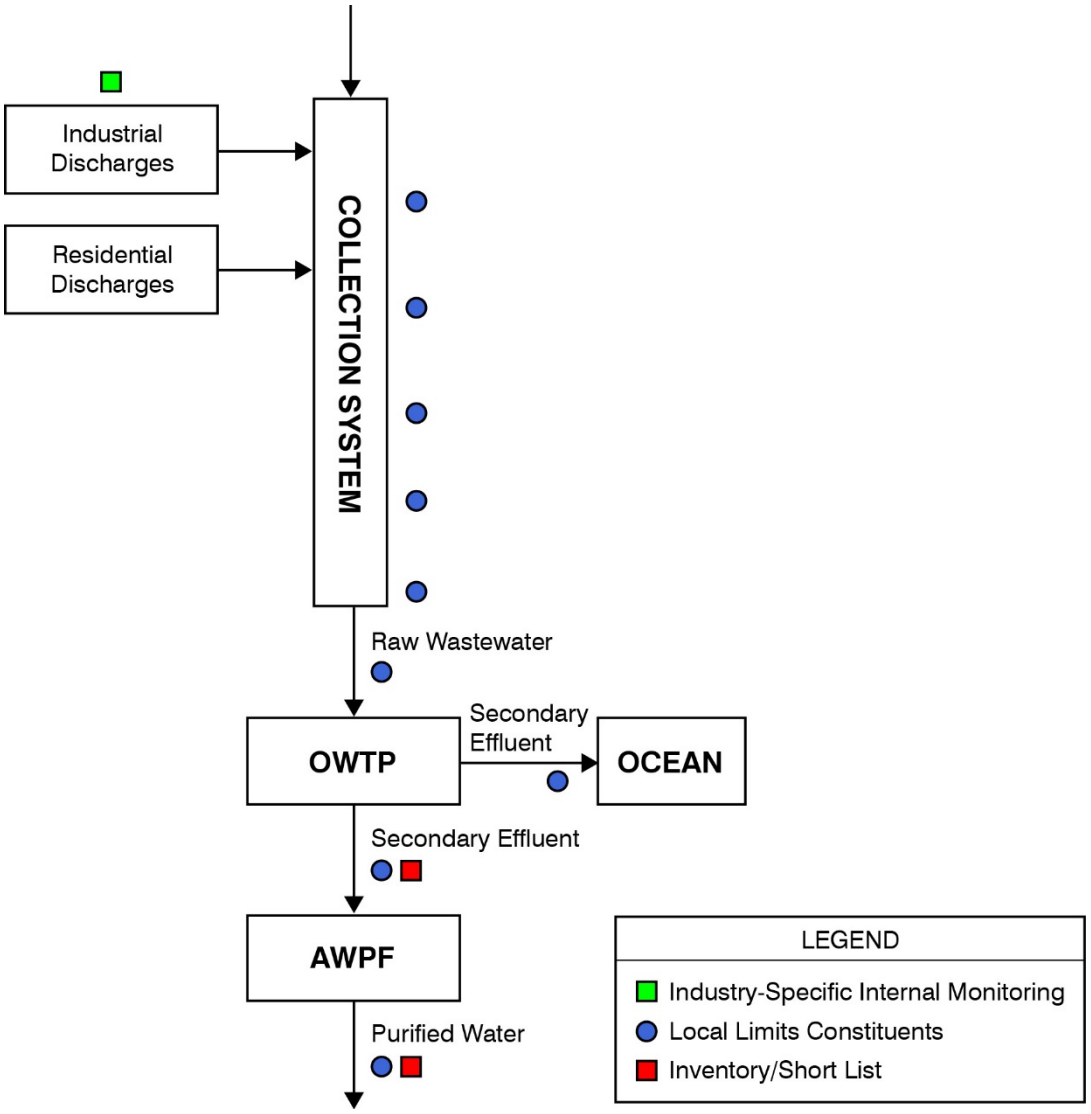

Figure 3.1 Dischargers, Sampling Locations and Monitoring Constituents across the Collection and Treatment System

Section 4

EXISTING INDUSTRIAL PRETREATMENT AND COLLECTION SYSTEM SOURCE CONTROL PROGRAM OVERVIEW

The OWTP is permitted under National Pollutant Discharge Elimination System [NPDES] No. CA0054097, issued to the City on October 11, 2018, and operates an Environmental Protection Agency (EPA)-approved industrial pretreatment program. That program is operating based upon an approved Local Limits program (from 1999).

Oxnard is currently updating that Local Limits program. The City is undertaking such an effort in accordance with the permit, and will submit the proposed limits to the Los Angeles office of the RWQCB for approval. As part of this new Local Limits effort, the City and its contractors have performed detailed sampling efforts of the various industrial users and across the OWTP and the AWPF. The sampling plan included different sewer sampling sites for residential sampling, as well as additional sites for industrial and commercial business sampling. A draft local limits report is now under evaluation by the City. The City continues to conduct public outreach to the industries.

Elements of, and updates to, the City's current source control program are provided below.

4.1 Description of Industrial Users

The OWTP treats wastewater from the City and Port Hueneme as well as the Point Mugu Naval Base, Ventura County. Approximately 75 percent of this collected flow is residential. The remaining 25 percent is from commercial and industrial users.

Categorical Industrial Users (CIUs) are defined by the federal government and subject to categorical pretreatment standards established in the Code of Federal Regulations. Their discharge requirements are applicable nationwide and are based on best available technology. CIUs, by definition, are also defined as Significant Industrial Users (SIUs). There are typically other SIUs which may not be CIUs.

An industrial user is classified as a SIU if it meets any of the following:

- Is subject to categorical pretreatment standards under 40 CFR 403.6 and 40 CFR Section I, Subsection N.
- Discharges an average of 25,000 gpd or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blowdown wastewater).
- Contributes a process waste stream that makes up 5 percent or more of the average dry-weather hydraulic or organic capacity of the POTW treatment plant.
- Is designated as such by the POTW on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

There are thirty-five industries in the service area identified as SIUs discharging into the OWTP collection system, as shown in Table 4.1. Included in Table 4.2 are several dischargers that are not defined as SIUs, but are regulated under the Oxnard Local Limits program. For each discharger shown in the table below, pertinent details are included, such as Regulatory Classification, Wastewater Type, Type of Pretreatment, Potential Contaminants, Average Daily Flow (ADF), Location, and Oxnard permit number. Figure 4.1 shows the location of these customers within the Oxnard wastewater collection system.-

Table 4.1 Industrial Dischargers to OWTP

	Regulatory Classification	Categorical Standard[1]	Wastewater Type	Type of Pretreatment	Potential Contaminants[2]	ADF, kgal (Permit)	Address	Permit #
Aluminum Precision	SIU with Local Limits	Aluminum Forming	Aluminum Forming for Aerospace Automotive and Military Industries	Metals Precipitation, Filter Press, Ultra-Filtration and pH Adjustment	Cd, Cr, Cu, CN, Pb, Ni, O&G, pH, TTO, Zn, Flow	7	1001 McWayne Blvd.	74162
Arcturus	SIU with Local Limits	Aluminum Forming	Ferrous & Non-Ferrous Metals Forming	Settling Pond, Oil Skimming, pH Adjustment with H2SO4	Cd, Cr, Cu, CN, Pb, Ni, O&G, pH, TTO, Zn, Flow	25	6001 Arcturus Ave.	308
Boskovich Farms, Inc.	SIU with Local Limits	N/A	Food Processor; wash, cool, package	Screenings & Filtration	BOD, H2S, O&G, TSS, Flow	250	711 Diaz Ave.	23035
Cal Sun	SIU with Local Limits	N/A	Strawberry Food Processor	Activated Sludge	BOD, H2S, pH, TSS, Flow	32	511 Mountain View Ave.	87549
City of Oxnard Desalter	SIU with Local Limits	N/A	Water Treatment	None	TDS, pH, TSS, Flow	1,500	251 S. Hayes Ave.	23233
Coastal Green Vegetables	SIU with Local Limits	N/A	Food Processor; wash, cool, package, freeze	Activated Sludge	BOD, H2S, O&G, pH, TSS, Flow	220	605 Buena Vista Ave.	94108
Coastal Metal Finishing *(now owned by Limons Metal Finishing)*	Local Limits Only	Metal Finishing	Metal Finishing	Batch Treatment: pH Adjustment, Filtration, Ion Exchange, Evaporation, Solids Dewatering	Ag, CN, Cr, Cu, Pb, Ni, pH, TTO, Zn	4	1160 Mercantile St.	86037
Consolidated Precision Products	SIU with Local Limits	Metal Molding and Casting (Foundries)	Metal Molding & Casting	pH Adjustment	Cd, Cr, Cu, Pb, Ni, Ag, Zn, O&G, pH, TSS, TTO, Flow	30	705 Industrial Ave.	OC-25
Crestview Municipal Water Company	SIU with Local Limits	N/A	Filter Backwash	None	BOD, TSS, pH	Not Operating	602 Valley Vista	OC-5
Deardorf Farms	SIU with Local Limits	N/A	Food Processor; wash, cool, package	Clarifier	BOD, H2S, O&G, TSS, pH, Flow	10	400 N. Lombard	24330
Duda Farms	SIU with Local Limits	N/A	Food Processor	Screening	BOD, H2S, TSS, pH, Flow	37	860 Pacific Ave.	87287
EF Oxnard	SIU with Local Limits	Steam Electric Power Generating	Steam Electric Power Generation; cooling tower blowdown, reverse osmosis reject	None	Cd, Cr, Cu, Pb, Ni, O&G, pH, TTO, Zn, Flow	15	550 Diaz	85723
Elite	SIU with Local Limits	Metal Finishing	Metal Finishing	Batch Treatment: pH Adjustment, Filtration, Ion Exchange, Evaporation, Solids Dewatering	Ag, CN, Cr, Cd, Cu, Pb, Ni, pH, TTO, Zn	14	540 Spectrum Circle	69418
Frozsun Foods, Inc. *(Sunrise Growers 3rd St.)*	SIU with Local Limits	N/A	Food Processor	Rotating Hydrosieve, Biological	BOD, H2S, pH, TSS, O&G, Flow	350	808 E. Third St.	60905
Frozsun, Inc. *(Sunrise Growers Sturgis)*	SIU with Local Limits	N/A	Food Processor; wash, cook, pack	Bio Reactors, Clarification, pH Adjustment	BOD, H2S, TSS, pH, Flow	40	2640 Sturgis Rd.	103247

Table 4.1 Industrial Dischargers to OWTP (continued)

	Regulatory Classification	Categorical Standard[1]	Wastewater Type	Type of Pretreatment	Potential Contaminants[2]	ADF, kgal (Permit)	Address	Permit #
Gills Onions	SIU with Local Limits	N/A	Food Processor; onion washing, cutting and packaging	Screening, Biological Treatment, Settling/Clarification	BOD, H2S, O&G, TSS, pH, Flow	250	901 Pacific Ave.	57277
Harris Water Conditioning	SIU with Local Limits	N/A	Water Softener Regenerator	Gravity Separator, Settling Tanks	BOD, H2S, O&G, pH, TSS, TDS, Flow	138	1025 S. Rose	2072
Herzog	SIU with Local Limits	N/A	Winery	Gravity Separator, pH Adjustment	BOD, H2S, pH, TSS, Flow	11	3201 Camino Del Sol	84360
J.M. Smuckers Co.	SIU with Local Limits	N/A	Food Processor; wash, process, package	Activated Sludge	BOD, H2S, pH, TSS, Flow	148	800 Commercial Ave.	88262
Limons Metal Finishing, Inc.	SIU with Local Limits	Metal Finishing	Metal Finishing	Batch Treatment: pH Adjustment, Filtration, Ion Exchange, Evaporation, Solids Dewatering	Ag, CN, Cr, Cu, Pb, Ni, pH, TTO, Zn	4	1160 Mercantile St.	26531
Mission Linen	SIU with Local Limits	N/A	Commercial Laundry	pH Adjustment, Gravity Separation, DAF and Filtration	BOD, O&G, pH, TSS, Flow, H2S, Temperature	39	505 Maulhardt	533
Naval Base Ventura Cty - Point Mugu Facility	SIU with Local Limits	N/A	Domestic/Commercial	Settling	BOD, Cd, Cu, Pb, O&G, H2S, pH, TSS, TTO, Zn, Flow	382	Bldg. 64, Point Mugu	OC-2
Naval Base Ventura Cty - Port Hueneme Facility	SIU with Local Limits	N/A	Domestic/Commercial	None	BOD, Cd, Cr, Ag, Cu, Pb, Ni, O&G, H2S, pH, TSS, TTO Zn, Flow	650	Mills Road Bldg. 1430, Port Hueneme	OC-04
New Indy	SIU with Local Limits	Pulp, Paper and Paperboard	Pulp, Paper, and Paperboard Processing	Activated Sludge	BOD, H2S, O&G, pH, TSS, TTO, Flow, PCP, TCP	309	5936 Perkins Rd.	100024
Oxnard Lemon Co.	SIU with Local Limits	N/A	Food Processor; wash, process, package	Activated Sludge, Clarification	BOD, H2S, O&G, pH, TSS, Flow	35	2001 Sunkist Circle	13266
Pacific Ridge Farms *(now owned by Frozsun)*	Local Limits Only	N/A	Food Processor; wash, cool, pack	Bio Reactors, Clarification, pH Adjustment	BOD, H2S, TSS, pH, Flow	30	2640 Sturgis Rd.	96073
Parker Hannafin	SIU with Local Limits	N/A	Membrane and Filter Manufacturing	Reverse Osmosis, Vacuum Distillation and UV Advanced Oxidation	BOD, TTO, O&G, pH, TSS, Zn	26	2340 Eastman	88211
Port Hueneme Water Agenc	SIU with Local Limits	N/A	Water Treatment	None	TDS, pH, TSS, Flow	650	5751 Perkins Rd.	56788
Proctor and Gamble	SIU with Local Limits	Pulp, Paper and Paperboard	Pulp, Paper and Paperboard Processing	Gravity Separation, Filtration, Dewatering, Equalization, Neutralization	BOD, H2S, O&G, pH, TSS, TTO, Flow, PCP, TCP	1,376	800 N. Rice	4438
Puretec Industrial	SIU with Local Limits	N/A	Water Softener Regenerator	pH Adjustment	BOD, H2S, O&G, pH, TSS, Flow	100	3151 Sturgis Rd.	56690
Raypak	SIU with Local Limits	Metal Finishing	Metal Finishing	Chemical Precipitation, Neutralization, Settling/Clarification, Filter Press, Filtration	O&G, Cd, Cr, Cu, CN, Pb, pH, Ni, Ag, TTO, Zn	11	2151 Eastman	64517

Table 4.1 Industrial Dischargers to OWTP (continued)

	Regulatory Classification	Categorical Standard[1]	Wastewater Type	Type of Pretreatment	Potential Contaminants[2]	ADF, kgal (Permit)	Address	Permit #
Saticoy Lemon	SIU with Local Limits	N/A	Food Processor; wash lemons, box and package	Biological Control, Clarification, Aeration, Screening	BOD, H2S, O&G, TSS, pH, Flow	50	600 E. Third St.	1345
Scarborough Farms, Inc.	SIU with Local Limits	N/A	Food Processor; vegetable washing, packaging	None	BOD, H2S, pH, TSS, Flow	17	731 Pacific Ave.	57313
Seaboard Produce	SIU with Local Limits	N/A	Food Processor	Settling, Clarification	BOD, H2S, O&G, TSS, Flow	6	601 Mountain View	9866
Seminis	SIU with Local Limits	N/A	Seed Processing	Batch Treatment, Precipitation, Clarification, pH Adjustment, Solids Removal, Ozone	BOD, H2S, TSS, pH, Flow, Zn, TTO, COD, O&G	19	2700 Camino Del Sol	47449
Simba Cal	SIU with Local Limits	Metal Finishing	Metal Finishing	None	Cd, Cr, Cu, Pb, Ni, Ag, Zn, CN, TTO, pH	0.75	1680 Universe Circle	32321
Terminal Freezers (Del Mar, Sun Coast, Tree Top)	SIU with Local Limits	N/A	Food Processor	Activated Sludge, Hydrosieve	BOD, H2S, pH, TSS, O&G, Flow	730	1300 E. Third St.	98242
Ventura Pacific	SIU with Local Limits	N/A	Food Processor; (processing & packaging of lemons)	Activated Sludge, Screening and Clarification	BOD, H2S, O&G, TSS, pH, Flow	70	245 E. Colonia Rd.	26979

Notes:
(1) N/A indicates the industry is not federally regulated.
(2) All TTOs required for monitoring are included in Table 4.3, with corresponding federal categorical standards, where applicable. TTO requirements for non-federally regulated industries are determined by the POTW and will be updated with the Local Limits study.

Table 4.2 Industrial Discharge Customer and Corresponding Numbers to Figure 4.1

INDUSTRIAL CUSTOMERS	
No.	Name
1	Aluminum Precision Products
2	Arcturus Manufacturing
3	Automobile Racing Products
4	Boskovich Farms
5	Cal Sun Produce
6	City of Oxnard Blending Station 3
7	City of Oxnard Desalter
8	Coastal Green Vegetable Company
9	Coastal Metal Finishing
10	Consolidated Precision Products
11	Crestview Municipal Water Company
12	Deardorf Farms
13	Duda Farm Fresh Foods
14	EF Oxnard
15	Elite Metal Finishing
16	Frozsun Foods
17	Frozsun Inc
18	Gill's Onions
19	Harris Water Conditioning
20	Herzog Wine Cellars
21	J.M. Smucker Co.
22	Limons Metal Finishing, Inc.
23	Mission Linen Supply
24	Naval Base Ventura County - Point Mugu Facility
25	Naval Base Ventura County - Port Hueneme Facility
26	New Indy
27	Oxnard Lemon Co.
28	Pacific Ridge Farms
29	Parker Hannifin
30	Port Hueneme Water Agency
31	Proctor and Gamble
32	Puretec Industrial Water

Table 4.2 Industrial Discharge Customer and Corresponding Numbers to Figure 4.1 (continued)

INDUSTRIAL CUSTOMERS	
No.	Name
33	Raypak
34	Santa Clara Waste Water Co.(1)
35	Saticoy Lemon #4
36	Scarborough Farms
37	Seaboard Produce Distributors
38	Seminis
39	Simba Cal
40	Terminal Freezer
41	Ventura Pacific Co.

Notes:
(1) Santa Clara Waste Water Co.'s permit is suspended.

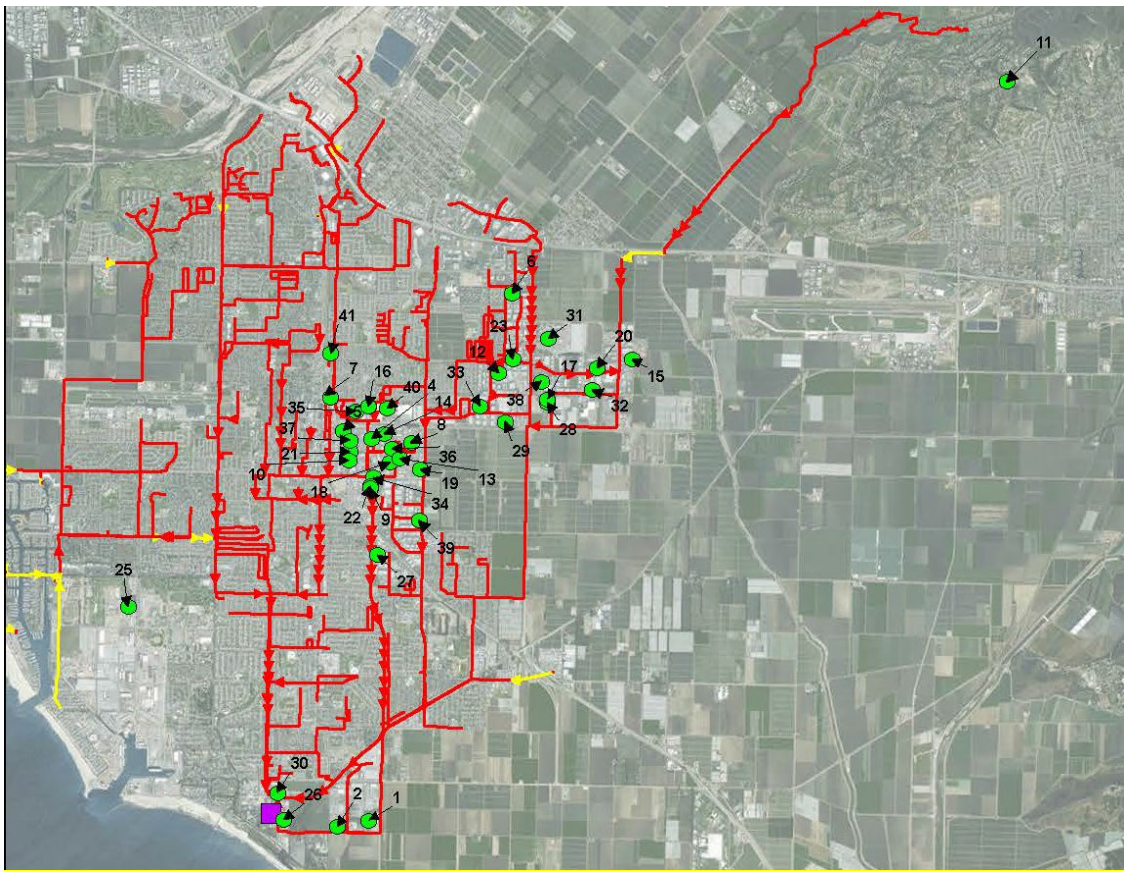

Figure 4.1 Oxnard Collection System with SIUs

4.2 Source Control Program Description

Oxnard's Source Control Program was established as part of the City's industrial pretreatment program, to prevent contaminants from entering the sewer system that could negatively impact the wastewater treatment process or reclaimed water quality. The source control program was also designed to protect the public and environment as well as OWTP personnel from harmful industrial waste. To achieve these goals, the City adopted a Sewer Ordinance within Section 19, Article 1 of the Oxnard Code of Ordinances. *Although not specifically designed to address potable water reuse, Oxnard's existing source control program is intended to protect OWTP effluent, which is the source to the AWPF.* The proposed source control program specifically tailored to potable water reuse is detailed further on in this document.

4.2.1 Local Limits Evaluation

A Local Limits Evaluation Report was produced in 1999 that determined allowable contaminant concentrations in industrial wastewater. The Local Limits Evaluation Report is now being updated (October 2017 Draft).

4.2.2 Permitting of Industrial Users

All SIUs are required to obtain an Industrial Wastewater Discharge Permit from the Oxnard City Manager. Permits are issued for up to five-year periods and contain both effluent limits and sampling requirements. These limits can be both local and federal. SIUs are required to submit their permit application at least 90 days before any proposed discharge. Table 4.2, above, includes all industrial dischargers permitted by the City.

4.2.3 Industrial Waste Monitoring

Oxnard's monitoring program provides necessary information for evaluating industry compliance, assessing OWTP loading and operation, and determining illicit discharges. SIUs are monitored via three mechanisms: self-monitoring, monitoring by the City, and surveillance sampling.

Self-monitoring is required for each SIU. The Industrial Wastewater Discharge Permits mandate daily flow monitoring as well as bi-monthly contaminant sampling. Each month the SIU must submit a Surveillance Monitoring Report to the City. Typical parameters for which dischargers must sample include: Biological Oxygen Demand (BOD), TSS, Total Toxic Organics (TTO), Oil and Grease, and pH. Industry specific metal monitoring is often also mandated. Monthly TTO monitoring may not be required if TTO samples contain less than 1.0 mg/L, and in this case, only yearly samples are necessary. The following Table 4.3 contains a list of all TTOs and the corresponding industry category that requires monitoring.

Table 4.3 Industrial Discharge Monitoring Requirements for TTOs

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
1,1,1-trichloroethane		X	X	X		
1,1,2,2-Tetrachloroethane		X		X		
1,1,2-trichloroethane		X		X		
1,12-benzoperylene (benzo(ghi) perylene)		X		X		
1,1-dichloroethane		X		X		
1,1-dichloroethylene		X		X		
1,2,4-trichlorobenzene		X		X		
1,2,5,6-dibenzanthracene (dibenzo(a,h)anthracene)	X		X			
1,2-benzanthracene (benzo(a) anthracene)		X		X		
1,2-dichlorobenzene		X		X		
1,2-dichloroethane		X		X		
1,2-dichloropropane		X		X		
1,2-dichloropropylene (1,3-dichloropropene)				X		
1,2-diphenylhydrazine	X	X		X		
1,2-trans-dichloroethylene		X		X		
1,3-dichlorobenzene		X		X		
1,3-Dichloropropylene (1,3-dichloropropene)		X				
1,4-dichlorobenzene		X		X		
11,12-benzofluoranthene (benzo(b) fluoranthene)				X		
11,12-Benzofluoranthene (benzo(k)fluoranthene)		X				
2,3,4,6-tetrachlorophenol					X	

Table 4.3 Industrial Discharge Monitoring Requirements for TTOs (continued)

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD)		X		X		
2,4,5-trichlorophenol					X	
2,4,6-trichlorophenol		X	X	X	X	X
2,4-dichlorophenol		X		X		
2,4-dimethylphenol		X	X	X		
2,4-dinitrophenol		X		X		
2,4-dinitrotoluene	X	X		X		
2,6-dinitrotoluene		X		X		
2-chloroethyl vinyl ether (mixed)		X		X		
2-chloronaphthalene		X		X		
2-chlorophenol	X	X		X		
2-nitrophenol		X		X		
3,3-dichlorobenzidine		X		X		
3,4,5-trichlorocatechol					X	
3,4,5-trichloroguaiacol					X	
3,4,6-trichlorocatechol					X	
3,4,6-trichloroguaiacol					X	
3,4-Benzofluoranthene (benzo(b) fluoranthene)	X	X		X		
4,4-DDD (p,p-TDE)		X		X		
4,4-DDE (p,p-DDX)		X		X		
4,4-DDT		X		X		
4,5,6-trichloroguaiacol					X	
4,6-dinitro-o-cresol		X		X		
4-bromophenyl phenyl ether		X		X		

Table 4.3 Industrial Discharge Monitoring Requirements for TTOs (continued)

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
4-chlorophenyl phenyl ether		X		X		
4-nitrophenol		X		X		
Acenaphthene	X	X	X	X		
Acenaphthylene	X	X		X		
Acrolein		X		X		
Acrylonitrile		X		X		
Aldrin		X		X		
Alpha-BHC		X		X		
Alpha-endosulfan		X		X		
Anthracene	X	X	X	X		
Antimony				X		
Arsenic				X		
Asbestos				X		
Benzene		X	X	X		
Benzidine		X		X		
benzo (a)anthracene (1,2-benzanthracene)			X			
Benzo(a)pyrene (3,4-benzo-pyrene)	X	X	X	X		
benzo(ghi)perylene	X					
Benzo(k)fluoranthene	X					
Beryllium				X		
Beta-BHC		X		X		
Beta-endosulfan		X		X		
Bis (2-chloroethoxy) methane		X		X		
Bis (2-chloroethyl) ether		X		X		

Table 4.3 Industrial Discharge Monitoring Requirements for TTOs (continued)

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
Bis (2-chloroisopropyl) ether		X		X		
Bis (2-ethylhexyl) phthalate	X	X	X	X		X
Bromoform (tribromomethane)		X		X		
Butyl benzyl phthalate		X	X	X		
Cadmium				X		
Carbazole						X
Carbon tetrachloride (tetrachloromethane)		X		X		
Chlordane (technical mixture and metabolites)		X		X		
Chlorobenzene		X	X	X		
Chlorodibromomethane		X		X		
Chloroethane		X		X		
Chloroform (trichloromethane)		X	X	X		
Chromium				X		
Chrysene	X	X	X	X		
Copper				X		
Cyanide, Total				X		
Delta-BHC (PCB-polychlorinated biphenyls)		X		X		
dibenzo(a,h)	X					
Dichlorobromomethane		X		X		
Dieldrin		X		X		
Diethyl Phthalate	X	X	X	X		
Dimethyl phthalate		X		X		

Table 4.3 Industrial Discharge Monitoring Requirements for TTOs (continued)

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
Di-N-Butyl Phthalate	X	X	X	X		
Di-n-octyl phthalate		X		X		
Endosulfan sulfate	X	X		X		
Endrin	X	X		X		
Endrin aldehyde	X	X		X		
Ethylbenzene	X	X		X		
Fluoranthene	X	X	X	X		X
Fluorene	X	X	X	X		
Gamma-BHC (lindane)		X		X		
Heptachlor		X		X		
Heptachlor epoxide (BHC-hexachlorocyclohexane)		X		X		
Hexachlorobenzene		X		X		
Hexachlorobutadiene		X		X		
Hexachlorocyclopentadiene		X				
Hexachloroethane		X		X		
Hexachloromyclopentadiene				X		
Indeno (,1,2,3-cd) pyrene (2,3-o-pheynylene pyrene)	X			X		
Indeno(1,2,3-cd) pyrene (2,3-o-phenlene pyrene)		X				
Isophorone	X	X		X		
Lead				X		
Mercury				X		
Methyl bromide (bromomethane)		X		X		

Table 4.3 Industrial Discharge Monitoring Requirements for TTOs (continued)

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
Methyl chloride (chloromethane)		X				
Methyl chloride (dichloromethane)				X		
Methylene chloride (dichloromethane)		X	X	X		
Naphthalene	X	X	X	X		
n-Decane						X
Nickel				X		
Nitrobenzene		X		X		
N-nitro sodi phenyl amine	X					
N-nitrosodimethylamine		X		X		
N-nitrosodi-n-propylamine		X		X		
N-nitrosodiphenylamine		X		X		
n-Octadecane						X
o-Cresol						X
Para-chloro meta-cresol (p-chloro-m-cresol)	X	X	X	X		
PCB-1016 (Arochlor 1016)	X	X		X		
PCB-1221 (Arochlor 1221)	X	X		X		
PCB-1232 (Arochlor 1232)	X	X		X		
PCB-1242 (Arochlor 1242)	X	X		X		
PCB-1248 (Arochlor 1248)	X	X		X		
PCB-1254 (Arochlor 1254)	X	X		X		
PCB-1260 (Arochlor 1260)	X	X		X		
p-Cresol						X
Pentachlorophenol		X		X	X	

Table 4.3 Industrial Discharge Monitoring Requirements for TTOs (continued)

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
Phenanthrene	X	X	X	X		
Phenol	X	X	X	X		
Pyrene	X	X	X	X		
Selenium				X		
Silver				X		
TCDD					X	
TCDF					X	
Tetrachlorocatechol					X	
Tetrachloroethylene	X	X	X	X		
Tetrachloroguaiacol					X	
Thallium				X		
Toluene	X	X	X	X		
Toxaphene		X		X		
Trichloroethylene	X	X	X	X		
Trichlorophenol					X	
Trichlorosyringol					X	
Vinyl chloride (chloroethylene)		X		X		
Zinc				X		

To help ensure the validity of self-monitoring results, sampling and analyses for required chemicals must be performed by a California state-certified laboratory, acceptable to the City's Technical Services Program – Source Control (TSP-SC), in accordance with 40 CFR, Part 136.

In addition to industry self-monitoring, the City conducts facility sampling twice per year. The sampling location is outlined in each SIU's permit.

To facilitate detection of illegal discharges of prohibited materials into the collection system, surveillance monitoring is also conducted. Such monitoring is performed if the City suspects illegal dumping or if there are complaints.

4.2.4 Slug Control

A slug load or slug discharge is defined as any discharge which would cause a violation of the industrial pretreatment program, either by a flow violation or an exceedance of contaminant concentration limit. Slug loads can be caused by accidental spills or batch discharges of irregular nature, causing a drastic increase in contaminant concentration ("slug") to occur in the collection system. Slug loads by definition are not routine or predictable. If an event occurs that may cause a slug discharge, the industrial user must notify the city manager immediately. The City Manager is then responsible for assessing the severity of the load and once identified, taking appropriate measures to ensure public safety and optimal operations. This may involve diverting the wastewater treatment plant effluent flow or purified water flow until the slug load has been processed appropriately.

It is recommended that the City should require all SIUs to develop and submit a Slug Discharge Control (SDC) Plan. The slug control plan would be reviewed and updated by the source control program manager as needed.

4.2.5 Inspection of Industries

Annual SIU inspections are conducted by City staff. Such inspections allow for the investigation of SIU permit compliance. These inspections also help identify if a SIU is responsible for treatment plant upsets. Additionally, the inspections act as industrial outreach efforts and help disseminate information on technical issues such as permit requirements and pollution prevention opportunities.

4.2.6 Centralized Waste Treatment

Oxnard has one of the largest centralized waste treatment (CWT) facilities in California within their service area, Santa Clara Wastewater (SCWW). CWTs treat hazardous and nonhazardous wastes (e.g. industrial tank residuals called "tank bottoms", oil field operations wastes, etc.). They are regulated under 40 CRF 437, and are managed by POTWs through their industrial pretreatment programs. The major issue surrounding the acceptance by POTWs of the discharge from CWT facilities, especially Subcategory D facilities that accept multiple wastestreams, is their potential impact on water reuse programs. An explosion occurred at the SCWW facility, a CWT that receives hauled waste from many sources, treats those wastes, then discharges them into the Oxnard collection system. The cause of the accident has been attributed to the unsafe mixture of specific chemicals with domestic sewage. Currently, the SCWW facility is not approved to discharge to the OWTP.

In response to the explosion event, Carollo prepared Best Management Practices (BMP) policy for CWTs on behalf of the City, which, were then endorsed by the California Association of

Sanitation Agencies (CASA). Carollo surveyed six POTWs regarding CWTs in their service areas. Carollo contacted and received help from POTWs that have CWTs; including OCSD, LACSD, City of LA, the City of San Jose, and Oxnard. The BMP for CWTs is attached as Appendix A to this document. Oxnard has implemented this BMP for any CWT within its collection system. Key elements of the BMP are:

- Waste Receiving Requirements - including manifests for haulers, testing of hauled waste before disposal, prohibition of specific activities, and allowance for random sampling.
- Treatment Requirements - treatment meeting EPA standards under 40 CFR 437, emergency shutoff, treatment reliability and redundancy, prohibition of holding tanks for dilution, and recording of treatment system operations details.
- Effluent Discharge and Sampling/Testing Requirements - continuous discharge prohibited, batch tanks continuously mixed, sampling and analysis before discharge required, reprocessing if necessary.
- Recommended Certification and Documentation Requirements - requirements for certifications, plans, procedures, O&M, treatment system details, documentation of all waste haulers, and testing and monitoring requirements.

4.2.7 Enforcement

Enforcement procedures for industrial dischargers are in place to ensure that out-of-compliance industries can be brought into compliance, or their service terminated. Sections 19, Article 1, Divisions 8 through 10 of Oxnard's Municipal Code outline all the allowable enforcement actions that can be taken by the City. If an SIU violates its permit, a written Notice of Violation (NOV) is sent to the SIU. The SIU then has 10 days to submit an explanation of violation and a plan for correction. For biological oxygen demand (BOD) and total suspended solids (TSS) limit violations, the SIU is surcharged based on a predetermined formula. For other exceedances, increasing enforcement action is taken as necessary. Such actions can include discontinuing sewer or water service, a cease and desist order, issuance of a fine, or termination of permission to discharge to the system.

The 2013 OWTP Annual Pretreatment Report identified 42 total industrial dischargers having 49 total violations (with zero penalties or legal action required), and 3 industrial dischargers with significant non-compliance necessitating public notification.

Section 5

COLLECTION SYSTEM AND OWTP WATER QUALITY RESULTS

5.1 Industrial Sampling Program

As a requirement of their local limits update, the City conducted an extensive wastewater sampling program to characterize pollutant loadings and process removals to develop scientifically-based local limits in the fall of 2015. In addition to this study, the City performed routine monitoring for NPDES permit requirements as well as industrial discharge constituents. OWTP's routine influent monitoring is conducted at the headworks of the plant, which is downstream of plant recycled flows.

5.1.1 Prior Incident of Pass-Through with Gross Beta Radioactivity

On September 4th, 2014 analytical results showed an exceedance of the OWTPs gross-beta NPDES defined permit limit. The gross-beta sample concentration was 94 pCi/L and the permit requirement was 50 pCi/L. The sample was taken one month prior on August 5th during a routine semiannual sampling event at the OWTP. Oxnard's Technical Services Program found hydraulic fracturing fluids to be a potential source of gross-beta contaminant. Wastewater staff then collected wastewater samples at City Water Yard and SCWW (both known to discharge this type of contaminants) on Wooley Road. Following analytical results reported on October 14, 2014, monitoring staff were informed that the SCWW sample port had a gross-beta concentration of 4400 pCi/L. The next day on October 15, 2014, the staff convened a meeting to determine an action plan.

On October 16, 2014 additional samples were taken upstream of the SCWW site to track the source of the gross-beta discharge into the Santa Clara collection system. Green Compass, the parent company of SCWW, was identified as the responsible discharger, stating that Vintage Productions, an industrial customer of SCWW, was the point source into their facility. A Cease and Desist order was issued to Green Compass, who immediately complied with the order. Continuous gross-beta monitoring was conducted near the sampling site for the following months, and a NOV was issued to SCWW for violations on sample dates 9/24, 10/16, 10/22 and subsequently 10/28, 11/6, and 11/13.

Shortly thereafter (11/2014), the aforementioned accident at the SCWW occurred and the Oxnard City Manager issued a suspension of discharge permit and prohibited SCWW from discharging any wastewater into the Oxnard Collection System.

5.2 Industry Water Quality Results

Industrial pretreatment programs are in place, and additional pretreatment and auditing programs are recommended as part of this enhanced source control program as detailed in Section 5. Table 5.1 contains a list of detected industrial discharge contaminants from 2013-2014. The permit limits for these industries are being updated (Local Limits Report), and

for some more stringent limits are to follow. All collection system monitoring samples are tested for the constituents listed, however, many of the industries do not produce or use these contaminants in their processes as shown by the blank cells. Internal monitoring program data is also available in the Local Limits study and internal auditing can take place by the SCPM when collection system monitoring data does not align.

5.3 Residential (only) Water Quality Results

The domestic/residential sectors of the service area had not been sampled in over 15 years prior to the recent Local Limits study. Four sampling locations were chosen for the study, based on collection system discharges and trunk lines (Figure 5.1). Concentrations from residential dischargers for a limited set of constituents tested are shown in Table 5.2. These results provide baseline concentrations for OWTP influent monitoring, allowing the isolation of industrial and domestic discharge inputs.

Table 5.1 Industry Water Quality Data 2013-2014 for all Industrial Dischargers to the City of Oxnard WWTP

Industry Name	2013 ADF	Avg BOD	Avg pH	Avg TSS	Avg H2S	Avg O&G	TDS	TTO	Cd	Cr	Cu	Pb	Zn	Ni	Ag	CN-	As	Sb	Ar	Co	Hg	Sn	Ti	V
	gpd	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Industries																								
Alliance Finishing & Manufacturing	--																							
Aluminum Precision Products	7,000	N/A	7.8	9	NA	4	2,063		0.0023	0.007	0.021	0.0075	0.21	0.0118		0.004								
Arcturus Manufacturing	25,000	N/A	8.3	NA	NA	14	N/A		0.004	0.01	0.04	0.009	0.008	0.065		0.004								
Automotive Racing Products*																								
Boskovich Farms	250,000	364	N/A	176	0.10	6	N/A																	
Cal Sun Produce	32,000	171	7.3	135	0.1	7	N/A																	
Coastal Green Vegetable Co.	220,000	219	7.2	300	0.02	5	N/A																	
Coastal Metal Finishing/Limons Metal Finishing	1,000	N/A	7.8	N/A			N/A	1	0.0200	0.2000	0.5000	0.0800	0.6000	1.3000	0.0200	0.0050	0.1000							
Consolidated Precision Products	11,907																							
Deardorff Family Farms	10,000	31	7.9	46	0.1	6	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Duda Farm Fresh Foods	37,000	507	7.3	156	0.02	9	N/A																	
EF Oxnard	15,000	N/A	7.7	N/A	0.20	4	2,842		0.0103	0.0403	0.0245	0.0528	0.1841	0.0263										
Elite Metal Finishing	14,000	N/A	8.1	N/A	NA	NA	N/A		0.01	0.06	0.1	0.03	0.14	0.15	0.01	0.03								
Frozsun Foods	350,000	371	7.2	119	0.10	N/A	N/A																	
Gill's Onions	250,000	185	7.5	53	0.38	5	N/A																	
Harris Water Conditioning	138,000	2	6.9-8.5	19	0.10	3	20,883	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Herzog Wine Cellars	10,000	2,187	7.2	190	0.5	6	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
J.M. Smucker Co.	148,000	139	7.7	224	0.12	4	N/A	na																
Mission Linen Supply	39,000	217	7.4	134	0.02	41	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 5.1 Industry Water Quality Data 2013-2014 for all Industrial Dischargers to the City of Oxnard WWTP (continued)

Industry Name	2013 ADF	Avg BOD	Avg pH	Avg TSS	Avg H2S	Avg O&G	TDS	TTO	Cd	Cr	Cu	Pb	Zn	Ni	Ag	CN-	As	Sb	Ar	Co	Hg	Sn	Ti	V
	gpd	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
New Indy	300,000	28	7.4	26	0.04	5	3,390	0.67	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Oxnard Lemon Co.	35,000																							
Pacific Ridge Farms	30,000	559	6.9	322	0.25	6	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Parker Hannifin	26,000	995	6.8	8	NA	5	N/A	0.037					0.05											
Proctor and Gamble	1,400,000	112	6.2-9.3	214	0.02	23	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Puretec Industrial Water	100,000	14	6.3-9.3	43	0.02	5	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Raypak	11,000	N/A	6.8-9.9	N/A	NA	6	N/A	0.03	0.02	0.06	0.02	0.05	0.12	0.04		0.031								
Saticoy Lemon #4	50,000	131	8.3	214	0.1	15	N/A																	
Scarborough Farms	17,000	25	7.2	432	0.1	NA	N/A																	
Schlumberger Technology																								
Seaboard Produce Distributors	25000																							
Seminis	19,000	156	8.1	455	0.1	17	N/A	0.46					0.29											
Industries																								
Alliance Finishing & Manufacturing	--																							
Simba Cal	750	N/A	9.3	N/A	NA	NA	N/A	<1 mg/l	0.01	0.052	0.67	0.05	0.21	0.027	0.013	0.005								
Terminal Freezer (Del Mar, Suncoast, Tree Top)	730,000	84	8.0	102	N/A		N/A																	
Ventura Pacific Co.	70,000	408	7.6	88	0.12	13																		
Other Agencies																								
City of Oxnard Desalter	1,500,000	N/A	7.2	5	N/A	N/A	1,580																	
Crestview Municipal Water Co.	0																							
NBVC Point Mugu	223,722																							
NBVC Port Hueneme	452,807																							
Port Hueneme Water Agency	347,947																							
Santa Clara Waste Water Co.	150,000	185	7.7	26	0.02	5	N/A	0.34	<0.01	0.01	0.02	0.03	0.06	0.01	0.01		<0.05	<0.01	<0.005	<0.005	0.01	0.01	0.03	

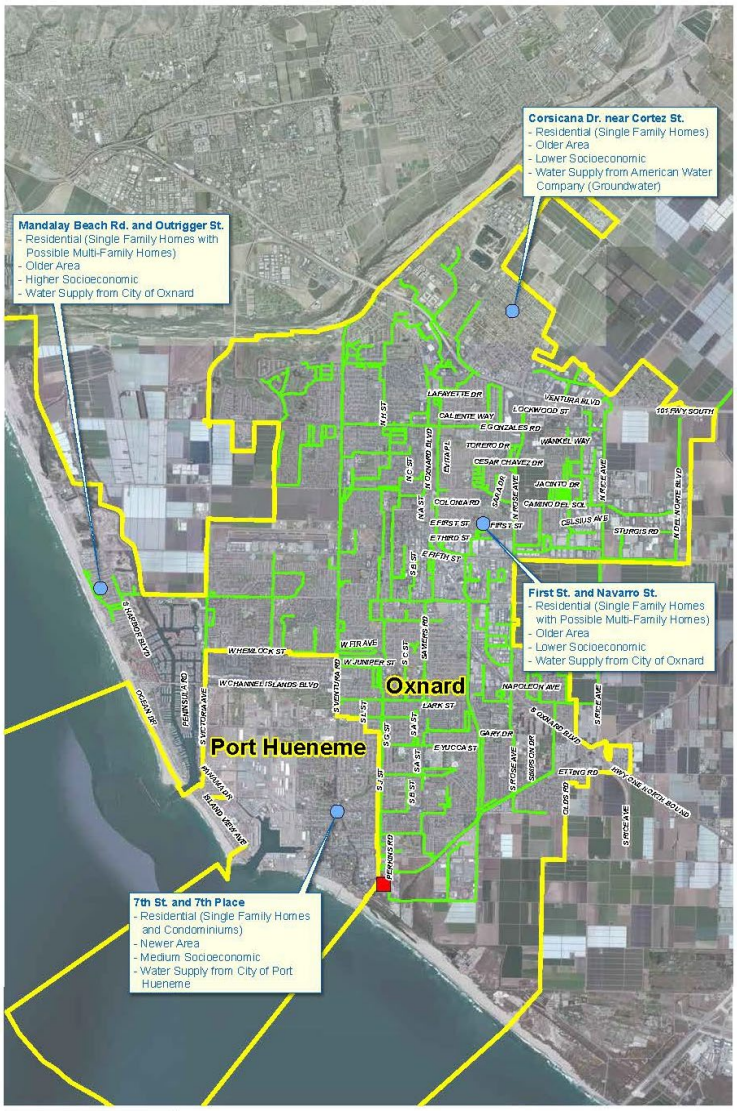

Figure 5.1 Four Residential Sampling Locations Included in the Local Limits Study

Table 5.2 Residential Wastewater Concentrations from 4 Sampling Locations Listed in Figure 5.1

Constituent	Units	Average	Geometric Mean
Ammonia Nitrogen	mg/L	39	38
Antimony Total	ug/L	1.011	1.009
Arsenic Total	ug/L	2.31	2.09
Barium Total	ug/L	45.46	40.1
Beta, Gross	pCi/L	21.96	21.04
Biochemical Oxygen Demand	mg/L	258	248
Boron Total	mg/L	0.77	0.76
Cadmium Total	ug/L	0.505	0.504

Table 5.2 Residential Wastewater Concentrations from 4 Sampling Locations Listed in Figure 5.1 (continued)

Constituent	Units	Average	Geometric Mean
Calcium Total	mg/L	98	88
Chloride	mg/L	123.1	116.8
Chromium Total	ug/L	1.39	1.24
Copper Total	ug/L	89.04	75.48
Fixed Dissolved Solids	mg/L	839	776
Fluoride	mg/L	0.54	0.53
Gross Alpha	pCi/L	3.55	3.44
Iron Total	mg/L	0.93	0.56
Lead Total	ug/L	1.81	1.54
Magnesium Total	mg/L	34.1	30.4
Manganese Total	mg/L	0.043	0.037
Mercury	ng/L	23.43	6.08
Molybdenum Total	ug/L	10.53	9.45
Nickel Total	ug/L	6.99	6.68
Potassium Total	mg/L	21.7	21.3
Selenium Total	ug/L	5.4	5.35
Silica	mg/L	27.8	26.5
Silver Total	ug/L	0.508	0.507
Sodium Total	mg/L	151.4	148.5
Specific Conductance	umho/cm	1689	1659
Strontium	mg/L	0.91	0.81
Sulfate	mg/L	325.4	284.7
Total Dissolved Solids	mg/L	1252	1187
Total Kjeldahl Nitrogen	mg/L	61	59
Total phosphorus as P	mg/L	7.3	7
Total Suspended Solids	mg/L	241	211
Uranium	ug/L	5.07	4.3
Zinc Total	ug/L	177.46	161.77
Strontium	mg/L	0.91	0.81
Sulfate	mg/L	325.4	284.7
Total Dissolved Solids	mg/L	1252	1187
Total Kjeldahl Nitrogen	mg/L	61	59
Total phosphorus as P	mg/L	7.3	7

Table 5.2 Residential Wastewater Concentrations from 4 Sampling Locations Listed in Figure 5.1 (continued)

Constituent	Units	Average	Geometric Mean
Total Suspended Solids	mg/L	241	211
Uranium	ug/L	5.07	4.3
Zinc Total	ug/L	177.46	161.77

Notes:
Concentrations were averaged for all five sampling locations for all dates tested.

5.4 Raw Wastewater Water Quality Results

As part of the Local Limits discharge update study, raw wastewater was tested for regulated, industrial and NPDES constituents. Results are included in the Local Limits study. It is important to note that although many constituents were tested for, few were found at detectable concentrations in the raw wastewater. This provides a further level of confidence for downstream treatment and secondary effluent source protection.

Section 6

PROPOSED ENHANCED SOURCE CONTROL PROGRAM FOR POTABLE REUSE

Title 22 Regulations require a source control program to be in place prior to operating an indirect potable reuse (IPR) facility. As previously discussed, Oxnard's current source control program meets all of the requirements; however, an enhanced source control program (ESCP) is recommended as an additional barrier for producing purified water from IPR. An ESCP would build on the existing source control program in place, with increased monitoring frequency and additional monitoring locations. The following section provides a framework for an ESCP, which could be implemented in Oxnard.

6.1 Source Control Program Manager

The current structure of the source control program at the City of Oxnard includes multiple points of contact covering the collection system, wastewater treatment plant, drinking water treatment plant and groundwater injection. In order to ensure all data is reported, logged and analyzed, a Source Control Program Manager (SCPM), acting as a single point of contact should be hired into a full-time position and charged with the following tasks:

- Collect and log all data from the collection system, OWTP, AWPF and groundwater monitoring program.
- Analyze online data for trends indicating potential upsets in the treatment process.
- Report any concerns, issues, and violations to City management. Any finished water violations would be reported by other City staff to the RWQCB.
- Plan and facilitate all industrial stakeholder workshops.
- Plan and oversee all residential outreach efforts.
- Ensure staffing needs are met for industrial audits, collection system sampling and outreach efforts.
- Update any new industrial dischargers or housing developments to source control program.
- Ensure all SIUs report monthly and annual TTO monitoring results.
- Annual review of slug discharge control plans from SIUs.

Data collected and provided to the SCPM will be analyzed by this person to create baseline trends and identify outliers, events, or a constituent that is slowly increasing through the collection system or through the OWTP. Analysis of pollutants through the AWPF and the groundwater system will be handled by the SCPM manager as it applies to raw wastewater source control. The same water quality data from the AWPF and groundwater system, pertaining to potable water reuse regulatory compliance, will be handled by other City management. The SCPM should have a second in command who is knowledgeable about the status of the source control program in the event the SCPM is not available.

6.2 Recommended Parameters, Detection Levels, and Methods

Monitoring wastewater influent, secondary treated wastewater, RO concentrate and AWPF water in one program can pose challenges due to analytical methods. The same contents could be monitored in each water type, but will likely require at least 2 different methods, if not 4. Methods for detecting all Title 22 monitored constituents in RO concentrate (very low water quality) and purified water (very high water quality) exist, but prove to be challenging due to their unique water qualities. Current analytical monitoring practices are described in detail below.

6.2.1 General Monitoring Provisions

General monitoring provisions proposed by the City include flow rate and water quality of the secondary effluent, AWPF finished water, receiving groundwater supply and production (ASR) wells. This enhanced source control document focuses on secondary effluent and AWPF finished water quality.

Compliance with RWQCB waste discharge requirements (WDRs) will be evaluated based on the analytical monitoring data. Monitoring reports produced by the SCPM will include at a minimum:

- Analytical results across the collection system through AWPF finished water (see Section 6.2).
- A clear map identifying the location of each sampling station, including groundwater monitoring and production wells (details following permit approval)
- Analytical test methods used and corresponding method report limits (MRLs).
- Name(s) and copies of laboratory certifications granted by the DDW's Environmental Laboratory Accreditation Program (ELAP).
- Quality assurance and control information.

Brief details about analytical testing methods and reporting are included in subsequent sections.

6.2.2 Sampling and Analytical Protocols

Though not required to be included in the monitoring reports unless specifically requested by DDW or the RWQCB, the City will have in place sampling protocols including procedures for handling, storing, testing, and disposing of purge and decontamination waters generated from sampling events. For groundwater monitoring, the sampling protocols will outline the methods and procedures for: measuring water levels; purging wells; collecting samples; decontaminating equipment; containing, preserving, and shipping samples; and maintaining appropriate documentation such as Chain of Custody (COC).

All wastewater samples and industrial wastewater samples will use the methods and QA/QC procedures contained in 40 CFR Part 136. All purified water samples will be analyzed and use the QA/QC procedures included in 40 CFR Part 141.

Where no methods are specified for a given pollutant, by methods approved by the DDW, RWQCB, and/or SWRCB. The City will select the analytical methods that provide MRLs lower than the limits prescribed in the WDR or as low as possible that will provide reliable data.

The City will instruct outside contract laboratories to establish calibration standards so that the MRLs (or its equivalent if there is a different treatment of samples relative to the calibration

standards) are the lowest calibration standard. At no time will analytical data extrapolated from below the calibration curve be used.

6.2.3 QA/QC Procedures

The RWQCB, DDW and the SWRCB Quality Assurance Program may specify maximum MRLs in any of the following situations:

- When the pollutant has no established method under 40 CFR 141.
- When the method under 40 CFR 141 for the pollutant has a MRL higher than the limit specified in the WDR.
- When the City proposes to use a test method that is more sensitive than those specified in 40 CFR Part 141.

For regulated constituents, the laboratory conducting the analyses will be certified by ELAP or approved by the DDW, LARWQCB, and/or SWRCB for a particular pollutant or parameter.

Samples will be collected with method specific containers and preservatives and analyzed within defined holding time limits as specified in 40 CFR Part 141. All QA/QC analyses will be run simultaneously with collected samples. The City SCPM will retain the QA/QC documentation in its files and make those files available for inspection and/or submit them when requested by the RWQCB or the DDW. Proper chain of custody procedures will be followed and a copy of this documentation will be submitted with the quarterly report.

6.2.4 Unregulated Chemical Procedures

For unregulated chemical analyses, the City will select methods according to the following approach:

- Use drinking water methods, if available and matrix appropriate.
- Use DDW-recommended methods for unregulated chemicals, if available and matrix appropriate.
- If there is no DDW-recommended or approved drinking water method for a chemical, then City staff will use the method that results in the lowest MRL for that chemical in the applicable matrix.
- If there is more than a single USEPA-approved method available, the most sensitive of the USEPA-approved methods for the applicable matrix will be used.
- If there is no USEPA-approved method for a chemical in the applicable matrix, and more than one method is available from the scientific literature and commercial laboratory, after consultation with DDW, use the most sensitive method.
- If no approved method is available for a specific chemical, the City's laboratory (or contract laboratory) may develop methods or use its own methods and will provide the analytical methods to DDW for review. Those methods may be used until DDW-recommended or USEPA-approved methods are available. This option is likely to be used when an unregulated contaminant needs to be traced back through the collection system and no raw wastewater matrix method exists or when sampling RO concentrate for the unregulated contaminant.

6.2.5 Online and Benchtop Constituent Monitoring

Online monitoring data from the OWTP and the AWPF will be reported to the SCPM and analyzed to create a baseline for nominal concentrations and process performance. Total

Organic Carbon (TOC), Electrical Conductivity (EC), BOD, Turbidity, and UV Transmittance (UVT) are all relevant monitoring parameters and will be continuously collected to award pathogen log removal (LRV) credits across the OWTP and AWPF. The online data trends used for LRV information will be directly applied to contaminant removal correlations. If a new contaminant or a slug load is detected, a process upset or unusual online data trend is observed, an intervention into the responsible process can be identified and responded to promptly to prevent further contaminant loading.

Accuracy and confidence in monitoring tools is important. Benchtop measurements are not necessarily more accurate that online monitors, however they provide an independent measure of the parameters being tracked. Therefore, benchtop measurements should be conducted frequently to compare online meter measurements and discrepancies should be evaluated, and calibrations on either benchtop or online meters should be performed immediately. Benchtop measurements as well as calibration dates and times should be well-documented and reported to the SCPM weekly. Online sampling parameters and benchtop verification frequencies are shown in Table 6.1 (to be coordinated with the latest NPDES Permit at the time).

Table 6.1 Online Sampling Parameters and Benchtop Verification Frequencies for the Potable Reuse Enhanced Source Control Program

Online Monitoring Parameters	Location and Frequency of Sampling				
	OWTP	Secondary Effluent	RO Influent	RO Permeate	Purified Water
TOC			Online	Online	
Bench			Bi-weekly	Bi-weekly	Bi-weekly
EC	Online	Online	Online	Online	Online
Bench	2 X daily	2 X daily	2 X daily	2 X daily	2 X daily
BOD					
Bench	Daily	Daily			
Turbidity	Online	Online	Online		
Bench	Daily	Daily	Daily		
UVT		Online	Online	Online	Online
Bench	Daily	Daily	4 X Daily	4 X Daily	4 X Daily

6.2.6 Regulated and Unregulated Constituents

Tables 6.2 through 6.6 constitute the required water quality performance, consistent with DDW (2018a). Within each table is a specific reference to the table within the regulation (e.g., Primary MCLs are listed in Table 6.2 below and also found in Table 64431-A).

Table 6.7 includes constituents with notification levels, which are health-based advisory levels for constituents that lack MCLs.

Tables 6.8-6.10 are related to constituents of emerging concern (CECs). The requirements for CECs are in flux. The SWRCB first adopted its recycled water policy (RWP) in 2009 and amended it in 2013 to specify monitoring requirements for CECs in recycled water based on the recommendations of an advisory panel, SWRCB (2010). The RWP contains a provision to reconvene a Science Advisory Panel every five years to update the recommendations for CEC

monitoring in recycled water. In April 2018, the reconvened science advisory panel published Monitoring Strategies for CECs in Recycled water, Recommendations of a Science Advisory Panel (SCCWRP, 2018). Based on the recommendations therein, the RWP is in the process of being updated. Therefore, this section contains monitoring recommendations in both the 2013 RWP (SWRCB 2013) and the 11/15/2018 Draft Amendment to the RWP (SWRCB, 2018 (draft)).

CECs are defined by SWRCB (2018, draft) as constituents in personal care products; pharmaceuticals; antimicrobials; industrial, agricultural, and household products; naturally-occurring hormones; food additives; transformation products; inorganic constituents; microplastics; and nanomaterials. CECs with health-based significance are assigned health based-screening levels, MTLs, which are designated for different types of potable reuse.

SWRCB 2013 CEC monitoring includes CECs with health-based significance, CECs that serve as performance indicators, and non-CECs that serve as performance surrogates. SWRCB (2018, draft) includes revised recommendations for CECs in all three aforementioned categories, as well as the addition of a new category for monitoring – bioanalytical screening tools. Monitoring requirements for CECs per SWRCB 2013 are provided in Table 6.8 Additional monitoring required by the Los Angeles RWQCB provided to our team by Elizabeth Erickson on 10/29/2014 are provided in Table 14. Monitoring requirements per SWRCB (2018, draft) are included in Table 6.10 Per SWRCB (2018, draft), RWQCB would not issue additional monitoring requirements for CECs beyond those in the RWP unless recommended by the SWRCB. The monitoring requirements in SWRCB (2018, draft) would replace those in SWRCB 2013, if the draft RWP amendment is accepted.

Table 6.2 Inorganics with Primary MCLs or ALs[1]

Constituents	Primary MCL or AL (in mg/L)	Constituents	Primary MCL or AL (in mg/L)
Aluminum	1.0	Fluoride	2
Antimony	0.006	Lead	0.015[4]
Arsenic	0.010	Mercury	0.002
Asbestos	7 (MFL)[2]	Nickel	0.1
Barium	1	Nitrate (as NO_3)	45
Beryllium	0.004	Nitrite (as N)	1
Cadmium	0.005	Total Nitrate/Nitrite (as N)	10
Hexavalent Chromium	0.010	Perchlorate	0.006
Copper	1.3[3]	Selenium	0.05
Cyanide	0.15	Thallium	0.002

Notes:
(1) Based on Table 64431-A.
(2) MFL = Million fibers per liter, with fiber lengths > 10 microns.
(3) Regulatory Action Level; if system exceeds, it must take certain actions such as additional monitoring, corrosion control studies and treatment, and for lead, a public education program; replaces MCL.
(4) The MCL for lead was rescinded with the adoption of the regulatory action level described in footnote '3'.

Table 6.3 Radioactivity[1]

Constituents	MCL (in pCi/L)	Constituents	MCL (in pCi/L)
Uranium	20	Gross Beta particle activity	50[2]
Combined radium-226 & 228	5	Strontium-90	8[2]
Gross alpha particle activity	15	Tritium	20,000[2]

Notes:
(1) Based on Tables 64442 and 64443.
(2) MCLs are intended to ensure that exposure above 4 millirem/yr does not occur.

Table 6.4 Regulated Organics[1]

Constituents	MCL (in mg/L)	Constituents	MCL (in mg/L)
Volatile Organic Compounds			
Benzene	0.001	Monochlorobenzene	0.07
Carbon Tetrachloride	0.0005	Styrene	0.1
1,2-Dichlorobenzene	0.6	1,1,2,2-Tetrachloroethane	0.001
1,4-Dichlorobenzene	0.005	Tetrachloroethylene	0.005
1,1-Dichloroethane	0.005	Toluene	0.15
1,2-Dichloroethane	0.0005	1,2,4 Trichlorobenzene	0.005
1,1-Dichloroethylene	0.006	1,1,1-Trichloroethane	0.2
cis-1,2-Dichloroethylene	0.006	1,1,2-Trichloroethane	0.005
trans-1,2-Dichloroethylene	0.01	Trichloroethylene	0.005
Dichloromethane	0.005	Trichlorofluoromethane	0.15
1,3-Dichloropropene	0.0005	1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2
1,2-Dichloropropane	0.005	Vinyl chloride	0.0005
Ethylbenzene	0.3	Xylenes	1.75
Methyl-tert-butyl ether (MTBE)	0.013		
SVOCs			
Alachlor	0.002	Heptachlor	0.00001
Atrazine	0.001	Heptachlor Epoxide	0.00001
Bentazon	0.018	Hexachlorobenzene	0.001
Benzo(a) Pyrene	0.0002	Hexachlorocyclopentadiene	0.05
Carbofuran	0.018	Lindane	0.0002
Chlordane	0.0001	Methoxychlor	0.03
Dalapon	0.2	Molinate	0.02

Table 6.4 Regulated Organics[1] (continued)

Constituents	MCL (in mg/L)	Constituents	MCL (in mg/L)
Dibromochloropropane	0.0002	Oxamyl	0.05
Di(2-ethylhexyl)adipate	0.4	Pentachlorophenol	0.001
Di(2-ethylhexyl)phthalate	0.004	Picloram	0.5
2,4-D	0.07	Polychlorinated Biphenyls	0.0005
Dinoseb	0.007	Simazine	0.004
Diquat	0.02	Thiobencarb	0.07/0.001[2]
Endothall	0.1	Toxaphene	0.003
Endrin	0.002	1,2,3-Trichloropropane	$5x10^{-9}$
Ethylene Dibromide	0.00005	2,3,7.8-TCDD (Dioxin)	$3x10^{-8}$
Glyphosate	0.7	2,4,5-TP (Silvex)	0.05

Notes:
(1) Based on Table 64444-A.
(2) Second value is listed as a Secondary MCL.

Table 6.5 Disinfection By-Products[1]

Constituents	MCL (in mg/L)	Constituents	MCL (in mg/L)
Total Trihalomethanes	0.080	Bromate	0.010
Total haloacetic acids	0.060	Chlorite	1.0

Notes:
(1) Based on **Table 64533-A.**

Table 6.6 Constituents/Parameters with Secondary MCLs

Constituents[1]	MCL (in mg/L)	Constituents[2]	MCL (in mg/L)
Aluminum	0.2	TDS	500
Color	15 (units)	Specific Conductance	900 uS/cm
Copper	1	Chloride	250
Foaming Agents (MBAS)	0.5	Sulfate	250
Iron	0.3		
Manganese	0.05		
Methyl-tert-butyl-ether (MBTE)	0.005		
Odor Threshold	3 (units)		
Silver	0.1		
Thiobencarb	0.001		
Turbidity	5 (NTU)		
Zinc	5		

Notes:
(1) Based on Table 64449-A.
(2) Based on Table 64449-B.

Table 6.7 Constituents with Notification Levels[1,2]

Constituents	NL (in µg/L)	Constituents	NL (in µg/L)
Boron	1,000	Methyl isobutyl ketone (MIBK)	120
n-Butylbenzene	260	Naphthalene	17
sec-Butylbenzene	260	N-Nitrosodiethylamine (NDEA)	0.01
tert-Butylbenzene	260	N-Nitrosodimethylamine (NDMA)	0.01
Carbon disulfide	160	N-Nitrosodi-n-propylamine (NDPA)	0.01
Chlorate	800	Perfluorooctanoic acid (PFOA)	0.014
2-Chlorotoluene	140	Perfluorooctanesulfonic acid (PFOS)	0.013
4-Chlorotoluene	140	Propachlor	90
Diazinon	1.2	n-Propylbenzene	260
Dichlorodifluoromethane (Freon 12)	1,000	RDX	0.3
1,4-Dioxane	1	Tertiary butyl alcohol (TBA)	12
Ethylene glycol	14,000	1,2,4-Trimethylbenzene	330
Formaldehyde	100	1,3,5-Trimethylbenzene	330
HMX	350	2,4,6-Trinitrotoluene (TNT)	1
Isopropylbenzene	770	Vanadium	50
Manganese	500[2]		

Notes:
(1) Based on http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/notificationlevels/notificationlevels.pdf
(2) The web link above also contains the levels of the pollutants in this table that must result in a removal of the water source from service.

Table 6.8 Monitoring Requirements for CECs per SWRCB, 2013. Advanced Water Purification Facility

Constituents	Relevance/ Indicator Type/ Surrogate	Monitoring Trigger Level (in µg/L)	Removal Percentages (%)
17B-estradiol(1)	Health	0.0009	--
Caffeine(1)	Health & Performance	0.35	>90
NDMA(1)	Health & Performance	0.01	25-50, >80(3)
Triclosan(1)	Health	0.35	--
DEET(1)	Performance	--	>90
Sucralose(1)	Performance	--	>90
Electrical Conductivity(1)	Performance Surrogate	--	>90
4-Chlorotoluene	140	Propachlor	90
TOC(2)	Performance Surrogate	--	>90

Notes:
(1) Monitored quarterly, per SWRCB 2013.
(2) Continuously monitored.
(3) 25 to 50 percent removal by RO, >80 percent removal by RO followed by UV, depending upon the UV dose.

Table 6.9 CECs Required for Monitoring by LARWQCB(1)

Constituent	Sample Type	Reporting Level, ng/L
17-alpha-estradiol	Composite	0.5
Caffeine	Composite	10
DEET	Composite	10
Iodinated Contrast Media (Iopromide)	Composite	10
Triclosan	Composite	10
NDMA	Composite	10
Sucralose	Composite	100

Notes:
(1) Information provided by Elizabeth Erickson to the project team on 10/29/2014.

Table 6.10 Monitoring Requirements for CECs per SWRCB (2018, draft)

Constituent	Relevance	MTL (µg/L)
1,4-dioxane	Health	1
NDMA(1)	Health and Performance Indicator	0.010
NMOR(2)	Health	0.012
PFOS	Health	0.013
PFOA	Health	0.014
Sulfamethoxazole(2)	Performance Indicator	-
Sucralose(2)	Performance Indicator	-
Dissolved Organic Carbon(2)	Performance Surrogate	-
UV Absorbance(2)	Performance Surrogate	-
EC(2)	Performance Surrogate	-
Estrogen receptor-alpha bioassay(2)	Bioanalytical Screening	-
Aryl hydrocarbon bioassay(2)	Bioanalytical Screening	-

Notes:
(1) Health-based CECs and Bioanalytical Screening to be monitored following treatment.
(2) Performance indicator CECs and surrogates to be monitored before RO and after treatment.

6.3 Monitoring and Enforcement Programs

As part of this enhanced source control monitoring plan for potable reuse, regulated and unregulated constituents will be monitored with the same frequency (for the first year of operation) and given equal scrutiny for detection and available health criteria in the source water (OWTP secondary effluent) and the purified effluent of the AWPF.

Each monitoring location, class of constituent (regulated, CECs, etc) and proposed monitoring frequency are summarized in Table 6.11. Following acceptable monitoring performance during the first year of operation, the sampling frequency in some monitoring locations will decrease for select classes of constituents. Monitoring and enforcement is described in further detail in the following sections.

Table 6.11 Class of Constituents, Location and Frequency Monitoring Plan

Constituent	Monitoring Plan				
	Industries	Collection System	Raw Wastewater Influent	Secondary Effluent	Purified Water
Industry-Specific	As specified in permit	2X annually			
Local Limits	2X annually	2X annually	Monhtly (first 6 months), TBD thereafter	Monthly (first 6 months), 2X annually thereafter	Monthly (year 1), quarterly thereafter
NPDES Permit		2X annually	As specified by NPDES permit	As specified by NPDES permit	
Regulated (MCLs)		2X annually (year 1), TBD thereafter	Monhtly (first 6 months), TBD thereafter	Monthly (first 6 months), 2X annually thereafter	Monthly (year 1), quarterly thereafter
Secondary Treatment Goals MCLs		2X annually (year 1), TBD thereafter	Monhtly (first 6 months), TBD thereafter	Monthly (first 6 months), annually thereafter	Monthly (year 1), annually thereafter
Notification Levels		2X annually (year 1), TBD thereafter	Monhtly (first 6 months), TBD thereafter	Monthly (first 6 months), 2X annually thereafter	Monthly (year 1), quarterly thereafter
Constituents of Emerging Concern (CECs)		2X annually (year 1), TBD thereafter	Monhtly (first 6 months), TBD thereafter	Monthly (first 6 months), annually thereafter	Monthly (year 1), 2X annually thereafter

Notes:
(1) Monitoring frequency for industrial dischargers will be determined by flow, as outlined in each industry permit.

6.3.1 Finished Water Monitoring and Enforcement

At a minimum, pursuant to Section 60320.201 of Title 22 (DDW 2018), the AWPF purified water effluent must be analyzed for all constituents with MCLs and NLs monthly for the first year. For subsequent years, Oxnard can apply for a reduced monitoring frequency of quarterly if no constituent exceeds its MCL or NL. Secondary MCLs must be monitored for annually.

CEC monitoring will be conducted according to the finalized 2018 RWP. Per SWRCB 2018 (draft) Appendix A, health-based CECs are to be monitored for in purified water quarterly for one year (initial assessment phase), and semi-annually for an additional three years (baseline monitoring phase). After the first four years, monitoring for health-based CECs may be eliminated based on

results of the first two phases. Bioanalytical screening tools are also to be used for monitoring purified water quarterly for the first four years. Monitoring using bioanalytical screening tools can be eliminated or reduced to semi-annually based on the results of the first two phases. SWRCB (2018, draft) lists additional monitoring requirements (surrogates and indicators) not described herein.

The monitoring and enforcement plans currently required by Title 22 and the RWP for purified water are shown as Figure 6.1 through Figure 6.8. This sampling pertains to finished water quality for potable water reuse; and is not an added sampling effort for the ESCP. However, the data obtained as part of this required sampling is a useful component of the ESCP.

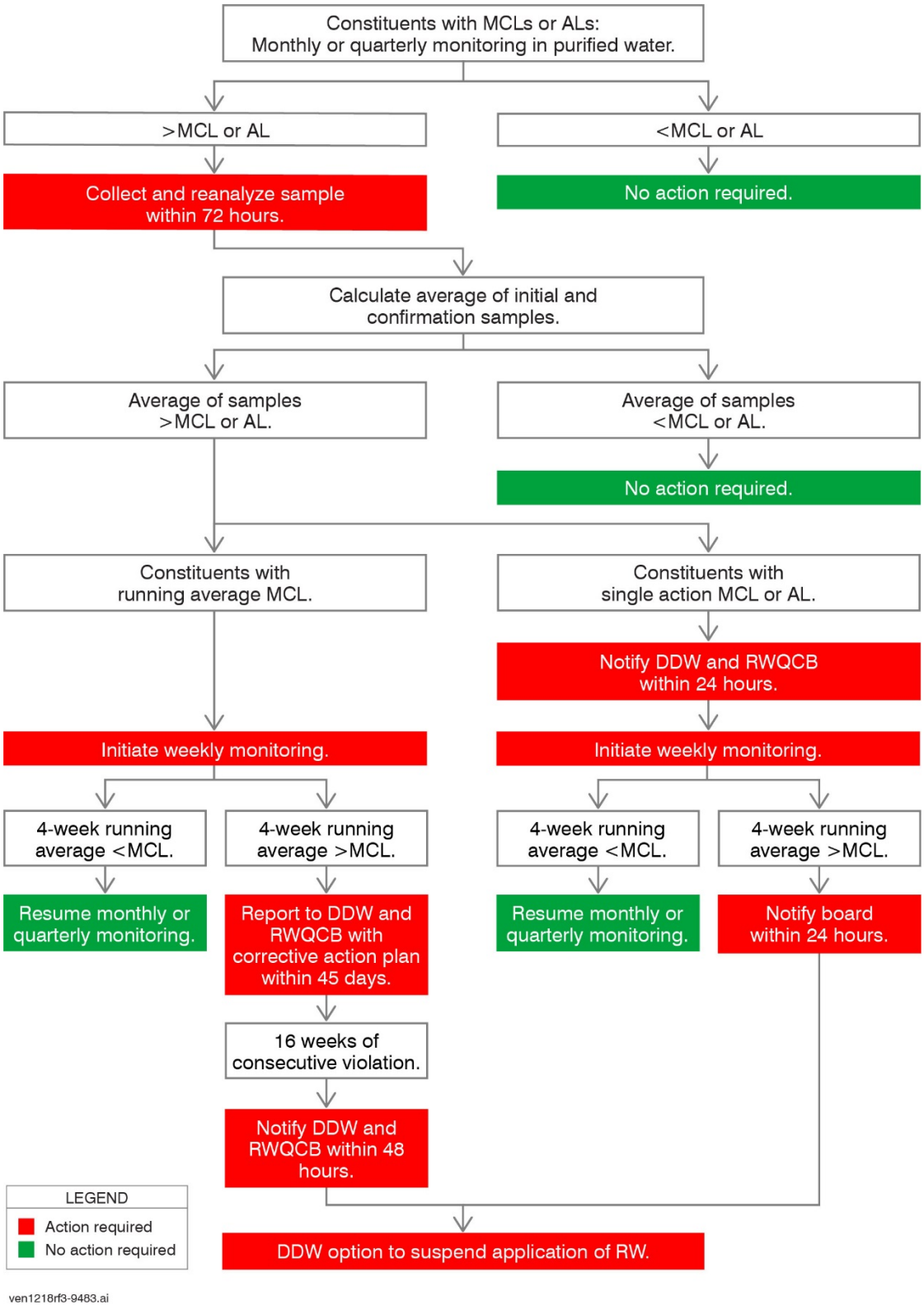

Figure 6.1 Title 22 MCL and AL Monitoring Requirements and Action Plan for Purified Water, per DDW 2018, Section 60320.212. List of Constituents in Tables 6.2-6.5.

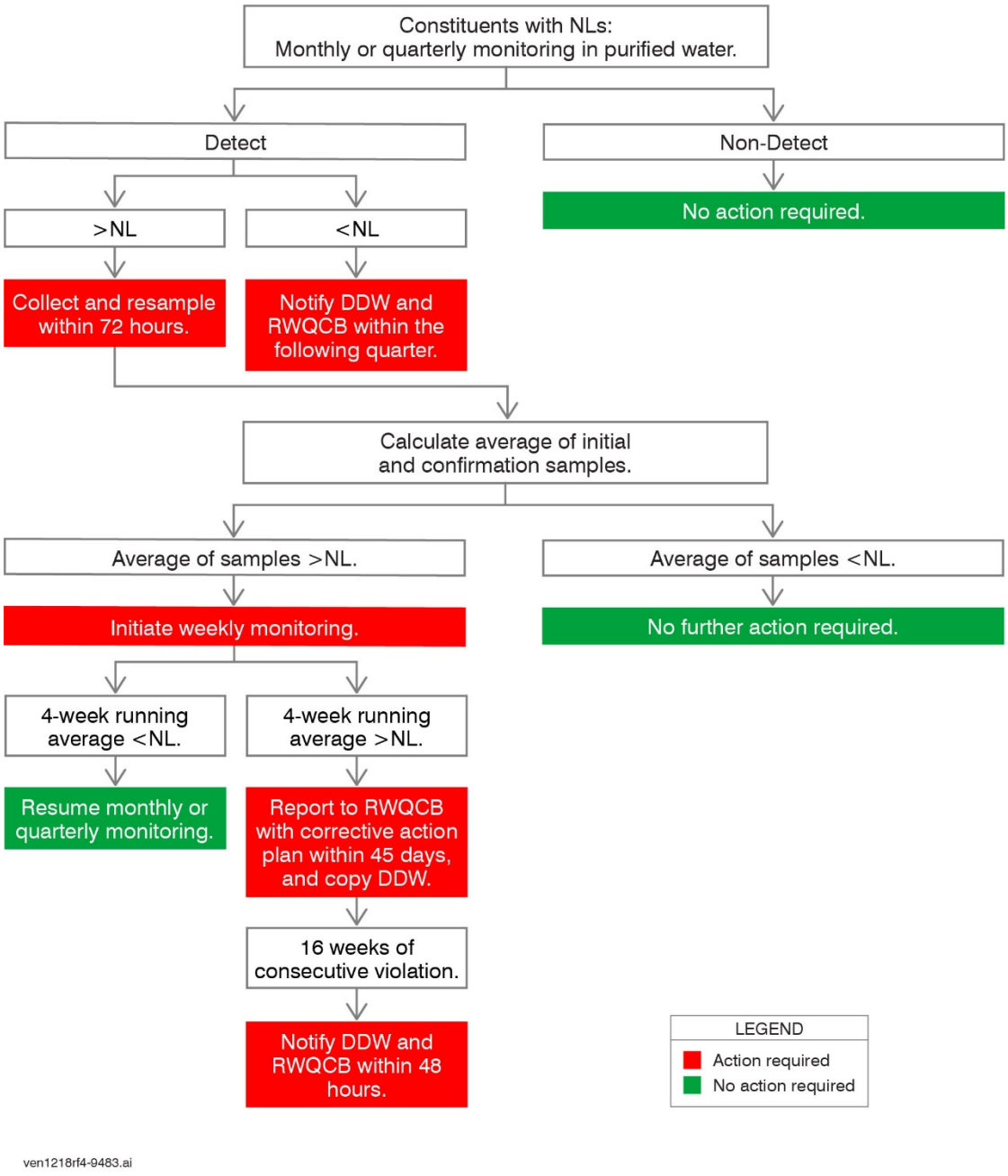

Figure 6.2 Title 22 NL Monitoring Requirements and Action Plan for Purified Water, per DDW 2018 Section 60320.220. List of Constituents Corresponds to Tables 6.7

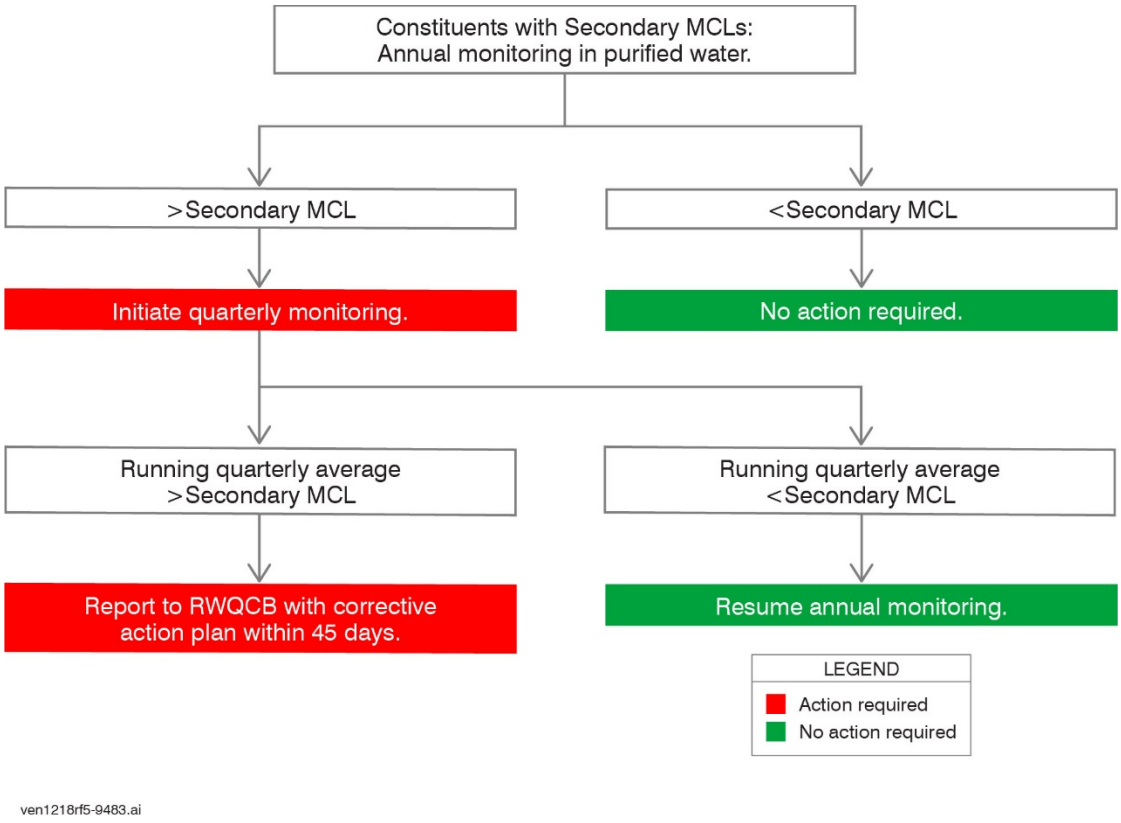

Figure 6.3 Title 22 Secondary MCL Monitoring Requirements and Action Plan for Purified Water, per DDW 2018 Section 60320.212. List of Constituents Corresponds to Table 6.6

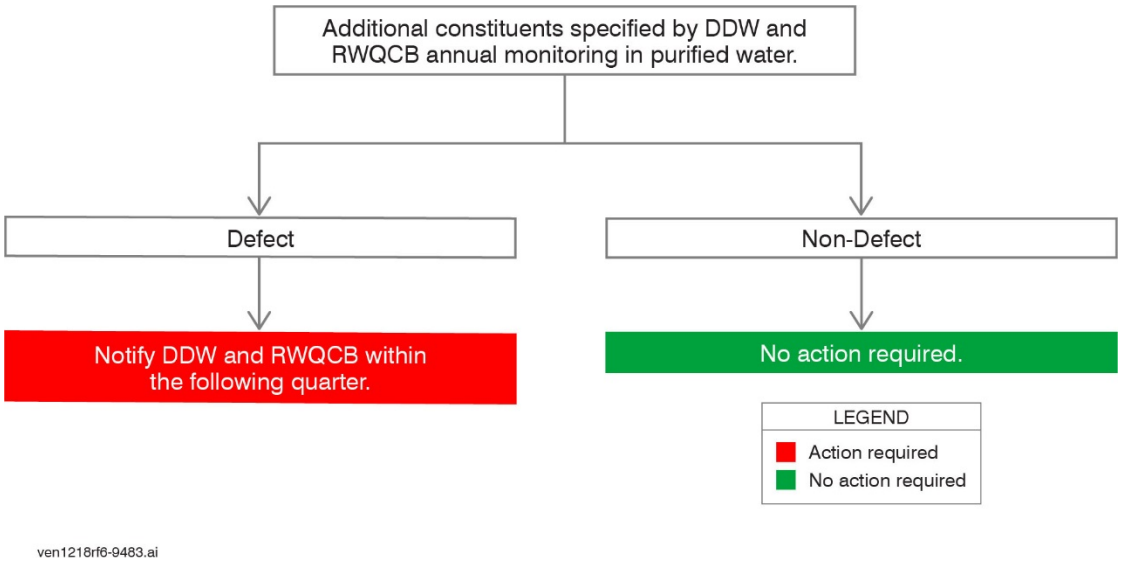

Figure 6.4 Title 22 Additional Monitoring and Action Plan for Purified Water, per DDW 2018, Section 60320.220 (d) & (e)

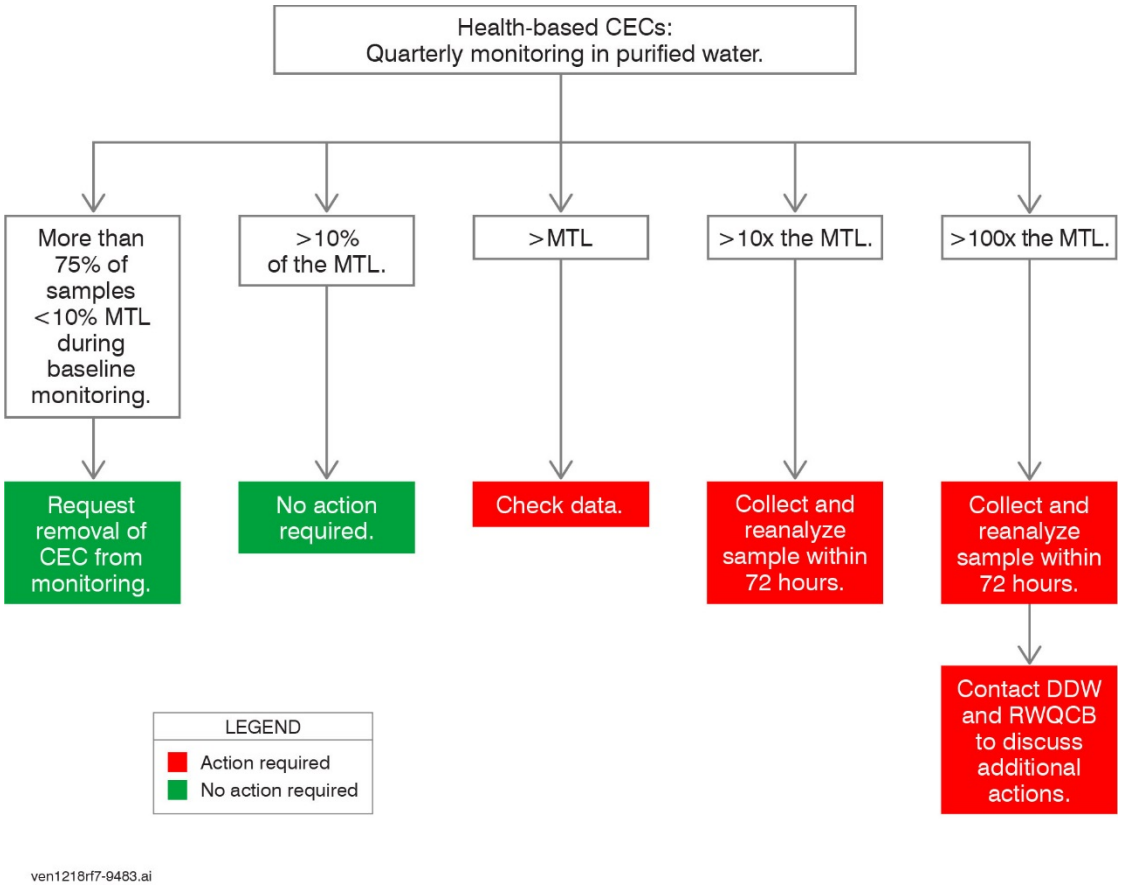

Figure 6.5 Title 22 CEC Monitoring and Action Plan for Purified Water, per SWRCB 2013, Appendix A. List of constituents corresponds to Tables 6.8 and 6.9, and/or Table 6.10

All constituents with MCLs, ALs, NLs, sMCLs, and health-based CECs (Tables 7-12 and 15 of this report) will be included in the "Inventory List"[1]. All constituents on the Inventory List will be monitored for on a monthly basis in purified water for the first year. After the first year, the monitoring frequency will be based on Title 22 requirements as shown in Figures 4 – 8.

Purified water quality data will trigger actions for enhanced source control. A response will be triggered if a constituent is detected in purified water at a level higher than 10% of its applicable level (MCL, sMCL, AL, NL, or MTL). Lengthy sampling efforts and tracing activities can be avoided with positive industrial relationships and close communication. Therefore, the first response will include direct outreach from the SCPM to potentially responsible industries, as well as discussion of the constituent at the next quarterly industry meeting. The discussion will include possible BMPs.

In parallel with industrial outreach, increased monitoring will be triggered for the problematic constituent. Similar to Title 22 requirements, a confirmation sample will be collected within 10 days of notification of the result. The initial and confirmation samples will be averaged. If the average of the two samples exceeds 10 percent of the applicable limit, and outreach efforts have not yet identified a culpable industry, samples will be collected in the purified effluent, secondary

[1] The inventory list does not include constituents with local limits, because all constituents with local limits also have an associated drinking water-related levels, except for FDS, H2S, and grease/oils/fats.

wastewater effluent, raw wastewater, and at the monitoring nodes within the collection system designated in the Source Mapping Strategy. These samples will be collected within 10 days of notification of the result of the confirmation sample. If loading of the problematic constituent is attributable to one of the four sewersheds, the constituent will be traced through the collection system per the Source Mapping Strategy.

If a new industry is determined to be discharging a problematic constituent, the industry will be included in the industrial discharge program through either voluntary means, or through the issuance of a new local limit and industrial discharger permit.

A constituent detected at greater than 10% of the applicable level in purified water will also be included on the "short list" and will be monitored on a monthly basis in both purified water, and secondary effluent until the average of six consecutive months of sampling is lower than 10 percent of the applicable level in purified water. Duplicate sampling for constituents on the short list as part of inventory list monitoring in either purified water or secondary effluent.

The purified water action and enforcement plan for ESCP is shown in Figure 6.6. All constituents on the short list will be closely monitored for changes during the subsequent sampling periods and the detections will be noted during the Industrial Source Control Workshops held quarterly by the SCPM.

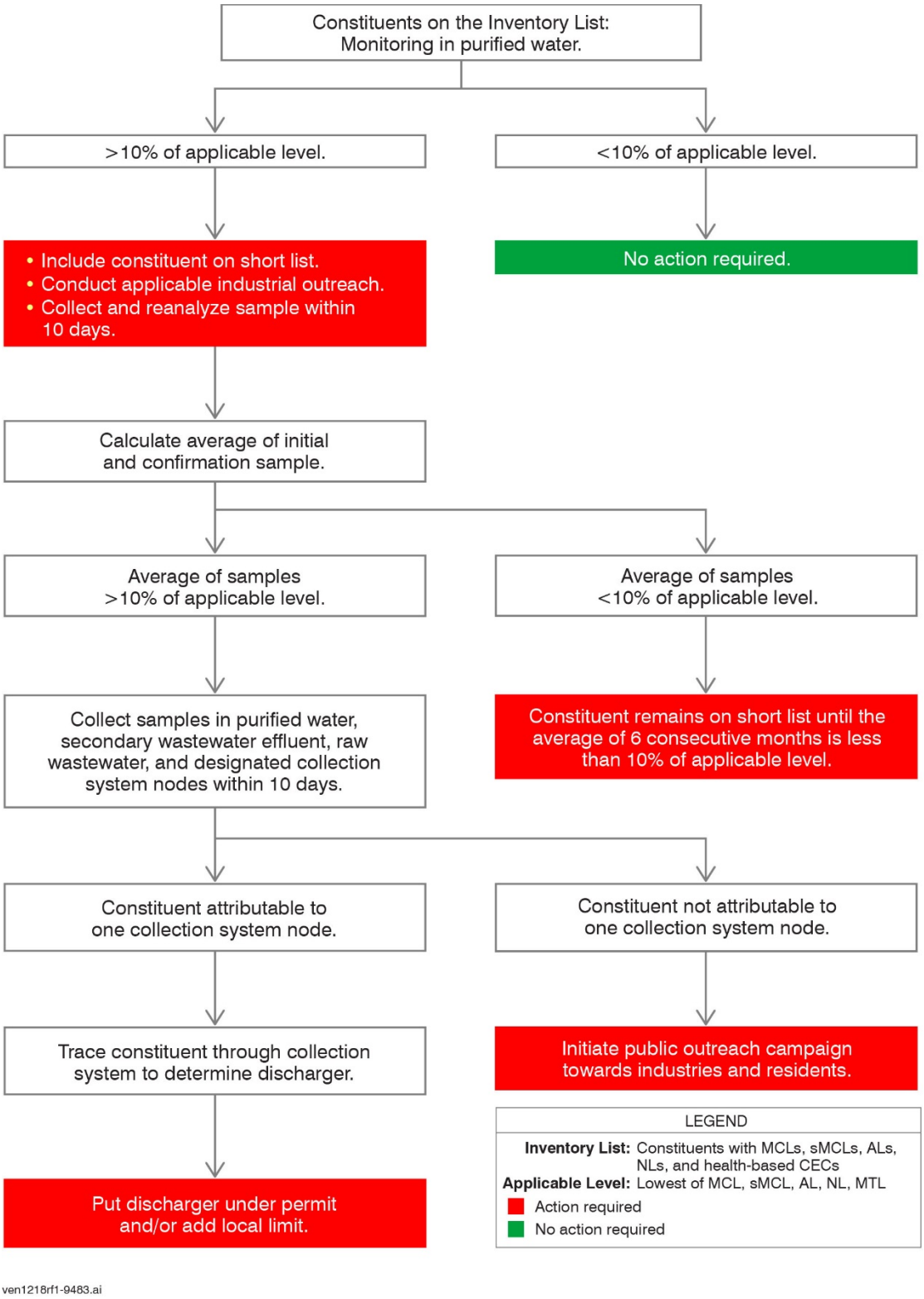

Figure 6.6 Purified Water Monitoring Response Plan for Proposed ESCP

6.3.2 Secondary Water Monitoring and Enforcement

This proposed ESCP includes monitoring of the secondary effluent source water. The recommended grab sample and online monitoring is detailed previously in this report and not repeated here.

All constituents on the Inventory List and all constituents with local limits will be monitored in the secondary effluent on a monthly basis for the first six months of AWPF operations. Following the first six months of operations, the monitoring frequency of constituents on the Inventory List in secondary effluent will be reduced to semi-annually for most constituents, except as described below.

As described above, if a constituent is detected at greater than 10% of the applicable level in purified water, the constituent will be included on the Short List and monitored monthly in both purified water and secondary effluent until the average of six consecutive months of testing shows the level to be lower than 10 percent of the applicable level in purified water.

Similarly, if a constituent is detected at a level higher than 10 percent of the applicable level *in the secondary effluent*, the constituent will also be included on the Short List. The constituent will remain on the Short List until the average of six consecutive months of testing shows the level to be lower than 10% of the applicable level in *purified* water. These constituents will be taken off of the Short List and added to the No-Trigger List, even if levels remain high in secondary effluent samples, because the constituent is sufficiently reduced through the AWPF. For these constituents, the only driver for inclusion in the Short List for a second time would be levels in purified water, not levels in secondary effluent. Three constituents with proven engineering solutions will start out on the No-Trigger List – NDMA, TDS, and Specific Conductance – meaning that elevated levels in secondary effluent will not trigger inclusion on the short list for increased monitoring frequencies.

All chemicals on the Short List will be closely monitored for changes during the subsequent sampling periods and the detections will be noted during the Industrial Source Control Workshops held quarterly by the SCPM.

Monitoring action plans tailored to secondary effluent sampling are included on Figure 6.7.

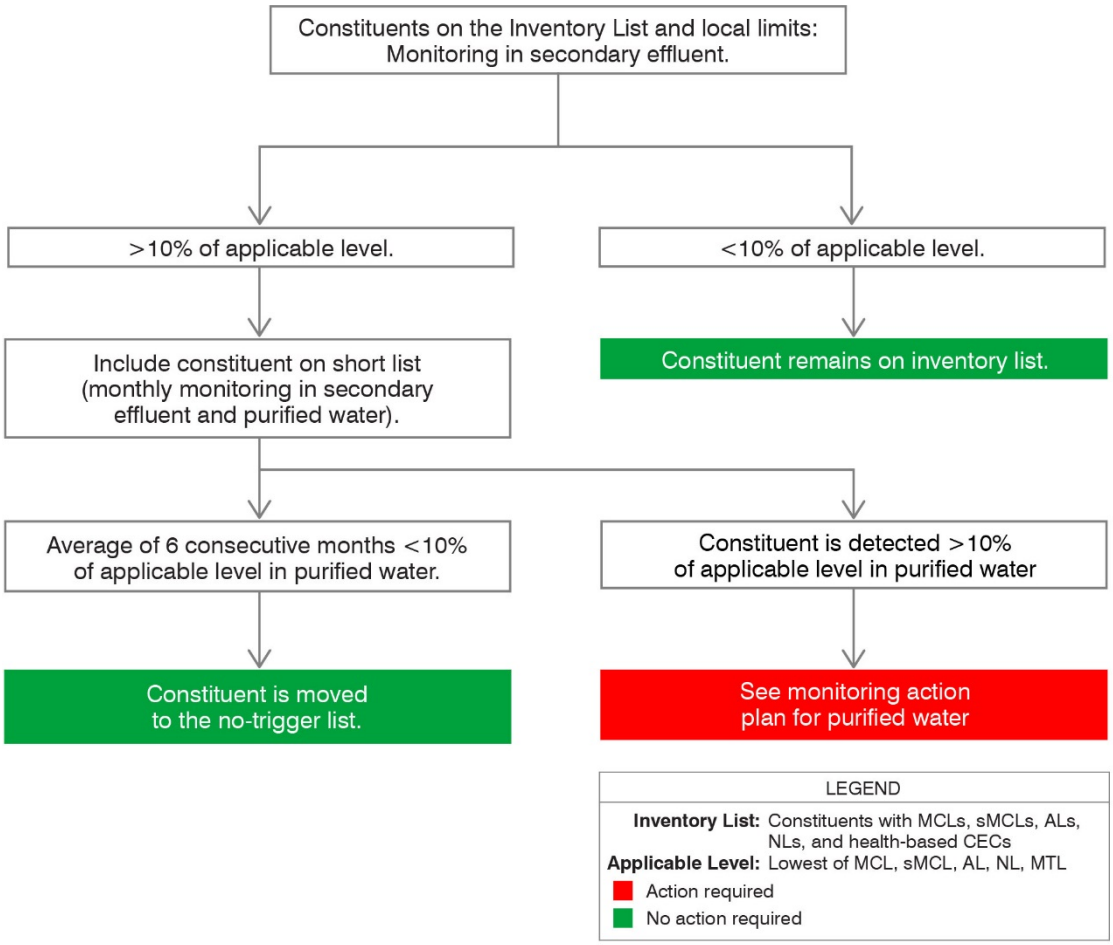

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Figure 6.7 Secondary Effluent Source Monitoring Action Plan for Proposed ESCP

6.4 Source Mapping Strategy

The City currently has a collection system tracing strategy that has proven effective by the "gross-beta" incident. For enhanced source control monitoring, a defined area strategy is proposed. This strategy includes defining areas of the collection system from which all major trunks meet and allows for increased isolation between domestic and industrial dischargers. Example mapping areas are shown below in Figure 6.8 as (M1 - M6). Each area will be monitored at the major junctions with the frequency and breadth defined previously in Table 6.11, and as needed for priority events where mapping contaminants through the system is necessary.

The initial discharge area in M4 will be monitored as a "baseline" for collection system contaminant accumulation. This will provide information about loading rates through each sampling event. Industry measured contaminant discharge data and flow rates will be used to create a mass balance for industry-specific loading rates. If these loading rates remain within a +/- (TBD by City)% margin, the loading rates will be acceptable. If out of this range, all industrial dischargers known to discharge this specific contaminant will be contacted. Household dischargers could also be responsible for contributing to this difference in industrial contaminant discharge. This approach is not meant to replace downstream monitoring of industrial discharge

by the City for confirmation of each industry, only to provide a larger data set for long-term monitoring and a first look at monthly data trending for increasing dischargers in the service area. This will also provide confirmation of residential input, not only industry input.

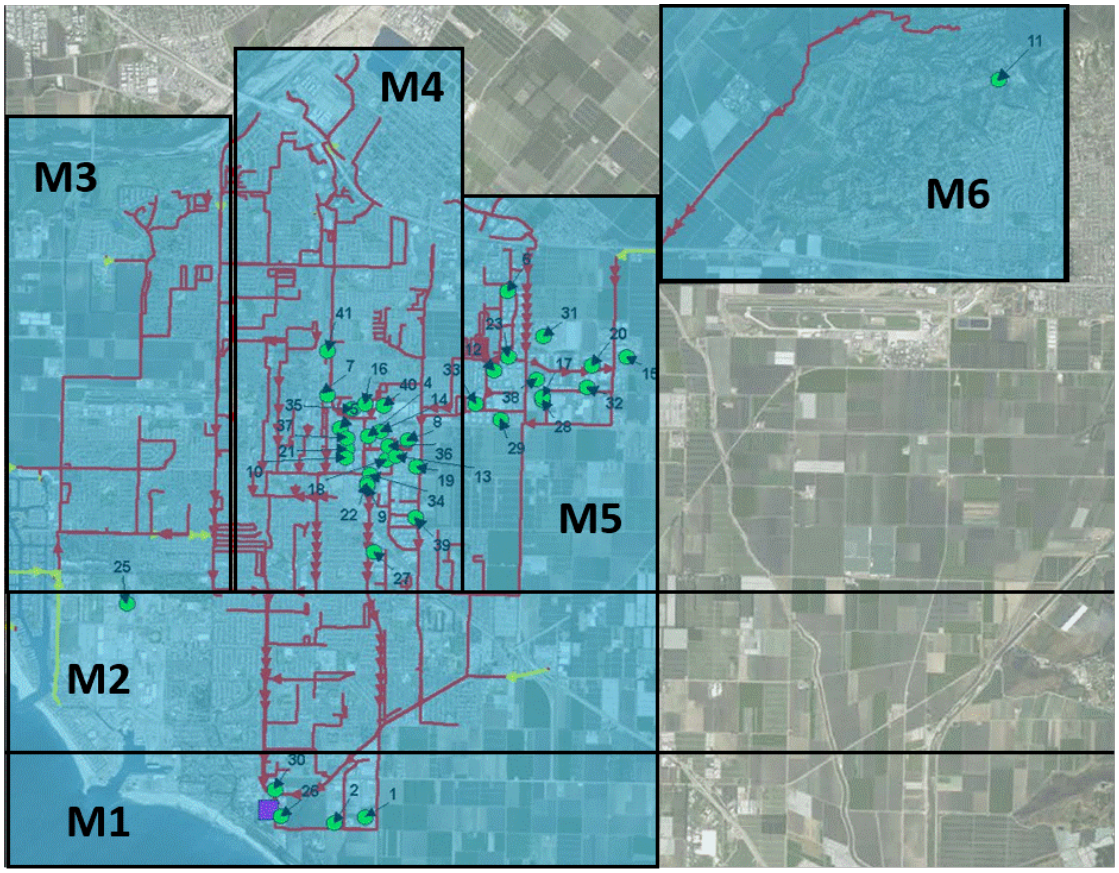

Figure 6.8 Proposed Collection System Strategic Monitoring Strategy for Both Routine Monitoring and Action Plan Response

To reduce the likelihood that harmful pollutants enter the OWTP, a monitoring and enforcement response plan similar to the SCWW "gross-beta incident" must be implemented. Monitoring and sampling effluent wastewater on a semiannual basis (to analyze for radioactivity) allows for early detection of contaminants. If a contaminant is found, research should be conducted to locate the source. Once locations are identified, samples should be taken from several locations - upstream, downstream, onsite and adjacent to suspected violators. If unacceptable concentrations of contaminants are found, proper action by the City should be taken to control the problem. This can include an order to Cease-and-Desist discharge, a Notice of Violation, and/or suspension of Industrial Waste Discharge Permit that would prohibit the discharge of any wastewater by the violators to the Oxnard Collection System.

The City of Oxnard has a mostly residential section of town and another section that contains significant numbers of industrial dischargers. If a household is discharging a contaminant of concern, it will be difficult to pinpoint which house is causing the violations. In order to minimize painstaking contaminant tracking through the sewage discharge lines, a heavy emphasis will be

put on household outreach and education. Additionally, the City will provide a hazardous waste disposal program where the public can bring medications, pesticides, and other hazardous waste items to the landfill for treatment, recovery, or burial. The plans for public outreach can be found in Section 7.3.

6.5 Hospital Discharge Program

Hospital waste discharge monitoring is not currently required in source control programs. The City of Oxnard has several hospitals, including animal hospitals, shown in Figure 6.9. SWRCB (2018 draft) produces the recommended constituents for monitoring in potable reuse projects among the pharmaceuticals and personal care products of emerging concern. The recommended constituents for monitoring are included in the Inventory List of contaminants and if an unexplained detection of these contaminants is found in the secondary effluent or purified water when tested, the compound will move to the Short List. If the action plan indicates a pharmaceutical contaminant should be traced back into the collection system (Figure 6.9), previously determined sampling locations downstream of the hospital dischargers will be utilized. Facilities with the highest discharge flow will be targeted first.

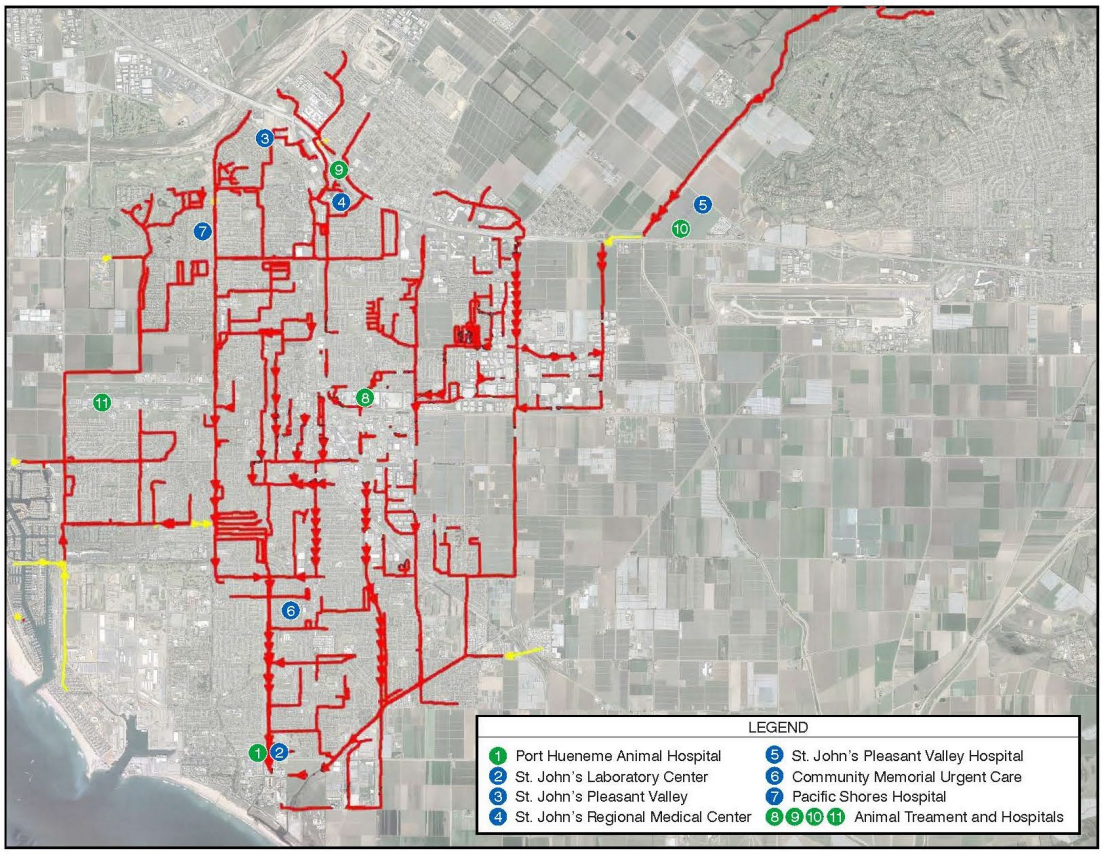

Figure 6.9 Short List of Human and Animal Hospitals Discharging to OWTP

6.5.1 Iohexol Hospital Discharge Indicator

Distinguishing hospital discharge versus residential discharge can prove challenging. Iohexol can be used as a potential indicator with which to identify hospital discharge locations and determine their contributions to the total flow. Iohexol is introduced into the wastewater

collection system almost exclusively through the urine of patients in hospitals that have undergone medical imaging. Iohexol acts as a contrasting agent for medical imaging, and is designed to have no impact on human or animal health. Advanced oxidation processes efficiently remove Iohexol, and the compound is typically completely degraded in secondary treated wastewater. If incorporating a hospital discharge program into the ESCP becomes necessary, Iohexol should be used to help track medical dischargers.

Section 7

OUTREACH PROGRAMS

7.1 Industrial Outreach

Meetings with all dischargers in groups will take place as described in the Local Limits Study. During these meetings, each discharger will be given their new discharge limits for all registered constituents. The rollout of the industrial discharge outreach program will be included in these meetings, where a clear plan will be made with each industrial discharger for what to do in the event of any constituent release changes. Changes could include a slug discharge event, a new contaminant introduced into production and needing to be added to the inventory list, removing a contaminant from a discharge list, and others.

Industrial dischargers will be reminded of the changes taking place downstream of them, and the effects discharging waste in violation of their permit could have on downstream potable reuse treatment and subsequent public consumption. The outreach plan will include 30 minutes to 1 hour monthly webinars to provide updates on their discharge statuses to each other and the City can provide the latest monitoring data and any updates or changes to the source control program. Monthly webinars will include information on any program updates, questions asked and answered by other dischargers during that time period and potable reuse monitoring information.

Quarterly 3-hour meetings will take place with all industries to send 1 representative to an update meeting in lieu of the monthly webinar. An example agenda for this meeting is shown as Figure 7.1. These meetings will be led by the SCPM with support from Oxnard staff. All industrial dischargers should participate with a short update on their recent monitoring and discharge information.

To encourage further engagement by industries, a yearly award will be given to those companies who have not had a discharge violation during audits or routine collection system monitoring. The "Enhanced Source Control Responsible Partner Award" is a yearly reminder to all industries that public health protection is a partnership with the community and water treatment system operations Figure 7.2.

7.2 Periodic Industry Reviews

In addition to educational outreach and coordinated industry discharger meetings, site audits currently run through the City's pre-treatment program will continue. The auditors will submit all data, reports, and meeting summaries directly to the SWPM immediately following site visits. The SWPM will then compile the data and files to ensure each industry is being properly monitored.

City of Oxnard Quarterly Source Control Dischargers Meeting

Meeting Month Day, Year

8:00 AM - 11:00 AM

Meeting Location

Welcome and Introductions (SCPM)	8:00 - 8:20
Source Control Program Updates (SCPM)	8:20 - 8:45
OWTP Monitoring Trends from Quarter (Oxnard Staff)	8:45 - 9:15
Individual Discharger Updates (Industry Representative)	9:15 - 10:30
Discussion and Q&A (Everyone)	10:30 - 10:50
Set Next Meeting Date and Agenda Items (SCPM)	10:50 - 11:00

SAMPLE

Figure 7.1 Example Quarterly Industrial Dischargers Source Control Meeting Agenda

Figure 7.2 ESCP Responsible Partner Award Certificate (Example)

If a violation is found during a site audit, the current enforcement plan for pre-treatment violations will apply, unless a more stringent enforcement plan is needed during audits in the

future. Any violations reported or recorded will be discussed during the quarterly and monthly industry outreach meetings that include representatives from each industry.

In the event of a new discharge license being issued by the City, a source control review will be triggered. This review will be discussed and integrated into the industry discharger partnership attending monthly and quarterly meetings. All business licenses for dischargers will be reviewed annually by the industry's assigned auditor. The licenses are required to be within expiration date, show proper fees have been paid to the City for the annual time period, and no new constituents or major changes have been made to the discharge matrices.

7.3 Residential Outreach

Household outreach and education is the major residential source control strategy for most communities. Due to the increased risk involved in potable reuse, the residents should be strongly educated as to where their waste is going and the potential impacts to the communities drinking water supply. An outreach plan for public acceptance purposes is already planned for this project, and the discharge information could be rolled out along with this initiative upfront. Providing a proactive awareness program for household discharges prior to the operation of IPR in the community can provide increased confidence to the City in their residential source water control strategy.

Contaminant discharges causing unwanted impact to the water supply cannot be tracked easily in residual areas due to the quantity of individual dischargers with low-volume inputs. In order to prevent unwanted discharges from households in the sewer line, educational tools and disposal centers will be used for the public to have options for disposing of unwanted items.

Discharge information will address a list of household items that would potentially be detrimental to the wastewater and water purification process, and alternative disposal options for the residents provided by the City or otherwise available. Educational materials will include a website developed to address safe disposal practices. For example, the public would be educated that flushing leftover antibiotics or pharmaceuticals is unsafe, however, household cleaners are acceptable. A detailed list with brand examples will be made available to ensure public understanding of the issue. An example of a public outreach website for residential discharge was developed by the San Francisco Public Utilities Commission (SFPUC). The website offers top things not to flush, and a flyer you can print with the title "Think Before You Flush". The website can be accessed here: http://sfwater.org/index.aspx?page=151

The majority of households in Oxnard primarily speak Spanish, therefore it is imperative that bilingual educational materials are developed alongside of materials in English. The SFPUC in the above example provides 4 language options (English, Spanish, Mandarin and Tagalog) to cater to that city's demographics. To direct residents to the informational website, a link and description will be highly visible on their monthly water bills mailed, or in their water bills provided online. Provided internet is not available in the household, annual residential source control program meetings will be organized by the SWPM to provide another educational option for City residents.

Section 8

OWTP AND AWPF WATER QUALITY RESULTS

8.1 Secondary Effluent Water Quality Standards and Results

In order for AWPF effluent to be used for indirect potable reuse, the water must first meet the existing NPDES OWTP effluent regulations and Los Angeles Region Basin Plan (Basin Plan) objectives. Since secondary effluent is the influent source for AWPF treated water, the higher the secondary effluent water quality, the higher our source water quality is for IPR.

8.1.1 NPDES Permit Regulations

The NPDES Permit for the OWTP includes regulations for major wastewater constituents such as 5-day biological oxygen demand (BOD_5) and total suspended solids (TSS), marine aquatic life contaminants, and contaminants relevant to human health (both carcinogens and non-carcinogens).

Per the NPDES permit, Oxnard already does periodic monitoring (quarterly) of the plant influent.

- Flow - continuous.
- pH, TSS, BOD - daily.
- Oil & Grease - weekly.
- Benzedrine, Heptachlor epoxide, PCBs, TCDD equivalents - quarterly.
- Everything else - semiannually.

8.1.2 Relevant Basin Plan Objectives

The Basin Plan was adopted in 1994 and outlines water quality requirements for waters in the Los Angeles region of which Oxnard is a part. All Basin Plan objectives pertaining to water designated for human consumption, are consistent with DDW requirements.

8.2 OWTP and AWPF Wastewater Quality

The OWTP has been in full compliance with its NPDES permit. Historical effluent data for BOD, TSS, turbidity, residual chlorine, pH, ammonia, oil and grease, and settleable solids are continuously measured in the OWTP effluent. Historical values for these parameters are provided in Tables 8.1 through 8.3. A summary of data for metals and trace pollutants in the OWTP effluent is shown in Table 8.2, including new data collected as part of the 2015 Local limits evaluation. The data provided in Tables 8.1 and 8.2 indicate that the OWTP provides high quality secondary-treated effluent suitable for advanced treatment and potable reuse. Further, the high beta radioactivity has been addressed through the source control program with the cease of all discharge from Santa Clara Wastewater, as demonstrated with the low beta radioactivity shown in Table 8.2.

Table 8.1 Effluent Regulatory Limits and OWTP Data - Typical Wastewater Constituents

Parameter	Units	NPDES Permit Limit		OWTP Data[1]
		Discharge Limit	Criteria	
BOD_5	mg/l	30	Monthly Average	14 - 22
		45	Weekly Average	11 - 28
	lbs/day	7,900	Monthly Average	2,326 - 3,621
		12,000	Weekly Average	1,880 - 4,403
TSS	mg/l	30	Monthly Average	5.8 - 10.4
		45	Weekly Average	4.6 - 19.1
	lbs/day	7,900	Monthly Average	965 - 1,696
		12,000	Weekly Average	760 - 3,063
Turbidity	NTU	75	Monthly Average	2.9 - 6.8
		100	Weekly Average	2.7 - 12.9
		225	Daily Maximum	20.7
Total Residual Chlorine	mg/L	0.085	Monthly Performance Goal	0.01 - 0.04
	lbs/day	23		1.4 - 7.2
pH		6.0 - 9.0	Instantaneous Minimum to Maximum	7 - 7.9[2]
Ammonia Nitrogen	mg/L	25	Monthly Performance Goal	25 - 34
	lbs/day	6,600		4,259 - 5,781
Oil and Grease	mg/L	25	Monthly Average	4.9 - 4.9
		40	Weekly Average	4.9 - 5.1
	lbs/day	6,630	Monthly Average	782 - 827
		10,600	Weekly Average	769 - 850
Settleale Solids	ml/L	1	Monthly Average	0.01 - 0.016
		1.5	Weekly Average	0.01 - 0.036
		3	Daily Maximum	0.10

Notes:
(1) Based on 2013 Data.
(2) From daily grab samples

Table 8.2 Effluent Regulatory Limits and OWTP Data – Other Pollutants

Contaminant	Units	Effluent Limitations		Title 22 Contaminant Action Levels[1] and OWTP Discharge Goals	OWTP Data[2]
		Average Monthly	Maximum Daily	Annual Average or Single Action	
Marine Aquatic Life Toxicants					
Arsenic	ug/L	-	-	10	0.7
Cadmium	ug/L	-	-	5	<0.5
Chromium VI	ug/L	-	-	10	<0.3
Copper	ug/L	-	-	1300	28
Lead	ug/L	-	-	15	<5
Mercury	ug/L	-	-	2	<0.2
Nickel	ug/L	-	-	100	5
Selenium	ug/L	-	-	50	2.4
Silver	ug/L	-	-	100	1
Zinc	ug/L	-	-	5000	19
Cyanide	ug/L	-	-	0.15	-
Phenolic Compounds (non-chlorinated)[3]	ug/L	-	-	5[4]	<23
Phenolic Compounds (chlorinated)[3]	ug/L	-	-	0.42[4]	<5
Endosulfan[3]	ug/L	-	-	0.05[4]	<0.03
HCH[3]	ug/L	-	-	0.1[4]	-
Endrin	ug/L	-	-	2	<0.01
Chronic Toxicity[3]	Tuc	-	99	-	-
Radioactivity					
Alpha Radioactivity	Pci/L	-	15	15	1.67 ± 0.24
Beta Radioactivity	Pci/L	-	50	50	94 ± 3.939[5,6]
Combined Radium-226 & Radium-228	Pci/L	-	5	5	-
Tritium	Pci/L	-	20000	20000	-
Strontium-90	Pci/L	-	8	8	-
Uranium	Pci/L	-	20	20	-
Human Health Toxicants – Non Carcinogens					

Table 8.2 Effluent Regulatory Limits and OWTP Data – Other Pollutants (continued)

Contaminant	Units	Effluent Limitations		Title 22 Contaminant Action Levels[1] and OWTP Discharge Goals	OWTP Data[2]
		Average Monthly	Maximum Daily	Annual Average or Single Action	
Acrolein(3)	ug/L	-	-	10(4)	<5
Antimony	ug/L	-	-	6	<2
Bis (2-chloroethoxy) methane[3]	ug/L	-	-	25[4]	<1
bis (2-Chloroisopropyl) ether[3]	ug/L	-	-	10[4]	<1
Chlorobenzene[3]	ug/L	-	-	2.5[4]	<1
Chromium (III)	ug/L	-	-	50	<5
Di-N-Butyl phthalate[3]	ug/L	-	-	0.19[4]	<1
Dichlorobenzenes	ug/L	-	-	260	<3
Diethyl phthalate	ug/L	-	-	63	<1
Dimethyl phthalate[3]	ug/L	-	-	10[4]	<1
2-Methyl-4,6-dinitrophenol[3]	ug/L	-	-	25[4]	<5
2,4-Dinitrophenol[3]	ug/L	-	-	25[4]	<10
EthylBenzene	ug/L	-	-	600	<1
Fluoranthene[3]	ug/L	-	-	0.039[4]	<1
Hexachlorocyclopentadiene	ug/L	-	-	5	<1
Nitrobenzene[3]	ug/L	-	-	5[4]	<1
Thallium	ug/L	-	-	2	<2
Toluene	ug/L	-	-	150	<1
Tributyltin[3]	ug/L	-	-	0.0263[4]	<0.005
1,1,1-Trichloroethane	ug/L	-	-	200	<1
Human Health Toxicants - Carcinogens					
Acrylonitrile[3]	ug/L	-	-	10[4]	<2
Aldrin[3]	ug/L	-	-	0.025[4]	<0.005
Benzene	ug/L	-	-	1	<1
Benzedrine	ug/L	0.0068	-	-	<10
Beryllium	ug/L	-	-	4	<0.5
Bis (2-chloroethyl) ether[3]	ug/L	-	-	5[4]	<1

Table 8.2 Effluent Regulatory Limits and OWTP Data – Other Pollutants (continued)

Contaminant	Units	Effluent Limitations		Title 22 Contaminant Action Levels[1] and OWTP Discharge Goals	OWTP Data[2]
		Average Monthly	Maximum Daily	Annual Average or Single Action	
Bis (2-ethylhexyl) phthalate[3]	ug/L	-	-	50[4]	10
Carbon Tetrachloride	ug/L	-	-	0.5	<1
Chlordane	ug/L	-	-	2	<0.01
Chlorodibromomethane[3]	ug/L	-	-	0.61[4]	<.001
Chloroform[3]	ug/L	-	-	1.2[4]	<1
DDT[3]	ug/L	-	-	0.25[4]	<0.01
1,4-Dichlorobenzene[3]	ug/L	-	-	0.041[4]	<1
3,3-Dichlorobenzidine[3]	ug/L	-	-	25[4]	<5
1,2-Dichloroethane	ug/L	-	-	5	<1
1,1-Dichloroethylene	ug/L	-	-	6	<1
Bromodichloromethane[3]	ug/L	-	-	2.5(4)	<1
Dichloromethane	ug/L	-	-	5	<1
1,3-Dichloropropene	ug/L	-	-	0.5	<2
Dieldrin[3]	ug/L	-	-	0.05[4]	<0.01
2,4-Dinitrotoluene[3]	ug/L	-	-	25[4]	<1
Azobenzene (1,2-Diphenylhydrazine)[3]	ug/L	-	-	5[4]	<1
Halomethanes	ug/L	-	-	80	<4
Heptachlor	ug/L	-	-	0.04	<0.01
Heptachlor epoxide	ug/L	0.002	-	0.02	<0.01
Hexachlorobenzene	ug/L	-	-	1	<1
Hexachlorobutadiene[3]	ug/L	-	-	5[4]	<1
Hexachloroethane[3]	ug/L	-	-	5[4]	<1
Isophorone[3]	ug/L	-	-	5[4]	<1
N-Nitrosodimethylamine (NDMA)	ug/L	-	-	10	<1
N-Nitrosodi-N-propylamine (NDPA)	ug/L	-	-	10	<1
PAHs[3]	ug/L	-	-	0.097[4]	<19
PCBs	ug/L	0.0019	-	0.5	<17.5

Table 8.2 Effluent Regulatory Limits and OWTP Data – Other Pollutants (continued)

Contaminant	Units	Effluent Limitations		Title 22 Contaminant Action Levels[1] and OWTP Discharge Goals	OWTP Data[2]
		Average Monthly	Maximum Daily	Annual Average or Single Action	
Total 2,3,7,8-TCDD Equivalence[3]	ug/L	0.00000039	-	-	<0.00001
1,1,2,2-Tetrachloroethane	ug/L	-	-	1200	<1
Tetrachloroethylene	ug/L	-	-	5	<1
Toxaphene	ug/L	-	-	3	<2.5
Trichloroethylene	ug/L	-	-	5	<1
1,1,2-Trichloroethane	ug/L	-	-	5	<1
2,4,6-Trichlorophenol[3]	ug/L	-	-	0.35[4]	<1
Vinyl chloride	ug/L	-	-	0.5	<1

The OWTP data collected to date was intended to demonstrate compliance with the existing NPDES permit and to address the local limits evaluation, and was not intended to address future potable reuse water quality standards. However, the OWTP secondary effluent data (Table 8.3) shows for any contaminant monitored under Title 22, the measured secondary effluent data meets or exceeds Title 22 maximum contaminant concentrations, with the exception of one event, where subsequent sampling consistently showed a much lower concentration. As discussed in the subsequent section, additional analytical testing of secondary effluent, ROP, and UV AOP effluent will be done during the startup of the AWPF and the production of non-potable recycled water, which will be done in the summer of 2016.

Table 8.3 AWPF Removal Efficiencies (Local Limits Constituents)

Constituent	Units	Secondary Effluent	Finished Water	Removal Efficiency[1]
Ammonia	mg/L	33.9	1.67	95.1%
Antimony	ug/L	0.84[2]	<1	40.5%
Arsenic	ug/L	2.09[2]	<1	76.0%
Barium Tot	ug/L	23.0	<2	95.7%
Beta, Gross	pCi/L	5.96[2]	<3	74.8%
Biochemical Oxygen Demand, total	mg/L	6.91[3]	2.31[3]	66.6%
Boron	mg/L	1.09	0.74	31.9%
Cadmium	ug/L	<0.5	<0.5	--
Calcium	mg/L	164	7.52	95.4%

Table 8.3 AWPF Removal Efficiencies (Local Limits Constituents) (continued)

Constituent	Units	Secondary Effluent	Finished Water	Removal Efficiency[1]
Chloride	mg/L	548	18.7	96.6%
Chromium	ug/L	0.52[4]	<1	4.2%
Copper	ug/L	7.16	<2	86.0%
Fixed Dissolved Solids	mg/L	1,603	1.14[4]	99.9%
Fluoride	mg/L	0.70	0.02	96.4%
Gross Alpha	pCi/L	26.5	<3	94.3%
Iron Total	mg/L	0.30	0.01[4]	96.2%
Lead Total	ug/L	<0.5	<0.5	--
Magnesium	mg/L	67.8	0.23	99.7%
Manganese	mg/L	0.11	<0.002	99.1%
Mercury	ng/L	6.01[2]	1.52	74.7%
Molybdenum	ug/L	16.4	<2	93.9%
Nickel	ug/L	6.57[2]	<5	62.0%
Potassium	mg/L	35.1	1.43	95.9%
Selenium	ug/L	8.05[2]	<5	69.0%
Silica	mg/L	30.8	1.01	96.7%
Silver Total	ug/L	<0.5	<0.5	--
Sodium	mg/L	397	17.4	95.6%
Specific Conductance	umho/cm	3,346	141	95.8%
Strontium	mg/L	1.55	0.01[4]	99.6%
Sulfate	mg/L	543	1.27	99.8%
Total Dissolved Solids	mg/L	1,869	69.9	96.3%
Total Kjeldahl Nitrogen	mg/L	34.3	1.70	95.0%
Total phosphorus as P	mg/L	1.45	0.03	97.8%
Total Suspended Solids	mg/L	5.32[2]	<10	6.1%
Uranium	ug/L	8.49	<1	94.1%
Zinc Total	ug/L	17.3[2]	<20	42.2%

Notes:

(1) Where the reported value is < reporting limit, the removal efficiency was calculated assuming the reported value equaled one half of the reporting limit.

(2) Some data points in this dataset were extrapolated below reporting limit based on other reported data at the sampling location. These datasets had three or more data points above the reporting limit to allow regression analysis for extrapolating concentrations below the level of detection.

(3) BOD data were collected on 9 days from 6/11/15 through 8/30/15.

(4) These datasets had less than three data points above the reporting limit which makes a regression analysis inaccurate. Thus, a geometric mean of all data points was used. Data reported below the reporting limit were assumed to be one half the reporting limit for calculating the geometric mean.

Section 9

SUMMARY

An ESCM Program framework has been proposed in this document, building on the existing source control program already in place at the City of Oxnard. The proposed ESCM for the City of Oxnard will include:

- A source control program manager overseeing all data collection and regulatory issues relating to discharge from the first user to groundwater wells.
- More frequent sampling than currently required of the secondary effluent and AWPF finished water, including for regulated, unregulated and industry-specific constituents.
- Use of historical and online monitoring data currently required for operation to create baselines and predict trends in process performance.
- Substantial industrial and residential outreach programs for potable reuse education and discharge initiatives.
- Mapping strategies for fast-acting collection system tracing of detected contaminants of health concern.
- Optional additions to discharge mapping, including hospitals.

Section 10

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Appendix A

BEST MANAGEMENT PRACTICES (BMPS) FOR CENTRALIZED WASTE TREATMENT (CWT)

CALIFORNIA ASSOCIATION OF SANITATION AGENCIES (CASA)

BEST MANAGEMENT PRACTICES

FOR

CENTRALIZED WASTE TREATMENT (CWT) FACILITIES

(SUBCATEGORY D MULTIPLE WASTESTREAM)

October 12, 2015

Purpose

These Best Management Practices (BMPs) have been endorsed by several major POTW's in California that currently accept CWT waste discharges. These major California POTWs have developed and adopted these BMPs to serve as guidance, and to help assure uniform compliance among POTWs in California with their mandates under the U.S. EPA pretreatment program requirements.

These requirements are designed to protect POTW wastewater treatment processes and conveyance systems; to assure compliance with the regulations governing discharge of treated effluent, water reuse, biosolids disposal/reuse, and air emissions; and to protect worker and public safety and the environment.

Acknowledgement

The following agencies participated in the development and review of this BMP.

- City of Oxnard
- County Sanitation District of Los Angeles
- City of San Jose (SJ/SC Water Pollution Control Plant)
- City of Los Angeles
- Orange County Sanitation District

Background

Centralized Waste Treatment (CWT) facilities are defined in Rule 40 CFR 437 as those that accept hazardous or non-hazardous industrial metal-bearing wastes, oily wastes and organic-bearing wastes received from off-site for pretreatment processing before discharge to a water of the U.S., or to a Publically Owned Wastewater Treatment (POTW) facility. Specifically, CWT Subcategory D dischargers are those that receive for treatment a combination of two of more any of the following three major categorical waste streams: metal-bearing wastes, oily wastes, and organic-bearing wastes.

CWTs are required to be permitted and to comply with all federal and local rules and regulations set by Rule 40 CFR 437. They are also required to meet those rules and regulations set by the local agency that owns and operates the POTW facility and administers the POTWs pretreatment program, if the CWT discharges to a POTW.

The EPA's guidance document labeled "Small Entity Compliance Guide, Centralized Waste Treatment (CWT) Effluent Limitations and Guidelines and Pretreatment Standards (40 CFR 437) (EPA 821-B-01-003; June 2001; Version 3.0) "sets guidance for businesses that are subject to the

Rule in complying with the national regulations and limitations set forth in the Rule." A Subcategory D discharger must establish that its facility provides "equivalent treatment" in terms of comparable pollutant removals to the applicable treatment technologies used as the basis for the federal limitations and pretreatment standards (40 CFR 437.2).

Best Management Practices

The following summarizes the recommended Best Management Practices (BMPs) for CWT facilities discharging to California POTWs. These recommended BMPs are organized based on the following topical headings:

- Waste Receiving Requirements
- Treatment Requirements
- Effluent Discharge and Sampling/Testing Requirements
- Recommended Certification and Documentation Requirements.

1. **Waste Receiving Requirements**
   a. The waste hauler bringing waste to a CWT shall submit a Waste Manifest to the CWT upon arrival at the CWT processing facility. The Waste Manifest shall include the following minimum information:
      i. Information as defined in Chapter 5 of Small Entity Compliance Guide, Centralized Waste Treatment (CWT) Effluent Limitations and Guidelines and Pretreatment Standards (40 CFR 437) (EPA 821-B-01-003; June 2001; Version 3.0). This shall include a date and time stamp.
   b. The following mandatory tests shall be performed for confirmation of the Waste Manifest in accordance with 40 CFR 403 General Pretreatment Regulations and the analytical methods and sampling techniques stipulated in 40 CFR 136:
      i. Heavy Metals
      ii. Cyanides
      iii. Total Phenol
      iv. Sulfides
      v. Volatile Organic Compounds
      vi. Oil and Grease
      vii. Total Toxic Organics (TTOs)
      viii. BOD and TSS
   c. Combining waste from multiple location into one tank truck (i.e. "Milk Runs") is prohibited.
   d. Additional random sampling of waste haulers by the CWT may be requested by the POTW to confirm the waste characteristics are as described in the Waste Manifest.
2. **Treatment Requirements**
   a. The minimum required treatment shall be as specified in 40 CFR 437, and as described in the Small Entity Compliance Guide, Centralized Waste Treatment (CWT) Effluent Limitations and Guidelines and Pretreatment Standards (40 CFR 437) (EPA 821-B-01-003; June 2001; Version 3.0).
   b. Emergency shutoff and re-routing procedures must be in place.
   c. Treatment reliability and redundancy requirements must meet. As a minimum, those that are established by the most recent version of the 'Ten-State Standards'

(Board of State and Provincial Public Health and Environmental Managers, Health Research, Inc., Health Education Services Division).

d. Holding tanks for the purpose of dilution will not be allowed.
e. A logbook shall be maintained of the operating parameters of the treatment process.

3. Effluent discharge and sampling/testing requirements.

a. Batch discharge will be required. Continuous discharge is not permitted.
b. The batch tanks will be continuously mixed.
c. A representative sample will be taken and analyzed by a POTW approved, State certified laboratory, before a decision is made to discharge to the POTW sewer system. Testing shall, as a minimum, be for the following:
    i. Local Limits as established by the POTW.
    ii. Applicable 40 CFR 437 Categorical Limits, adjusted by the combined waste stream formula if non-regulated waste streams are discharged at the compliance point.
    iii. Toxicity as determined by Specific Oxygen Uptake Rate (SOUR), Method 1683, EPA-821-R-01-014.
    iv. Any other limits imposed by the POTW.
d. The batch discharge will only be allowed if the above test results meet the applicable discharge limits.
e. Adequate emergency shut-off/rerouting procedures must be established. Incoming wastes must be halted or diverted to storage if an emergency shutdown of the treatment system is required.
f. If the federal or local discharge limitations are not met for a parameter other than pH, then the tank contents shall to be returned to the beginning of the treatment process train for reprocessing. If the federal or local pH limits are not met based on pH only, then the CWT Facility can add an acid or base to bring the pH into the allowable range before discharge. The POTW may have restrictions on the acid or base chemical that can be used for pH adjustment.
g. Installation of flow metering of the discharge to the POTW is required and must be maintained and calibrated routinely by a qualified professional.

4. Recommended General Certification and Documentation Requirements

Documents must be developed and submitted to the POTW, and be available for the POTW to review at the CWT site all times.

Note that all documents, forms, and other submittals must be certified and stamped by a registered professional engineer in California with expertise in industrial treatment. This list includes, but is not limited to the following.

5. Initial Certification Statement.

a. Submit initial Certification Statement to the POTW in accordance with 40 CFR 437.41.
b. The initial Certification Statement must be reviewed and approved by the POTW before a Permit to Discharge is granted to the CWT by the POTW.

6. Plans/Procedures

a. Monitoring, Sampling and Testing Plan (MSTP). The MSTP shall specify: location, frequency, and methodology for all monitoring/sampling of waste received,

treatment processes and performance, and treated effluent discharged to the POTW.

b. Monitoring Plan Reporting: Monthly and annual reports shall be submitted summarizing all mandatory and self-monitoring data results.
c. Slug Discharge Control Plan.
d. Spill Containment plan.
e. Flow Metering Plan.
f. Rainwater and Stormwater Management Plan (Note: stormwater cannot be commingled with received and/or treated CWT wastes).
g. Solvent Management Plan.
h. Waste Minimization Plan.

7. Treatment Process/Facility Information.

a. O&M Manual
    i. Routine O&M Procedures
    ii. Emergency Response, Bypass, and Storage O&M Procedures
    iii. O&M Logbook
b. Unit process sizing and design criteria. Information shall be sufficient for independently assessing the rated treatment capacity of all unit operations, including physical dimensions, and process design criteria (e.g. hydraulic detention times, overflow rates, pollutant removals, etc.).
c. Engineering Design Drawings (100% Design Drawings/As-built).
d. Process and Instrumentation diagram. This shall show the following information:
    i. Process flows for all major unit operations (routine and emergency conditions). This shall include identification of all flow and recycle streams for each treatment process
    ii. Process monitoring parameters (location and metrics). As a minimum these shall include:
        1) Flow rates
        2) pH
        3) Temperature
        4) Others as recommended by the POTW.
e. Wastewater Treatment Operator Requirements.
f. Water Usage. Copies of historical water bills and/or local well records showing water usage for a five-year (5) period.
g. Operating Records. All plant operating and performance records relating to wastewater discharge and waste manifests for up to five (5) years, including all monitoring, testing, and analytical results (See Testing and Monitoring Information, below).

8. Received Waste Documentation

a. Comprehensive list of all generators accepted by the CWT.
b. Waste Hauler Reports.
c. Logbook of all prequalification for each of the CWTs clients, this includes;
    i. Generator information
    ii. Initial Sample information
    iii. Requalification tests
d. d. Customer Laboratory Treatability Information.

9. **Testing and Monitoring Information**
    a. All sampling, testing and laboratory analyses must be performed by an independent testing laboratory that is licensed and certified in California.
    b. All laboratory analytical results, including QA/QC information, shall be submitted monthly, and records maintained for a five-year period.
    c. Effluent pH recordings from the previous 180 days
    d. Flow Meter Calibration and Maintenance Reports (Note: must be signed and stamped by a registered professional engineer in California).
        i. Flow meter locations
        ii. Flow meter descriptions
        iii. Flow meter system details
        iv. Calibration methods/results
        v. Corrective measures
        vi. Discharge log (with signature(s) from responsible party at time of release from CWT facility to the POTW system.)
        vii. Time, date, and volume of when the contents from the tank are discharged to the sewer
        viii. Signature from responsible operator
        ix. Other observations
    e. Chain of custody forms for monitoring samples with signatures.
    f. All other sampling reports.
10. **Compliance Paperwork**
    a. On-site Compliance Paperwork, as required by 40 CFR Part 437.47(a)(4)
    b. Periodic Certification of equivalent treatment statement in the Self-Monitoring Report 40 CFR Part 437.41(b)
    c. Facility shall continue to submit application information on a five-year cycle, with all applicable documentation and any information pertaining to changes planned for the future years. The information provided must include changes in the nature or volume of the discharge, or anticipated customers.

Appendix B

PRELIMINARY HYDROGEOLOGICAL STUDY REPORT, CITY OF OXNARD GREAT PROGRAM, CAMPUS PARK GROUNDWATER REPLENISHMENT AND REUSE PROJECT

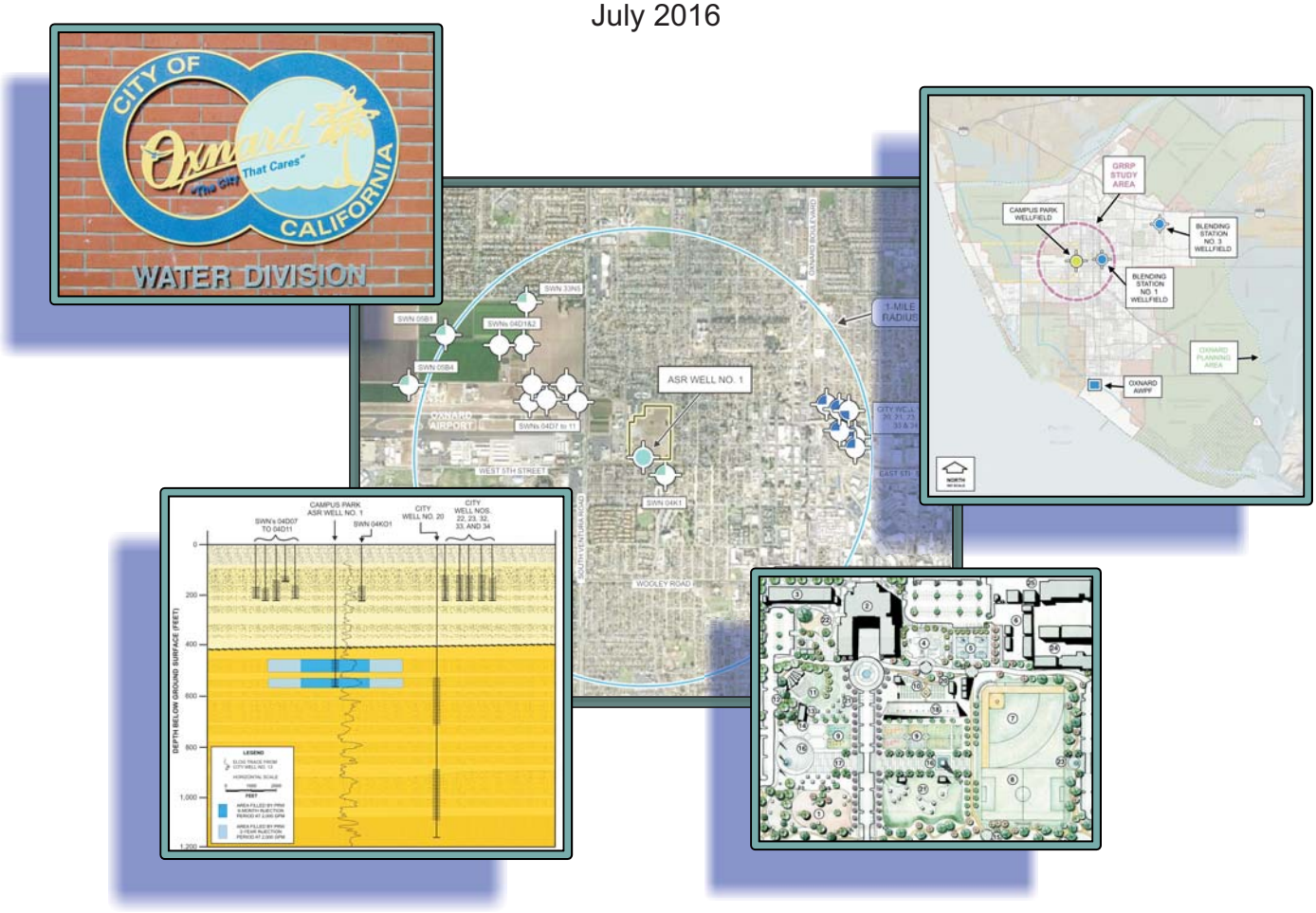
HOPKINS GROUNDWATER CONSULTANTS, INC.

PRELIMINARY HYDROGEOLOGICAL STUDY

CITY OF OXNARD GREAT PROGRAM CAMPUS PARK GROUNDWATER REPLENISHMENT AND REUSE PROJECT OXNARD, CALIFORNIA

Prepared for:
City of Oxnard

July 2016



HOPKINS
GROUNDWATER
CONSULTANTS, INC.
THE WATER RESOURCE SPECIALISTS

July 26, 2016
Project No. 01-011-09E

City of Oxnard
305 West Third Street, Second Floor, East Wing
Oxnard, California 93030

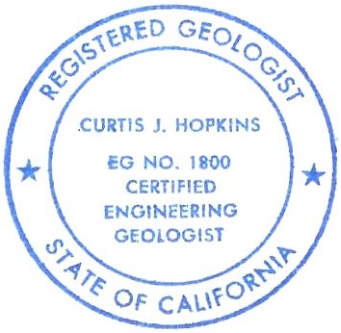
Attention: Mr. Daniel Rydberg
Public Works Director

Subject: Preliminary Hydrogeological Study, City of Oxnard Great Program, Campus Park Groundwater Replenishment Reuse Project, Oxnard, California.

Dear Mr. Rydberg:

Hopkins Groundwater Consultants, Inc. (Hopkins) is pleased to submit this final report summarizing the findings, conclusions, and recommendations developed from a preliminary study evaluating the feasibility of a Groundwater Replenishment Reuse Project (GRRP) that is proposed as part of the City of Oxnard Groundwater Recovery Enhancement and Treatment (GREAT) Program. The study findings indicate that the Campus Park GRRP site proposed for Indirect Potable Reuse is a feasible location and that the replenishment and recovery of groundwater with an improved quality could be achieved by the project for Indirect Potable Reuse. The study provides detailed hydrogeological findings in compliance with Groundwater Replenishment Using Recycled Water regulations designated DPH-14-003E, dated June 18, 2014, to augment the Indirect Potable Reuse engineering report required for the project, and to facilitate discussion with State regulatory agencies, local groundwater management agencies, and stakeholder groups that may have a direct interest in the project.

As always, Hopkins is pleased to be of service. If you have questions or need additional information, please give us a call.



Sincerely,

HOPKINS GROUNDWATER CONSULTANTS, INC.

Curtis J. Hopkins
Principal Hydrogeologist
Professional Geologist PG 5695
Certified Hydrogeologist HG 114
Certified Engineering Geologist EG 1800

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APPENDIX A – GROUNDWATER ELEVATION CONTOUR MAPS

ACRONYM LIST

AFY – Acre-Feet Per Year

ASR – Aquifer Storage and Recovery

AWPF – Advanced Water Purification Facility

BGS – Below Ground Surface

BS-1 – Blending Station No. 1

BS-3 – Blending Station No. 3

CDPH – California Department of Public Health

CRWQCB – California Regional Water Quality Control Board

DDW – California Department of Drinking Water

FCGMA – Fox Canyon Groundwater Management Agency

GPM – Gallons Per Minute

GREAT – Groundwater Recovery Enhancement and Treatment

GRRP – Groundwater Replenishment Reuse Project

GRURW – Groundwater Replenishment Using Recycled Water

IPR – Indirect Potable Reuse

LAS – Lower Aquifer System

MSL – Mean Sea Level

MG/L – Milligrams Per Liter

PRW – Purified Recycled Water

PSI – Pounds Per Square Inch

TDS – Total Dissolved Solids

UAS – Upper Aquifer System

UWCD – United Water Conservation District

VCWPD – Ventura County Watershed Protection District

CITY OF OXNARD GREAT PROGRAM
CAMPUS PARK GROUNDWATER
REPLENISHMENT AND REUSE PROJECT

INTRODUCTION

GENERAL STATEMENT

Presented in this report are the findings, conclusions, and recommendations developed from a preliminary hydrogeological study conducted by Hopkins Groundwater Consultants, Inc. (Hopkins) to assist the City of Oxnard (City) in evaluating the feasibility of a Groundwater Replenishment Reuse Project (GRRP) using purified recycled water (PRW). This hydrogeological study was conducted to support the City's Groundwater Recovery Enhancement and Treatment (GREAT) Program by developing an aquifer storage and recovery (ASR) project that will provide Indirect Potable Reuse (IPR) of the PRW produced at the City's Advanced Water Purification Facility (AWPF).

The proposed City GRRP includes developing a sustainable program for groundwater replenishment and IPR of PRW using aquifer units located in the Oxnard Plain Groundwater Basin. The proposed GRRP is intended to augment the City's potable water system by; 1) improving the delivered water quality, 2) increasing the available supply, and 3) providing greater reliability through source redundancy. The GRRP study area is indicated on Figure 1 – Study Area Location Map.

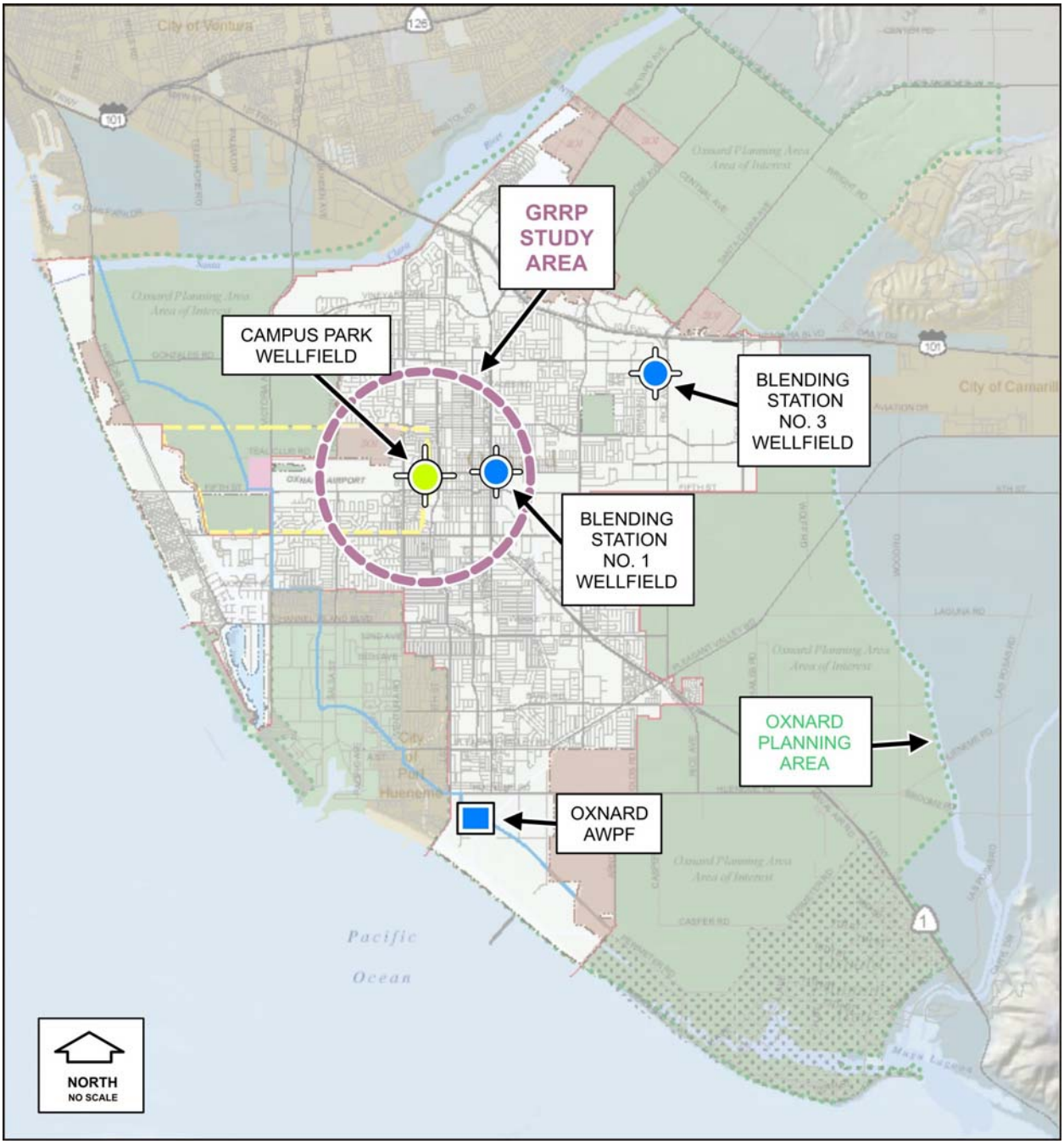
BACKGROUND

The present City water supply is a combination of sources including; a) imported water from the State Water Project, b) groundwater produced by the United Water Conservation District (UWCD), and c) groundwater produced by the City wellfields at Blending Station Nos. 1 and 3 (BS-1 and BS-3). Historically, the City has improved the quality of its municipal supply by blending the higher quality imported water with its local groundwater supplies. The recent construction of the brackish groundwater desalter facilities located at BS-1 has provided the City with the means to further improve its water quality through the desalination of poor quality groundwater. During the desalination process, approximately 20 percent of the produced groundwater feeding the desalter is lost as brine reject that is discharged to the sewer ocean outfall.

The present operation of the City's groundwater desalter has allowed the City to shift groundwater production from the higher quality aquifer zones in the Lower Aquifer System (LAS) to the poorer quality aquifer zones in the Upper Aquifer System (UAS). This shift of

pumping was designed to comply with the most recent groundwater management strategies of the Fox Canyon Groundwater Management Agency (FCGMA).

Figure 1 – Study Area Location Map



The GREAT Program was originally developed at a time when recycled water regulations treated all recycled water in the same manner. State regulations required onerous project development studies, monitoring and reporting programs, and dilution requirements utilizing another potable supply. Soil and aquifer treatment criteria could require extended retention times and travel distances through an aquifer to provide additional treatment prior to beneficial potable reuse. With these regulations, the City believed the best approach was to inject the PRW into the local aquifer system at a location that optimized basin management strategies, and extract a like amount of native groundwater from another area of the basin for municipal use. Consistent with this approach, the City proposed the direct use of the PRW for permissible agricultural purposes. Subsequently, a transfer of the unused groundwater would be provided to the City for municipal uses. Both of these strategies would provide the City with a source of potable groundwater in exchange for its recycled water.

This original approach required that the City purify a greater portion of the groundwater with a desalter and resulted in additional treatment costs and a loss of approximately 20 percent of the produced groundwater supply. The present approach for IPR would eliminate the additional step of desalting groundwater by allowing the indirect reuse of the high quality PRW. This will conserve energy and prevent wasting 20 percent of the supply as part of the redundant treatment process. The stored and recovered PRW by the GRRP can be blended with lower quality groundwater to achieve the City's water quality objectives.

Since construction of the GREAT Program AWPF, Federal and State recycled water regulations have been updated to the present Groundwater Replenishment Using Recycled Water (GRURW) regulations designated DPH-14-003E, dated June 18, 2014. These regulations accommodate the use of highly treated effluent produced by the PRW process by reducing or eliminating the requirement for soil/aquifer treatment. The State has recognized that the threat to public health is significantly lower after municipal wastewater receives advanced purification and disinfection using reverse osmosis, advanced oxidation, and ultraviolet radiation treatment processes. Because of the PRW extreme high quality, the new GRURW regulations significantly reduce the requirements for IPR compared to wastewater treated to secondary or tertiary standards.

PURPOSE

The purpose of this hydrogeological assessment of the proposed GRRP is to provide specific information to comply with the GRURW regulations pursuant to section 60320.200(h) and permit the preliminary investigation to develop site specific information that is required for the GRRP Title 22 engineering report. The findings of this study are also intended to further define the conceptual components of the ASR program that will be necessary to implement the IPR of PRW as a municipal supply in accordance with regulation provisions.

As part of the GRRP, the City proposes a project that:

1) utilizes (to the extent practicable) existing pipelines and facilities to control potential costs,

2) recharges aquifer zones that preserve the water quality during underground storage,

3) minimizes the risk to other potable well facilities,

4) is consistent with the FCGMA and UWCD groundwater management strategies,

5) has operational flexibility to adapt to changing system demands and aquifer conditions,

6) demonstrates the ASR capacity of the Oxnard Plain LAS,

7) can be increased to facilitate future AWPF expansion, and

8) can simplify monitoring and reporting to UWCD, the FCGMA, the California State Water Resources Control Board Division of Drinking Water (DDW), and the California Regional Water Quality Control Board (CRWQCB).

This hydrogeological study utilizes the City GREAT Program Update, dated June 25, 2012, as the guide for the anticipated capacity of the AWPF and the initial availability of PRW. This study is intended to provide the mandatory hydrogeological assessment to accompany the engineering report required pursuant to section 60323 of the Title 22, California Code of Regulations, GRURW regulations for a new GRRP.

Additionally, this hydrogeological assessment is intended to provide operational criteria based on aquifer parameters estimated from historical well data, which will define the range of ASR capacity that can be reasonably anticipated from the underlying aquifer system. Subsequently, a conceptual GRRP operational schedule can be developed for the ASR operations to comply with the response retention time requirements of the GRURW regulations for IPR that is based on reasonable expectations of the natural aquifer system constraints.

Sources of available data and published information that were used for the study include; a) City data and reports, b) UWCD data and reports, c) United States Geological Survey, and d) Ventura County Watershed Protection District (VCWPD) databases.

HYDROGEOLOGICAL CONDITIONS

The City recognizes that the threat of seawater intrusion is a regional issue. The City has historically complied with FCGMA regulations and participated in UWCD groundwater supply

management programs. Implementation of the GREAT Program is intended to continue this cooperative management effort and the beneficial use of the local groundwater resources in the vicinity of the City. The proposed GRRP using PRW includes ASR wells constructed in aquifer zones that comprise the LAS. Recharge into the LAS will store water in aquifer zones that receive significantly less groundwater recharge than the UAS because of the regional confined aquifer conditions. The UAS readily receives groundwater recharge derived from natural percolation of rainwater and Santa Clara River flows in the Oxnard Forebay Basin, as well as from river flow diversions into the engineered recharge facilities operated by UWCD.

The GRRP ASR Well will be designed to inject PRW into discrete aquifer zones in the LAS and subsequently facilitate groundwater extraction after the response retention time is achieved and regulatory approval is granted. The proposed ASR Well No. 1 is anticipated to be constructed with a completion depth of about 580 feet below ground surface (bgs) and with a screened interval limited to a discrete aquifer zone(s) in the LAS. The well will be designed for an injection capacity of up to 2,000 gallons per minute (gpm). Plate 1 – Preliminary ASR Well No. 1 Design Drawing provides preliminary design details that reflect the anticipated hydrogeology and comply with the VCWPD sealing zone requirements.

Water to be injected during initial testing is proposed to be 100 percent PRW. Initially, the water may be conveyed to the ASR well from the City recycled water system using temporary piping. The initial phase of aquifer testing will determine the percentage of recovery that occurs prior to evidence of native groundwater mixing with the PRW along with any change in the PRW chemistry that could occur as it travels through the aquifer matrix. During the test period, PRW that is extracted from the ASR well will be discharged back into the recycled water transmission main and subsequently used for irrigation.

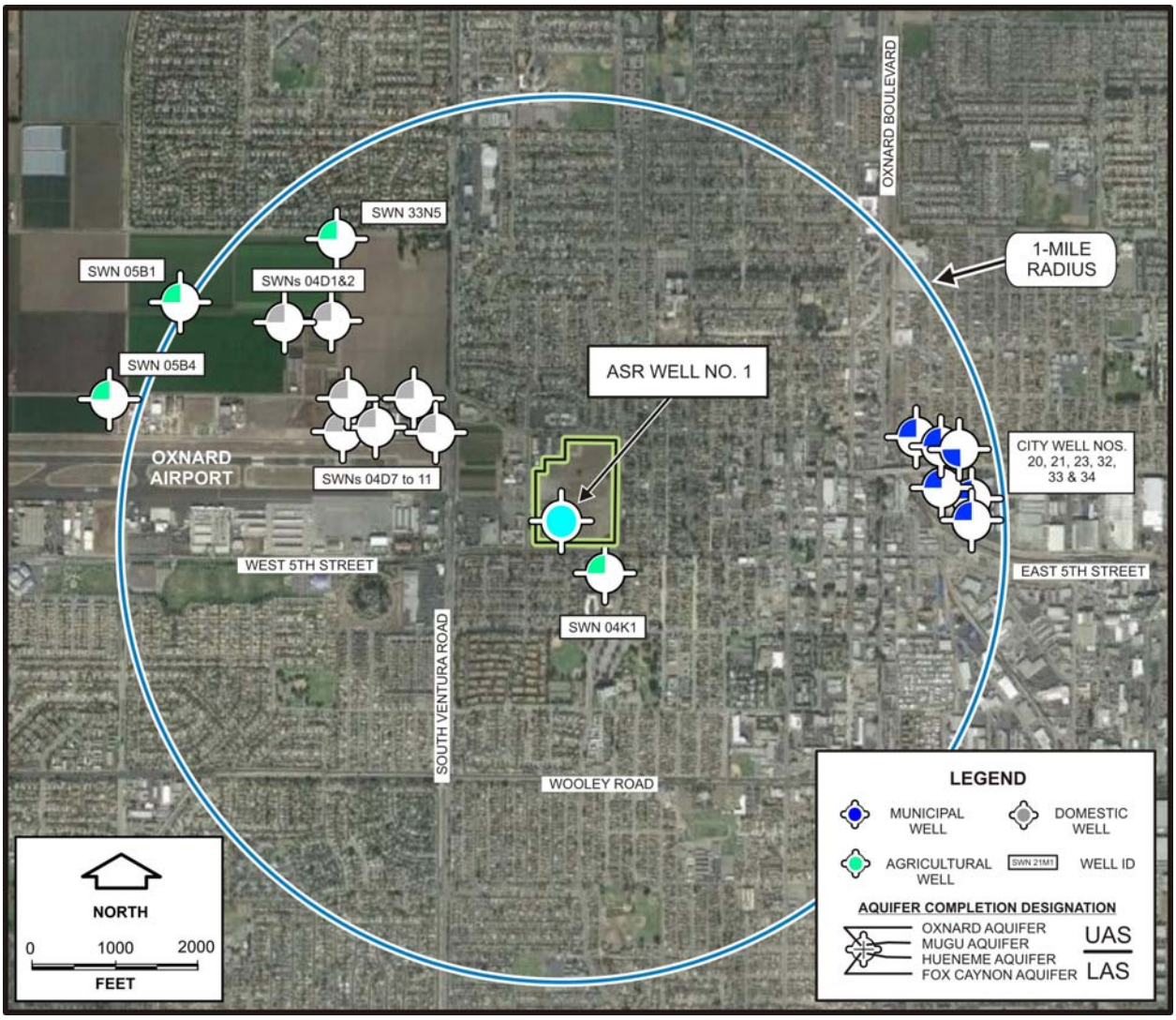
The ASR demonstration program, as developed, will comply with GRURW regulations and last for an anticipated period of between 2 and 4 months. During the initial demonstration period, monitoring well data and water quality samples will be collected and analyzed to verify the preliminary estimations of aquifer parameters, groundwater storage volumes, and groundwater travel times effectuated by PRW recharge. These data will be utilized to finalize the permit application required for full-scale project operation using the PRW generated by the AWPF.

The proposed GRRP would ultimately be sized to accommodate the first phase of the AWPF, providing the ability to store and reuse up to 1,500 acre-feet per year (AFY). The GRRP location identified for groundwater recharge wells is indicated in Figure 2 – Proposed GRRP ASR Well Site Location Map. This location serves to isolate City groundwater facilities within the City boundaries where it has control of surrounding land uses and future groundwater development.

Figure 2 – Proposed GRRP ASR Well Site Location Map

The property selected for installation and operation of the GRRP ASR Well is owned by the City and had an existing City well proximately located and constructed in the LAS (City Well No. 13). While the old City well has since been destroyed, several smaller wells are presently active in the unincorporated area north of the Oxnard Airport along the western City limit. Figure 3 – Existing Well Location Map shows all the active wells within a 1-mile-radius of the GRRP ASR well location.

Figure 3 – Existing Well Location Map



As shown, many proximate wells are constructed in the UAS and as such will not be hydraulically connected with the LAS aquifer zones proposed for use by the GRRP. Review of available data indicates that the nearest well constructed in the LAS is almost 1 mile away and is

a municipal supply well owned by the City. The closest existing LAS well is City Well No. 20 located at BS-1. As such, the City ASR well location appears to provide more than a sufficient distance from existing LAS wells to allow GRRP operations without interference.

HYDROGEOLOGY AND AQUIFER DELINEATION

Geology

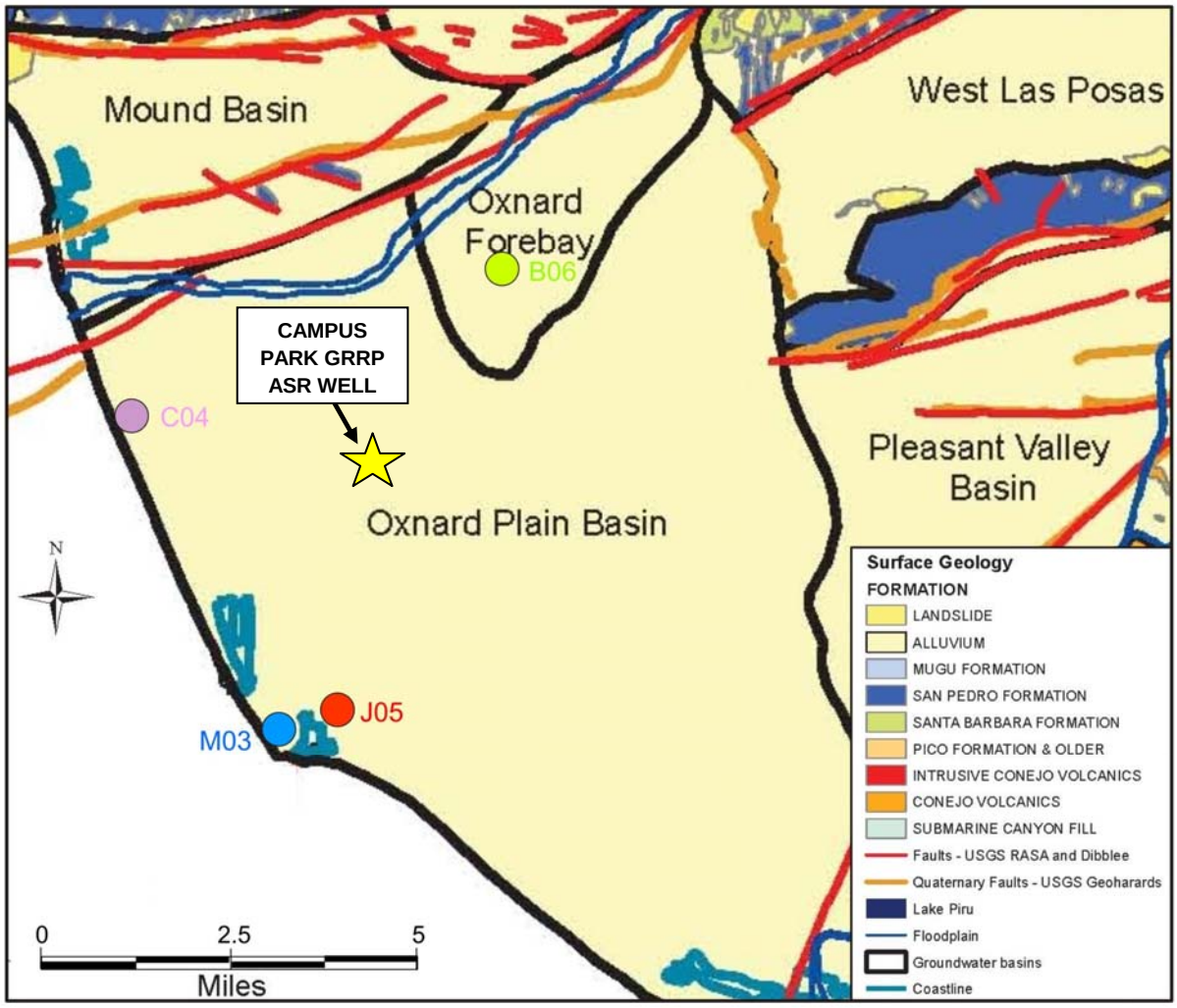
The proposed City project is located in the Oxnard Plain Groundwater Basin, which is part of the Transverse Ranges geologic/geomorphic province and defined by a number of geologic structures and features that separate it from the adjacent groundwater basins. The geology of the Oxnard Plain Basin has been described in detail by several authors including the California State Water Resources Board (SWRB, 1953), Turner (1975), and UWCD (2012). Figure 4 – Generalized Geologic Map and Oxnard Plain Basin Boundaries shows the project location in relation to the adjacent boundaries of the Oxnard Plain Basin with the Mound, Oxnard Forebay, West Las Posas, and Pleasant Valley Basins.

Plate 2 – Hydrogeological Cross-Section Location Map shows the location of cross-sections constructed from available well data to illustrate the subsurface profiles of the geological formations that comprise the underlying aquifer systems. Plate 2 also shows the location of wells that provided geophysical data near the Campus Park GRRP site. Plates 3 and 4 – Hydrogeological Cross-Section A-A' and B-B', respectively, provide an interpretation of the hydrostratigraphy in the study area. This conceptual understanding of the confined Oxnard Plain Basin aquifer system is key to the understanding of how the GRRP potential impacts are limited by natural conditions. It also illustrates how the GRRP was developed to utilize discrete aquifer zones that will allow rotation of the three phases of project operations; 1) injection/recharge of the PRW produced from the AWPF, 2) storage/response retention time, and 3) recovery and reuse/IPR.

Aquifer Zone Designation

The subsurface geology that controls groundwater flow in the study area is differentiated into two primary geologic units that include; the Holocene and late Pleistocene alluvium, and the San Pedro Formation. The first unit is comprised largely of unconsolidated sedimentary deposits and includes all older and Recent alluvial deposits. These shallower units are coarse-grained sand and gravel layers that form the Oxnard and Mugu Aquifers and comprise the UAS in the Oxnard Plain Basin (see Plates 3 and 4). The San Pedro Formation consists of consolidated marine and nonmarine clay, silt, sand, and gravel deposits that comprise the Hueneme and Fox Canyon Aquifers that are designated as the LAS. The low permeability geologic formations underlying the San Pedro Formation are generally considered to be non-water-bearing and effectively define the base of fresh water.

Figure 4 – Generalized Geologic Map and Oxnard Plain Basin Boundaries

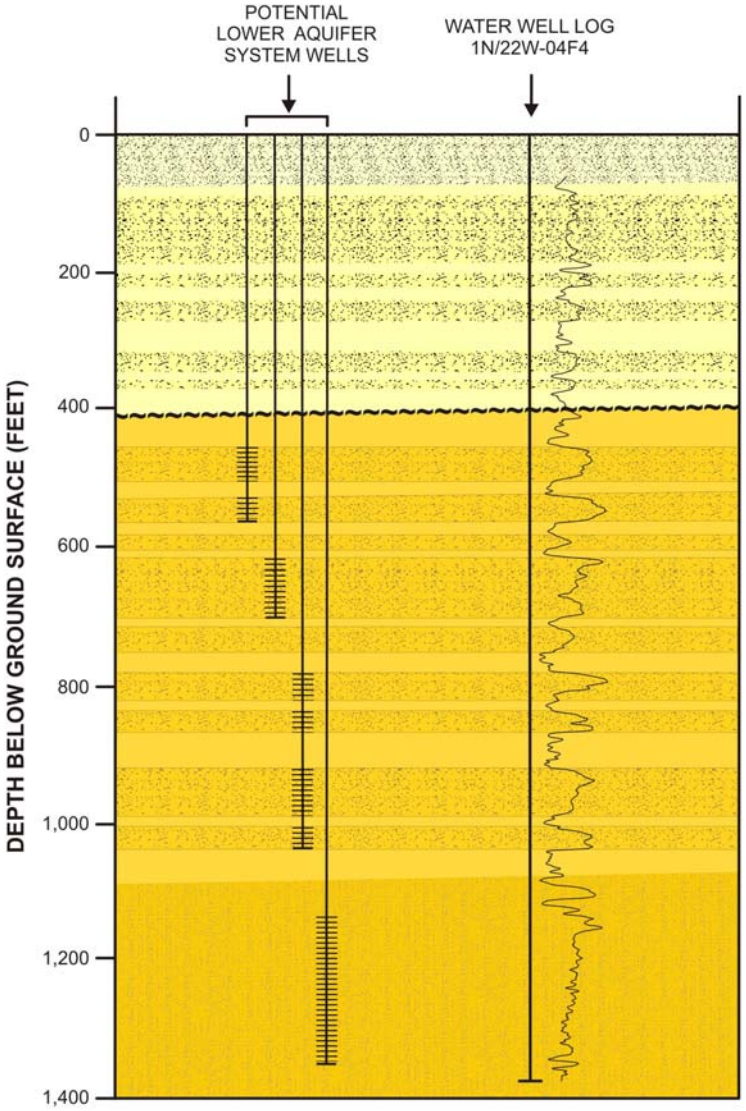


FROM UWCD, 2012

The groundwater in the Oxnard Plain Basin LAS is isolated from overlying land uses by the laterally extensive aquitard (silt and clay) layers that separate and confine the Hueneme and Fox Canyon Aquifer zones. The conceptual subsurface profile shown in Figure 5 – Discrete Aquifer Zone Delineation uses the geophysical survey (electric log) from the proximate City Well No. 13 to show the anticipated geology and aquifer zones beneath the Campus Park GRRP site. The aquifer zones shown in Figure 5 are discretely separated by clay layers that are laterally continuous and appear as marker beds in other well logs shown in Plates 3 and 4. The significance of the highly confined condition that results from the discretely layered aquifer system is that wells located in close proximity (50 feet apart) but producing from different aquifer layers, do not have hydraulic connectivity with each other.

Figure 5 shows a series of proposed wells that could be designed to utilize the storage capacity of discrete aquifer units while being effectively isolated from each other by the natural confining clay layers. This concept can allow the design and use of discrete aquifer zones as individual storage units, as demonstrated by Well Nos. 28, 29, 30, and 31 located at City BS-3. One aquifer zone can be filled without affecting wells that are competently constructed in other aquifer zones. The benefit of this natural condition to the GRRP is that multiple wells can be operated on the same site with a rotating schedule which allows discrete recharge, storage (response retention time), and recovery from separate aquifer zones.

Figure 5 – Discrete Aquifer Zone Delineation

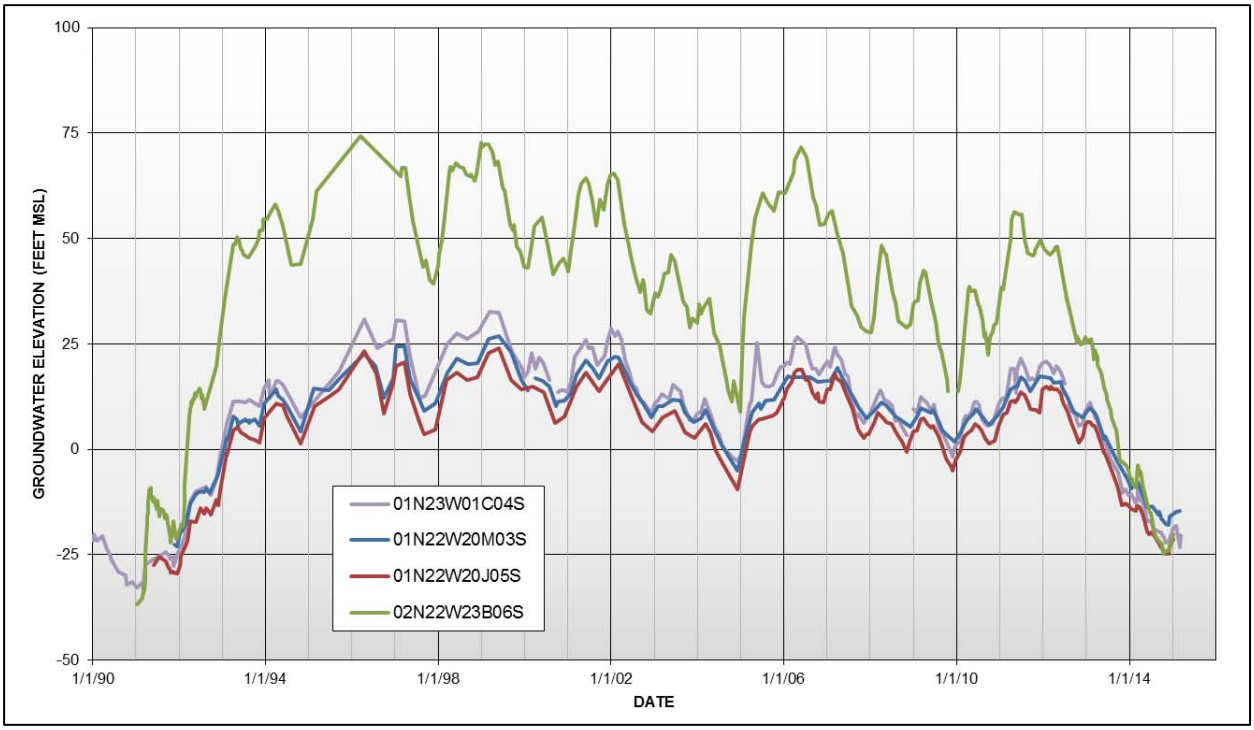


The proposed GRRP utilizes this natural confined aquifer condition to develop an operational scenario that is unique in its application. It can satisfy the GRURW regulations that require a minimum 2-month retention response time, while optimizing the proposed ASR well facilities at a single site. It can operate independent of groundwater flow direction and serve to minimizing the potential risk and consequence of PRW treatment violations (to be explained in following sections).

Groundwater Levels

Groundwater elevations in the Oxnard Plain Basin vary over time. Figure 6 – Groundwater Elevation Hydrograph shows the fluctuation of water levels in the upper Hueneme Aquifer zones in LAS. These data are from discretely screened monitoring wells in aquifer zones that correlate to the aquifer zones proposed for use by ASR Well No. 1. The location of the wells is shown on Figure 4 using the same color for the well symbols as is used for the water levels in the Figure 6 graph. Three of the wells are coastal monitoring wells, and one is located in the Oxnard Forebay where the upper Hueneme Aquifer zones lie unconformably beneath the overlying alluvium of the UAS. The Oxnard Forebay Basin is the primary source of recharge to the LAS.

Figure 6 – Groundwater Elevation Hydrograph



The groundwater elevation in the LAS proximate to the GRRP study area has dropped to approximately 25 feet below mean sea level (msl) during the 1986 to 1990 drought and has risen as high as 20 to 25 feet above msl in wet years. These available data indicate that seasonal fluctuations in the Oxnard Plain Basin groundwater levels are typically around 5 to 10 feet. Dry climatic conditions result in consecutive annual declines in the coastal water levels of up to 45 feet (see Figure 6). These same dry climatic conditions result in water level declines in the Oxnard Forebay Basin on the order of 100 feet. These groundwater level conditions indicate that ASR well operation may require the ability to operate/inject under pressure during high water level conditions while gravity-flow injection operations may be sustained during dry climatic periods.

Combining these water level conditions with the depth to the top of the proposed aquifer units, an injection pressure of 20 pounds per square inch (psi) should be allowable without adverse consequences. The deeper the aquifer zone(s), the greater the operational pressure that is allowable for recharge without creating the potential for adverse effects.

Groundwater Gradient and Flow Velocity

Utilizing data provided by the UWCD, the groundwater elevations in the vicinity of the GRRP were contoured quarterly for 2011 and 2013. These years are believed representative of normal to wet groundwater conditions (2011) and dry year groundwater conditions (2013). Water level data from August 2014 were also contoured and represent groundwater flow conditions after multiple dry years. A series of quarterly groundwater elevation contour maps for the years selected are provided in Appendix A – Groundwater Elevation Contour Maps. Table 1 – Groundwater Gradient and Flow Direction summarizes the results of groundwater gradient estimations using the maps in Appendix A.

For the purpose of the Campus Park GRRP study, the use of the groundwater gradients provided by these data are believed sufficient for understanding the seasonal and climatic changes that occur to the groundwater gradient and the approximate prevailing flow directions in the upper Hueneme Aquifer zones of the LAS.

Table 1 – Groundwater Gradient and Flow Direction

OBSERVATION PERIOD	ASR WELL NO. 1	
	FLOW DIRECTION	GRADIENT
JANUARY 2011	S 43º W	0.0008
APRIL 2011	S 41º W	0.0011
JULY 2011	S 44º W	0.0011
OCTOBER 2011	S 43º W	0.0009
JANUARY 2013	S 44º W	0.0004
APRIL 2013	S 47º W	0.0004
JULY 2013	S 67º W	0.0003
OCTOBER 2013	N 74º W	0.0002
AUGUST 2014	N 04º E	0.0002

TABLE DATA DISPLAYED GRAPHICALLY ON PLATES IN APPENDIX A

As shown, during normal and wet years, recharge in the Oxnard Forebay Basin is significant and establishes a predominant southwesterly groundwater flow direction in the Oxnard Plain Basin (see Appendix A). During the Spring of 2011, the upper Hueneme Aquifer groundwater gradient was generally 0.0011 (dimensionless) and the flow direction was S 41º W as shown on Figure 7 - LAS Groundwater Elevation Contour Map April 2011. The fall gradient in October 2011 was observed to flatten out to a value of 0.0009 (see Table 1).

During dry years like 2013, the groundwater flow direction was observed to be roughly the same as 2011 but the gradient continued to flatten out and the groundwater elevations were closer to sea level. This prevailing flow pattern continues until inland pumping causes water levels to fall below sea level. The lack of recharge during repeated dry years can result in inland groundwater elevations that are substantially below sea level. Figure 8 – LAS Groundwater Elevation Contour Map August 2014 shows the groundwater elevations and flow direction that developed under a 3-year-drought condition.

Figure 7 – LAS Groundwater Elevation
Contour Map April 2011

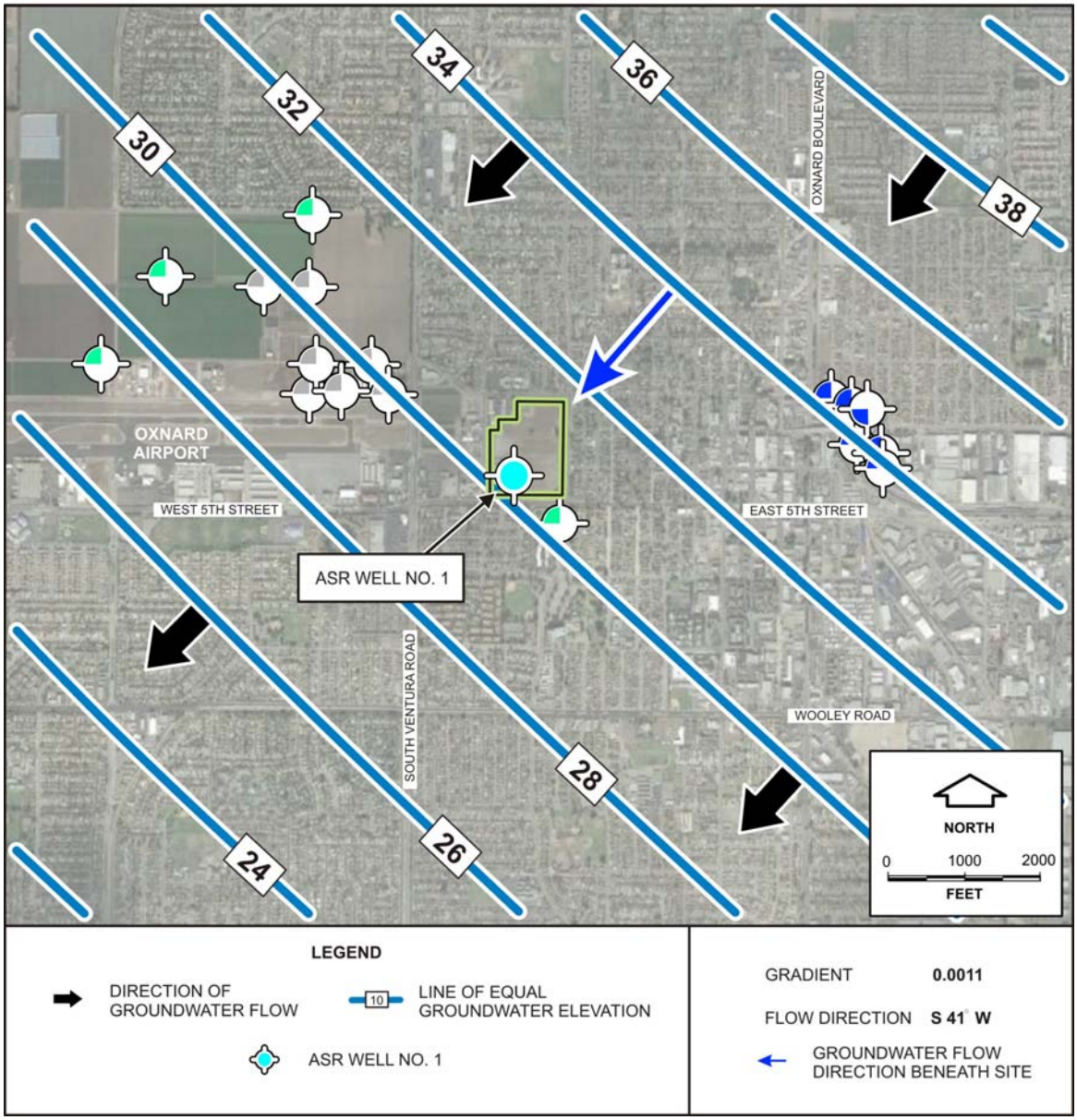
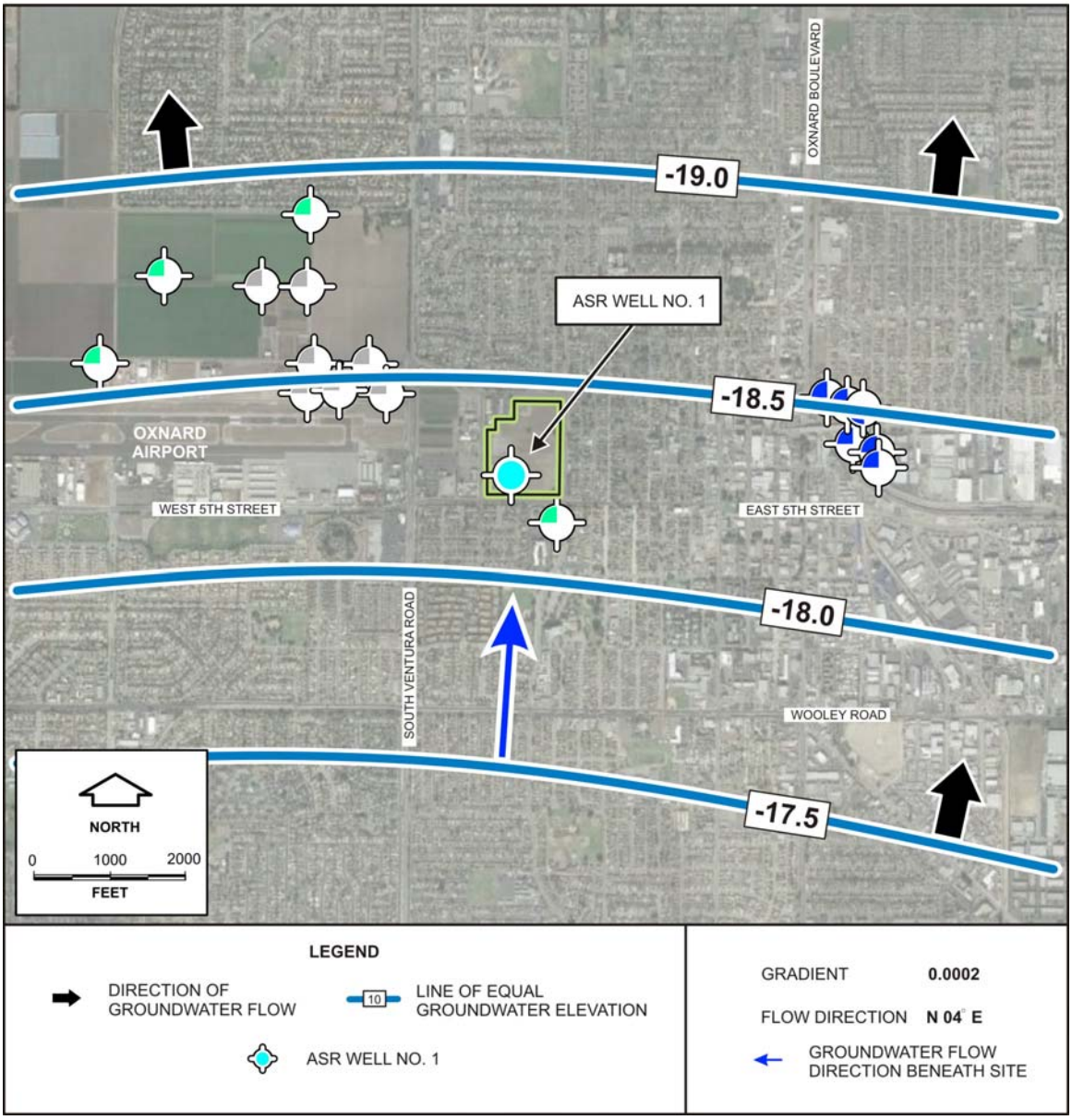


**Figure 8 – LAS Groundwater Elevation
Contour Map August 2014**



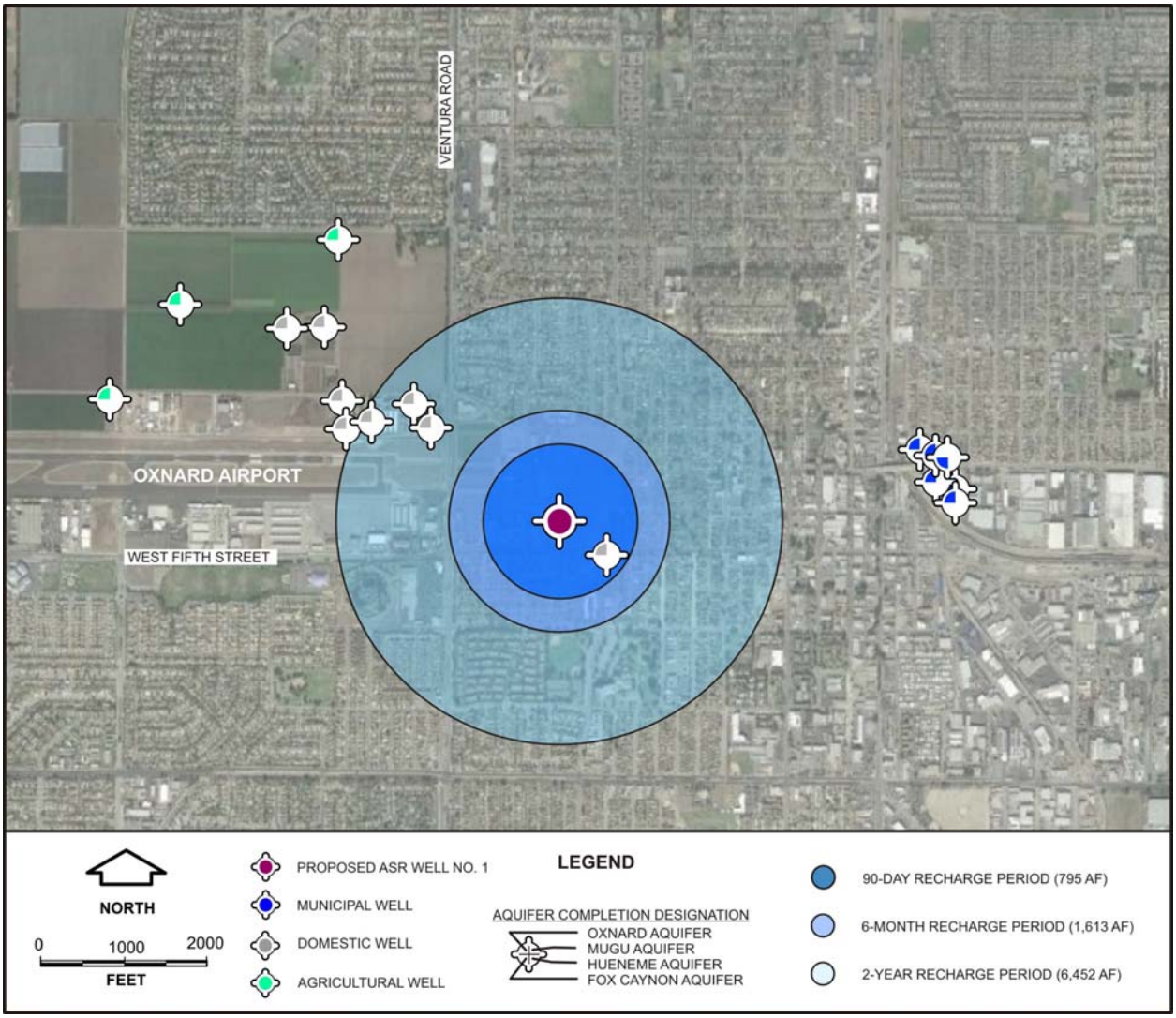
Aquifer Recharge and Retention

The area potentially influenced by recycled water recharge in the vicinity of the ASR well is determined by the aquifer area filled with the PRW during injection and the rate and direction of groundwater flow while it is in storage. The aquifer area filled by PRW replenishment was estimated by using;

- a discrete aquifer thickness of 85 feet,
- radial flow in the aquifer away from the center of recharge, and
- an average aquifer porosity of 15 percent (to be conservative).

The resulting aquifer area filled after injection of PRW at a rate of 2,000 gpm for a period of; 90 days (795 AF), 6 months (1,613 AF) and a period of 2 years (6,452 AF) is shown in Figure 9 – Aquifer Area Filled With Purified Recycled Water.

Figure 9 – Aquifer Area Filled With Purified Recycled Water



The aquifer area filled by these injection volumes would be proportionally less than those shown in Figure 9 as the porosity of the aquifer increases. Table 2 – Radial Distance Calculations shows the magnitude of change in the size of the recharge bubble within a range of typical aquifer porosity values.

Table 2 – Radial Distance Calculations

POROSITY	30-DAY RADIAL DISTANCE (FEET)	60-DAY RADIAL DISTANCE (FEET)	90-DAY RADIAL DISTANCE (FEET)	6-MONTH RADIAL DISTANCE (FEET)	2-YEAR RADIAL DISTANCE (FEET)
15 %	537	759	930	1,324	2,649
20%	465	658	806	1,147	2,294
25%	416	588	720	1,026	2,052
30%	380	537	658	937	1,873

AQUIFER THICKNESS IS 85 FEET AND THE INJECTION RATE IS 2,000 GPM

While the proposed City ASR operation will recharge the aquifer for a period of up to 3-months, a 6-month and 2-year-period of recharge were provided for comparison of potential project impacts. The estimated aquifer area filled with PRW in Figure 9 is believed conservative because a larger porosity value is highly likely. As shown, the nearest drinking water supply well (municipal well) constructed in the LAS is the City's and is beyond the 2-year aquifer replenishment area.

To approximate the area potentially influenced by PRW as it flows away from the point of recharge under the local groundwater gradient, the linear groundwater flow velocity was estimated by using;

- an average hydraulic conductivity value estimated from City Well No. 13 production test data (125 feet/day),
- the groundwater gradient at representative points in time (see Table 1),
- an average aquifer porosity of 15 percent (to be conservative), and
- the average linear flow velocity equation:

$$V = K\ I/\eta$$

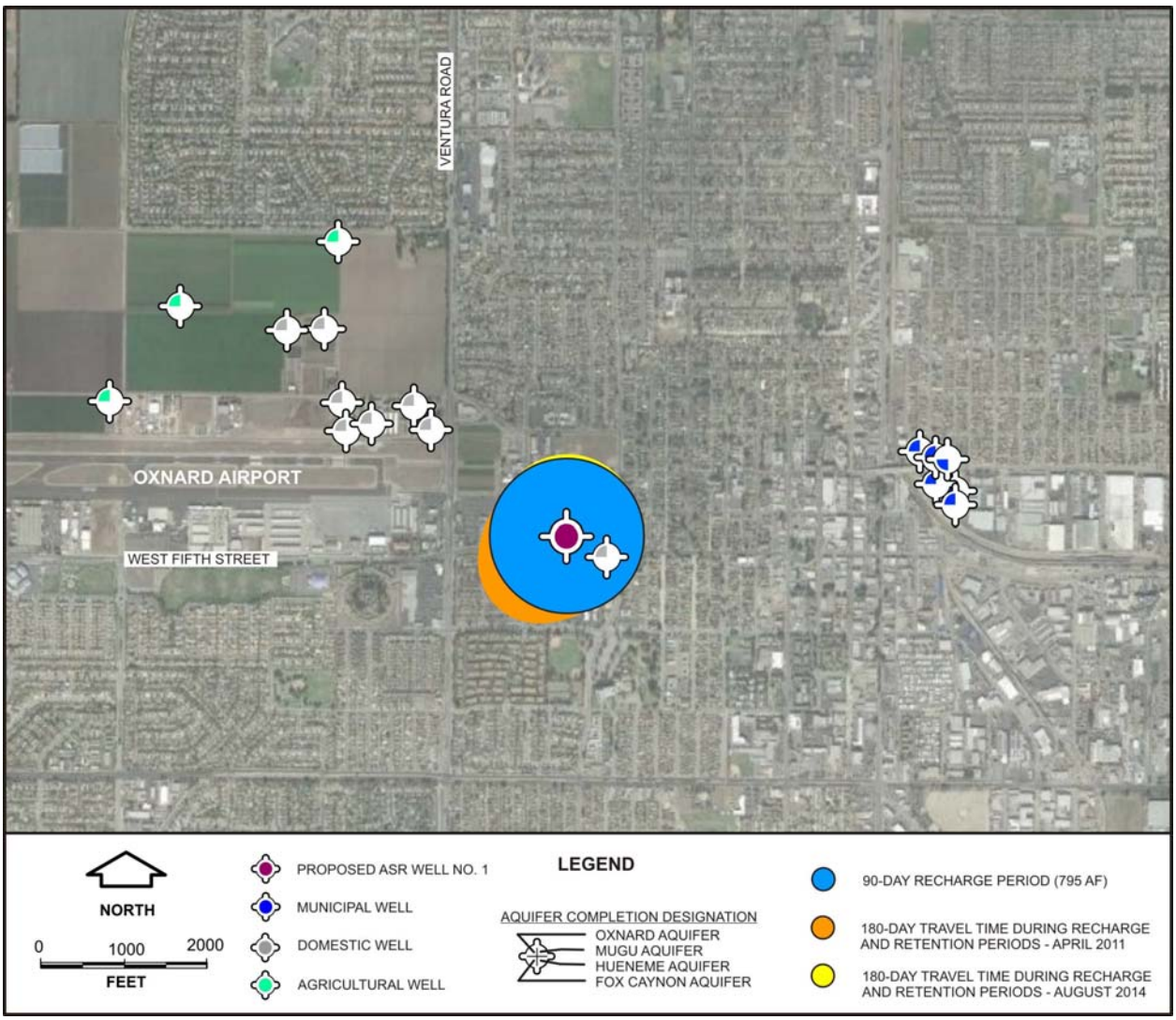
V	=	GROUNDWATER FLOW VELOCITY
K	=	AQUIFER HYDRAULIC CONDUCTIVITY
I	=	GROUNDWATER GRADIENT
η	=	AQUIFER POROSITY

The hydraulic conductivity of the upper Hueneme Aquifer zones was estimated from well production test data provided from City Well No. 13 combined with our experience and knowledge of wells in the Oxnard Plain Basin. The hydraulic conductivity of the aquifer zones that are proposed for ASR Well No. 1 was estimated to be 125 feet per day (ft/d). Using this hydraulic conductivity value and the range of groundwater gradients that are shown in Table 1, results in groundwater flow velocity estimates that range between 0.17 ft/d and 0.92 ft/d. Applying these two linear groundwater flow velocities over a 6-month period that includes the 3-month recharge period and the 3-month retention time, results in groundwater movement of a total distance between 30 feet and 165 feet.

The relative movement of the PRW from the ASR well during these 2 extreme conditions (April 2011 and August 2014) is shown in Figure 10 – Range of Purified Recycled Water Movement From ASR Well Location. These extremes are believed to bracket the actual anticipated movement of the recharge bubble in these aquifer zones. Because the quarterly groundwater measurements indicate a gradient of less than approximately 0.0011 exists a majority of the time (see Table 1), the transient groundwater gradient and flow direction will likely result in a cumulative movement that is between the two extremes indicated in Figure 10.

The result of this analysis indicates that the volume of water proposed for cyclical storage in the upper Hueneme Aquifer zone(s) of the LAS at the Campus Park GRRP well site will not have an adverse effect on any existing wells. Because of the assumptions stated above, these estimates are believed to be conservative and the area filled by PRW would likely be smaller. Based on the proposed cyclical recovery of the PRW for IPR, the distance of movement from the ASR well location could be significantly shorter. These factors indicate that the potential area of impact from the proposed GRRP presents little risk to existing well facilities.

Figure 10 – Range of Purified Recycled Water Movement From ASR Well Location



Water Quality

Review of historical water quality data indicate that groundwater in the LAS is generally a calcium sulfate chemical character of fair to poor quality with total dissolved solids (TDS) concentrations in the range of 900 to 1,300 milligrams per liter (mg/l) and sulfate concentrations that range from 400 to 650 mg/l. These historical data indicate that the storage of the proposed recycled water will improve the general mineral quality of groundwater in the LAS (a beneficial impact) and that injection water chemistry can likely be controlled (buffered) to be compatible with native groundwater and avoid degradation.

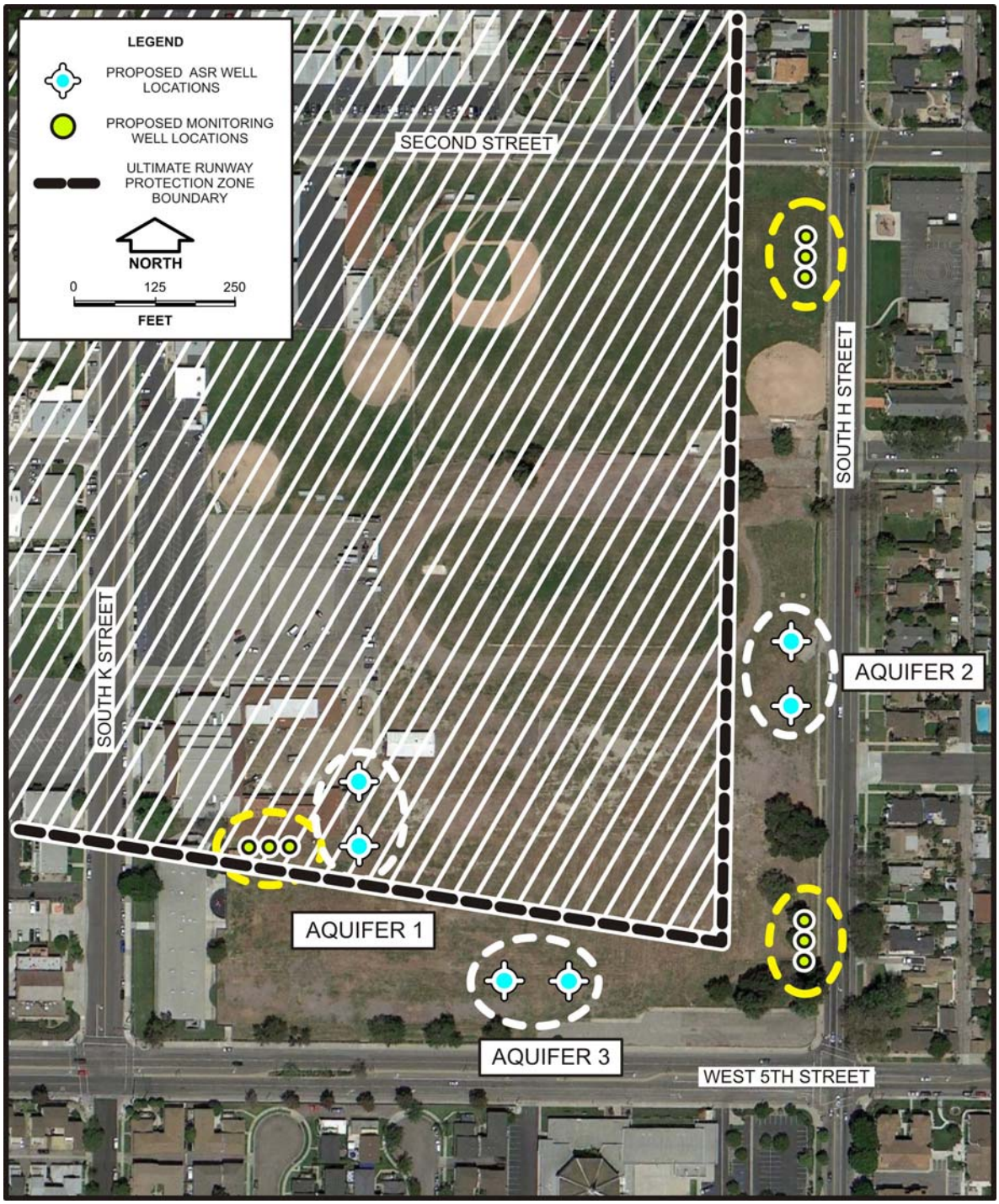
SITE LAYOUT AND FACILITIES DESIGN

To fully develop the Campus Park GRRP location, the City will utilize ASR well facilities that are constructed in discrete aquifer zones. These facilities will be used to conduct the demonstration testing required for final permitting of the IPR GRRP. The site specific groundwater data generated will further define the groundwater gradient, the aquifer materials, the site specific hydrogeology available for GRRP operations, local water quality, and ultimately the aquifer replenishment potential at the ASR well location. Initially, the proposed upper Hueneme Aquifer zone ASR well will be constructed along with 3 monitoring wells to develop information that establishes site specific data. Figure 11 – Proposed Campus Park ASR Wellfield Location Map shows the approximate location of the proposed ASR Wells and Monitoring Wells as they are positioned in the proposed City park development plan.

The proposed well locations were selected to construct facilities that will accomplish wellfield construction and data collection that complies with GRURW regulations and still be within the City property on the Campus Park site. As shown on Figure 11, the well locations are designed to be outside the ultimate runway protection zone boundary proposed by the County of Ventura Department of Airports for Federal Aviation Administration approval. This wellfield layout is designed to accommodate present and future conditions that may restrict the use of the Campus Park Property where drilling equipment of up to 60 feet high may be allowed to operate.

As shown, it is ultimately anticipated that a minimum of two wells will be required in each discrete aquifer zone(s) to achieve the full recharge and extraction capacities desired by the City. ASR Well No. 1 is located in the group labeled Aquifer 1 (see Figure 11). Aquifer 2 is the designated site for the wells that will utilize an aquifer(s) immediately below the Aquifer 1 wells. Accordingly, Aquifer 3 will utilize a deeper aquifer(s) to provide the final ASR capacity required for the recharge, retention, and recovery cycle to support continuous utilization of PRW produced from the AWPF. The initial demonstration ASR well location (see Figure 2) is within the Aquifer 1 area and the 3 monitoring wells are located within each of the monitoring well locations at variable distances from the ASR well.

Figure 11 – Proposed Campus Park ASR Wellfield Location Map



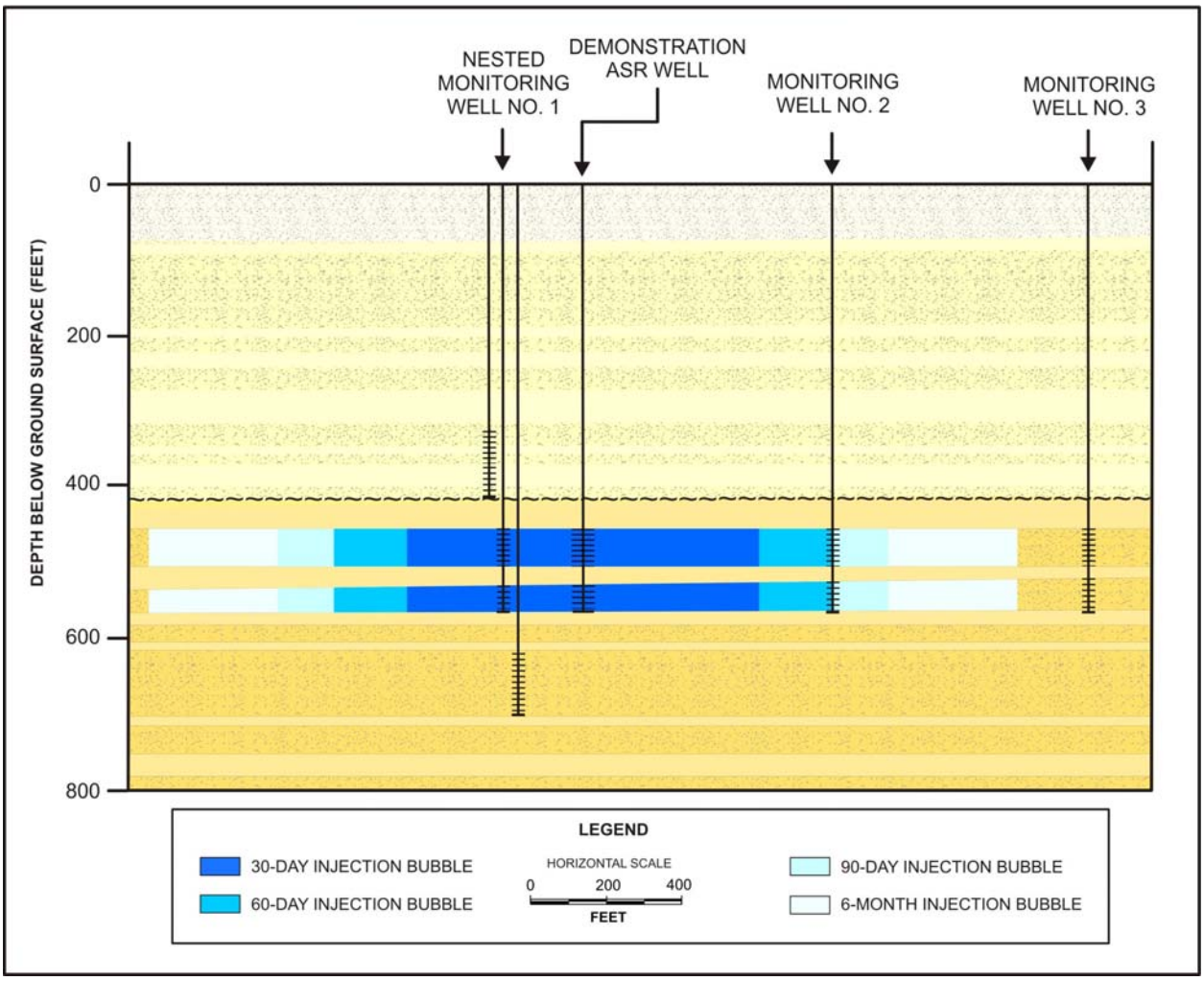
Well construction will be conducted by drilling and logging a pilot hole to select the aquifer(s) to be utilized by the ASR well(s). Based on these data, the final design of the demonstration ASR well and monitoring wells will be provided in the uppermost aquifer unit. The monitoring well locations selected are designed to test the aquifer properties and confirm groundwater travel time estimates at the Campus Park site in compliance with the GRURW regulations. Upon completion of well construction, groundwater tracer testing using an intrinsic tracer will be conducted to satisfy regulation provisions and obtain a CRWQCB permit for operation of the GRRP. Additional analyses to be conducted during the site investigation will include evaluating the geochemical compatibility of the PRW with the native groundwater and with the lithology of aquifer materials through direct sample analysis of the PRW during the recovery phase of the initial recharge cycle.

The locations of the monitoring wells are designed to; a) be far enough apart to collect water levels that will define the site specific groundwater gradient, b) be close enough to comply with GRURW regulation monitoring well requirements for GRRP permitting including a travel time of greater than 2 weeks and less than 6 months, and c) utilize the City owned parcel and minimize impacts to airport operations and future park development to be planned. The location of the demonstration ASR well is presently on the periphery of the future park property and positioned to allow the additional ASR wells to be constructed on the site.

Figure 12 – Subsurface Profile of PRW Travel Time Estimates shows the radial distances estimated that will be filled with PRW during replenishment in the discrete aquifer zones identified for storage using Campus Park ASR Well No. 1. These estimations were calculated using an aquifer porosity of 20 percent (which is believed a reasonable value for this purpose) and a test injection rate of 2,000 gpm. Variations in aquifer porosities will either decrease or increase the estimated travel time proportionally as shown in Table 2. As shown, the displacement volume from ASR Well No. 1 replenishment is anticipated to fill the aquifer at radial distances that will reach Monitoring Well No. 1 within approximately 2 weeks and Monitoring Well No. 2 in approximately 60 days. The estimated displacement volume from the proposed injection rate is not anticipated to reach Monitoring Well No. 3 for over 6 months and would likely be on the order of 9 months.

Based on the regional groundwater gradient, the travel time of PRW will be primarily dominated by the rate of injection and the displacement of native groundwater in the aquifer and not by the background flow of groundwater through Aquifer No. 1. Because the GRRP Wellfield is located within an area of the City where it has control over water well permitting, a prohibition of private wells constructed in the LAS can be implemented and prevent potential impacts to private well owners during the lifetime of the project. This condition effectively establishes the required isolation zone for future well construction.

Figure 12 – Subsurface Profile of PRW Travel Time Estimates



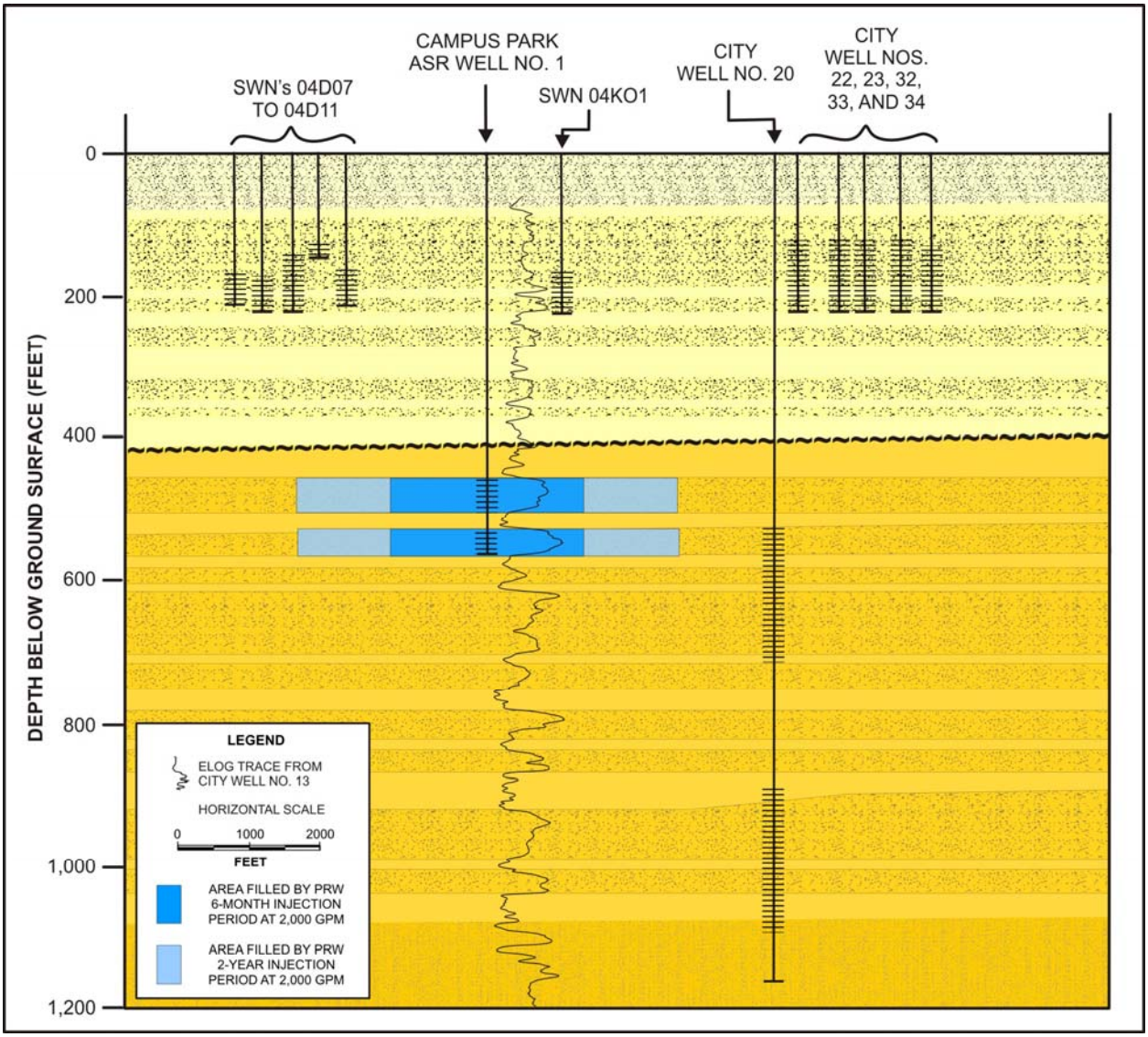
GRRP OPERATION AND VIOLATION MITIGATION

GRRP OPERATIONS

The conceptual design of the GRRP includes the cyclical recharge and storage of PRW in the discrete aquifer zones utilized by each ASR well. While it is anticipated that the majority of the recycled water produced by the AWPF during the first phase of production will be sold for in-City uses or for agricultural purposes, winter season demand will likely require injection and storage of the PRW to prevent plant shutdown or discharge to the ocean. The proposed use of

the well is cyclical in nature, however, the actual amount that will be required for storage under full plant capacity is unknown and operational flexibility is always desirable. This study evaluated the merit of a 6-month and 2-year recharge/storage cycle (see Figure 9). The results indicated that these volumes can be accommodated if required, without adverse impacts to proximal well facilities. Figure 13 – Profile of Existing Wells shows the closest wells to the Campus Park site along with their approximate distance and completed depth. As indicated, City Well No. 20 is the only well within a mile of the site that is constructed in the LAS.

Figure 13 – Profile of Existing Wells



The injection volumes shown on the scaled drawing represent the radii of a 6-month and 2-year recharge period. This clearly indicates the low risk of the 3-month ASR cycle proposed. In addition, it illustrates the multiple confining layers and aquifer zones between the proposed ASR well constructed in the upper Hueneme Aquifer and the existing shallow 200- to 230-foot-deep wells constructed in the Oxnard Aquifer.

Preliminary analysis of the GRURW regulation requirements for treatment credits was performed by the City to understand the ability of the designed AWPF treatment process to satisfy the minimum 12-log reduction of enteric virus, 10-log reduction of Giardia cyst, and 10-log reduction of Cryptosporidium oocyst. The findings of that review indicated that the treatment process is capable of achieving the credits required for an IPR project for Giardia and Cryptosporidium, but is approximately 3-log reduction short of the requirement for enteric virus. Because of this finding, the aquifer used for storage may also be used for soil aquifer treatment to obtain the additional credit required for virus removal to achieve the IPR requirement (if no other treatment process is added to obtain additional credit). Based on the information in Table 60320.208 in the GRURW regulations, the necessary retention time will be approximately 3 months. The primary assessment of this hydrogeological study was to accommodate planned ASR operations on a 3-month cycle until treatment process improvements are implemented.

For initial GRRP operations, the City proposes to recharge the well for approximately 3 months with PRW. Upon completion of the recharge cycle, the City will allow a 3-month retention time (or less if additional treatment is provided) where the PRW will continue to move through the aquifer under the influence of the regional groundwater gradient (whichever direction that may be) and receive soil aquifer treatment throughout the retention time. Upon completion of the retention time necessary to achieve the required 3-log reduction credit, the stored water will be produced over an approximate 2- to 3-month recovery period. During recovery of the PRW, the well will discharge into the recycled water system and the recovered groundwater will be utilized for irrigation. Upon approval of use for IPR purposes, the groundwater will be recovered and conveyed to BS-1 for blending and use in the City municipal system.

Additional wells can be added to accommodate greater recharge and storage volumes or achieve higher retention time, as desired.

WATER QUALITY VIOLATION MITIGATION

The proposed GRRP is designed to allow rapid response and mitigation in the event of a AWPF treatment failure resulting in a water quality violation. Because the GRRP is designed to recapture the stored PRW at the point of replenishment, the ability for recapture of all of the water has a high level of certainty regardless of changes in the groundwater gradient direction. The steps toward mitigation at the time of violation detection would include the following components:

1. Stop aquifer recharge into the specific well(s) receiving the unsuitable water upon immediate discovery of a violation.

2. Address the treatment plant problem and supplement the recycled system, if necessary, with a potable supply.

3. Immediately begin removal/recapture of the tainted groundwater (if necessary) and discharge to a location other than the municipal water supply system until all the water has been removed from the aquifer system. The recovered water would be discharged either back into the recycled water system and used for irrigation (if suitable) or discharged to the sewer for disposal.

4. Initiate injection into another ASR well after the AWPF treatment problem has been solved and until the tainted groundwater in the previously active well has been remediated.

5. Allow the stored volume of water to remain in the aquifer for a greater response/retention time to receive additional soil aquifer treatment for the required time necessary based on the specific violation prior to subsequent removal and reuse.

Well discharge can be conducted until the affected aquifer zone is completely purged. Discharge from the affected well(s) can be directed to the most beneficial use allowable for its determined quality. City facilities provide multiple locations for discharge of the inadequately treated water, which include the City:

- sanitary sewer

- recycled water system for permitted irrigation reuse

- IPR after additional response retention time or aquifer travel time (soil aquifer treatment) has been achieved to mitigate the violation.

CONCLUSIONS AND RECOMMENDATIONS

In June 2014, the DDW released the final GRURW regulations that reflect its current thinking on the regulation for replenishing groundwater with PRW and the subsequent reuse as a potable supply. Based on the findings of this study, we conclude that available data indicate the proposed GRRP is feasible and that replenishment and recovery of groundwater with an improved quality could be accomplished in this portion of the Oxnard Plain Basin that would be consistent with the current GRURW regulations.

It is anticipated that properly designed and constructed ASR wells located at the proposed Campus Park GRRP site will provide operational well capacities beneficial for the proposed IPR program. Injection into the LAS in the Oxnard Plain Basin will require multiple wells that will likely be capable of sustained injection rates between 1,500 to 2,000 gpm. While the initial proposed demonstration project includes a single ASR well to achieve permitting, and a total of 3 ASR wells to achieve cycling for continual operation, additional wells can be added to facilitate a higher capacity GRRP operation in each of the aquifer storage units.

The City's review of the DDW regulations indicates that IPR operations may require a response retention time that achieves a 3-log removal credit for enteric virus and that the retention time of the PRW in the aquifer will likely be 3 months prior to reuse until additional treatment at the AWPF is provided. We conclude that it is feasible to inject PRW over a 3 to 6-month period into any discrete aquifer zone(s) and expect a high percentage of recovery after a 3-month retention period that allows full compliance with permit conditions. The proposed GRRP has direct control over the response retention time in that the ASR well facility that replenishes the aquifer(s) will remain off until the specified retention time has been achieved. Recovery of the final portion of the PRW will likely produce a component of groundwater with a reduced quality as a result of mixing with the native groundwater. Recovery percentages can be improved with the establishment of a buffer zone around the recharge bubble by originally using a greater quantity of the PRW than planned for recovery.

We conclude that while zone specific water level data from the Campus Park site are not available, the prevailing groundwater conditions indicated by available data in the Oxnard Plain Basin support the ability for effective capture and reuse of the higher quality recharge water from the Campus Park ASR Wellfield. As designed, the project does not rely on horizontal movement through an aquifer in any specific direction to allow capture at some distance away from the point of recharge. The point of capture is anticipated to be near the center of the PRW recharge bubble. We also conclude that in the event of a water quality violation where non-compliant water is injected in the aquifer system, the GRRP design will allow immediate mitigation and, as necessary, recapture of the non-compliant volume of PRW. There are no drinking water wells constructed in the LAS within ¾ of a mile of the proposed GRRP location. The only potable well in the LAS within a mile of the Campus Park is City Well No. 20.

Anticipated travel time to the nearest potable water supply well is greater than 2 years, if the PRW is not recovered for IPR. Because the City is the permitting agency and can control well construction within its limits, the proposed IPR operation has an effectively established isolation zone from future well construction.

We recommend the City drill a pilot borehole to a depth of 580 feet to define the site specific aquifer zone depths for use in final design of the GRRP ASR Well No. 1 in the upper Hueneme Aquifer zones (see Plate 1). We also recommend the City construct 3 monitoring wells at the designated locations which are preliminarily identified on Figures 2 and 11 to allow collection of groundwater data in compliance with the GRURW regulation pursuant to section 60320.200(h)(4). We recommend Monitoring Well No. 1 be constructed as a nested monitoring well to allow monitoring of the aquifer zones above and below the depths of Aquifer Storage Unit No. 1 during the operation of ASR Well No. 1.

PERSONNEL QUALIFICATIONS

The assessment of hydrogeological conditions for the proposed GRRP was conducted by and under the direction of Mr. Curtis J. Hopkins, Principal Hydrogeologist with Hopkins Groundwater Consultants, Inc. Mr. Hopkins is the company's president and is certified as a Professional Geologist (PG 5695), Certified Engineering Geologist (EG 1800) and Certified Hydrogeologist (HG 114) in the State of California. Mr. Hopkins has over 27 years of work experience on groundwater development projects performed throughout the Southern and Central California area and specifically, the Oxnard Plain Basin. Mr. Hopkins has extensive experience with water supply studies to establish municipal wellfields and with design and management of well construction projects.

CLOSURE

This report has been prepared for the exclusive use of the City of Oxnard and its agents for specific application to the City of Oxnard GREAT Program utilization of PRW treated at the AWPF and properly applied at the proposed Campus Park GRRP site for IPR. The findings, conclusions, and recommendations presented herein were prepared in accordance with generally accepted hydrogeological planning and engineering practices. No other warranty, express or implied is made.

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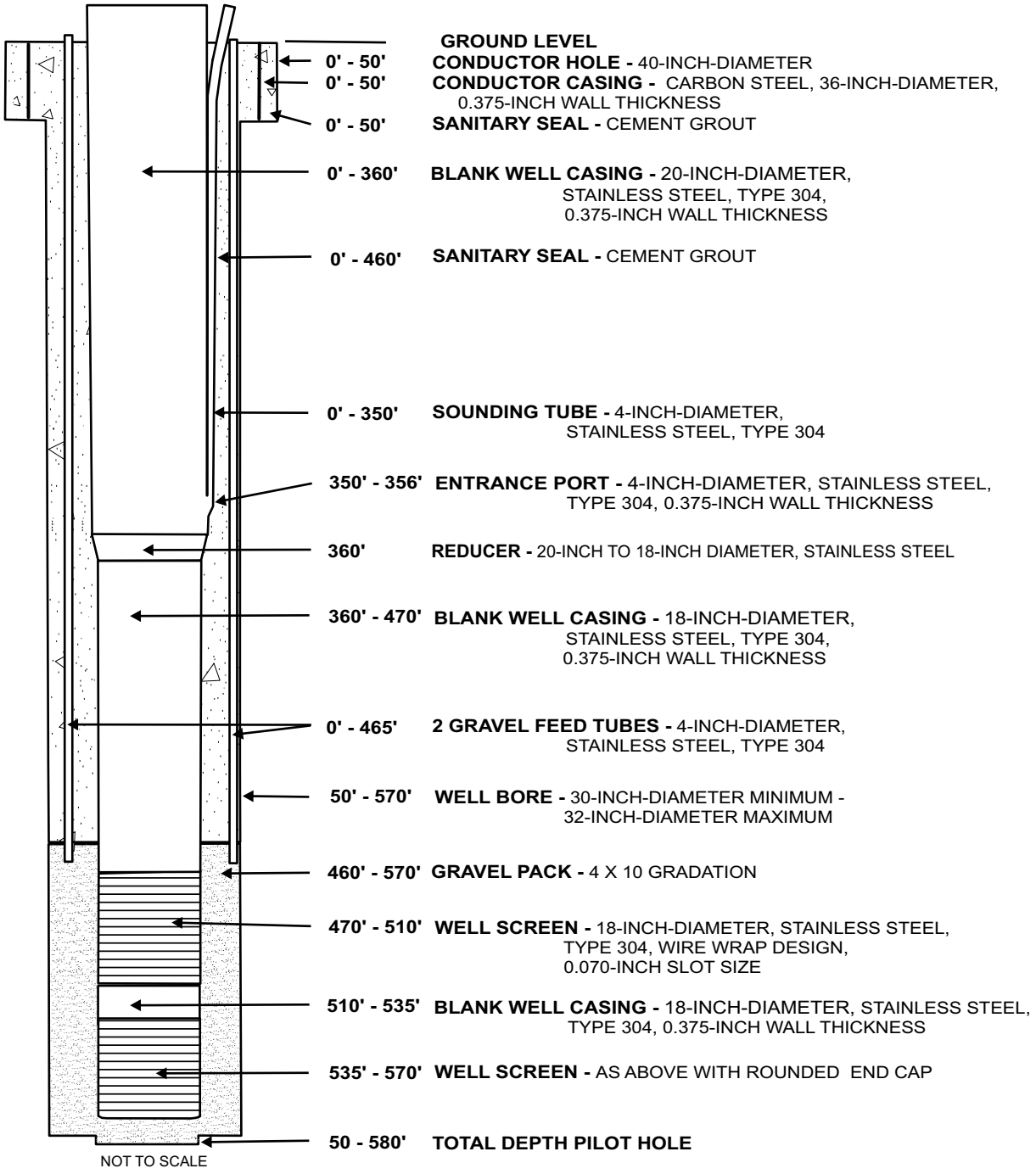
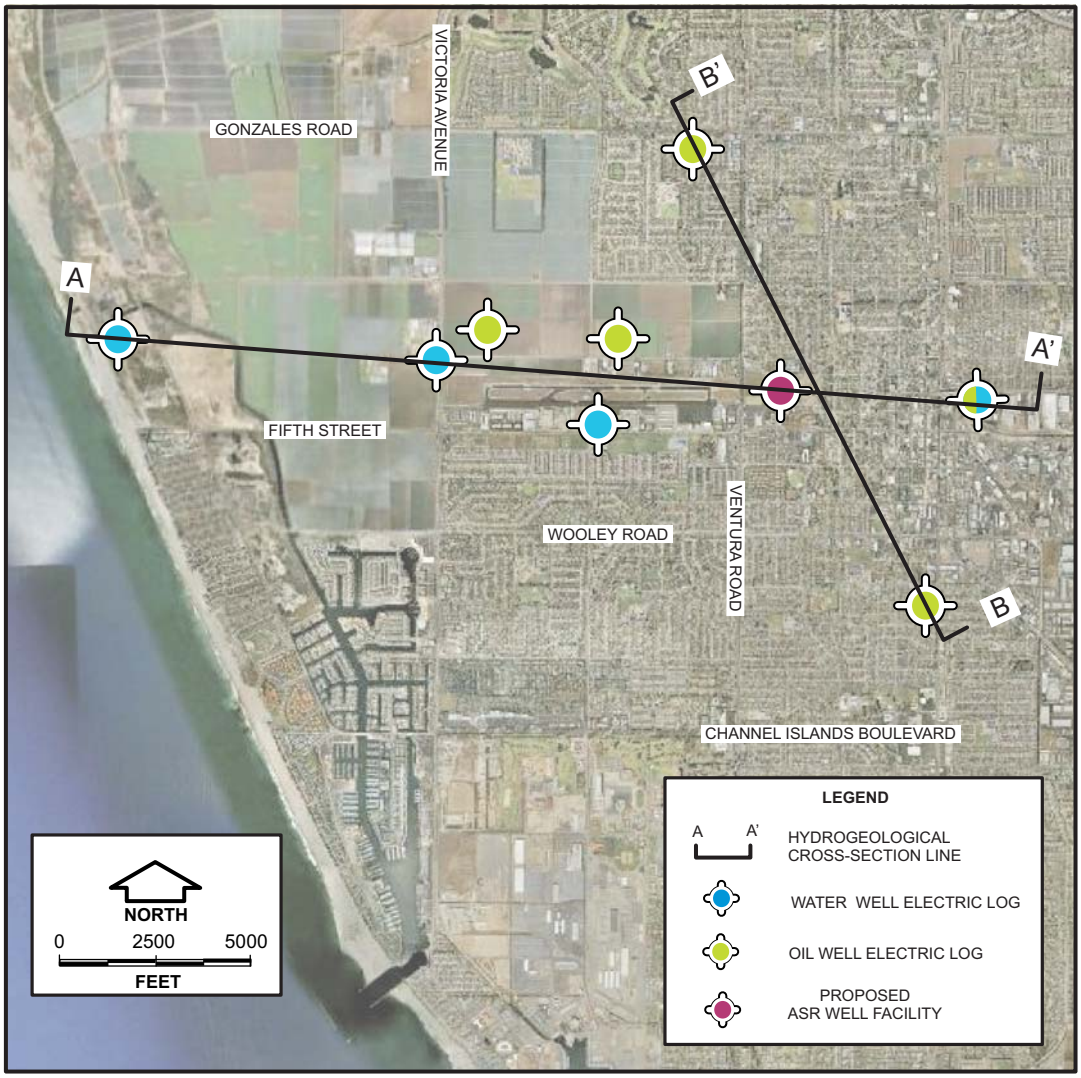
PLATES



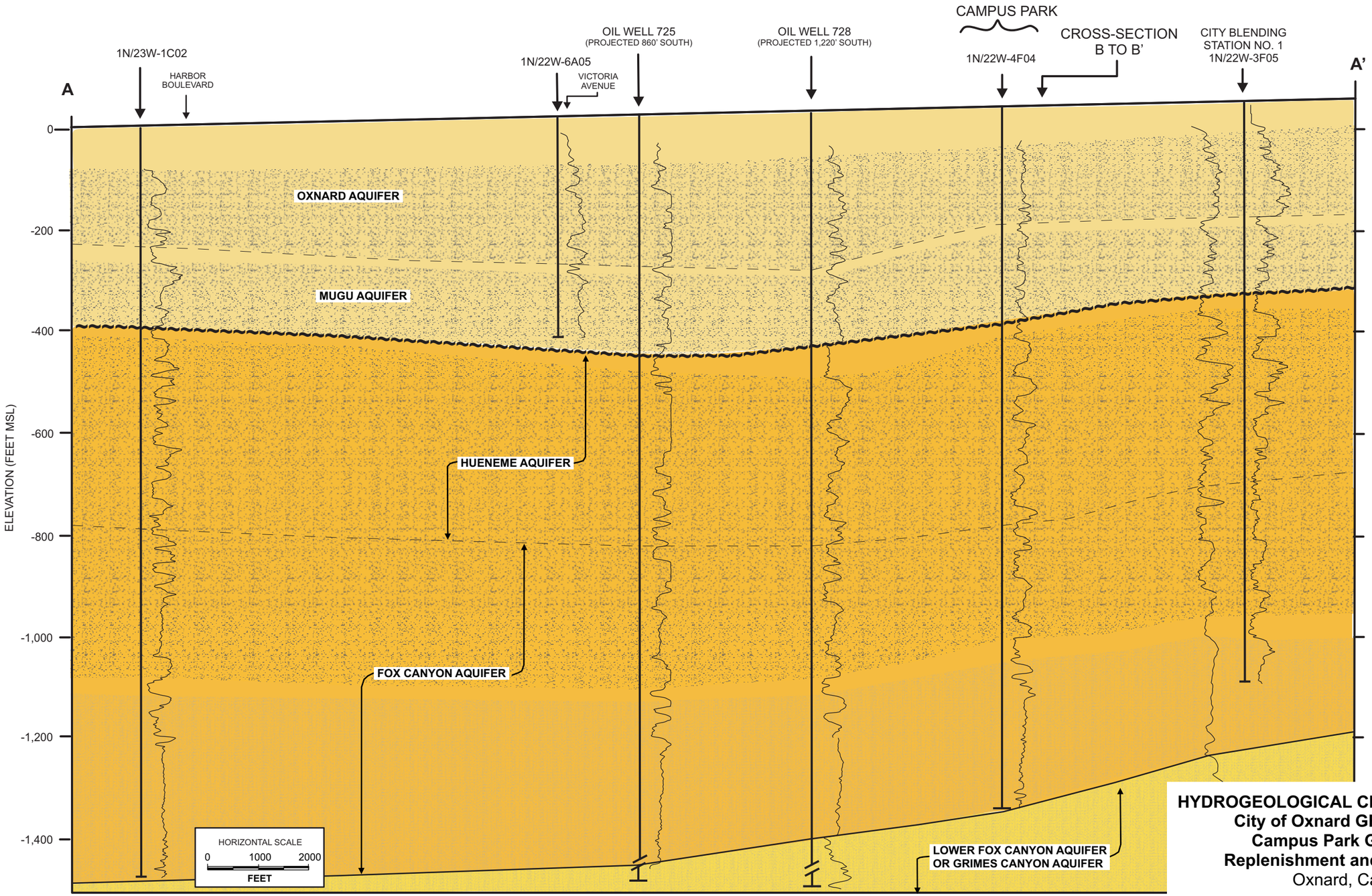
PRELIMINARY ASR WELL NO. 1 DESIGN DRAWING
City of Oxnard GREAT Program
Campus Park Groundwater
Replenishment and Reuse Project
Oxnard, California

PLATE 1



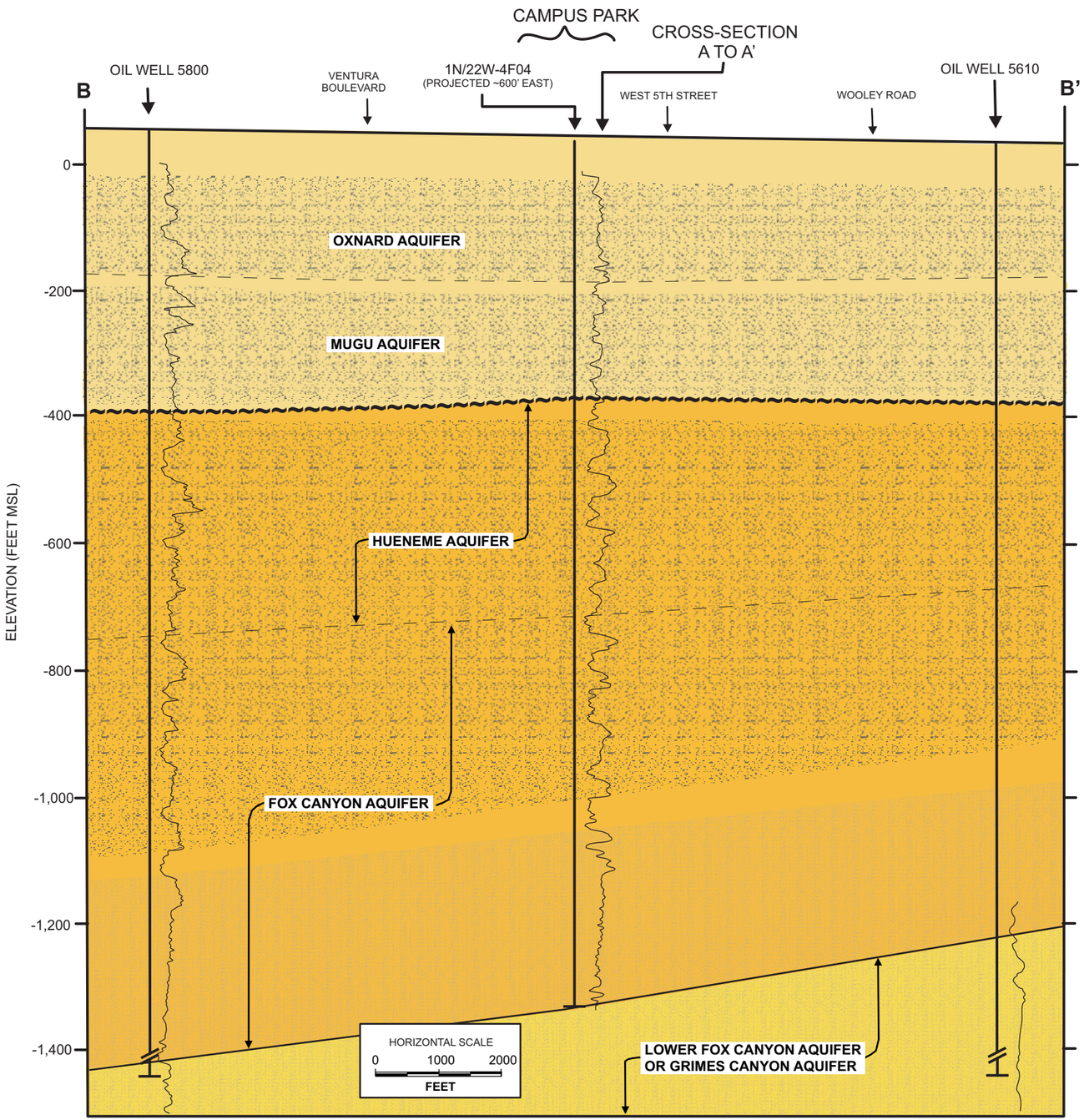
HYDROGEOLOGICAL CROSS-SECTION LOCATION MAP
City of Oxnard GREAT Program
Campus Park Groundwater
Replenishment and Reuse Project
Oxnard, California

PLATE 2



HYDROGEOLOGICAL CROSS-SECTION A - A'
City of Oxnard GREAT Program
Campus Park Groundwater
Replenishment and Reuse Project
Oxnard, California

PLATE 3



LEGEND

QUATERNARY — HOLOCENE

Qoa — **UN-DIFFERENTIATED OLDER AND YOUNGER ALLUVIUM -** older alluvial gravel, and silt/clay

PLEISTOCENE

QTs — **SAUGUS FORMATION -** weakly consolidated alluvial deposits, light gray to light brown gravel composed of pebbles and small cobbles mostly of white to light gray granitic rocks, in coarse sandy matrix; weakly indurated sand, and fossiliferous sand, silt, and clay

Qtlp / Qsb — **LAS POSAS SAND OR SANTA BARBARA FORMATION -** weakly indurated, fine to medium grained sand, in Las Posas Hills contains thin lenses of calcareous fossilliferous pebbly sandstone; unconformity at base

SYMBOLS

Formation contact - dashed where inferred or indefinite

Unconformable formation contact

Electric Log Trace of Resistivity Curve

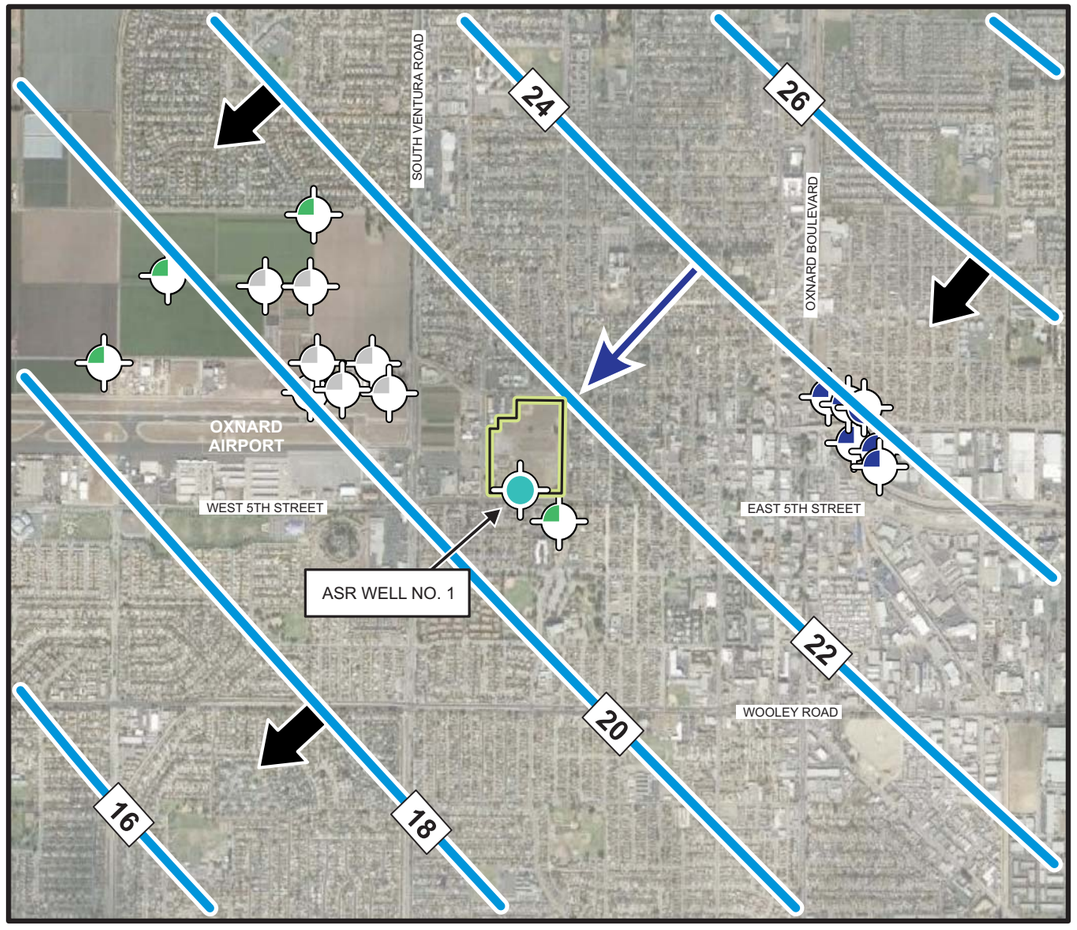
Location of Historical Water or Oil Well

Geology from: THOMAS W. DIBBLEE

HYDROGEOLOGICAL CROSS-SECTION B - B'
City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE 4

APPENDIX A
GROUNDWATER ELEVATION
CONTOUR MAPS



JANUARY 2011

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0008**

FLOW DIRECTION **S 43° W**

NORTH

0 1000 2000

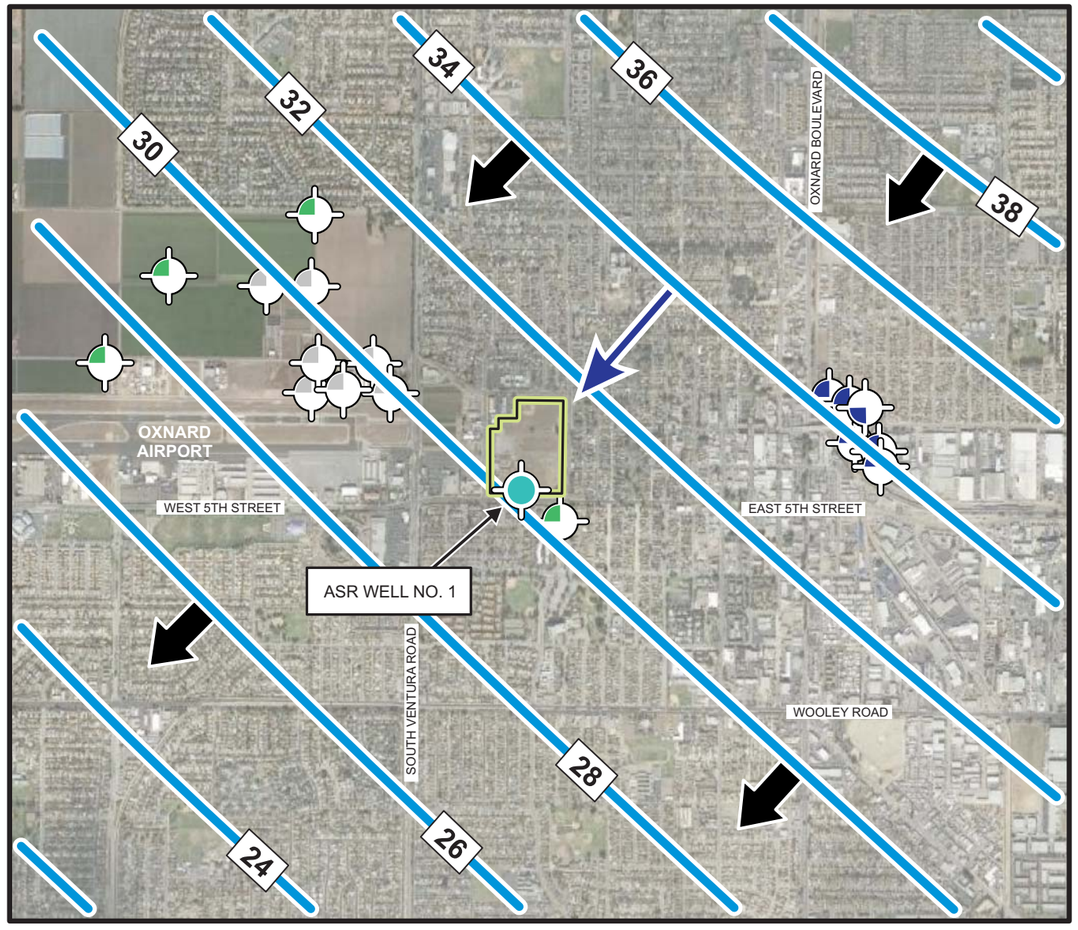
FEET

WELL LEGEND

- MUNICIPAL WELL
- DOMESTIC WELL
- AGRICULTURAL WELL
- SWN 21M1 — WELL ID

AQUIFER COMPLETION DESIGNATION

- OXNARD AQUIFER — UAS
- MUGU AQUIFER
- HUENEME AQUIFER
- FOX CAYNON AQUIFER — LAS



APRIL 2011

GROUNDWATER LEGEND

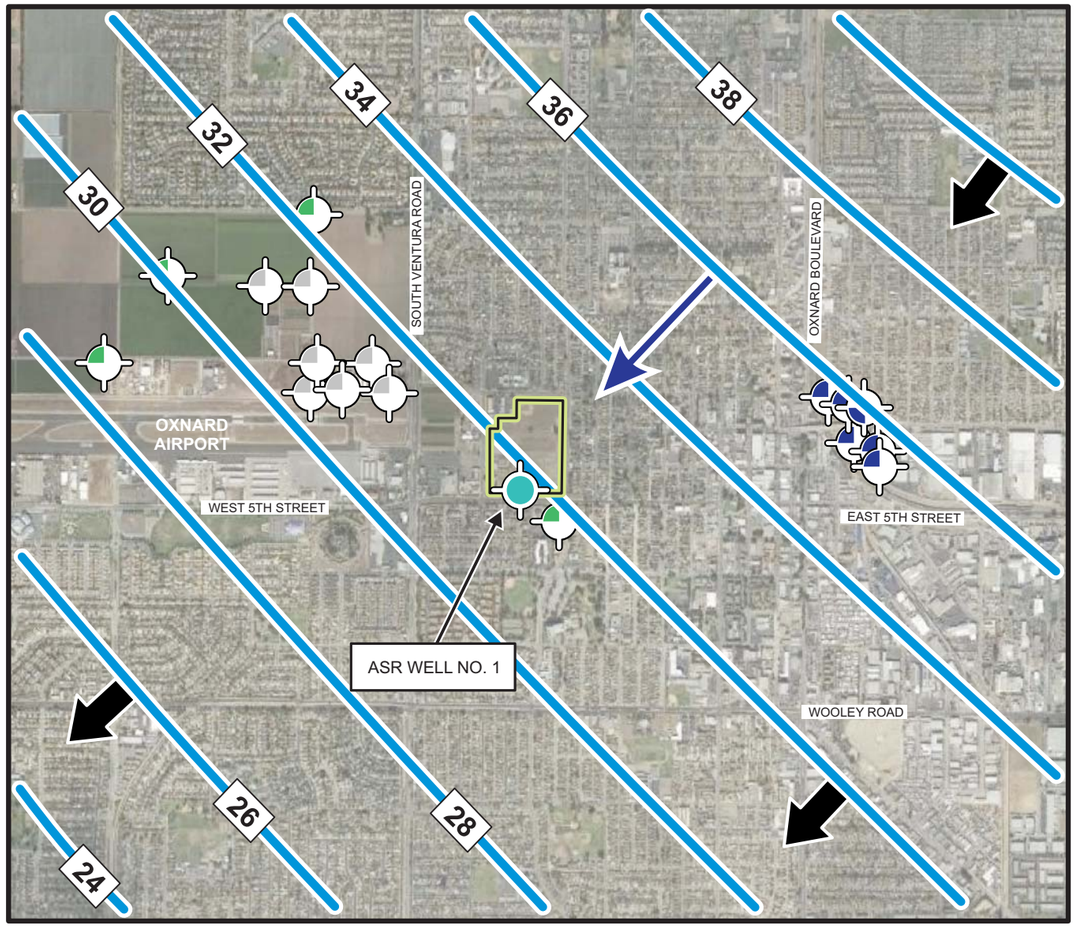
- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0011**

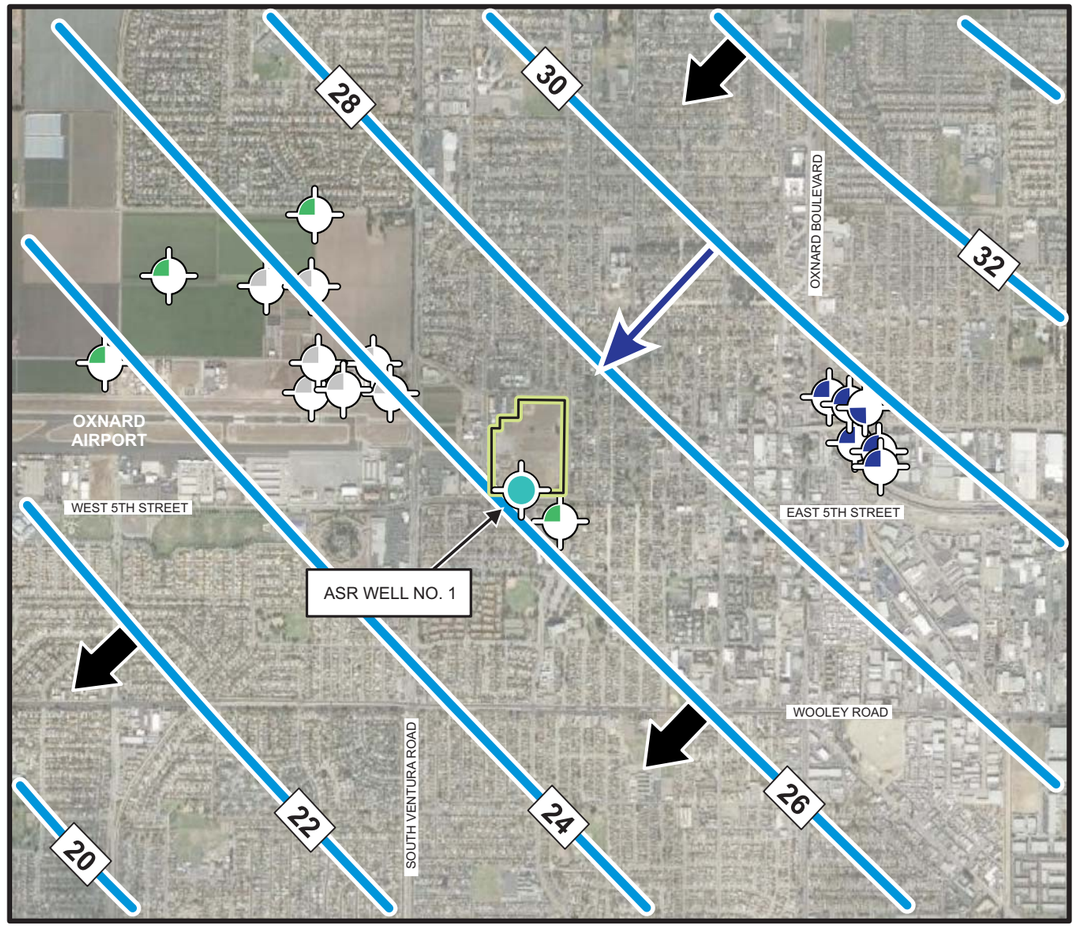
FLOW DIRECTION **S 41° W**

GROUNDWATER ELEVATION CONTOUR MAPS
JANUARY AND APRIL 2011
City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE A1



JULY 2011



OCTOBER 2011

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0011**

FLOW DIRECTION **S 44° W**

NORTH

0 1000 2000

FEET

WELL LEGEND

- MUNICIPAL WELL
- DOMESTIC WELL
- AGRICULTURAL WELL
- SWN 21M1 — WELL ID

AQUIFER COMPLETION DESIGNATION

- OXNARD AQUIFER
- MUGU AQUIFER
- HUENEME AQUIFER
- FOX CAYNON AQUIFER

UAS

LAS

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

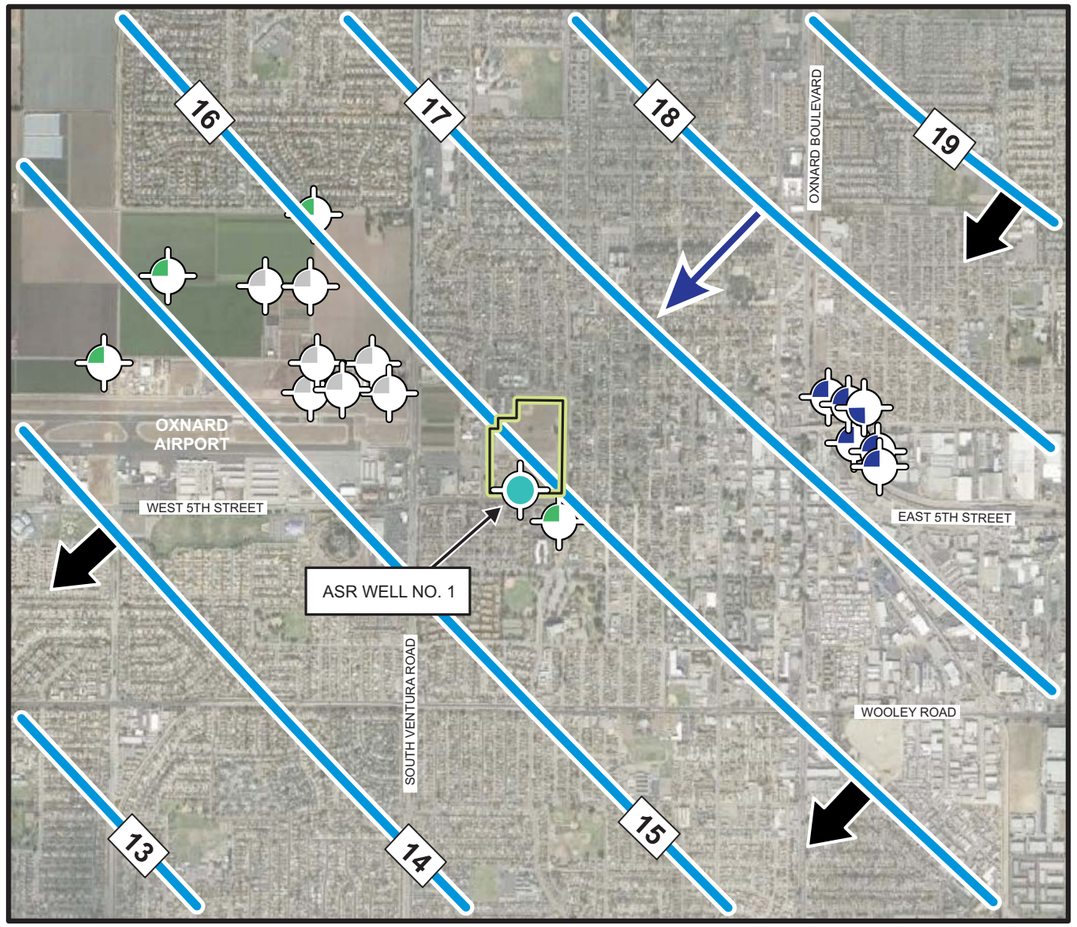
GRADIENT **0.0009**

FLOW DIRECTION **S 43° W**

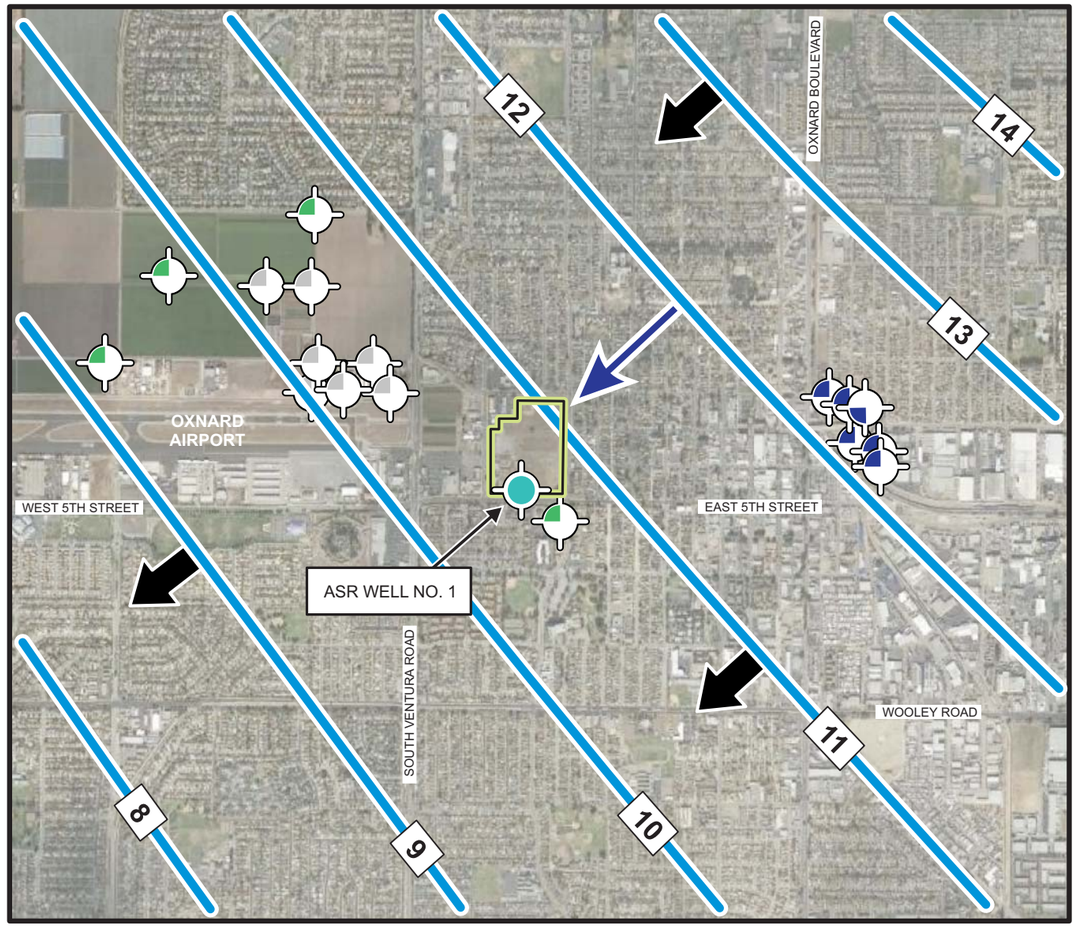
GROUNDWATER ELEVATION CONTOUR MAPS JULY AND OCTOBER 2011

City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE A2



JANUARY 2013



APRIL 2013

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0004**

FLOW DIRECTION **S 44° W**

NORTH

0 1000 2000

FEET

WELL LEGEND

- MUNICIPAL WELL
- DOMESTIC WELL
- AGRICULTURAL WELL
- SWN 21M1 — WELL ID

AQUIFER COMPLETION DESIGNATION

- OXNARD AQUIFER
- MUGU AQUIFER
- HUENEME AQUIFER
- FOX CAYNON AQUIFER

UAS / LAS

GROUNDWATER LEGEND

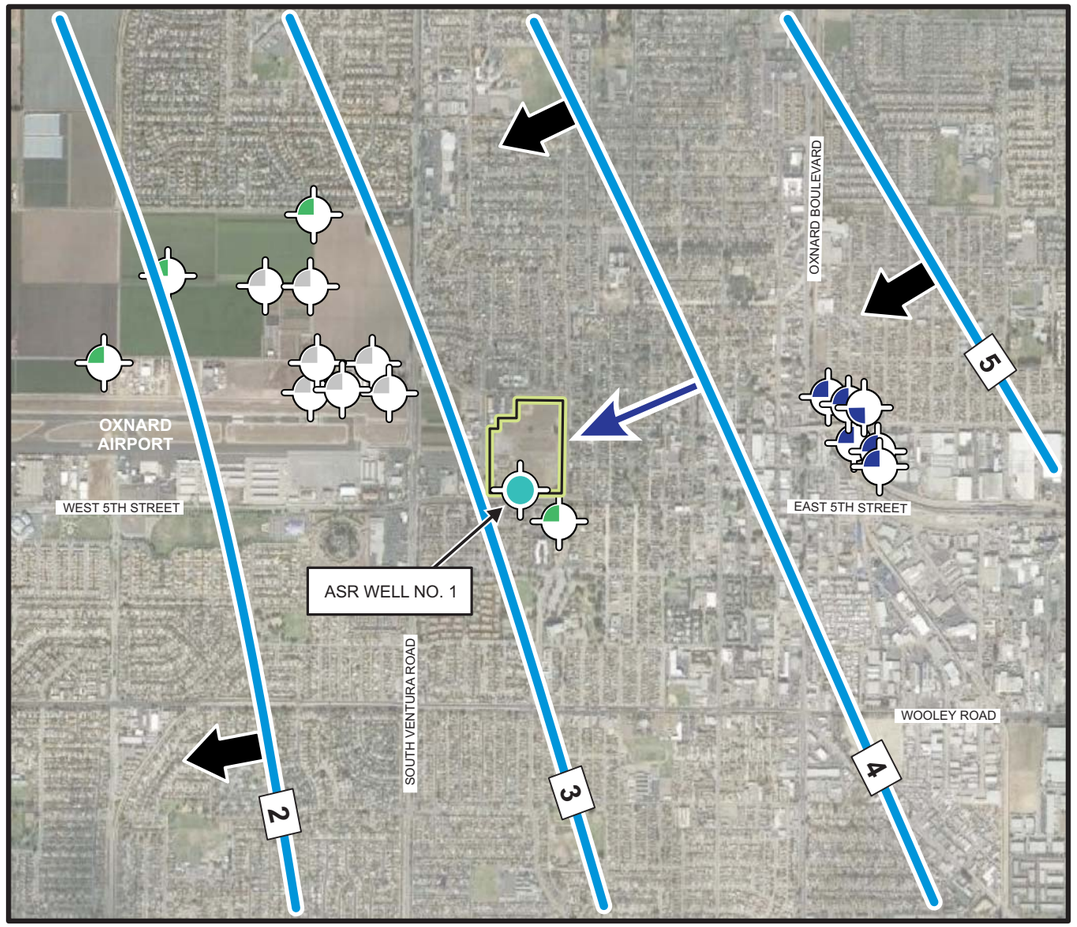
- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0004**

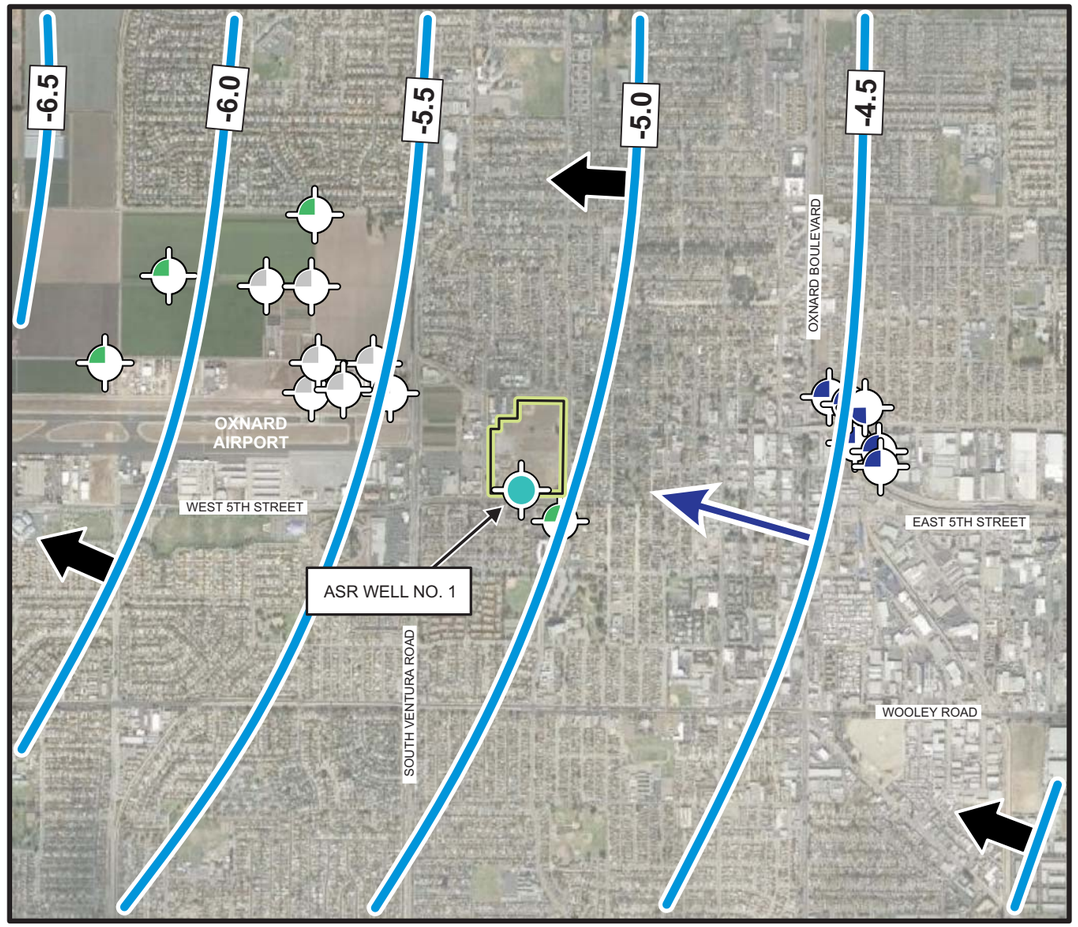
FLOW DIRECTION **S 47° W**

GROUNDWATER ELEVATION CONTOUR MAPS JANUARY AND APRIL 2013
City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE A3



JULY 2013



OCTOBER 2013

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0003**

FLOW DIRECTION **S 67° W**

NORTH

0 1000 2000

FEET

WELL LEGEND

- MUNICIPAL WELL
- DOMESTIC WELL
- AGRICULTURAL WELL
- SWN 21M1 — WELL ID

AQUIFER COMPLETION DESIGNATION

- OXNARD AQUIFER
- MUGU AQUIFER
- HUENEME AQUIFER
- FOX CAYNON AQUIFER

UAS / LAS

GROUNDWATER LEGEND

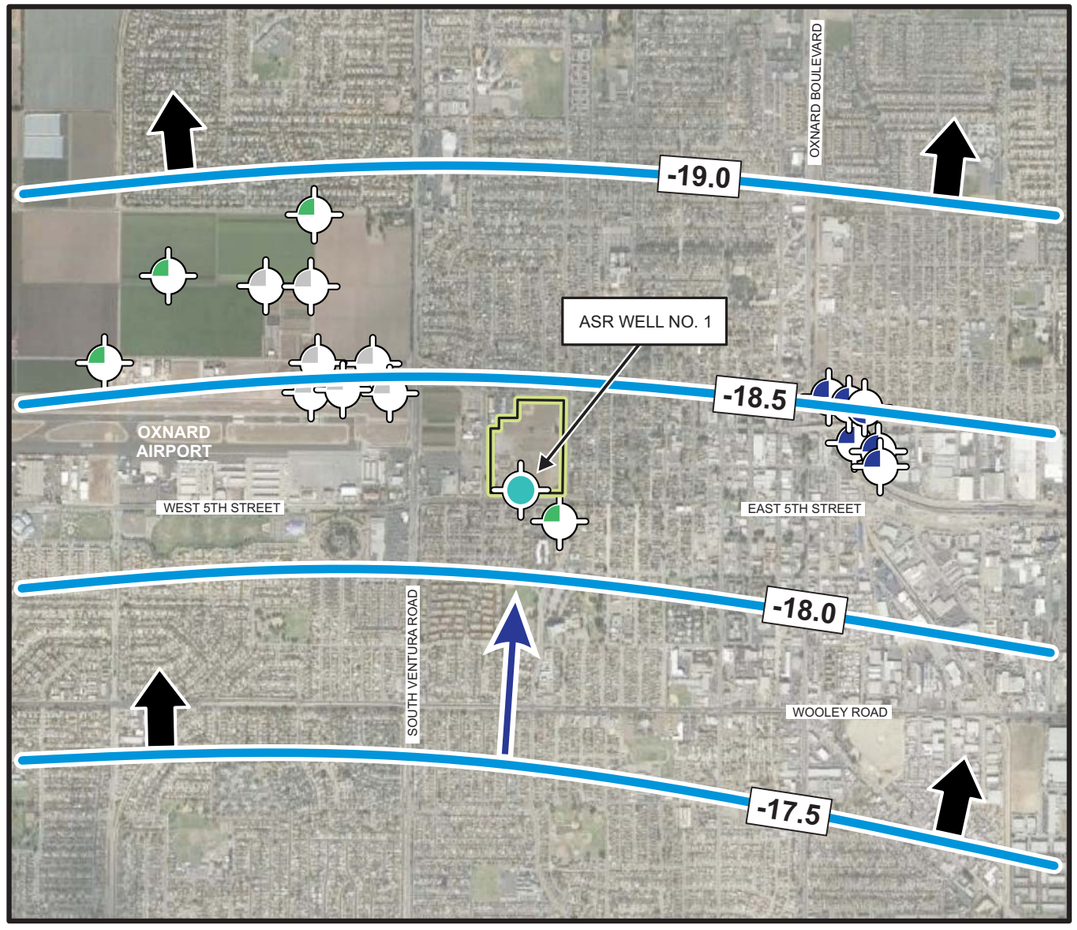
- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0002**

FLOW DIRECTION **N 74° W**

GROUNDWATER ELEVATION CONTOUR MAPS
JULY AND OCTOBER 2013
City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE A4



AUGUST 2014

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE
- GRADIENT **0.0002**
- FLOW DIRECTION **N 04° E**

NORTH

0 1000 2000

FEET

WELL LEGEND

- MUNICIPAL WELL
- DOMESTIC WELL
- AGRICULTURAL WELL
- SWN 21M1 — WELL ID

AQUIFER COMPLETION DESIGNATION

- OXNARD AQUIFER
- MUGU AQUIFER
- HUENEME AQUIFER
- FOX CAYNON AQUIFER

UAS / LAS

GROUNDWATER ELEVATION CONTOUR MAPS
AUGUST 2014
City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE A5

Appendix C

PALL MF PDT/LRV ANALYSIS

Pall Corporation

Resolution and LRV Calculations for Direct Integrity Testing Using the MFGM Method for Water Treatment Plant at 01.00106 Oxnard, CA

Objectives

The objective is to determine (1) the testing pressure required to meet the resolution criterion of 3 μm or less as specified in the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), (2) the pressure decay value (PDR) corresponding to required Log Reduction Value (LRV) for particles with the size of 3 μm at plant design conditions.

Calculation for Resolution and Sensitivity of the Membrane System

1. Determining Testing Pressure for Required Resolution (≤3 μm)

   The testing pressure can be calculated per Equation (4.1)

$$P_{test} = (0.193 * \kappa * \sigma * \cos\theta) + BP_{\max} \qquad \text{Equation (4.1)}$$

Table 1. Calculation Variables (P_{test})

Item	Description	Unit	Value
P_{test}	Test pressure for required resolution	psi	17.47
k	Shape correction factor	dimensionless	1
σ	Surface tension of water @ 5 °C	dynes/cm	74.97
θ	Water contact angle of membrane medium	degree	0.00
BP_{max}	Sum of backpressure and static head	psid	3

Since the testing pressure to be used is 25 psi or above and the pressure decay is anticipated lower than 1 psi during the duration of the test for Pall MF system, the resolution criterion is satisfied.

2. Calculating Sensitivity (LRV_{DIT})

The LRV calculation is performed by using Equation (4.9) in USEPA's Membrane Filtration Guidance Manual (USEPA, 2005):

$$LRV_{DIT} = \log\left(\frac{Q_p * ALCR * P_{atm}}{\Delta P_{test} * V_{sys} * VCF}\right)$$ Equation (4.9)

The air-liquid conversion ration (ALCR) is calculated using Darcy Equation by assuming that the hollow fiber breaks completely at the interface of potting layer, which results in a shortest flow path for bypass flow. The calculation also uses the highest trans-membrane pressure (TMP) during a filtration cycle. This results in a conservative result that has a low LRV.

Air-to-liquid-conversion ratio (ALCR):

$$ALCR = 170 * Y * \sqrt{\frac{(P_{test} - BP)(P_{test} + P_{atm})}{(460 + T) * TMP}}$$ Equation (C.4)

$$Y \propto \left[\frac{1}{\frac{(P_{test} - BP)}{(P_{test} + P_{atm})}}, K\right]$$ Equation (C.5)

K: resistant coefficient

$$K = f * \frac{L}{d_{fiber}}$$ Equation (C.6)

The parameters used in the LRV calculation are presented in Table 2.

Table 2. Parameters Used for LRV Calculation

Item	Description	Unit	Value
Q_p	design (instantaneous) flow per rack	gpm	1,554
VCF [a]	volumetric concentration factor	dimensionless	1.00
ΔP_{test}	The smallest pressure decay rate associated w/ a breach	psi/min.	0.06
V_{sys} [b]	system hold-up volume	ft^3	44.17
P_{atm}	Atmospheric pressure	psi	14.7
BP [b,c]	back-pressure during pressure decay test	psi	0
T [b]	Temperature	^oF	80.6
TMP [b]	terminal trans-membrane pressure during filtration	psi	40
f	friction factor	dimensionless	0.025
L [c]	the length of flow path for breach	M	0.06
D	diameter of hollow fiber lumen	M	0.00064
P_{test} [b]	testing pressure for pressure decay test	psi	25.0

Note: a - *Dead-end filtration*

b - *Based on the design data*

c - *Assume worst-case fiber breakage (at the top potting layer)*

Find K:

$$K = f * \frac{L}{d_{fiber}} \qquad \text{Equation (C.6)}$$

f: friction factor

L: the length of flow path of the breach (equal to the potting thickness)

d_{fiber} lumen diameter of the fiber.

$$K = 0.025 * \frac{0.06}{0.00064}$$

Find Y value using the chart on page A-22 from Crane:

$$Y \propto \left[\frac{1}{\frac{(P_{test} - BP)}{(P_{test} + P_{atm})}}, K \right]$$

Substitute Y into Equation (C.4):

Substitute ALCR into Equation (4.9):

Table 3. Additional Parameters Used for LRV Calculation

Item	Description	Unit	Value
K	Resistant coefficient	dimensionless	2.34
Y	Net expansion factor	dimensionless	0.63
$ALCR$	Air to liquid conversion ratio	dimensionless	22.84
LRV_{dit}	Sensitivity of direct integrity test	log	4.4

Therefore, the sensitivity of direct integrity testing is = LRV_{dit} in Table 3.

1. Calculate Upper Control Limit (UCL) and Alert Level (AL) for Direct Integrity Testing. The UCL for direct integrity testing, the pressure decay rate corresponding to the required LRV, is determined by rearranging Equation (4.9):

$$UCL = \frac{Q_p \bullet ALCR \bullet P_{atm}}{10^{LRC^*} \bullet V_{sys} \bullet VCF} \qquad \text{Equation (4.17)}$$

Where: UCL - upper control limit for pressure decay rate, psi/min.
LRC^* - required LRV for the membrane system

If the required LRV for the membrane system is 4-logs, substitute $LRC^* = 4$ and

the same parameters in Table 2:

The plot of LRV as a function of pressure decay rate is presented in Figure 1 in which the UCL is marked with red dotted line.

Table 4. Results of UCL Calculation

Item	Description	Unit	Value
UCL	Upper control limit	dimensionless	0.16

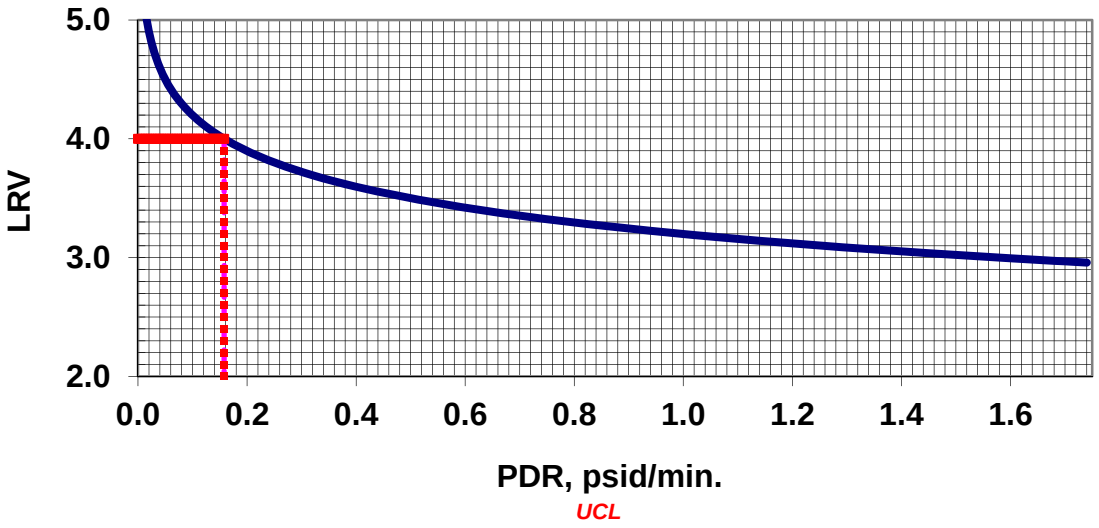


Figure 1: LRV as a function of pressure-decay rate (PDR)

UCL is indicated on the graph corresponding to LRV of 4-logs.

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Sethi, S., G. Crozes, D. Hugaboom, B., Mi, J. M. Curl, and B. J. Mariñas (2004): *Assessment and Development of Low-Pressure Membrane Integrity Monitoring Tools* , AwwaRF Report No. 91032, Denvor, CO.

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carollo

CITY OF OXNARD CALIFORNIA

MARCH 2017

Advanced Water Purification Facility

Indirect Potable Reuse Engineering Report

VOLUME 1 OF 2

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This document is released for the purpose of information exchange review and planning only under the authority of Andrew Salveson, 3/27/2017, State of California, PE No. 56902 and Tracy Anne Clinton, 3/27/2017, State of California, PE No. 48199.

CITY OF OXNARD

ADVANCED WATER PURIFICATION FACILITY

INDIRECT POTABLE REUSE
POTABLE REUSE ENGINEERING REPORT

FINAL
VOLUME 1 OF 2

March 2017

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CITY OF OXNARD
ADVANCED WATER PURIFICATION FACILITY

INDIRECT POTABLE REUSE
POTABLE REUSE ENGINEERING REPORT

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APPENDIX C - Pall MF PDT/LRV Analysis

INDIRECT POTABLE REUSE POTABLE REUSE ENGINEERING REPORT

Note: *This version of the Engineering Report reflects comments received from the State Water Resources Control Board Division of Drinking Water, letter dated December 5, 2016 and a letter dated February 17, 2017. These letters were prepared in response to an October (2016) draft of this Engineering Report. This version of the report also reflects comments received from the State Water Resources Control Board Division of Drinking water, letter dated April 21, 2016. That letter was prepared in response to an October (2015) draft of this Engineering Report. Since the last submittal, extensive startup testing has been completed on the AWPF, demonstrating water quality in accordance with regulatory objectives, with the results presented within this report. Further, an Enhanced Source Control Program (ESCP) has been developed for Oxnard as they move into potable water reuse. That ESCP is also presented within this report.*

1.0 PROJECT OVERVIEW

The City of Oxnard (City) owns and operates a regional publicly-owned treatment works (POTW) that serves the City, City of Port Hueneme, Naval Base Ventura County and several surrounding unincorporated communities. It is comprised of the Oxnard Wastewater Treatment Plant (OWTP) and its associated wastewater collection system and outfall line. The OWTP is a secondary treatment facility with a design flow of 31.7 million gallons per day (mgd) and an average daily flow of 20 to 22 mgd.

The City's Advanced Water Purification Facility (AWPF) which, when placed into operation, will divert 8 to 9 mgd of biologically-treated secondary effluent for purification using three advanced treatment steps: microfiltration (MF), reverse osmosis (RO), and advanced oxidation with ultraviolet light and hydrogen peroxide (UV AOP). Because of reject streams, the 8 to 9 mgd of influent flow to the AWPF will result in 6.25 mgd of purified water. The MF reject and backwash wastewater produced at the AWPF will be returned to the OWTP headworks. The RO concentrate waste produced at the AWPF will be commingled with the OWTP secondary treated effluent and discharged to the Pacific Ocean.

This Engineering Report is submitted to the State Water Resources Control Board Division of Drinking Water (DDW) for review and approval. This Report is intended to provide the necessary information to permit indirect potable reuse (IPR) of up to 6.25 mgd of purified AWPF-treated product water. This first phase (Phase 1) will be IPR through Aquifer Storage and Recovery (ASR) in the Lower Aquifer System (LAS). For the ASR project, the City plans to inject the AWPF-treated recycled water into specific wells at the Campus Park location (at the corner of 5th and H Street in Oxnard), keep the water underground for a set

period of time, then extract the water (from the same wells into which the water was injected) for potable and non-potable use.

1.1 Water in Oxnard

The City's current water supply comes from surface and groundwater sources. Fifty percent of the City's water supply is from northern California rainfall and snowmelt pumped through the Sacramento–San Joaquin Delta and imported to southern California via the State Water Project (SWP). This water is delivered by the Calleguas Municipal Water District (CMWD). Twenty-five percent of the City's water is regional groundwater supplied by the United Water Conservation District's (UWCD) spreading and pumping operations on the Santa Clara River and Oxnard Plain. Local, City owned and operated wells account for the remaining twenty-five percent of the City's water.

1.1.1 CMWD

The City receives SWP water from CMWD's Springville Reservoir (supplied by Metropolitan Water District of Southern California [MWDSC]) through the City's Oxnard and Del Norte conduits that feed five of the City's six water blending stations. Existing agreements between the City and CMWD do not guarantee the quantity of water the City may purchase. The City has a current MWDSC Tier 1 entitlement. Tier 1 water corresponds to the amount "contracted for" by the City. It is in essence a capacity reservation and includes the water being delivered to the Port Hueneme Water Authority (PHWA). MWDSC Tier 2 water is normally available to the City; however, the cost per acre-foot is higher. There is less availability and reliability of Tier 2 water in periods of drought.

1.1.2 Fox Canyon Groundwater Management Authority (FCGMA)

The FCGMA was created at the direction of the State Water Resources Control Board (SWRCB) to address ongoing overdraft and seawater intrusion into the Oxnard Plain Pressure Basin. The purpose of the FCGMA is to manage the region's groundwater supply by protecting the quantity and quality of local groundwater resources and by balancing the supply and demand for groundwater resources.

The FCGMA governs all extractions from the groundwater basin and, thus, the City's use of UWCD water and its own local wells is governed by the "safe yield" extraction volumes set by FCGMA.

In 2009 the City participated in the Ferro Pit Program, in which the City helped UWCD purchase an additional recharge basin, known as the Ferro Pit.

In 2016, the FCGMA issued a permit for the installation of the proposed Campus Park ASR well (letter dated June 24, 2016).

1.1.3 UWCD

UWCD currently provides a portion of the City's groundwater supply. This arrangement has been in place since 1954, and was formalized in the 1996 Water Supply Agreement for Delivery of Water through the O-H Pipeline. UWCD holds a pumping sub-allocation for all users of the O-H Pipeline, which includes the City, PHWA, and a number of small mutual water companies.

1.1.4 2002 Three-Party Agreement

The City, CMWD, and PHWA entered into a Three-Party Agreement in 2002, which provides PHWA with CMWD water through Oxnard's O-H pipeline. The City also supplied water to the Ocean View Municipal Water District (OVMWD) until 2008, when the OVMWD was dissolved and has since been managed and operated by the City. The OVMWD's distribution system is now referred to as the Ocean View System and the demand of the Ocean View customers is accounted for as part of the City's total demand, with much of the demand categorized as agricultural water use.

The City does not sell water to any other agencies. However, with the completion of Blending Station Number 6 in 2011, the City can provide desalted groundwater to PHWA in the case that PHWA's O-H pipeline supply becomes temporarily unavailable.

1.2 GREAT Program

To ensure a future reliable and affordable supply of high-quality water, the City has developed the Groundwater Recharge Enhancement and Treatment or GREAT program to be implemented and operated in two phases. Phase 1 (6.25 mgd, or 7,000 AFY) treatment facilities are now in operation for non-potable water reuse, whereas additional treatment will be constructed in the near future to 12.5 mgd, with a future final capacity of 25 mgd. At this time, regulatory approval is only sought for the 6.25 mgd flow. The objectives of the GREAT program are as follows:

- Increased reliability of water supply.
- Reduced cost of water supply.
- Improved dependability of water supply in accommodating existing needs and meeting planned growth and associated water demand.
- Enhanced stewardship of local water supply through recycling and reusing a substantial portion of the region's wastewater.

The GREAT program includes treating effluent from the OWTP and providing state-of-the-art MF, RO, and advanced oxidation with UV/H_2O_2 at the AWPF, schematically shown in Figure 1.

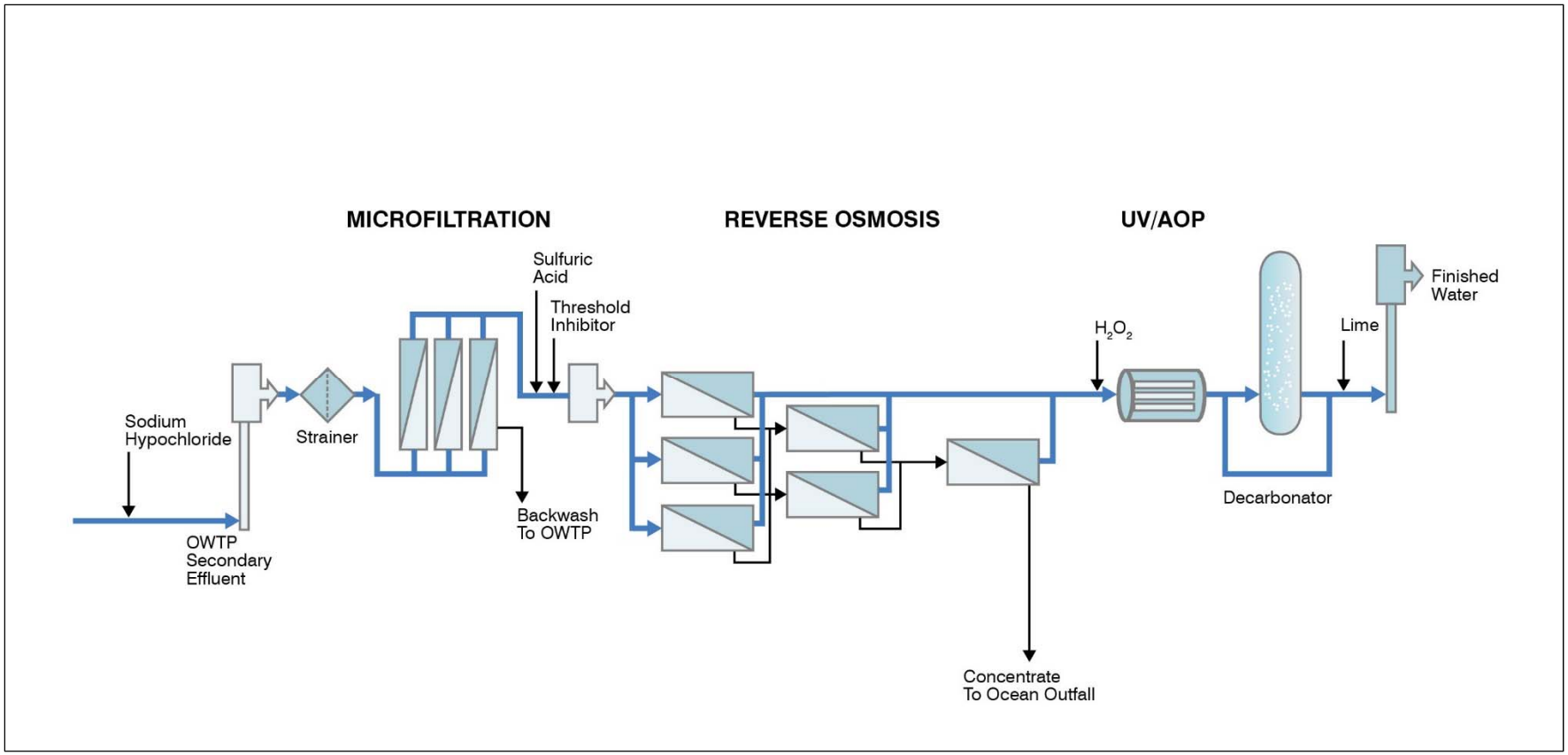

Figure 1 Advanced Treatment Schematic

Elements of the GREAT program are summarized as follows:

- Recycled Water Delivery System - Distributes recycled water for irrigation to agricultural users.
- Aquifer Storage and Recovery - Intended to help alleviate groundwater overdraft conditions and associated water quality problems, including coastal seawater intrusion. Will allow seasonal storage of potable water supplies to maximize use of the existing potable water distribution system.
- Regional Desalter - Membrane filter systems to remove dissolved minerals from groundwater, in order to reduce the levels of nitrates and total dissolved solids (TDS) in the groundwater basin.
- Blending Station No. 5 - Provides improved water supply infrastructure reliability, water quality, and hydraulic efficiencies. It also assists in meeting peak-hour and fire-flow water supply demands.
- Concentrate collection system from regional brine dischargers - Avoid discharge of high-salinity concentrate into City sanitary sewer system and Oxnard WWTP.
- Permeate Delivery System - Permeate delivery from regional desalter to industrial users.

All of the end uses (agricultural irrigation, landscape irrigation, injection into the aquifer, and industrial) will be served with a common water quality that meets the groundwater recharge (groundwater recharge) criteria for injection of purified recycled water. In exchange for the delivery of recycled water, agricultural customers would transfer their groundwater pumping allocations to the City on a one-for-one basis. The additional pumping by the City would be from the poor-quality Oxnard Aquifer, which would require additional treatment prior to delivery to the City's distribution system. The GREAT desalter constructed in 2007/2008 would provide this treatment. It does not increase the total water supply. It does, however, allow full use of the City's groundwater resources.

1.2.1 Project Site

The project site is Oxnard, California. The location of the AWPF and the ASR location are shown in Figure 2.

1.2.2 Existing Facilities and OMMP

The OWTP liquid processes include preliminary treatment, primary clarification, secondary treatment (biofiltration (trickling filters) followed by activated sludge), and chlorine disinfection in order to achieve an acceptable level of water quality for ocean discharge. The solids-handling processes include gravity thickening of primary sludge, dissolved air flotation thickening of secondary sludge, anaerobic digestion, and belt filter press dewatering.

Figure 2 Project Location

The AWPF is a standard MF/RO/UV AOP system to purify secondary effluent. It includes the following processes: automatic strainers, MF system (detailed below), equalization tank, RO transfer pumps, Cartridge filter, High pressure RO feed pump, Two-stage RO train (detailed below), UV disinfection system (detailed below), Decarbonator, lime stabilization, product water pumps, and chemical storage. The AWPF is located adjacent to the OWTP (Figure 3).

The three primary advanced treatment processes (MF, RO, and UV AOP) are designed to meet DDW performance criteria for indirect potable water reuse. A summary of each process is provided in Table 1.

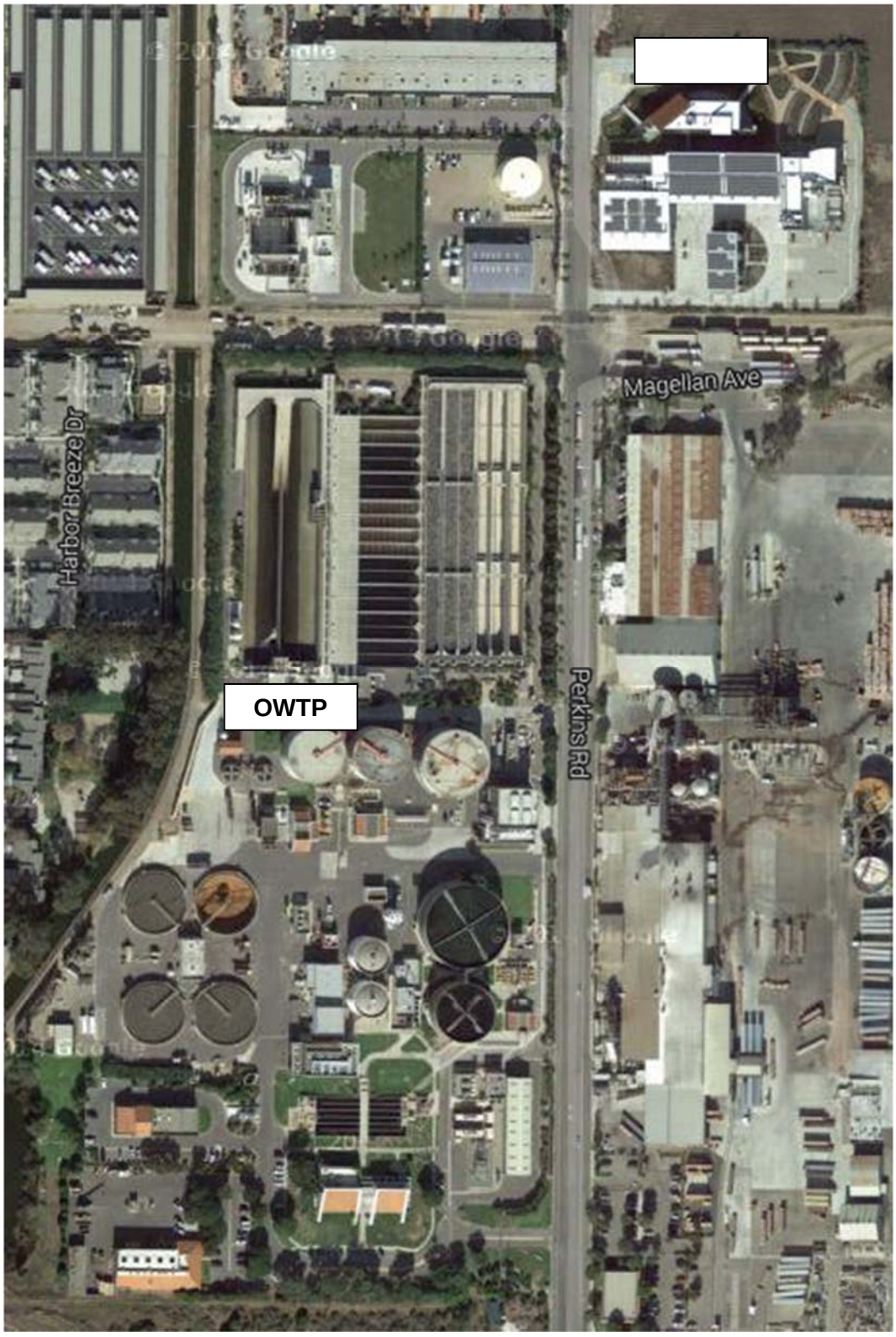

Figure 3 OWTP and AWPF

Table 1	Advanced Treatment Design Criteria Advanced Water Purification Facility City of Oxnard	
Process	**Performance Goal**	**Performance Monitoring**
MF	Filtrate Nephelometric Turbidity Unit (NTU)<0.2 NTU.	Maintaining turbidity values of <0.2 NTU indicates no gross membrane failure. However, insufficient research exists to correlate MF filtrate turbidity with pathogen removal.
	Pressure Decay Test (PDT, also called membrane integrity test (MIT)) <0.3 pounds per square inch per 5 minutes (psi/5min).	Daily testing demonstrates MF integrity, allowing for 4-log protozoa credit.
RO	Each membrane element must achieve ≥99% rejection of sodium chloride, and average rejection of ≥ 99.2% sodium chloride.	Track and trend electrical conductivity (EC) reduction through the RO membrane. Pathogen reduction credits for RO based upon this measured value.
	RO permeate must have a total organic carbon (TOC) ≤ 0.25 mg/L greater than 95% of the time at startup and through 20 weeks of operation. Subsequently, RO permeate TOC must be ≤0.5 mg/L.	No online TOC metering is currently installed, but online TOC metering will be installed prior to IPR operation. It remains to be determined TOC will be installed just after RO, or before and after RO.
UV AOP	≥0.5-log reduction of 1,4-dioxane; at least one continuously monitored surrogate or operational parameter shall be established to reflect that the minimum 1,4-dioxane criterion is being met.	Startup testing documents 1,4-dioxane removal and correlates such removal with an online surrogate (UVI/Q).
	6-log reduction of adenovirus.	UVI/Q values correlate with N-Nitrosodimethylamine (NDMA) destruction, which maintains continuous documentation of a UV dose well in excess of 235 mJ/cm^2; which is the dose for 6-log adenovirus. This minimum dose will be maintained at all times.

1.2.2.1 MF System

The MF system (Figure 4) is an outside-in MF system (PALL Microza) and consists of MF feed strainers, MF feed water ORP, pH, turbidity, and total chlorine residual analyzers. The

MF is used to remove particulate and microbial contaminants, including turbidity, *Giardia,* and *Cryptosporidium* using a low-pressure filtration system. Upstream of RO, this system mitigates RO membrane fouling by reducing the level of particulates and larger colloids. MF also reduces the concentration of bacteria – particularly those that are particulate-associated. There are six treatment trains in parallel in the MF room with capacity for an additional six trains to be built if needed. One of the six trains can be out of service and the MF system will still maintain production of sufficient flow to result in 6.25 mgd of RO permeate.

Figure 4 MF Photos at the AWPF

1.2.2.2 RO System

RO units are furnished by H2O Innovation (Figure 5), and installed with Hydranautics ESPA2 membrane elements. The RO units are housed in their own room, with two identical skids running in parallel with individual production capacities of 3.125 mgd. Space for three additional RO skids of 6.25 mgd each is built into the room in for possible future needs. The RO system is monitored using online EC at the MF filtrate (RO feed) and several places on the RO. discharge; Stage 1, 2 and 3, total flow, and concentrate. These EC locations are at both trains. Currently there is no online TOC metering of this MF filtrate or RO permeate, though the City intends to install TOC monitors on the RO feed and RO permeate prior to operation.

Figure 5 RO Photos at the AWPF

1.2.2.3 UVOX System

Three Trojan UVPhox D72AL75 reactors are installed to provide additional treatment of the RO permeate (ROP) via AOP. These reactors operate with low-pressure high-output (LPHO) lamps and with dosed hydrogen peroxide (H_2O_2); based upon a target EEO sufficient for 0.5 log reduction of 1,4-dioxane. Startup testing, documented further on, demonstrates the dose capacity of this system and effective monitoring using a UVI/Q process. These three reactors each have two banks, for a total of six banks of UV lamps. Five of those banks are duty, and the sixth bank is redundant. Similar to the MF and RO systems, there is room to expand this UV system to meet future needs (Figure 6).

1.3 Public Outreach and Coordination Effort

The City has yet to initiate a formal outreach effort to the general public to discuss this IPR project. Stakeholders, however, are aware of this project and will be further informed as detailed below.

Figure 6 Photo of Similar UV Phox

1.3.1 Stakeholders

Key regional stakeholders are aware of this IPR project. These stakeholders include the CMWD, the UWCD, the FCGMA, and the City of Ventura. CMWD, UWCD, and FCGMA are directly involved in water supply to the City. Other regional stakeholders include various regulatory and governmental bodies, and several environmental organizations. The Program Environmental Impact Report (PEIR), completed in 2004, included the required public notice and engagement regarding the various aspects of the GREAT program, including potable reuse (CH2MHill, 2004).

Once this Engineer's Report is submitted for review and approval by DDW and the Regional Water Quality Control Board (RWQCB), the City will re-engage with project stakeholders.

1.3.2 System Startup

As outlined in subsequent sections of this Engineer's Report, extensive testing of the purification system has been completed to demonstrate compliance with DDW's groundwater recharge regulations. This testing was done during the normal operation of the GREAT system for non-potable reuse applications. These tests are detailed in the following Chapter 17.

After the construction of the proposed IPR ASR well, a series of tests will be done on the background groundwater quality. This information, once it is thoroughly reviewed, will be presented to the various stakeholders and for regulatory review.

1.3.3 Public Hearing and Notifications

The City will follow the public hearing requirements specified in the DDW groundwater recharge regulations, which were adopted in June 2014 and are now included in the Division of Drinking Water (DDW) Water Recycling Criteria (CDPH, 2014). Section 60320.202 includes a review of the necessary public and regulatory notice requirements of the proposed project. In general, the following approach will be followed:

- The City will provide DDW and the RWQCB the information it intends to present at the hearing regarding this IPR project.
- After the Engineering Report has been approved, the City will post the Report on its website and make it available at the City's office at least 30-days prior to the hearing.
- The City will notify the public about the availability of the information and the public hearing, including how the public can provide comments and attend the hearing. This can be done through several media channels.
- The City will notify the first downgradient potable water well owner and well, which is the City of Oxnard.
- Further outreach will also occur once the draft tentative permit is issued. In accordance with California Water Code (CWC) Section 13167.5, the Los Angeles RWQCB (LARWQCB) must provide notice and a period of at least 30 days for public comment prior to adoption of a Waste Discharge Requirement (WDR) and/or Water Recycling Requirement (WRR). This is accomplished by providing a draft of the amendment to anyone who has requested a copy or by posting the draft on the LARWQCB website and providing an electronic notice to interested parties. After posting on the consent calendar, the LARWQCB will hold a public hearing that provides opportunity for further public comment.

1.3.4 California Environmental Quality Act (CEQA)

The CEQA compliance is summarized below under the "Environmental Compliance" section.

1.4 Environmental Compliance

The CEQA process for the GREAT treatment facilities has already been completed (CH2MHill, 2004). This process provided an open forum for public comment on the project at the time of that work (2004).

An addendum to that EIR was completed in January of 2015 by Hollee King to address the ASR well and monitoring wells (King, 2015). In a letter dated January 21, 2016, the Governor's Office of Planning and Research State Clearinghouse and Planning Unit issued

a letter of compliance to Oxnard for the ASR project, stating "that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act" (State of California, 2016).

1.5 Project Goal

The goal of the GREAT program is to ensure a future reliable and affordable supply of high-quality water. Phase 1 (6.25 mgd, or 7000 AFY) treatment facilities have been constructed and is now producing water for non-potable use. The City has plans to expand the production capability of this facility, and will provide details of this expansion at a future date.

1.6 Purpose of This Report

The purpose of this Title 22 Engineering Report is to provide detailed information on the design of the City's AWPF, describe the water reuse goals for the City, clearly indicate the means for compliance with DDW's groundwater recharge regulations and any other features specified by the RWQCB, and in total, gain approval for the City to implement an IPR groundwater recharge project.

This Engineering Report is in compliance with the State of California Water Recycling Criteria (CDPH, 2014) that requires the submission of an Engineer's Report to the RWQCB and DDW prior to any modification to an existing project or implementation of a new project.

2.0 PROJECT PARTICIPANTS

The City intends to recharge groundwater and extract groundwater from the same location. This operation, under the current plan, will not impact other utilities or entities. With that said, there are a number of key participants outside of the City that have had, and will have, a role in the successful implementation of IPR. The project participants, their role, and their contact information are listed below in Table 2.

3.0 REGULATORY REQUIREMENTS

The overarching regulatory requirements are summarized in this section. The specific parameters for monitoring and permit compliance are documented in Sections 9 and 15.

3.1 California Water Code (CWC)

The CWC stipulates that each RWQCB formulate and adopt Water Quality Control Plans (Basin Plans) for all areas governed by the board. These plans must contain water quality objectives for surface water and groundwater within the regions that provide reasonable protection of the beneficial uses of the waters. During the process of formulating such plans the RWQCBs must consult with and consider recommendations of affected state and local agencies. Such plans shall be periodically reviewed and may be revised (Section 13240).

Table 2 List of Key Project Participants
Advanced Water Purification Facility
City of Oxnard

Organization	Name	Contact Information	Project Role
City of Oxnard	David Lutz, AWPF Plant Manager	Desk: (805) 271-2203 Cell: (760) 415-2496 david.lutz@oxnard.org	Responsible for Daily Production of Purified Water and Operation of the ASR System.
City of Oxnard	Dan Rydberg, Director of Public Works	(805) 385-8055. Daniel.Rydberg@ci.oxnard.ca.us	Overall potable reuse program manager for the City.
City of Oxnard	Thien Ng, Wastewater Division Manager	(805) 432-3575 Thien.Ng@ci.oxnard.ca.us	Project Manager for this potable reuse project.
RWQCB	Elizabeth Erickson	(213)576-6665 Elizabeth.Erickson@waterboards.ca.gov	Lead RWQCB permitting authority for this project.
DDW	Jeff Densmore, District Engineer	(805)566-1326 Jeff.densmore@waterboards.ca.gov	Lead DDW permitting authority for this project.
DDW	Kurt Souza, South Field Branch Chief	(805)566-1326 Kurt.souza@waterboards.ca.gov	Regional oversight and perspective on potable reuse.
CalMWD	Kristine McCaffrey, Manager of Engineering	805-579-7173	Regional Stakeholder.
UWCD	Tony Morgan, GW Dept Manager Tony Emmert, Deputy GM	805-525-0621 805-317-8961	Regional Stakeholder.
FCGWMA	Gerhardt Hubner	805-654-5051	Regional Stakeholder.
City of Ventura	Shana Epstein, General Manager	805.652.4518 sepstein@venturawater.net	Adjacent City dealing with similar water supply concerns and potable reuse considerations.
Consultant Team			**Project Role**
Carollo Engineers	Tracy Clinton, Project Manager	(925)932-1710 tclinton@carollo.com	Project Manager for Water Reuse Permitting and Implementation, working for the City.
Carollo Engineers	Andrew Salveson, Project Engineer	(925)932-1710 asalveson@carollo.com	Engineer of Record for this Engineer's Report.
Hopkins Groundwater Consultants	Curtis Hopkins, Principal Hydrogeologist	(805)653-5306 chopkins.hgc@sbcglobal.net	Groundwater hydrogeologist of record for this Engineer's Report & Well Monitoring Plan
HLK Planning	Hollee L. King	(805)901- 2261 hollee@hlkplanning.com	CEQA Permitting Lead.
MV Engineering LLC	Mary Vorissis	(805) 217-8494 mary.vorissis@gmail.com	Operations and Maintenance Management Plan (OMMP)

In accordance with CWC Section 13260, all persons discharging waste within the region must file with the appropriate board, and provide information pertaining to their discharge. Within the region, it is not permitted for a person to construct, maintain, or use any waste well that interferes with a source for domestic water supply without proper permitting or exceptions (CWC Section 13540). “Recycling criteria” are the levels of constituents of recycled water, and means for assurance of reliability under the design concept which will result in recycled water safe from the standpoint of public health, for the uses to be made (CWC Section 13520). Section 13521 of the CWC states that the State Department of Public Health (now DDW) shall establish uniform statewide recycling criteria for each varying type of use of recycled water where the use involves the protection of public health.

Section 13522 stipulates that if a contamination occurs as a result of recycled water, then procedures for abating this contaminant must be followed in accordance with the Health and Safety Code. The use of recycled water must not cause, constitute, or contribute to, any form of contamination. In order to comply with contamination prevention with recycled water use, any person recycling or proposing to recycle water must file for appropriate permitting with the regional board (Section 13522.5).

If a master recycling permit is granted, it must include at a minimum (Section 13523.1): waste discharge requirements(WDRs), a permittee statewide recycling criteria compliance requirement, recycled water producer end user rule enforcement requirement, requirement for a recycled water use quarterly report, periodic facility inspection requirement, and additional requirements given by the regional board in permit. Recycled water may only be used for the permitted purpose, as specified by the regional board (Section 13524).

3.2 DDW Requirements

DDW (formerly CDPH) has developed criteria for both non-potable uses of recycled water and groundwater recharge for subsequent potable use, with the most recent version updated as of June 2014 (CDPH, 2014). This Engineering Report deals specifically groundwater recharge for potable reuse.

This project will meet the requirements specified in the Water Recycling Criteria (CDPH, 2014). Key regulatory requirements related to groundwater recharge are summarized in Table 3.

3.3 RWQCB Requirements

The OWTP currently discharges to the Pacific Ocean under existing NPDES permit (CA0054097) Order No. R4-2013-0094 which was adopted on June 6, 2013 and became effective on July 26, 2013 (WW-16). The City also operates an AWPF under its GREAT Program, to produce non-potable water for reuse. The GREAT Program operates under a separate WRR and WDR Order No. R4-2008-99-0083 (WW-17), as amended by Order No. R4-2011-0079 and R4-2008-0083-A01.

Table 3 List of Key Potable Reuse Regulatory Requirements for Groundwater Recharge Advanced Water Purification Facility City of Oxnard

Issue	Regulation Citation	Regulatory Concept	Section in This Report
Alternate Source of Supply	60320.200(b)	The project proponent must have a plan for an alternative water supply in the event of a treatment process failure or unforeseen water quality event.	8
Background Groundwater Quality Sampling	60320.200(c)	Background groundwater quality must be documented to allow for a comparison with the recycled water.	12
Underground Retention Time for Recharged Water	60320.200(d)	The recycled water must be stored for a specific time prior to potable use to allow for monitoring of water quality and response in the event of water quality concerns.	6,7
Groundwater Flow Maps and Hydrogeology	60320.200(e, h)	The groundwater transport must be sufficiently and conservatively documented to provide confidence that a minimum specified travel time is obtained.	6
Treatment Process Performance	60320.200(f,g)	The proponent must demonstrate its ability to produce a high quality water protective of public health.	5,9
Advanced Treatment Criteria, RO	60320.201 (a,b)	The RO membranes must meet specific EC and TOC performance criteria and be monitored by a proven method to demonstrate continuous performance.	5
Advanced Treatment Criteria, Advanced Oxidation	60320.201 (d,e)	The advanced oxidation system must be sufficiently robust to provide specific log reduction of one or more trace pollutants and have a proven method for monitoring performance online.	5
Public Hearing	60320.202	The project proponent must provide notice to the public and stakeholders regarding the intent and implementation of the potable reuse project.	1
Wastewater Source Control	60320.206	A rigorous wastewater source control is required to minimize impacts to potable reuse water quality.	4
Pathogenic Microorganism Control	60320.208	Specific pathogen reduction targets must be met through a series of multiple treatment processes. The log reduction requirements for virus, *Giardia,* and *Cryptosporidium* are 12, 10, and 10, respectively.	5
Nitrogen Compounds Control	60320.210	A total nitrogen standard of ≤10 mg/L must be met at all times.	9
Regulated Contaminants and Physical Characteristics Control	60320.212	The recycled water must meet DDW drinking water regulations for MCLs and action levels for lead and copper.	9

Table 3 List of Key Potable Reuse Regulatory Requirements for Groundwater Recharge
Advanced Water Purification Facility
City of Oxnard

Issue	Regulation Citation	Regulatory Concept	Section in This Report
Diluent Water	60320.214	No diluent water is being proposed for this project.	10
Recycled Water Contribution (RWC)	60320.216	The RWC is the relative amount of recycled water compared to the total water being recharged. For this project, the RWC is 100 percent.	10
Total Organic Carbon	60320.218	TOC is used as a bulk surrogate for organics in the purified water. A maximum TOC value of 0.5 mg/L is required.	9
Additional Chemical and Contaminant Monitoring	60320.220	Monitoring of recycled water and groundwater is required for priority toxic pollutants, chemicals with notification levels, and other chemicals specified by DDW.	15
Operation Optimization and Plan	60320.222	Prior to operation, a detailed Operation Optimization Plan approved by DDW is required to operate, maintain, and monitor the project.	16
Response Retention Time	60320.224	The response retention time (RRT) is the time to monitor and respond to treatment process failures. The RRT must be less than the underground retention time of the stored purified water.	7
Monitoring Well Requirements	60320.226	Prior to operation, monitoring wells must be placed in appropriate locations to monitor the movement and water quality of the injected water.	6,11

This potable reuse project will require a reissuance of the WDR/WRR Order No. R4-2008-0083, including the Monitoring and Reporting Program No. 9456. A Report of Waste Discharge (ROWD) is required to initiate the permit application process.

The LARWQCB regulates groundwater recharge projects under numerous state laws and regulations, including the Water Quality Control Plan, Los Angeles Region (hereinafter, the Basin Plan) and SWRCB policies. The Basin Plan requirements include groundwater objectives for minerals and drinking water Maximum Contaminant Levels (MCLs). The Basin Plan also applies the state's Anti-degradation Policy, which has been further interpreted pursuant to the 2013 SWRCB Recycled Water Policy (SWRCB, 2013).

3.4 SWRCB Requirements

The SWRCB has two policies related to this proposed IPR project. They are the Anti-Degradation Policy and the Recycled Water Policy. While the full expectation for this IPR

project is to improve groundwater quality through the injection of advanced-treated recycled water, the specific provisions of these two policies must be identified and met.

3.4.1 Anti-degradation Policy

Resolution 68-16 is the state's Anti-degradation policy, titled "Statement of Policy with Respect to Maintaining High Water Quality in California." The key components of this Resolution, listed here verbatim, are:

- "Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality water will be maintained until it has been demonstrated to the state that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies."
- "Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to ensure that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

3.4.2 Recycled Water Policy

The Recycled Water Policy was adopted by the SWRCB in 2009 and revised in 2013 (SWRCB, 2013). Relevant components of the Policy include Salt Nutrient Management Plans (SNMPs), Recycled Water Groundwater Recharge Projects (GRPs), anti-degradation, and monitoring constituents of emerging concern (CEC). Each of these is summarized below.

3.4.2.1 SNMPs

This element of the Recycled Water Policy requires SNMPs to be developed for every groundwater basin/sub-basin in California within five years of the Recycled Water Policy adoption (seven years with approved extensions). The objective of the SNMP is to manage salts and nutrients from all sources" on a basin-wide or watershed-wide basis in a manner that ensures attainment of water quality objectives and protection of beneficial uses." The SNMP includes the following tasks:

- Identify the SNMP work group and develop the SNMP work plan.
- Establish and manage a stakeholder process.
- Summarize/Characterize Water Management and Salt/Nutrient Management Goals and Objectives.
- Characterize Groundwater Basin Geology, Hydrology, and Hydrogeology.

- Summarize Existing Groundwater and Surface Water Monitoring Programs and Water Quality.
- Develop Salt and Nutrient Source Identification.
- Estimate Assimilative Capacity for Each Sub-Basin.

The City of Oxnard developed a preliminary draft SNMP for the Oxnard Plain (inclusive of the Oxnard Forebay) and Pleasant Valley groundwater basins (Carollo, 2016b). The preliminary draft was submitted to the LARWQCB and other stakeholders in July 22, 2016 for review and comment. The LARWQCB provided comments (email from Ginachi Amah, September 1, 2016). The United Water Conservation District provided comments regarding including potential use of purified water from the AWPF for recharge at UWCD facilities (personal communication, Dan Detmer UWCD). The City of Oxnard sent a response to comments to the LARWQCB in September 2016. The response to comments included the following request, related to allowing the City of Oxnard to obtain recycled water permits.

> *"The City of Oxnard respectfully requests that the RWQCB accept the Preliminary Draft Oxnard SNMP, as a draft document (with minor changes to accommodate TAG comments), with the understanding that the SNMP process is well underway, and that obtaining recycled water permits for the proposed projects identified in the Preliminary Draft Oxnard SNMP will not be impacted by delaying the development of a Final Oxnard SNMP. The City of Oxnard requests that the Final Oxnard SNMP be delayed to be coincident with the development of the Groundwater Sustainability Plan (GSP). It is envisioned that at that time, the involved stakeholders will determine the need for additional modeling and analysis based on the findings of the GSP."*

The Oxnard SNMP includes all of the required elements in the SNMP evaluation. Critical to the evaluation is the assessment of assimilative capacity and the evaluation of proposed projects.

The SNMP includes evaluation of existing groundwater quality and calculation of area weighted average TDS, chloride, and nitrate concentrations, by basin. Assimilative capacity for each constituent, which is a comparison of the existing groundwater quality with the target groundwater quality, summarized here. Note two things. First, the proposed ASR project is in the Oxnard Plain, which has assimilative capacity for chloride, TDS, and nitrate. Second, the purified water that will be used for groundwater recharge, will result in improved groundwater quality for all conditions.

- Oxnard Plain Excluding Coastal Saline Zone UAS (upper aquifer system)
  - Chloride Assimilative Capacity - YES
  - TDS Assimilative Capacity - YES
  - Nitrate Assimilative Capacity - YES

- Oxnard Plain Excluding Coastal Saline Zone LAS (lower aquifer system)
  - Chloride Assimilative Capacity - YES
  - TDS Assimilative Capacity - YES
  - Nitrate Assimilative Capacity - YES
- Oxnard Forebay
  - Chloride Assimilative Capacity - YES
  - TDS Assimilative Capacity - YES
  - Nitrate Assimilative Capacity - YES
- Pleasant Valley
  - Chloride Assimilative Capacity - YES - LIMITED
  - TDS Assimilative Capacity - NO
  - Nitrate Assimilative Capacity - YES

The City of Oxnard is planning to implement ASR in the Oxnard Plain. The purpose of the proposed ASR projects is to provide potable water supply. It is conservatively assumed that the proposed ASR project(s) would not necessarily lead to a reduction in groundwater pumping (via offsetting use of existing wells) or use of imported water, both of which would have potential groundwater quality benefits. The intent of the ASR project is to inject recycled water into a groundwater aquifer, allow it to remain within the aquifer for a specified retention time, and then extract the water for potable use.

Agricultural irrigation with recycled water from the AWPF may be delivered directly to agricultural areas east of the City of Oxnard and/or delivered to PVCWD. Use of recycled water would likely offset existing water supplies for agricultural irrigation (groundwater or other). Recycled water delivered directly to agricultural areas east of the City of Oxnard would recharge the Oxnard Plain. If recycled water from the AWPF is sold to PVCWD, then it would be comingled with PVCWD existing water supplies and delivered for agricultural irrigation within the PVCWD service area. Recycled water delivered to PVCWD would recharge the Oxnard Plain and the Pleasant Valley Basin.

The AWPF treatment facility will produce purified recycled water and includes MF, RO, and UV AOP. It is anticipated that lime will be added to restore the alkalinity and calcium to the water to minimize the corrosivity of the recycled water. Prior estimates for TDS and chloride of the reverse osmosis permeate was projected as 201 mg/L and 70 mg/L, respectively (Jensen Design and Survey 2015). Approximately 30 m/L of additional TDS was attributed to lime addition. Therefore, the predicted TDS, chloride and nitrate concentrations were 230 mg/L, 70 mg/L, and 0.7 mg/L as N, respectively. More recent numbers for the AWPF reverse osmosis permeate water suggest values of approximately 51 mg/L TDS, 14 mg/L chloride, and 0.11 mg/L as N of nitrate. Accounting for the additional TDS of lime addition, and adding in conservatism (factor of 2) to the estimates, it is assumed for this analysis that

the recycled water from the AWPF has 160 mg/L TDS, 30 mg/L chloride, and 0.2 mg/L nitrate as N. The predicted water AWPF recycled water quality is well below the objectives and existing water quality in all systems of all basins within the study area.

As discussed, the City of Oxnard's proposed recycled water projects include potable reuse via ASR. In an ASR configuration, the recycled water is injected into an aquifer and extracted for use after some specified residence time. The purpose of the ASR projects is to provide water to meet increasing demands, and it is conservatively assumed that the water from the ASR project(s) will not offset existing groundwater pumping.

Relative to the time scales that are important in groundwater fate and transport, the residence time in an ASR configuration is relatively short. ASR effectively provides a relatively small and temporary additional load to the basin. There may be localized mixing of the injected water (desalted) and the groundwater aquifer during the residence time in the aquifer. However, any mixing that would occur would provide a diluting effect on existing groundwater, due to the superior quality of the AWPF recycled water as compared to existing groundwater quality. Therefore, if there is any effect of the temporary injection of AWPF water into aquifers in the Oxnard Plain, then it would be a beneficial effect of dilution. From a salt and nutrient loading perspective, ASR generates a no-net change to the existing system. Since ASR will effectively provide no change to groundwater quality (or possibly a benefit to groundwater quality) then it is reasonable to conclude that the proposed ASR project(s) are allowable under the SNMP framework and should proceed, provided that other regulatory requirements are met.

The SNMP evaluation of the City's proposed recycled water projects concluded that these projects can be implemented provided that all other regulatory requirements are met. It should be noted, that the SNMP includes management measures and a monitoring plan, and that the City will likely share the responsibility for implementing management measures and monitoring as part of future management and evaluation of groundwater quality in the Oxnard Plain and Pleasant Valley Basins.

3.4.2.2 Recycled Water Groundwater Recharge Projects

As listed in the Recycled Water Policy, approved GRPs must meet the following criteria:

- Compliance with regulations adopted by CDPH for groundwater recharge projects (CDPH, 2014).
- Implementation of a monitoring program for CECs and priority pollutants, consistent with recommendations from DDW.

Additionally, the Recycled Water Policy states that the “Regional Water Board” can implement “additional requirements for a proposed recharge project that has a substantial adverse effect on the fate and transport of a contaminant plume or changes the geochemistry of an aquifer thereby causing the dissolution of constituents, such as arsenic, from the geologic formation into groundwater.”

3.4.2.3 Anti-degradation

As stated in the Recycled Water Policy, "the proponent of a groundwater recharge project must demonstrate compliance with Resolution No. 68-16. Until such time as the City's SNMP is completed, such compliance may be demonstrated as follows:

- A project that utilizes less than 10 percent of the available assimilative capacity in a basin/sub-basin (or multiple projects utilizing less than 20 percent of the available assimilative capacity in a basin/sub-basin) need only conduct an antidegradation analysis verifying the use of the assimilative capacity. For those basins/sub-basins where the Regional Water Boards have not determined the baseline assimilative capacity, the baseline assimilative capacity shall be calculated by the initial project proponent, with review and approval by the Regional Water Board, until such time as the salt/nutrient plan is approved by the Regional Water Board and is in effect. For compliance with this subparagraph, the available assimilative capacity shall be calculated by comparing the mineral water quality objective with the average concentration of the basin/sub-basin, either over the most recent five years of data available or using a data set approved by the Regional Water Board Executive Officer. In determining whether the available assimilative capacity will be exceeded by the project or projects, the Regional Water Board shall calculate the impacts of the project or projects over at least a ten-year time frame.
- In the event a project or multiple projects utilize more than the fraction of the assimilative capacity designated in subparagraph (1), then a Regional Water Board-deemed acceptable antidegradation analysis shall be performed to comply with Resolution No. 68-16. The project proponent shall provide sufficient information for the Regional Water Board to make this determination. An example of an approved method is the method used by the State Water Board in connection with Resolution No. 2004-0060 and the Regional Water Board in connection with Resolution No. R8-2004-0001. An integrated approach (using surface water, groundwater, recycled water, stormwater, pollution prevention, water conservation, etc.) to the implementation of Resolution No. 68-16 is encouraged."

The regional groundwater quality is presented in Section 12 of this report. A review of anti-degradation and assimilative capacity is included in Section 14 of this report.

3.4.2.4 CEC Monitoring

The Recycled Water Policy addresses CECs and acknowledges that the state of knowledge on CECs is incomplete. CEC concentrations in finished water should be minimized through effective source control and treatment programs. The monitoring of specific CECs is required for groundwater recharge projects, and the CEC requirements for injection projects are reviewed in Section 9 of this Engineer's Report.

3.5 Recycled Water Conveyance Pipeline

The advanced treated recycled water is pumped from the AWPF north in an existing recycled water backbone line and to the east to serve farmers. These lines are feeding recycled water to several non-potable applications. The line currently terminates near the River Park Development. Spurs from this line will be constructed to carry the recycled water to the West for the ASR application and to the North for future spreading operations.

3.6 Spreading Facilities

In addition to the proposed ASR application, the City has investigated potential potable reuse spreading applications at other locations within the City (Woolsey Pits, Ferro Pits). At this time, the City does not intend to pursue these alternatives.

3.7 Injection Facilities

The injection and monitoring facilities must meet the criteria of CDPH (2014), including section 60320.226. This section specifies:

- Prior to operating a Groundwater Replenishment Reuse Project (GRRP), a project sponsor shall site and construct at least two monitoring wells downgradient of the GRRP such that:
  - At least one monitoring well is located no less than two weeks but no more than six months of travel time from the GRRP, and at least 30 days upgradient of the nearest drinking water well.
  - At least one monitoring well is located between the GRRP and the nearest drinking water well.

For this project, sufficient monitoring wells are proposed that meet CDPH (2014), as detailed in Section 11.

4.0 SOURCE WATER FOR POTABLE REUSE

The production of purified water starts with an effective source control program and is followed by reliable primary and secondary treatment. Source water, and an enhanced source water control program, are detailed in the following report, which is intended as a stand-alone document, but also vital to this Engineering Report: *Indirect Potable Reuse Enhanced Source Water Control and Collection System Monitoring Program* (Carollo, 2016a); also attached here as Appendix A. Sections from that report are briefly summarized here.

The OWTP is permitted under Waste Discharge Requirements Order No. R4-2013-0094 (NPDES No. CA0054097), which was issued to the City in June 2013, and operates an EPA-approved industrial pretreatment program. That program is operating based upon an

approved Local Limits program (from 1999). Oxnard is now updating that Local Limits program.

The regulatory requirements for wastewater source control are defined in Section 60320.206 of the regulations for groundwater recharge with recycled water (CDPH, 2014). For this project, the City must administer an industrial pretreatment and pollutant source control program that includes, at a minimum:

A. An assessment of the fate of Department-specified and RWQCB-specified chemicals and contaminants through the wastewater and recycled municipal wastewater treatment systems.

B. Chemical and contaminant source investigations and monitoring that focuses on Department-specified and RWQCB-specified chemicals and contaminants.

C. An outreach program to industrial, commercial, and residential communities within the portions of the sewage collection agency's service area that flows into the water reclamation plant subsequently supplying the GRRP, for the purpose of managing and minimizing the discharge of chemicals and contaminants at the source.

D. A current inventory of chemicals and contaminants identified pursuant to this section, including new chemicals and contaminants resulting from new sources or changes to existing sources, that may be discharged into the wastewater collection system.

E. Is compliant with the effluent limits established in the wastewater management agency's RWQCB permit.

The referenced report (*Indirect Potable Reuse Enhanced Source Water Control and Collection System Monitoring Program)*, included as Appendix A, is intended to address each of these items to the satisfaction of the Division of Drinking Water (DDW).

The Enhanced Source Control Monitoring Program (ESCMP) builds on the existing source control program already in place at the City of Oxnard; including:

- A source control program manager overseeing all data collection and regulatory issues relating to discharge from the first user to groundwater wells.
- More frequent sampling than required in the secondary effluent and AWPF finished water, including regulated, unregulated and industry-specific constituents.
- Use of historical and operationally collected online monitoring data required for operation to create baselines and predict trends in process performance.
- Heavily involved industrial outreach programs and residential outreach programs for potable reuse education and discharge initiatives.
- Mapping strategies for fast-acting collection system tracing of detected contaminants of health concern.

- Optional additions to discharge mapping, including hospitals.
- Ensure all SIUs report monthly and annual TTO monitoring results.
- Annual review of slug discharge control plans from SIUs.

5.0 PATHOGEN MICROORGANISM CONTROL

CDPH (2014) requires that potable reuse projects for groundwater recharge provide a combined level of treatment resulting in 12-log virus reduction, 10-log *Giardia* reduction, and 10-log *Cryptosporidium* reduction (12/10/10-log removal). No single process can receive more than 6-log reduction credit. CDPH (2014) also states that at least three processes must provide at least 1-log reduction. Beyond those three key processes, processes which provide <1-log reduction can be included within the analysis.

The step-by-step removal of pathogens, from raw wastewater to the production of potable water is reviewed below.

5.1 Primary and Secondary Treatment

Table 2-3 of USEPA (1986) lists less than 10 percent removal of total coliforms, 35 percent removal of fecal coliforms, and less than 10 percent removal of virus through primary treatment. Protozoa removal through primary treatment is not listed. The same Table (2-3) includes bacteria and virus removal percentages for secondary treatment (not including disinfection), indicating 90 to 99 percent removal of both total and fecal coliforms, and 76 to 99 percent removal of virus.

Francy *et al.* (2012) indicates 99 to 99.98 percent removal of bacteria and 88 to 99.9995 percent removal of various virus and coliphage. The single data set with any data below 90 percent removal, which was for adenovirus, showed removal ranging from 88 to 99.93 percent with a median removal of 99.8 percent.

One of the most recent DDW approval of pathogen removal credits for combined primary and secondary treatment, was obtained by the Water Replenishment District (WRD) (2013). That document relied upon risk analysis data presented in Olivieri *et al.* (2007) which was developed based upon Rose *et al.* (2004). Within Rose *et al.* (2004), the research team defined the range of bacteria, enterovirus, *Cryptosporidium*, and *Giardia* removal through six different full-scale wastewater treatment plants. The raw data from that work is reported in Olivieri *et al.* (2007). For WRD (2013), the pathogen removal credits for their secondary process were based upon the data from two of the six tested secondary process configurations. Specifically, two of the secondary process trains (Facilities C and D, with SRTs of 1.6-2.7 days and 3-5 days, respectively) had SRT values less than the secondary process feeding the WRD advanced treatment system (>9 days), and thus are presumed to be conservative estimates of performance. Per CDPH request, WRD (2013) used the lower 10th percentile values calculated for each pathogen, resulting in 2.06-log reduction of

enterovirus, 1.42-log reduction of *Cryptosporidium*, and 2.42-log reduction of *Giardia.* Note that analysis of the same data set by Carollo Engineers found one data translation error, but the overall impact on the log reduction credits is minimal.

Interpretations of the data set (Rose *et al.,* 2004) suggest that longer SRT values result in increased pathogen removal. While this may be the case, the raw data from Rose *et al.* (2004) does not show this clearly (Table 4). For example, Facility F from that research with the longer SRT has reduced protozoa reduction than most of the other facilities, but also shows the best virus removal compared to the other facilities. The lowest virus removal occurs at Facility A, which has an SRT of 6 to 8 days, similar to the TIWRP. This data set is limited and making projections based upon SRT is speculative. Without site-specific data, our team recommends using the lower 10th percentile of the entire data set in Table 4, which results in 1.9-log reduction of virus, 1.2-log reduction of *Cryptosporidium*, and 0.8-log reduction of *Giardia*.

Table 4 Pathogen Reduction Values Through Primary and Secondary Treatment (from Rose *et al.*, 2004)
Advanced Water Purification Facility
City of Oxnard

Lower 10th Percentile Values		**Log Reduction**		
SRT	**Facility**	**Enterovirus**	***Giardia***	**Crypto**
1.6-2.7	C	1.8	2.6	1.25
3-5	D	2.05	1.35	1.4
3.5-6	B	1.95	2.45	1.6
6-8	A	1.65	0.8	0.7
8.7-13.3	E	1.75	2.6	1.9
8-16	F	2.6	0.9	0.25
1.6-16	**ALL**	**1.85**	**0.8**	**1.2**
7-8	***Projected for OWTP***	***1.9***	***0.8***	***1.2***
50th Percentile Values		**Log Reduction**		
SRT	**Facility**	**Enterovirus**	***Giardia***	**Crypto**
1.6-2.7	C	2.05	3.05	1.65
3-5	D	2.5	1.9	2.6
3.5-6	B	2.25	2.6	1.9
6-8	A	2.1	1.6	1.1
8.7-13.3	E	2.2	2.8	2.1
8-16	F	2.75	1.1	0.95
1.6-16	**ALL**	**2.3**	**2.6**	**1.6**
7-8	***Projected for OWTP***	***2.3***	***2.6***	***1.6***

As part of WateReuse Research Foundation Project 14-16, Oxnard has been researching the pathogen removal by the OWTP, in an effort to supplement, and potentially better understand, pathogen removal through the primary and secondary processes. The work, as of yet unpublished, examines a range of pathogens (*Giardia, Cryptosporidium*, norovirus,

total culturable virus, *E. coli*), biological surrogates (enterococci, total coliform, male specific coliphage, somatic coliphage), chemical surrogates (UV Absorbance, TOC, DOC, BOD), and innovative monitoring (fluorescence). The laboratory work was done by Southern Nevada Water Authority (chemistry) and BioVir (biology). Spanning nearly 12 months, with sampling over 6 dates (four data sets are currently complete), the project team is developing an understanding of pathogen concentrations and removal (Figures 7, 8, and 9).

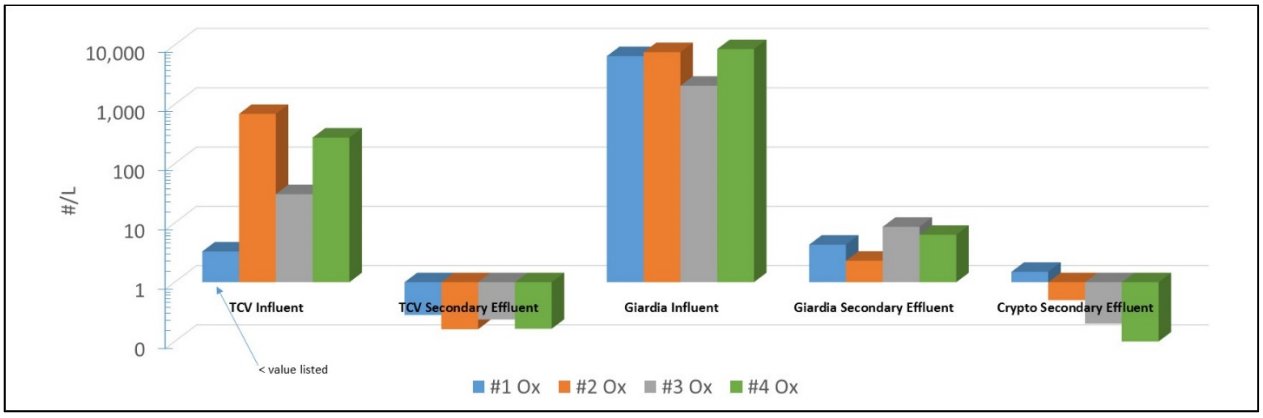

Figure 7 Total Culturable Virus, *Giardia*, and *Cryptosporidium* Concentrations in Raw Wastewater and Secondary Effluent for Oxnard

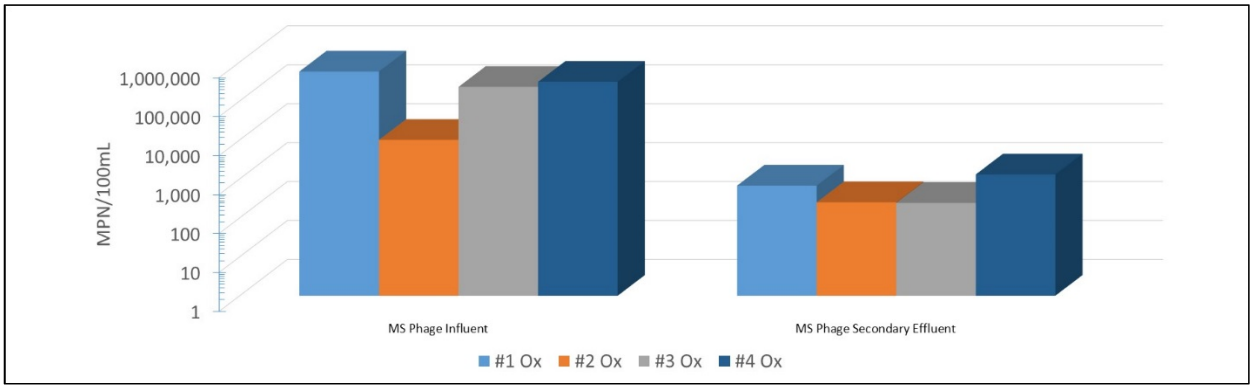

Figure 8 Male Specific Phage Concentrations in Raw Wastewater and Secondary Effluent for Oxnard

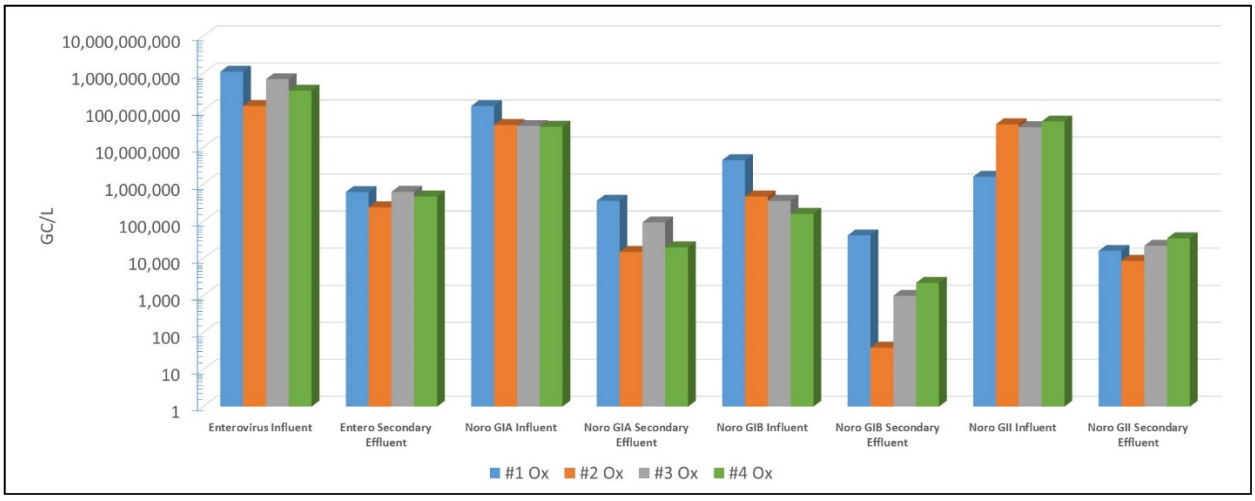

Figure 9 Enterovirus and Norovirus Concentrations in Raw Wastewater and Secondary Effluent for Oxnard

Analytical difficulty with *Cryptosporidium* enumeration inhibited calculation of log reduction for this organism. Log removal values (LRVs) for all other organisms were:

- Male Specific Phage - 1.6 to 2.98 LRV, with an average value of 2.47 LRV.
- Giardia - 2.38 to 3.52 LRV, with an average value of 3.05 LRV.
- Enterovirus - 2.7 to 3.2 LRV, with an average value of 2.97 LRV.
- Total Culturable Virus - 2.1 to 3.6 LRV, with an average value of 2.99 LRV.
- Norovirus Type GIA - 2.6 to 3.4 LRV, with an average value of 2.96 LRV.
- Norovirus Type GIB - 1.9 to 4.1 LRV, with an average value of 2.63 LRV.
- Norovirus Type GII - 2.0 to 3.7 LRV, with an average value of 3.01 LRV.

While raw wastewater and secondary effluent were sampled on the same day, the samples were not time-coupled, meaning that they do not necessarily represent the same drop of water and thus the average log reductions are likely more representative of performance compared to individual numbers. Using the lowest average for all virus removal and the average for Giardia removal, reasonable LRVs for protozoa and virus are 3-log and 2.5 log, respectively. **If we were to assume accuracy in the individual sample events and use the lowest measured reductions for protozoa and virus (not coliphage), we would result in 2.4-log and 1.9-log, respectively.** DDW, in a letter dated December 5, 2016, acknowledged the value of this new research to the industry, but raises important concerns regarding the lack of a surrogate to monitor log removal performance. As a result, DDW has stated that they will only approve the lower log removal values from Rose et al (2004); 1.9-log reduction of virus, 1.2-log reduction of *Cryptosporidium*, and 0.8-log reduction of *Giardia*.

The concentrations of the organisms in the secondary effluent also allow for an analysis of risk. Water treatment regulations for pathogens are predicated on reducing the risk of infection to minimal levels. For this project, the team has targeted the concentration end goals for pathogens that correspond to a modeled, annual risk of infection of 1 in 10,000 or less (Trussell *et al.*, 2013). DDW used this risk level to develop their pathogen criteria (CDPH, 2014a) and NWRI used this risk level to develop their pathogen criteria (NWRI, 2013). This risk level corresponds to the following potable water concentrations:

- *Giardia* - 6.80E-06 cysts/L.
- Cryptosporidium - 3.00E-05 oocysts/L.
- Enteric virus - 2.22E-07 MPN/L.

Giardia and *Cryptosporidium* results varied from 2.3 to 8.6 #/L and <0.1 to 1.5 #/L, respectively. Taking the highest count for each *Giardia* and *Cryptosporidium* results in a need for 6.1-log and 4.7-log of additional treatment following the secondary process to meet the risk-based levels above. Considering that subsequent MF treatment will provide 4-log protozoa removal, the subsequent RO will provide 1 to 2-log protozoa removal, and subsequent UV will provide 6-log protozoa removal, protozoa in the finished water does not represent a health concern.

For virus, there are many more data sets to evaluate. Total culturable virus concentrations in secondary effluent were 0.16 to 0.28 MPN/L. Taking the highest count results in a need for 6.1-log of additional treatment following the secondary process to meet the risk-based levels above. Considering that subsequent RO will provide 1 to 2-log virus removal and subsequent UV will provide 6-log virus removal, total culturable virus concentrations in the finished water does not represent a health concern.

Enterovirus, norovirus GIA, norovirus GIB, and norovirus GII had concentrations of 240,000 to 630,000, 15,000 to 360,000, 39 to 42,000, and 8,600 to 35,000 GC/L, respectively. ***An important difference*** between the total culturable virus test and the other tests is the use of a culture to measure viable organisms in the former, while the measurement of gene copies in the latter. Gene copy numbers do not necessarily correlate to viable pathogens and this is a current topic of research within our industry. A highly conservative approach would be to assume all gene copies to be viable pathogens. Following that approach and using the highest GC/L counts, an additional 11 to 12-log removal of virus would be needed through subsequent processes. Considering that subsequent RO will provide 1 to 2-log virus removal, subsequent UV will provide 6-log virus removal, and groundwater recharge can provide up to 6-log virus removal (depending upon travel/storage time), the finished water does not represent a health concern.

5.2 MF

Reardon *et al.* (2005) reported numerous studies showing bacteria rejection of 3 to 9 logs, protozoa rejection of 4 to 7 logs, and unreliable rejection of virus. The AWPF utilizes Pall Microza MF membranes, which are credited by CDPH for 4-log protozoa removal and 0.5-log virus removal (95 percent of the time), as documented by CDPH (2011). According to the Supplier's documentation, which cites USEPA (2003) and Sethi (2002) to calculate a maximum allowable pressure decay test (PDT) result that correlates to a specific protozoa log reduction.

Pall's approach is to use the maximum allowable TMP, the minimum feed water temperature, the maximum filtrate flow (27.2 gfd based upon the maximum flux in the Pall Operating Protocol and as measured in their 2011 Initial Performance Test), and a default VCF of 1.08. The result is that a PDT of 0.16 psi/min equates to a protozoa LRV of 4, which equates to a PDT of 0.80 psi/5min. Details on Pall's approach can be found in Appendix C.

Extensive SCADA data exists demonstrating compliance with this maximum PDT. As part of start-up demonstration testing of Oxnard's purification processes in April, May, and June of 2016, Carollo staff recorded a handful of PDTs and turbidity values, as shown below.

- **4/27/2016:** Rack 2 - 0.2, Rack 3 - 0.2, Rack 4 - 0.18, Rack 5 - 0.18, Rack 6 - 0.20
- **5/2/2016:** Rack 1 - 0.31, Rack 2 - 0.2, Rack 3 - 0.17
- **5/3/2016:** Rack 1 - 0.26, Rack 4 - 0.17, Rack 5 - 0.15, Rack 6 - 0.16
- **6/3/2016:** Rack 1 - 0.25, Rack 2 - 0.20, Rack 3 - 0.18, Rack 4 - 0.18, Rack 5 - 0.16, Rack 6 - 0.22
- **Influent Turbidity:** 3.48 to 5.09
- **Effluent Turbidity:** 0.04 to 0.10

During the May site visit and inspection, MF influent and effluent samples were also collected to analyze the particle size distribution (PSD). The analysis was done with Carollo's optical particle sizer/counter (PSS AccuSizer 780/SIS), with a sensitivity down to approximately 1 micron (Figure 10). The goal of the PSD testing was to set a baseline of performance for particle removal, focusing on the size range of protozoa (4 to 15 microns). The results demonstrate >3-log removal of particles in the 4 and 5 micron range, affirming the PDT performance shown above.

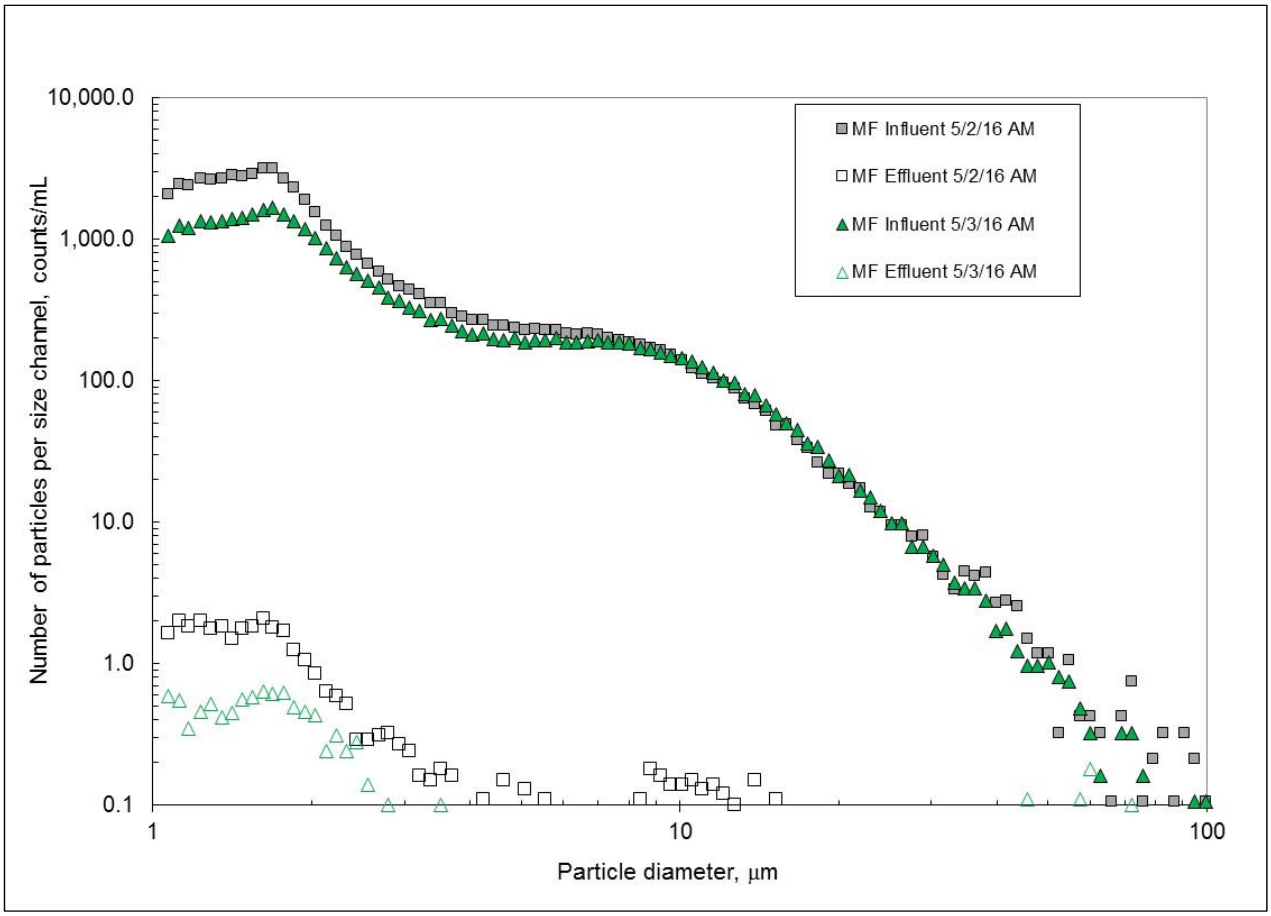

Figure 10 Particle Size Distribution for MF Influent and Effluent (5/2/16 and 5/3/16)

Online turbidity and PDT measurements for December 2014 through June 2016 are shown as Figures 11 and 12, respectively. The online results back demonstration results previously presented, showing the MF in normal operation at Oxnard is able to consistently achieve the PDT target. Online microfiltration filtrate turbidity measurements confirm a required effluent turbidity limit of <0.2 NTU is consistently met. Exceedances of 0.2 NTU in the MF filtrate were seen when 1) the online turbidimeter requires cleaning and calibration or 2) when the plant is cycling through a startup period and flow has not yet stabilized. Influent turbidity concentrations from secondary effluent, typically range between 1 - 6 NTU. Benchtop and online turbidimeter measurements during testing showed consistency when compared.

Overall, the City proposes to use 0-log virus reduction credit and 4-log protozoa reduction credit for this Pall membrane. No virus credit is sought because PDTs do not have sufficient resolution to measure virus removal performance.

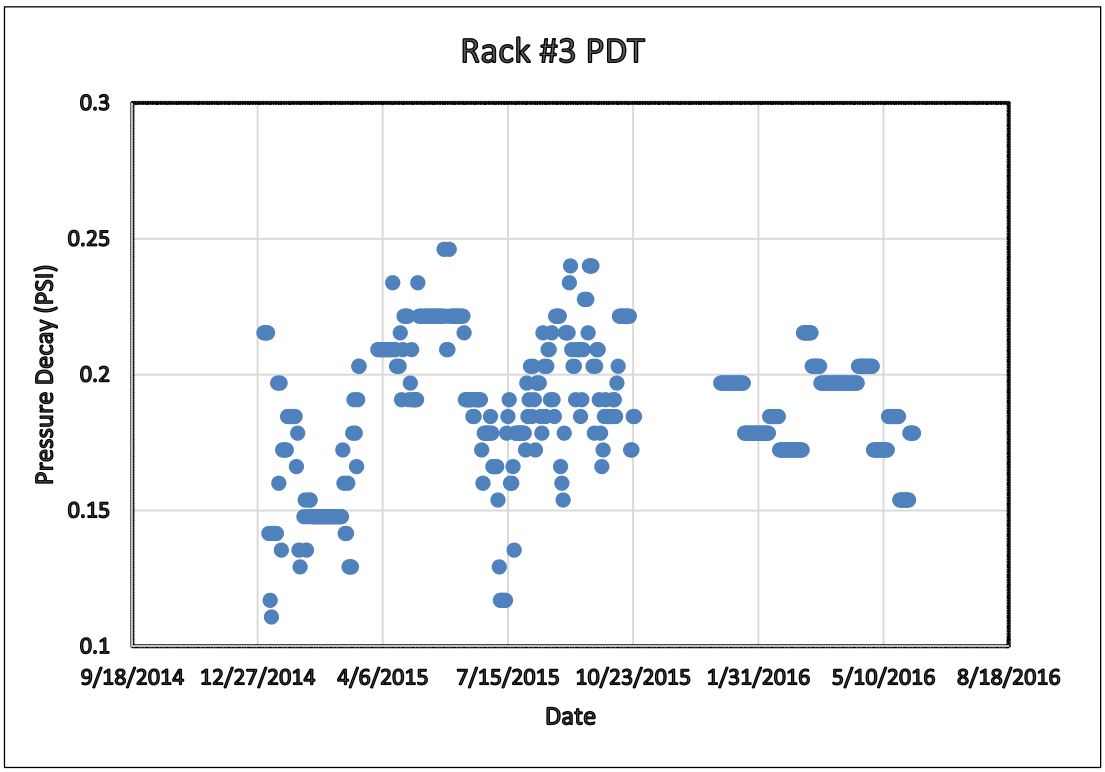

Figure 11 MF Online PDT Results for December 2014 through June 2016

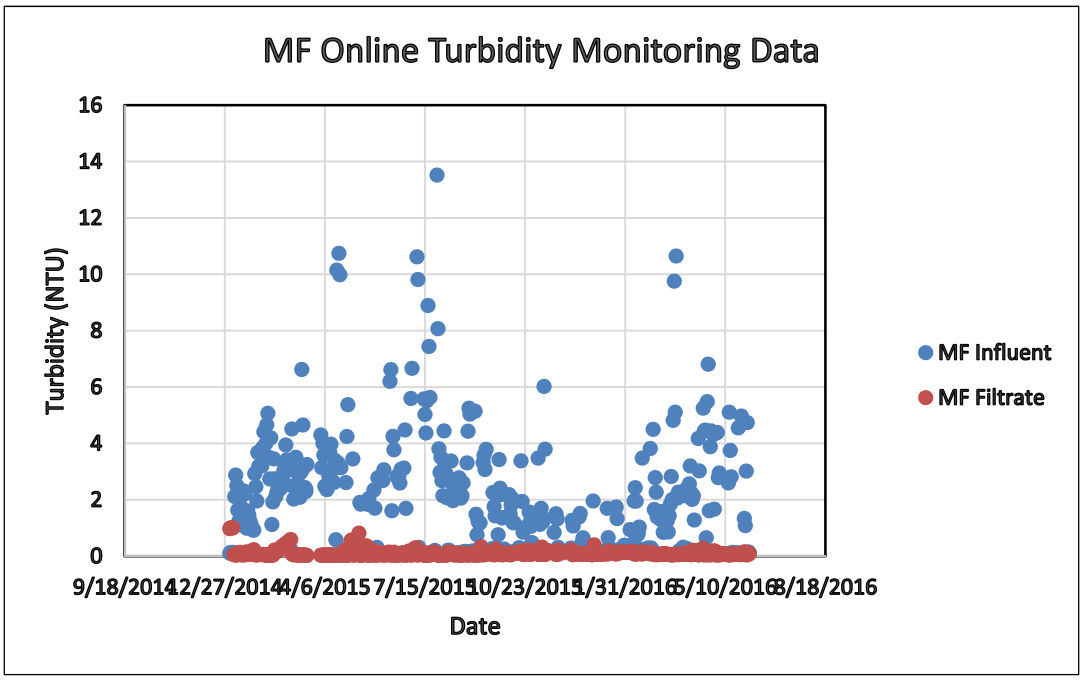

Figure 12 MF Influent and Filtrate Online Turbidity Data for December 2014 through June 2016

5.3 Reverse Osmosis

RO process performance for pathogen rejection is not governed by the ability of an intact membrane to reject pathogens but by the ability to monitor process integrity (Reardon *et al.* (2005) and Schäfer *et al.* (2005)). The monitoring tools currently used, electrical conductivity meters and total organic carbon (TOC) meters, can measure 99 percent or less removal of both parameters through the RO process. Recently, the CDPH granted 1.5-log reduction credit for all pathogens (i.e., virus, *Giardia*, and *Cryptosporidium*) for RO (WRD, 2013), based upon a requirement to continuously monitor TOC reduction across RO.

Currently, the City only measures EC across the RO membranes. During the Carollo performance demonstration testing and site audit, our team collected EC data.

- **5/2/2016:** Influent EC 2693 to 2787 µS/cm, Effluent EC 107 to 134 µS/cm.
- **EC LRV is 1.3 to 1.4.**

Monitoring and performance data showing online EC measurements of the RO system from March - May 2016 are displayed in Figure 13, with the average, minimum and maximum LRV results by train shown in Table 5 and Figure 14. The online data confirms The site inspection results from Carollo, showing an average of 1.47 LRV from a 3 month period, with a minimum LRV of ~1.29. These online results indicate consistent and reliable LRV of EC, that can be confidently correlated to pathogen removal credits.

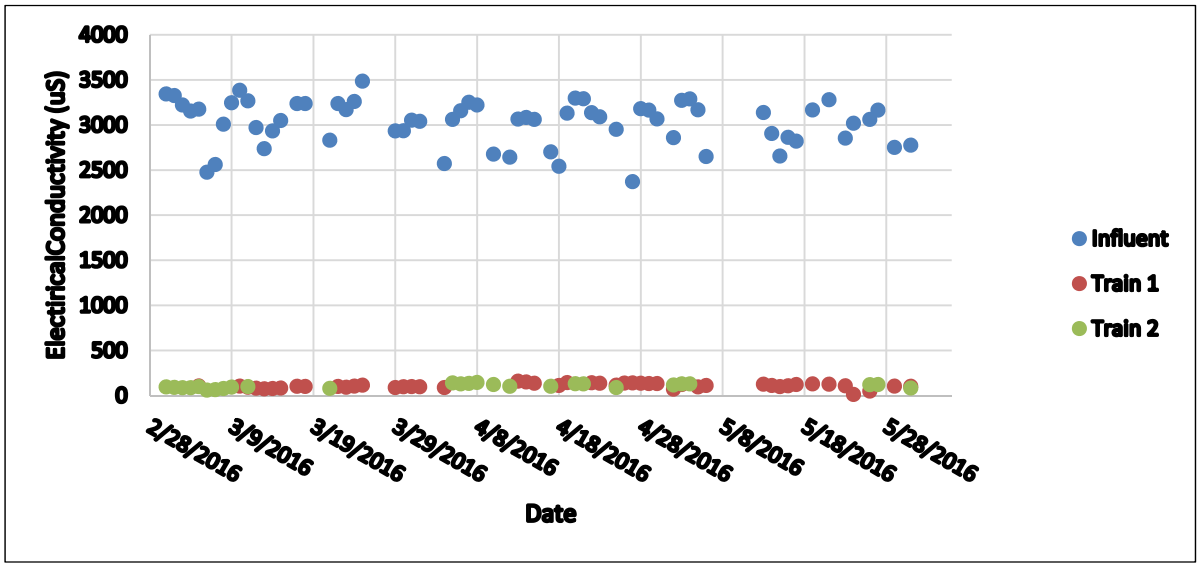

Figure 13 Influent and Effluent Historical (March 2016 - May 2016) Electrical Conductivity Online Data

Table 5	Average, Minimum and Maximum EC LRV through RO treatment March 2016 - May 2016 Advanced Water Purification Facility City of Oxnard		
	Train 1 LRV	**Train 2 LRV**	**Total Perm LRV**
Average	1.47	1.47	1.47
Min	1.23	1.34	1.29
Max	2.44	1.62	2.03

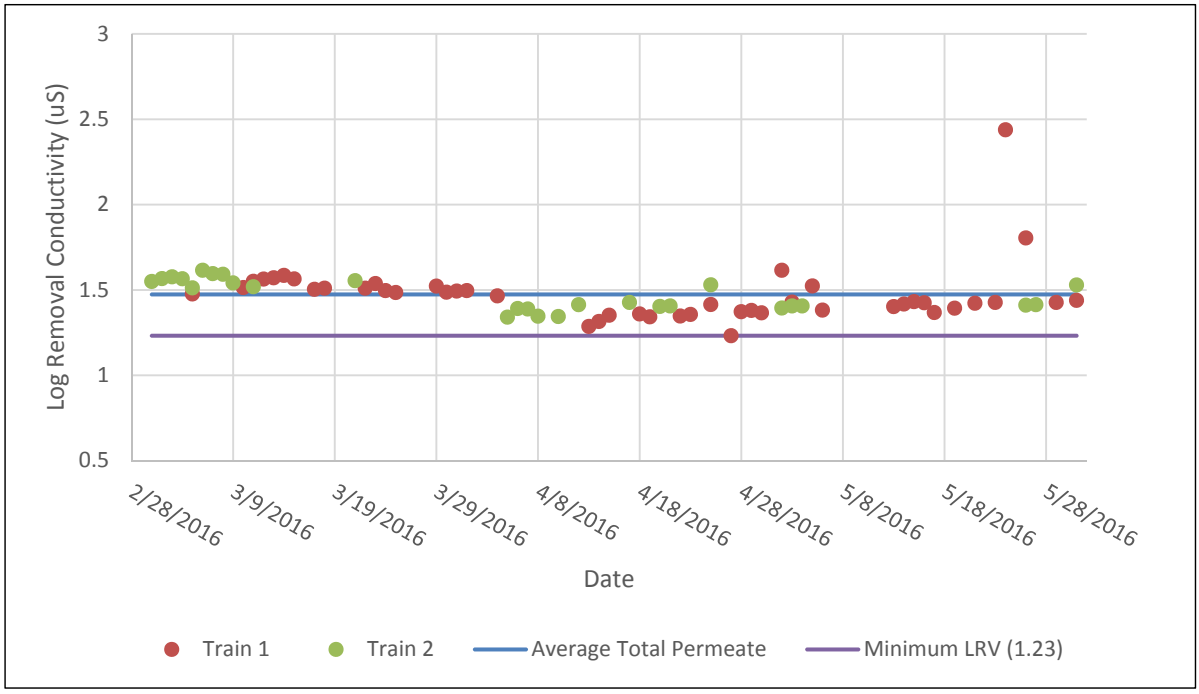

Figure 14 EC LRV Online Monitoring Data March 2016 - May 2016

The AWPF does not have online TOC meters, though intends to install them in the near future prior to operation. Grab samples were taken during the May Carollo inspection to document TOC removal across the RO process. TOC concentrations in the RO feed was 16 mg/L (on both 5/2 and 5/3), whereas RO permeate TOC concentrations were at the detection limit of 0.3 mg/L or below detection (again on 5/2 and 5/3). The LRV for this limited TOC data set is 1.7, suggesting that TOC reduction may be a more sensitive monitoring tool for RO performance and RO LRV credits.

In the April 2016 letter from DDW to the City, DDW stated that "online EC can show log reduction value (LRV) of approximately 0.5 to 1.0". The data collected here demonstrates a higher level of performance monitoring, with a minimum of 1.3 LRV. The City proposed to use the 1.3-log reduction value for all pathogens for RO at this time and use EC to monitor the performance of the system. DDW, in a letter dated December 5, 2016, approved a

credit of 1-log based upon EC monitoring. *In the future, the AWPF intends to install TOC meters and potentially demonstrate higher LRV credits using this or other advanced monitoring (such as online fluorescence) resulting higher pathogen removal credit.*

5.4 UV Advanced Oxidation

The UV advanced oxidation process (AOP) provides three primary values:

- Disinfection.
- NDMA Destruction by Photolysis.
- Trace Chemical Destruction Through Advanced Oxidation (1,4-dioxane).

Following RO treatment, advanced oxidation is accomplished through the use of UV and hydrogen peroxide (H_2O_2), with an H_2O_2 dose of up to 6 mg/L. The UV system is the D72AL75, which has gone through extensive validation for non-potable water reuse applications and is the same reactor as the ones used at the OCWD for the Groundwater Replenishment System. For the AWPF, there are three D72AL75 reactors in series (stacked). The “D” in “D72AL75 means “dual”, as each reactor actually has two banks of lamps within it. This system is designed with redundancy, with five banks of lamps required for operation and the sixth bank of lamps for redundancy.

Note: The discussion here, which is in the disinfection section of this report, focuses upon all three components of performance, disinfection, NDMA destruction, and 1,4-dioxane destruction; as each of the three data sets are necessary to fully understand UV AOP performance and the recommended controls.

5.4.1 Current UV System Controls

Historically, UV AOP systems have been controlled to provide a target EEO, or electrical energy use per order of magnitude destruction of a target pollutant. UVI and a pure "dose" based control has yet to be implemented for the various installed UV AOP systems for potable water reuse in California (e.g., OCWD, WBMWD, WRD), but will soon be implemented for the City of Los Angeles' Terminal Island facility.

The target of the City's UV AOP control system is to provide sufficient power to achieve a required level of treatment (removal) of the target compound, NDMA. The control system calculates the target power for a UV system via the EE/O metric. EE/O as a function of flow rate and UVT is computed by the system, and adjusted for a Lamp Efficiency Factor (LEF), based on the target contaminant removal setpoint. The power modulation can be described as:

Power = a x f(flow, UVT, LEF*), where

a = Trojan-specific empirical factor, and

LEF = f(lamp age, temperature, power level efficiency)

The present power (summation of all power output by the system at any timepoint) is then compared to the target power (based on a LRV contaminant setpoint), to allow for power reduction in times of low flow or high UVT as the present power should be greater than the target power.

The current target NDMA LRV setpoint for Oxnard is 1.0. As part of startup testing, the Carollo/Oxnard team obtained SCADA data to document the performance of the existing control system to meet the 1.0 NDMA LRV metric. Actual system LRV outputs and UVT values are recorded by plant staff directly from the UV system monitoring screen every 4 hours. Data provided by plant staff from 9/27 and 9/28/16 show the system's response to changes in UVT in terms of LRV achieved (Figure 15). All LRV values were above the setpoint of 1.0, showing the system was meeting the target setpoint at all times during the two days analyzed.

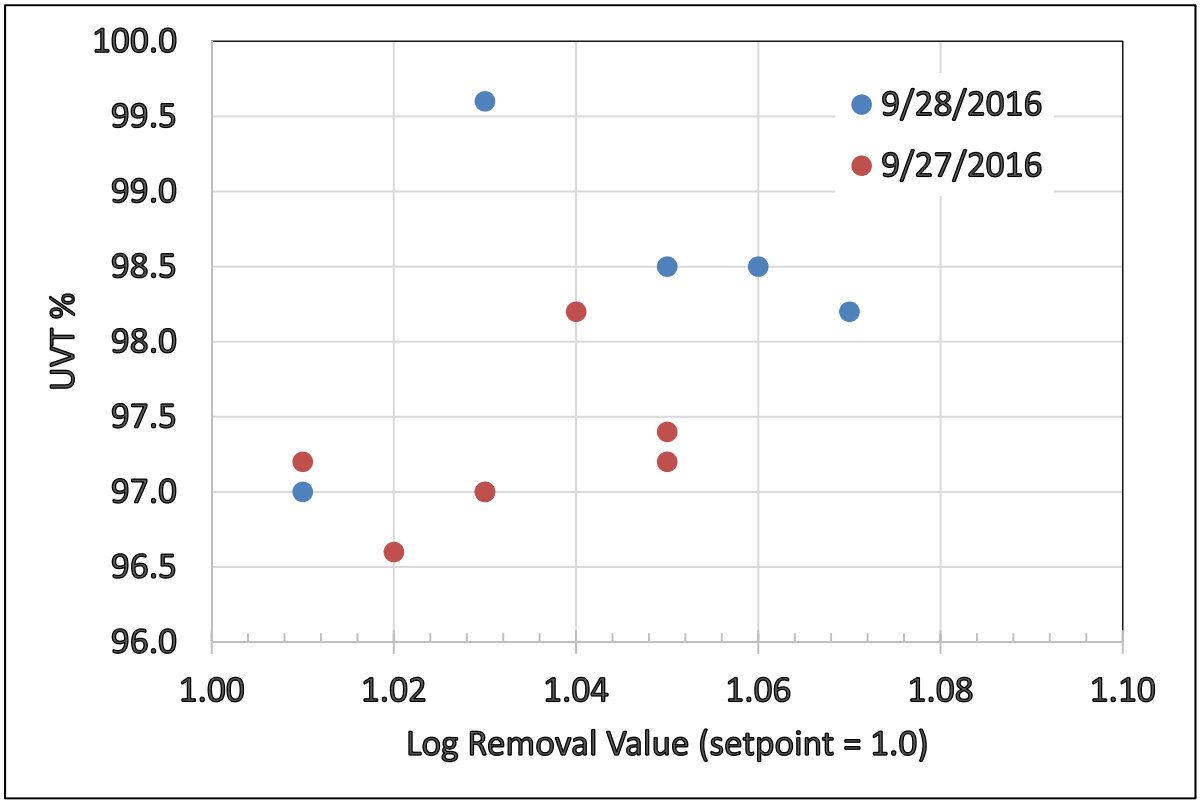

Figure 15 Percent UVT and corresponding Log Removal Values for 9/27 and 9/28/2016

The LRV-based control takes into account changes in flow rate and UVT. Additional data was collected showing the system's response to UVT and flow for the same 9/27 - 9/28/2016 dates, Figure 16. This result confirms the system's control philosophy is functioning as intended.

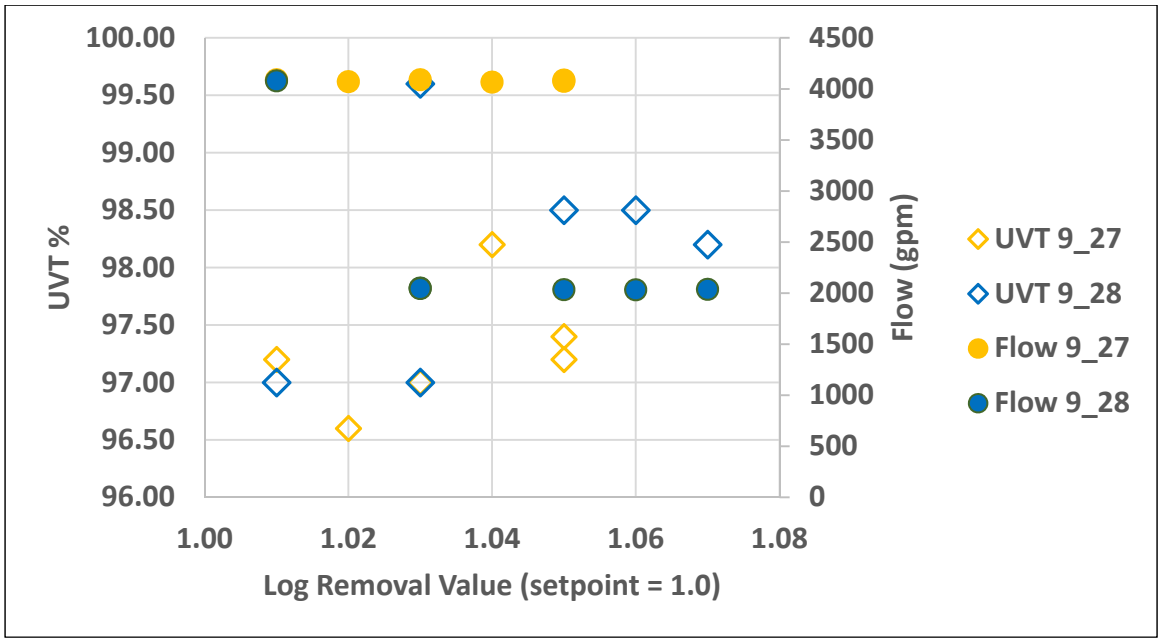

Figure 16 UV Log Removal Value as a Function of UVT and Flow

Power modulation is the final step in the UV AOP control strategy. The apparent power and target power across the UV system was analyzed for consistency across 9/27 and 9/28 operation (Figure 17). This consistency shows the UV system's ability to modulate the power to limit the energy input to the system to only what is necessary to meet the target power at any given time based on the UVT and flow.

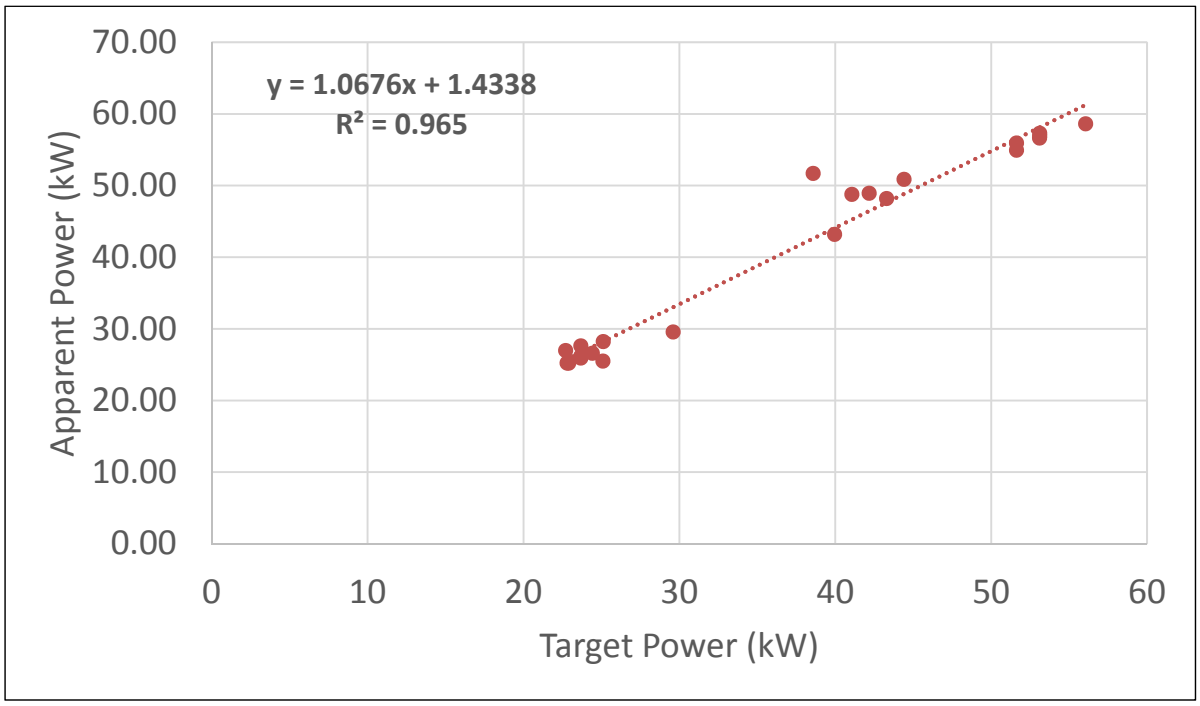

Figure 17 Apparent Power vs. Target Power (data collected 9/25 - 9/28/16)

The sections and analysis that follows evaluates the capacity of the installed UV AOP to destroy NDMA, pathogens, and 1,4-dioxane; then determine if the existing control system (as defined above) is sufficient or if it needs some level of adjustment.

5.4.2 UV Sensor Performance

Though UVI is not an active control within the UV system (at this time), the Carollo project team did a preliminary analysis of sensors for the installed 6-bank UV system. The orientation of the reactor sets the naming of the reactors and the corresponding UVI sensors, as shown in Figure 18 below; LWR LFT (lower left), MID RHT (middle right), and HGH LFT (high left) are three naming examples. Note that in the figure below, the terms "left" and "right" refer to the direction of flow (with flow going from left to right), not the visual location of the banks.

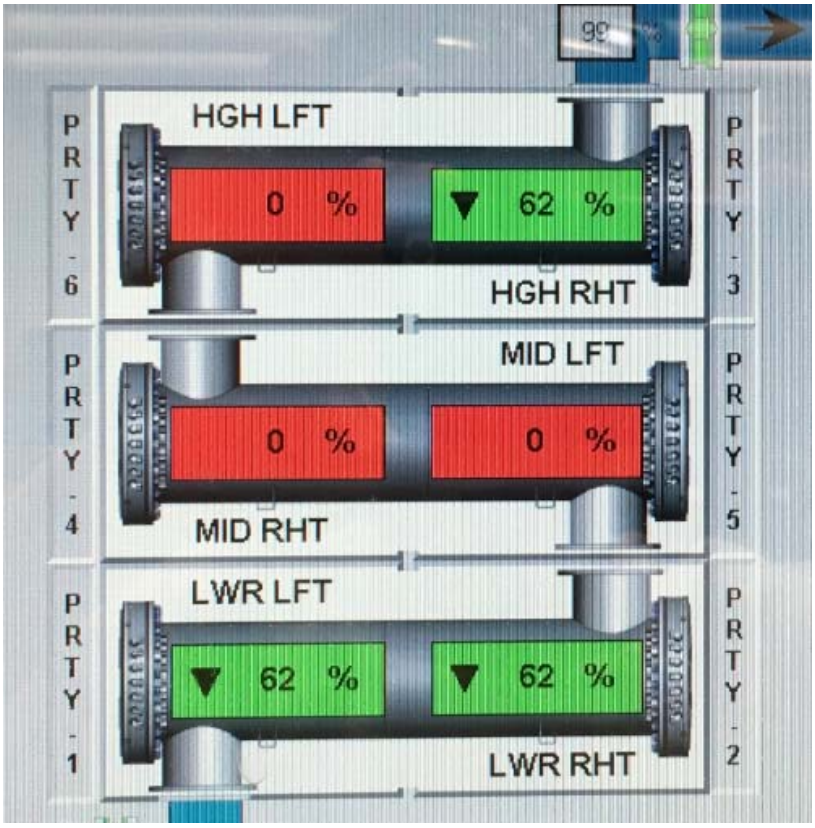

Figure 18 Screenshot of Trojan HMI at Oxnard

Through twenty-two different tests, different flow, different UVT, different # of reactors, and different reactor power settings were used. UVT transmittance readings were taken from an online meter, from a calibrated bench-top meter, and with laboratory grab sampling with subsequent analysis. Samples were taken before and after UV. For this analysis, only samples from the influent side of the UV were used, and only the results from the calibrated bench-top meter were used. The logic of this approach is based upon our team's

confidence in the accuracy of the bench-top meter coupled with the future method of system monitoring, which is UVT on the influent to the UV system.

The sensor results are shown in Figure 19 below. Substantial sensor variability was shown. At a basic level, the sensors did track changes in UVT and power.

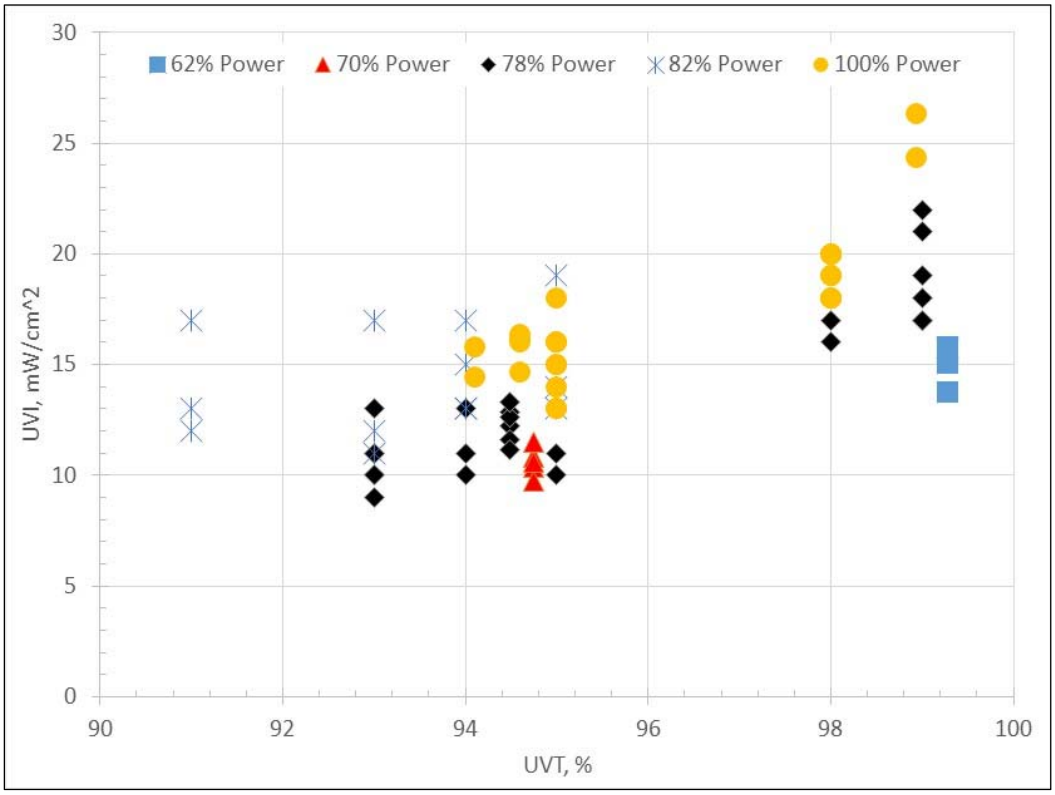

Figure 19 Sensor Values for Different UVT and Power Values

Using the sensor data points, a predictive formula was developed for the sensors. Sensor intensity is a function of UV absorbance (UVA) and ballast power (BP), as follows:

$$S = 10^{A} \times UVA^{B} \times BP^{C}$$

Where:

A = -1.27979

B = -0.25179

C = 1.02881

This formula results in an R^2 value of 0.92, which indicates a good measure of data variability. The prediction residuals are shown in Figure 20, demonstrating the accuracy of the predictive formula to be plus or minus 20 percent.

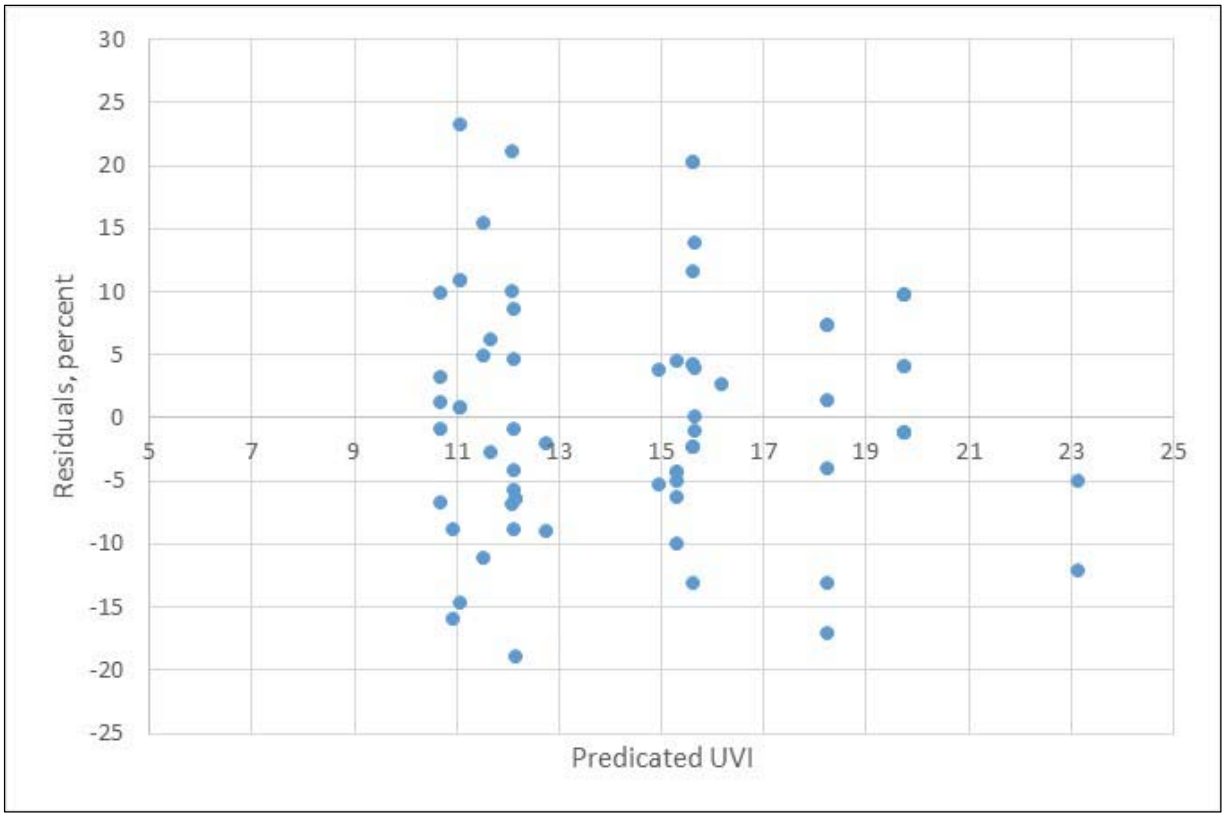

Figure 20 Sensor Residuals

5.4.3 Disinfection Performance

The D72AL75 validation is documented in Carollo (2009). That work documented reactor performance over a range of flow (1.05 to 7.3 mgd) and over a range of UV transmittance (UVT) (41.4 to 80.8 percent), with the data analyzed in accordance with National Water Research Institute Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (NWRI, 2003) but not NWRI (2012). The validation of the D72AL75 is based upon the dose delivery per reactor, recognizing that there are two 72 lamp banks within each reactor. Note that the Oxnard UV AOP system is controlled based upon the use of each bank, so three reactors results in a total of 6 banks of UV light. For this application at the AWPF, the flow per reactor is 6.25 mgd (as all three reactors are in series). As the UVT in ROP is greater than 95 percent, the validation formula from Carollo (2009) is conservative. Using the maximum validated UVT of 80.8 percent the dose of five banks of lamps from the three D72AL75 reactors (leaving one bank in standby) is >250 mJ/cm^2.

As this is a potable reuse application, disinfection credit for UV should be based upon adenovirus disinfection. Adenoviruses comprise a large group of serologically different viruses that can cause a broad spectrum of diseases with varying severity (USEPA, 2010). Research on the dose-response relationship of Adenoviruses, using Low Pressure (LP) UV radiation on a bench-scale collimated beam setup, is mainly limited to Adenovirus types 2, 40, and 41. The dose response relationship at high UV doses (>200 mJ/cm^2) is more widely

published for Adenovirus type 2 (Ad2), and shows that 6-log reduction of Ad2 may be obtained at a dose of 235 mJ/cm^2 (Gerba *et al.*, 2002). The dose response relationship of Ad2 as well as other viruses is shown in Figure 21, demonstrating that Ad2 is a conservative surrogate for a wider range of virus.

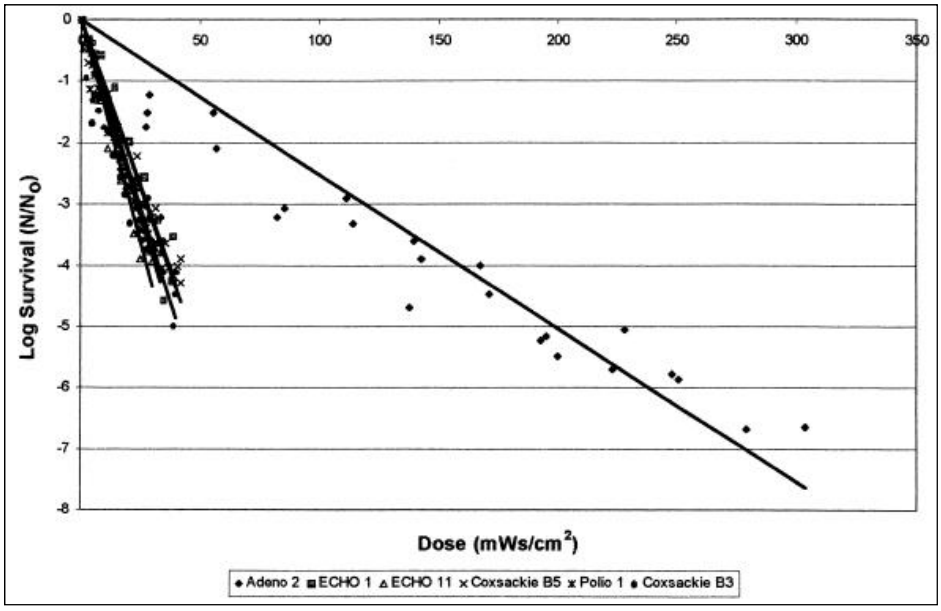

Figure 21 LP UV Dose Response Relationship of Ad2

USEPA (2010) published a dose-response equation for Ad2 of:

$$\text{Log Reduction} = 0.0262 * \text{UV Dose} + 0.2774$$

This dose response relationship is based on a dose range between 20 and 160 mJ/cm^2 (USEPA, 2010). Other studies have shown similar dose responses, consistently indicating that a 6-log reduction of Ad2 is met with a LP UV dose of up to 235 mJ/cm^2.

Pertaining directly to Oxnard and their Trojan D72AL75, the following can be said:

- The system, with five banks in series, results in a predicted UV dose of >250 mJ/cm^2 at a UVT of 80.8 percent. For a UVT of 95 percent or higher, as is the case for potable reuse projects using RO permeate, the UV dose will be substantially higher.
- 6-log adenovirus can be obtained based upon a UV dose of 235 mJ/cm^2. Because MS2 is more sensitive to UV light than adenovirus, using an MS2-based validation conservatively estimates dose for adenovirus. The underlying concept for this conclusion is found in the discussion of RED bias in USEPA (2006).
- USEPA (2006) (Table 6 below) provides data on the dose required for up to 4-log reduction, but did not go further as such higher reductions are not required for drinking water disinfection applications.

- In total, the UV system, operating at a UV dose in excess of 250 mJ/cm^2, installed at the AWPF is sufficient to provide 6-log reduction of both virus and protozoa.

Table 6 UV Dose Targets for Log Inactivation Credit, mJ/cm^2 (USEPA, 2006)
Advanced Water Purification Facility
City of Oxnard

Target	0.5-log	1.0-log	1.5-log	2.0-log	2.5-log	3.0-log	3.5-log	4.0-log
Crypto	1.6	2.5	3.9	5.8	8.5	12	15	22
Giardia	1.5	2.1	3	5.2	7.7	11	15	22
Adenovirus	39	58	79	100	121	143	163	186

5.4.4 NDMA Destruction Performance and Correlation to Disinfection Performance

While this section of the report is focused on disinfection credits, the destruction of NDMA provides a clear documentation of high UV dose delivery, and thus a high level of disinfection.

NDMA destruction is required to reduce RO permeate NDMA concentrations to below the DDW notification level of 10 ng/L (ppt). NDMA destruction has a proven correlation with UV dose, as shown in Figure 22, below. Using the information below, 1-log reduction of NDMA correlates to a UV dose in the range of ~700 to ~1100 mJ/cm^2. Such a wide variation does require further refinement by the industry. However, remembering that our disinfection target dose is 235 mJ/cm^2, there is a margin of comfort that dose sufficient to meet NDMA targets will also be sufficient to provide disinfection. Using the NDMA destruction dose/response from Sharpless and Linden (2003), the results of 22 NDMA destruction test runs at Oxnard can be evaluated for dose delivery and accuracy of system control, as shown in Figures 23 and 24, below.

Note: The NDMA data was collected over four different days, and the influent concentrations to the UV AOP system was consistent on each specific day, but varied from one day to the next. Thus, the NDMA destruction analysis utilized the average of influent NDMA concentrations for each day. Daily influent numbers are shown below:

- 5/4/2016 - 32, 23, 29, 25, 23, 28.
- 6/20/2016 - 28, 32.
- 6/21/2016 - 24, 22, 19, 23, 20.
- 6/22/2016 - 11, 12, 13, 12.

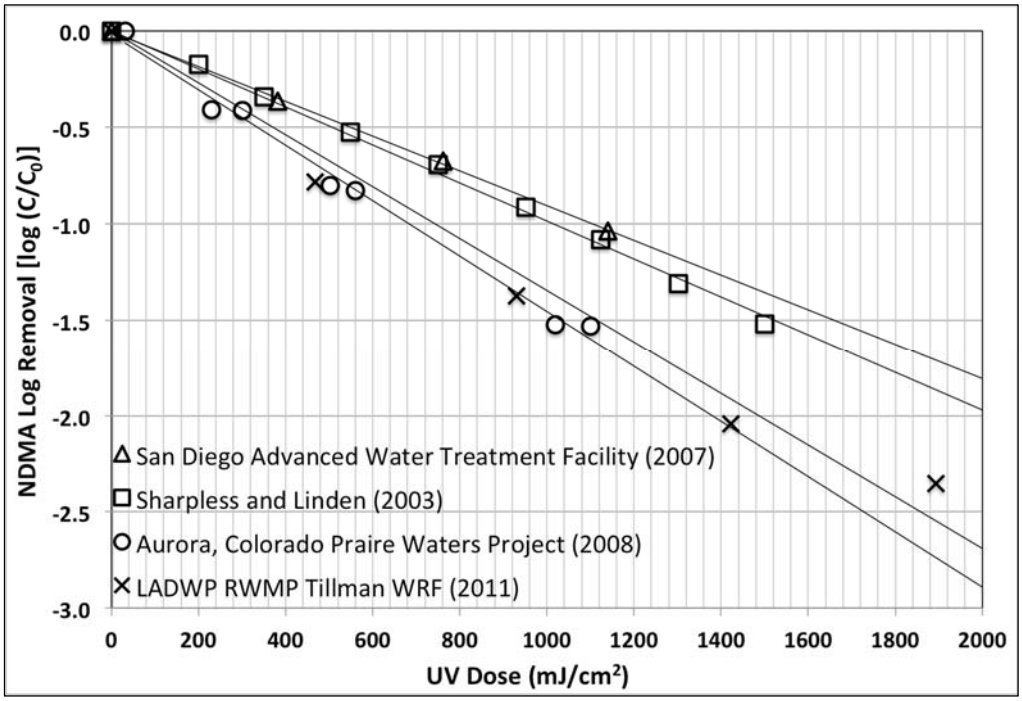

Figure 22 Collimated Beam Bench Testing Results for NDMA Collected in different Studies (Sources of Data: City of San Diego, 2007; Sharpless and Linden, 2003; Swaim et al., 2008; Hokanson et al., 2011). The Colorado Prairie Waters Project in Aurora, Colorado is the only reference study that used hydrogen peroxide (5 mg/L). The results shown for the other three studies used UV photolysis (graphic credit: Trussell Technologies).

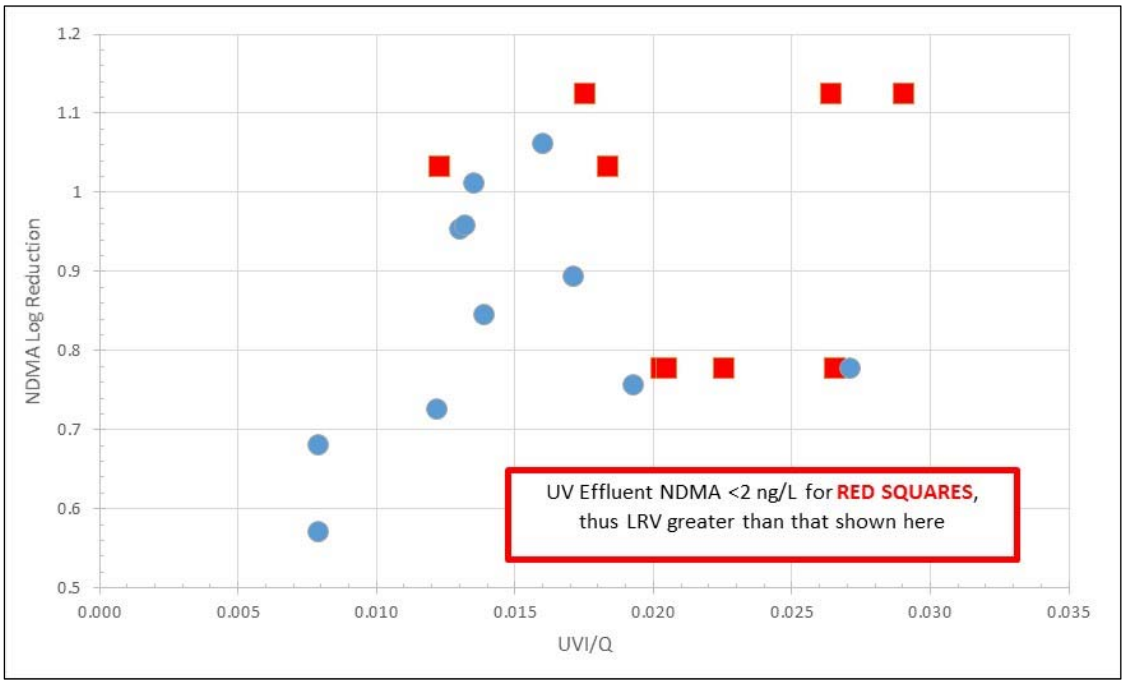

Figure 23 NDMA Destruction as a Function of UVI/Q

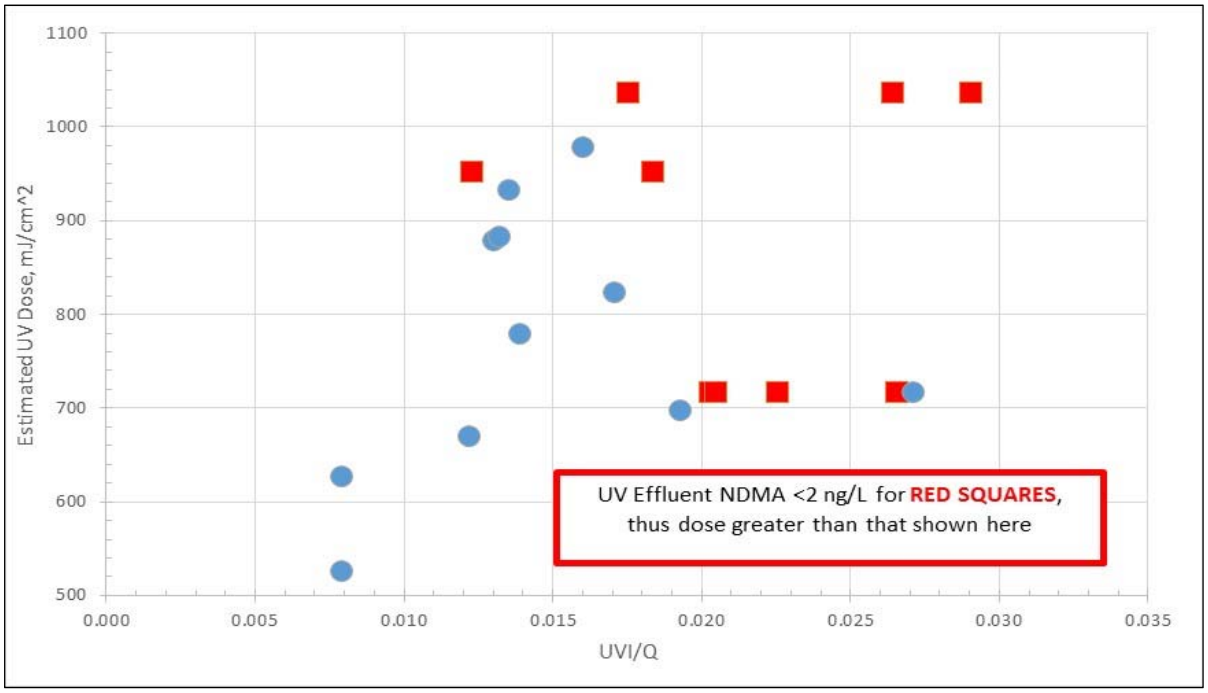

Figure 24 UV Dose as a Function of UVI/Q

The data in the figure above cannot be trended because a large number of the test events had NDMA below detection (<2 ng/L) in the UV effluent. However, this information can be used as a set-point control or alarm system for both disinfection and NDMA destruction based upon the following approach:

- NDMA concentrations in the RO permeate, through limited testing, have been in the range of 11 to 32 ng/L. Using the highest measured influent concentration (32 ng/L), and targeting the NDMA notification level of 10 ng/L, a minimum NDMA destruction of 0.5 could be required.
  - Assuming that NDMA levels in the RO permeate will vary from the measured numbers, and understanding that some level of operational safety factor is warranted to meet the 10 ng/L target, a finished water NDMA target of 5 ng/L is recommended, resulting in a need for an NDMA reduction target of 0.8-log.
  - 0.8-log NDMA destruction, based upon the collected data, can be obtained at a UVI/Q of 0.014 (with UVI being the sum of all UVI for operational reactors and Q being the total flow to the system in gpm).
- Regarding UV dose, the UVI/Q of 0.014 correlates to a UV dose of >800 mJ/cm^2, well in excess of the dose needed for 6-log reduction of all known pathogens.

An important question thus exists on the capacity of the UV system under reduced UVT conditions, as detailed in Table 7 below, which predicts the UVI based upon the sensor equation and data detailed previously. As shown, even at a much reduced UVT of

95 percent, the UV system is projected to attain a UVI/Q of 0.018, which is greater than the minimum desired value of 0.014.

Table 7 UV Capacity to Meet NDMA Target of 5 ng/L Advanced Water Purification Facility City of Oxnard

UVT	Q, mgd (gpm)	UVI for One Bank, mW/cm^2	# Banks in Operation at 100% Power	Combined UVI, mW/cm^2	UVI/Q
Ambient (~99%)	6.25 (4,340)	23.6	5	118	0.027
Reduced (95%)	6.25 (4,340)	15.6	5	78	0.018

5.4.5 1,4-Dioxane Destruction Performance

The UV AOP system, per CDPH (2014) must demonstrate 0.5-log reduction of 1,4-dioxane, or demonstrate destruction of a wider range of trace pollutants. Similar to ongoing and recently completed work for the City of LA (LA Sanitation, LASAN) and the Santa Clara Valley Water District (SCVWD), Seeding and destruction of 1,4-dioxane is the most precise method for such performance demonstration. Testing was completed over a range of H_2O_2 (hydrogen peroxide, peroxide) doses to demonstration 0.5-log reduction of 1,4-dioxane. Values for UVT, UV intensity, and UV reactor power were recorded. Testing was performed in triplicate, with all seeding and sampling done over a two-day period, with results shown in Figures 25 and 26.

Recognizing that analytical and sampling variability may account for some data variability, the analysis of the data using the Peroxide Weighted Dose concept, then back-calculating the minimum UVI/Q, may be more appropriate. Figure 26 indicates that a minimum UVI/Q should be in the range of 0.072 to 0.088; resulting in a tapered peroxide dose based upon the target UVI/Q. Assuming the more conservative peroxide weighted dose of 0.088, the following target UVI/Q values are recommended:

- Peroxide dose of 3 mg/L - *Minimum* UVI/Q = 0.029;
- Peroxide dose of 4 mg/L - *Minimum* UVI/Q = 0.022;
- Peroxide dose of 5 mg/L - *Minimum* UVI/Q = 0.018.

Understanding that the installed system has a set UV system capacity, the recommended approach is to utilize a peroxide dose of 6 mg/L and maintain a minimum UVI/Q of 0.018 to meet the required 0.5-log reduction of 1,5-dioxane.

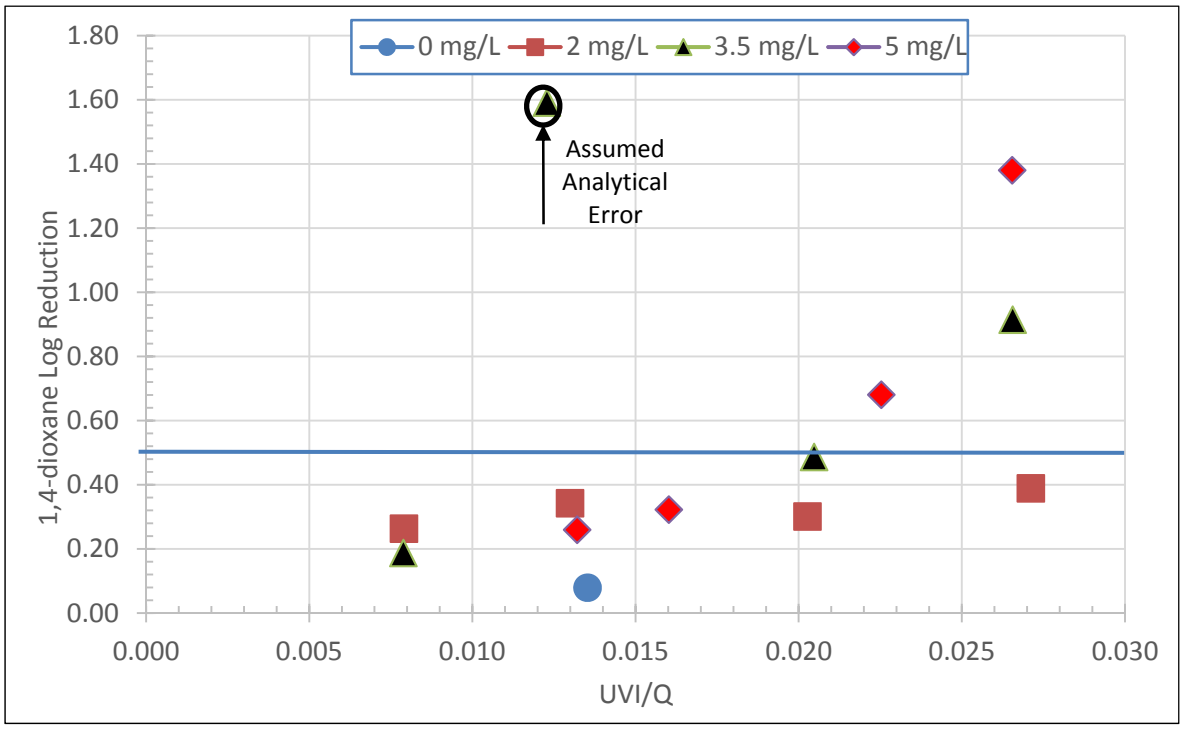

Figure 25 1,4-dioxane Destruction as a Function of UVI/Q and peroxide dose

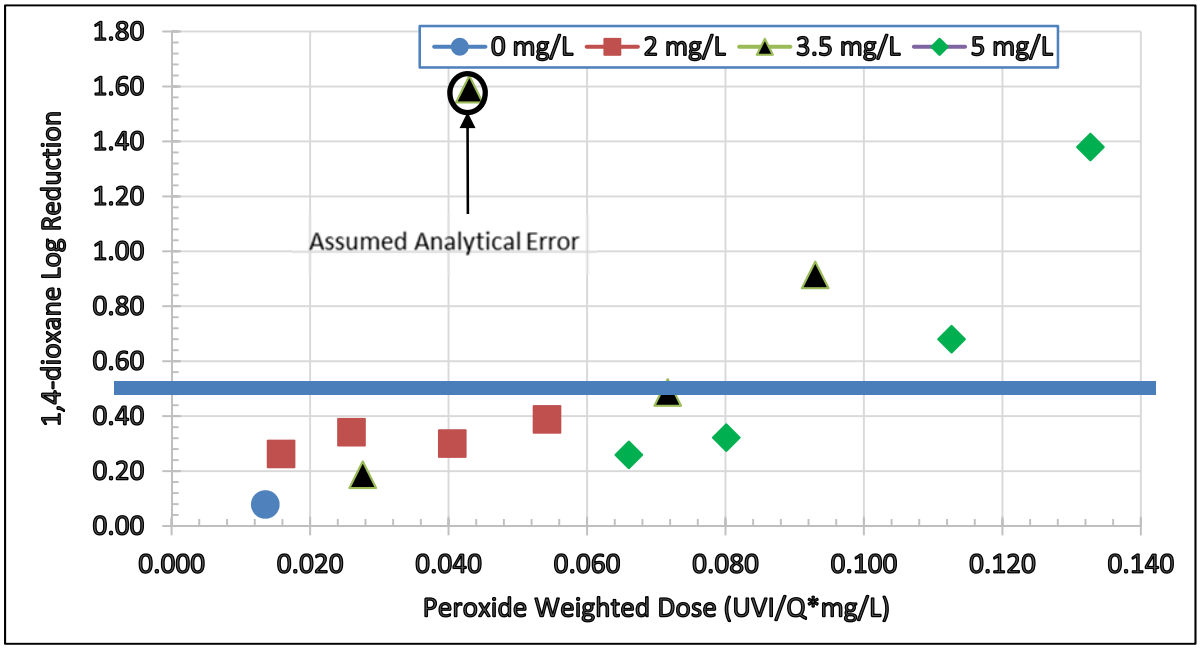

Figure 26 1,4-dioxane Destruction as a Function of Peroxide Weighted Dose

Based upon Figure 25, for a peroxide dose of 3.5 mg/L, the minimum UVI/Q should be 0.021; whereas for a peroxide dose of 5 mg/L the minimum UVI/Q should be 0.020. Recommendations on UV AOP Control Based Upon Disinfection, NDMA, and 1,4-Dioxane Performance Targets

The recommended UVI/Q to reliably below the 10 ng/L NDMA notification level is 0.014. This correlates to a minimum NDMA log reduction of 0.8, which also correlates to a UV dose well in excess of 235 mJ/cm^2 (the minimum UV dose for 6-log adenovirus disinfection). The use of 6 mg/L peroxide allows for the use of a minimum UVI/Q of 0.018 for 1,4-dioxane destruction. As shown in Table 7 (above), at a UVT of 95 percent, with 5 of 6 reactors in service, the installed system is projected to be able to attain the target 0.018 UVI/Q value; while still allowing for maintaining one UV reactor as redundant. **Thus, the key conclusion is that the installed system has sufficient capacity to meet disinfection, NDMA destruction, and 1,4-dioxane destruction at peak flow (6.25 mgd) and at a reduced UVT (95%).**

The remaining focus is the determination of what NDMA LRV setpoint is necessary to maintain the target UVI/Q of 0.018. As part of startup testing, the project team collected the necessary data to compare UVI/Q with the NDMA LRV setpoint, as shown in Figure 27. With one exception, the existing control system maintained a UVI/Q at or above ~0.013, which is noticeably below the recommended target of 0.018. **Accordingly, our recommendation is to adjust the NDMA LRV setpoint from 1.0 to 1.0*0.018/0.013, which results in a NDMA LRV setpoint of 1.4.**

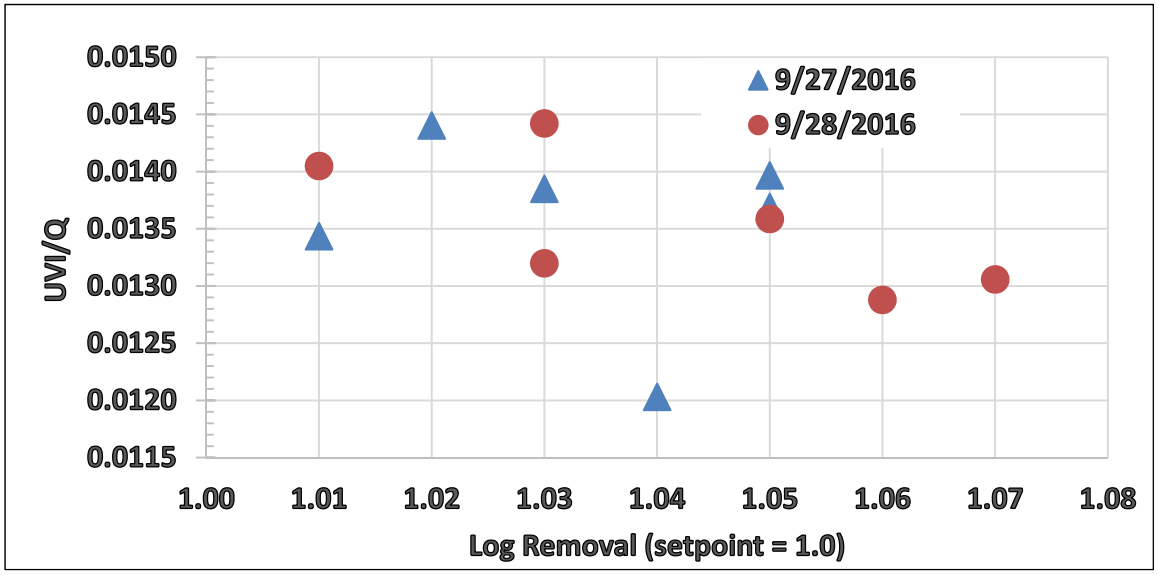

Figure 27 UVI/Q and NDMA LRV Control System Comparison

As a final point of comparison, DDW has become accustomed to the EEO concept for system control and permitting. Figure 28, below, plots the calculated EEO as a function of UVI/Q, presented here for information only. This data suggests that an EEO target would be in excess of 0.230 for Oxnard's particular application.

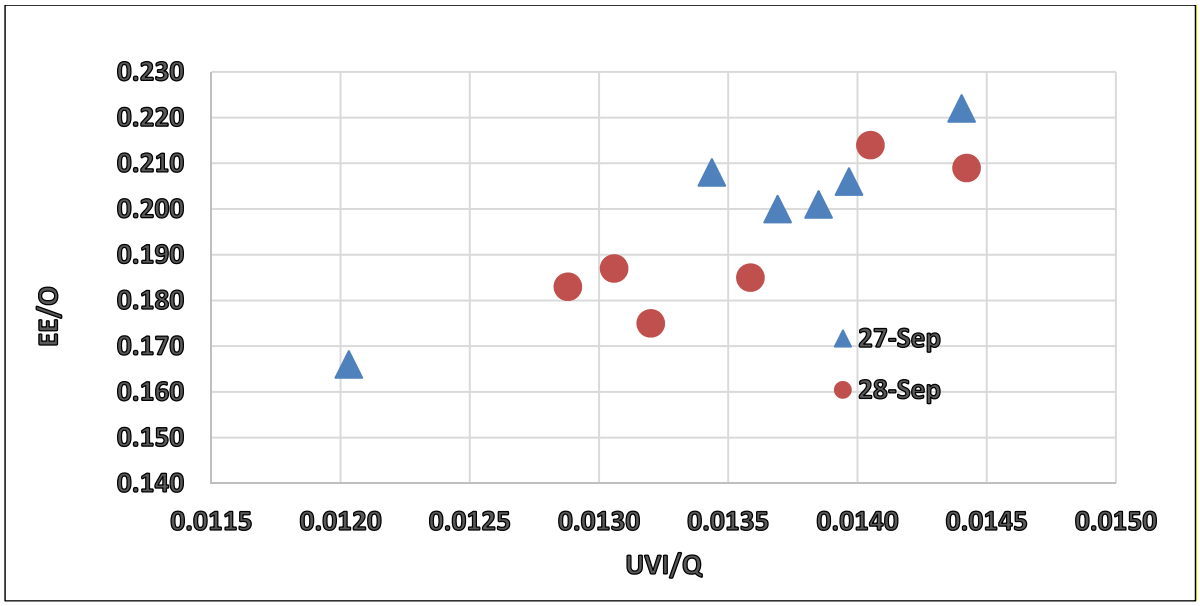

Figure 28 UVI/Q and EEO Comparisons

5.5 Subsurface Pathogen Removal Credit

Per CDPH (2014), utilities employing groundwater injection are granted 1-log virus removal credit per month of subsurface travel time, but are currently not granted credit for protozoa removal. Recent work by the WateReuse Research Foundation (led by Jorg Drewes) has documented the subsurface die-off rate of *Cryptosporidium* at 0.025 to 0.072-log reduction per day, with a mean of 0.039-log reduction per day (Drewes *et al.*, 2014). For 6-months of underground storage, the work by Drewes suggests 7-logs of die-off. Peng *et al.* (2008) reported 85 to 268 days of time to result in 1-log die-off of *Cryptosporidium* in sterile water at 4 degrees C. For 6-months of underground storage, the work by Peng suggests 0.7 to 2.1-log die-off. Per the April 2016 letter from DDW to the City, the DDW is not ready to allow protozoa removal credits based upon the referenced literature.

For the proposed groundwater recharge projects (Phase 1 – ASR and Phase 2 – conventional injection and Downgradient extraction) the water will be in the subsurface for a minimum subsurface retention time of 2 months, though longer periods may be required to attain the full 12-log virus credit requirement. Based upon current virus credits documented in Table 8, below, the minimum subsurface time is 3.1 months.

5.6 Findings for Disinfection Credit

When taken together, the treatment processes discussed in Section 5.1 have the ability to meet (and exceed) the 12/10/10 pathogen log reduction requirements specified in the groundwater recharge regulations, as shown in Table 8. The total pathogen log reduction credits are 12.0/11.8/12.2 for a groundwater recharge project with 3.1 months of subsurface storage time.

Table 8 Total Pathogen Log Reduction Credits Advanced Water Purification Facility City of Oxnard			
Process	**Virus**	***Giardia***	***Crypto***
Primary/Secondary Treatment	1.9	0.8	1.2
MF	0.0	4.0	4.0
RO	1.0	1.0	1.0
UV Advanced Oxidation	6	6	6
Groundwater Retention Time	3.1	0.0	0.0
Totals	***12.0***	***11.8***	***12.2***
DDW Requirements	***12***	***10***	***10***

6.0 GROUNDWATER RECHARGE OPERATIONAL STRATEGY

As mentioned previously, the City proposes one groundwater recharge operation at this time. This operation is proposed with 100 percent recycled water (i.e., no blending with diluent water). The City plans to inject the purified water into specific wells at the Campus Park location into aquifer zones within the Lower Aquifer System (LAS), keep the water underground for a minimum of 3.1 months (or the required response retention time [RRT]), then extract the water from the same ASR well for potable and non-potable use. In the future, should the City implement more advanced monitoring for the RO system and gain greater credits, the minimum time of 3.1 months may be reduced to 2 months.

This summary is based upon Hopkins (2016) study, which is included as Appendix B – Hydrogeological Study Report. The Hopkins report is provided to comply with regulations pursuant to section 60320.200(h), with a short summary provided here.

The City's long-term plan is to inject up to 6.5 mgd (4,500 gpm) of recycled water into several wells at the Campus Park location. The first ASR well location is proposed to ultimately include two adjacent wells (3 if necessary), each with an injection capacity of up to 2,000 gpm (totaling 4,000 gpm for this first application). This first pair of wells will inject purified water into a discrete aquifer zone(s) in the LAS and subsequently facilitate groundwater extraction after the required RRT is achieved and regulatory approval is granted.

The Campus Park location is ideal, as the ASR wells and monitoring wells can all be placed on City property, thus firmly controlling the use of groundwater in this area. Further, the proposed injection is into the LAS, whereas nearby potable wells are all in the Upper Aquifer System (UAS), and thus hydraulically isolated from the LAS. The closest well to the

proposed ASR location that is constructed within the LAS is located nearly 1 mile to the east and is owned and operated by the City.

For the fully expanded ASR project, the Campus Park location would host several pairs of ASR wells, with each pair recharging discrete aquifers. A pair of wells is anticipated to be necessary to fully utilize the operational capacity of each aquifer zone available for replenishment and reuse at the Campus Park site. This concept is described in detail by Hopkins (2016).

The construction of ASR well facilities in discrete aquifer zones uses the isolation of natural clay layers to allow simultaneous operation of replenishment, retention, and reuse without mutual interference. Wells located in Aquifer 1 are by design isolated from wells located in Aquifer 2 and 3. Utilization of the confined aquifer system in this manner will allow optimization of a continual ASR operation and full utilization of the wellfield location. Utilization of discrete aquifer zones also serves to preservation of the replenished water quality and minimizes mixing with native groundwater. This type of operation will require validation that the minimum time requirement is in compliance prior to the distribution of recycled water.

The ASR operation, upon full execution, will involve recharge of some wells concurrent with extraction of water from other wells. This process is intended to be flexible to allow the City to maximize recharge of the groundwater. One potential example of operation is as follows:

- Recharge ASR Well No. 1 in confined Aquifer 1 at flows up to 2,000 gpm. The period of recharge time must be sufficient so that recharged water does not migrate to off-site potable water wells. The duration of injection may range from 3.1 months to 6 months or greater.
- After the allocated time, stop recharge of ASR Well No. 1. Hold water in Aquifer 1 for a minimum of 3.1 months or the required RRT starting from the time the last drop of water entered the ASR well.
- Extract Water from ASR Well 1 at a rate of up to 3,000 gpm.
- Repeat the three steps described above in rotation for all operational ASR wells to allow a continual IPR operation.

Though this operation is fully intended as an ASR operation, in the event that some recharged water is not extracted and migrates toward drinking water wells, the time to the nearest downstream potable water supply well must be determined and documented to be more than 3.1 months of time for this project, though regulations allow for as little as 2 months of travel time as long as all pathogen reduction criteria are met.

Utilizing a conservative estimation of soil porosity (15 percent), an average hydraulic conductivity value of (125 feet /day), and the range of groundwater gradients calculated

from available data, Hopkins (2016) used the average linear flow velocity equation to predict the subsurface travel time caused by the seasonal gradients in the aquifer system.

During normal to wet years, the groundwater gradient is toward the southwest away from the Oxnard Forebay, the primary area of aquifer recharge (Hopkins, 2016). During dry years, the groundwater gradient is predominantly westward toward the area of greatest agricultural use (Hopkins, 2016). During a drought with repeated dry years where the groundwater levels in the aquifer system fall below sea level, the groundwater gradient migrates to the north toward inland pumping and away from the ocean where offshore storage is located in the aquifer system. The movement of groundwater caused by the regional gradient is slow and results in very little movement of the injected purified water plume, with an estimated travel time of between 0.17 and 0.92 feet per day.

The injection of purified water at 2,000 gpm results in a purified plume at a ~1,000 foot radius and ~1,500 foot radius after 3 months and 6 months of continuous injection, respectively (Hopkins, 2016). Using the 0.17 to 0.92 ft/day travel time, the purified water will move 30 to 165 feet in the direction of groundwater flow (to the Southwest or to the North) over a period of six months (during 3 months of injection and 3 months of retention). DDW regulations (CDPH, 2014) require a safety factor of 4 times the distance for groundwater calculations using Darcy's law methods (0.25 log credit for virus and 0.25-month response time credit per month of transport using Darcy's law methods). This results in a projected movement of 120 to 660 feet after the completion of a 180-day injection and retention period. This distance is significantly short of the distance to the nearest potable wells, both municipal and private wells.

After the 2-year injection period at 2,000 gpm, the area of the displaced volume is predicted by Hopkins (2016) to not reach the nearest potable supply well (City Well No. 20, located in the LAS). **Note: until tracer studies document otherwise, the maximum proposed injection period is 90 days.**

The proposed monitoring well locations and related hydrogeology are also documented by Hopkins (2016). These well locations are intended to track the travel time of the injected water (greater than 2 weeks and less than 6 months, in accordance with CDPH (2014)). As proposed, the three monitoring wells will sufficiently define the groundwater gradient in Aquifer 1. The location of Monitoring Well No. 2 is between the proposed ASR well and the City municipal supply Well No. 20. The differential well spacing will generate data through tracer testing to confirm the displacement rate of native groundwater. As detailed by Hopkins (2016), Monitoring Well No. 1 is anticipated to see the recharge bubble within 2 weeks while Monitoring Well No. 2 should see the recharge bubble at around 60 days. If our estimates are accurate, Monitoring Well No. 3 will not see the recharge bubble prior to the end of 90 days of recharge.

7.0 MONITORING AND RESPONSE RETENTION TIME

Over time, detection of trace pollutants in the monitoring wells and reduced treatment performance may occur. Depending upon the issue, the City may handle the issue internally, or, in the event of a regulatory exceedance, the City must provide the appropriate notification to DDW and RWQCB staff. These meetings and discussions will determine if the produced water remains protective of public health or if some form of mitigation is required. The need for and magnitude of response from the City will be based upon the following analysis:

- **Analytical detection of a pollutant above a regulated value.** The City will resample the groundwater and concurrently evaluate the AWPF performance. Should resampling still demonstrate non-compliance, appropriate remediation measures will be taken, which may include shutting down production wells or installation of well-head treatment for wells that may extract inadequately treated water. For the ASR operation, the ASR wells can be put into extraction mode and water can be pumped and used for non-potable applications.
- **Analytical detection of a pollutant below a regulated value.** The City will evaluate the occurrence, cause, and significance of the trace pollutant at the AWPF and may take corrective measures to reduce the concentration of the pollutant, either through source control or through treatment process modification.
- **Process failures or online metering/process monitoring failures above regulated values.** The City will evaluate the potential impact on treatment performance, both in terms of pathogen reduction and trace pollutant reduction.
- Included in the analysis by City and regulatory staff is the potential impact of dilution and attenuation of the pollutant of concern in the groundwater basin. Because the ASR operation is intended to be a fill and draw operation with minimal loss of injected water, dilution is not anticipated to be significant.

For the purpose of the RRT, the City anticipates a time period of 4 to 6 weeks for resampling, analysis of treatment processes, and regulatory consultation, as detailed below. This time value is less than the proposed minimum RRT of 3.1 months, as reviewed below.

7.1 Proposed RRT Concept

The ASR operations will follow the requirements of CDPH (2014), Sections 60320.200(b) and 60320.224. For the ASR project, the RRT is based entirely upon City operation of the well. The minimum time of storage for this ASR operation will be 3.1 months to meet the pathogen credits for potable reuse. In the event of a stoppage in ASR operation, the travel distance to the nearest potable water well (City Well #20) is ~4,000 feet. As shown by Hopkins (2016), two years of continuous recharge does not reach City Well #20. As only a 3-month to 6-month recharge period is originally proposed, and as DDW requires a 4X

safety factor for Darcy's Law estimations, a 6-month RRT is readily achieved without having the purified water reach a potable well.

For this project, a RRT of three months is more than sufficient to:

- Gain 3-log virus credit through subsurface storage time.
- Identify a treatment failure or detect an inadequately-treated constituent.
- Consider appropriate actions to protect public health.
- Implement corrective measures.

7.1.1 Online Process Control Monitoring

The AWPF controls are designed to maintain water quality that is protective of public health. The AWPF will have both continuous online monitoring and periodic monitoring of treatment performance. Production of water for IPR applications may cease based upon the process monitoring approaches listed in Table 9 below. The RRT for each of these monitoring approaches is also included within Table 9.

The OMMP (OMMP, KEH, 2015)[1] provides further details on the operations and control concepts for the production of water for non-potable and potable reuse.

7.1.2 Offline Analytical Monitoring

Details on the required water quality monitoring and the proposed sampling plan are included in Sections 9 and 17, respectively. This section provides information on the RRT for sampling, analytical monitoring, and response.

The monitoring and control of the MF, RO, and UV AOP systems focuses on process performance to maximize pathogen reduction, plus additional monitoring of trace constituent removal or destruction. The offline monitoring program focuses on chemicals that could present a chronic risk. Most of the monitored constituents are regulated based on conservative estimates of the lifetime health risk associated with chronic exposure. Accordingly, the RRT must be sufficient to respond to acute health concerns such as pathogens as well as several specific chemicals (e.g., nitrate, nitrite), but need not necessarily account for the response time for constituents with long term chronic concerns.

With the above context, the project team examined the RRT for different analytical parameters that represent a chronic concern (Table 10). Because the groundwater storage time for this ASR project is at least 3.1 months, there is more than sufficient RRT to address any potential issues related to regulated and non-regulated constituents.

[1] This document, which has previously been reviewed by DDW, can be provided upon request.

Table 9 RRT Values for Online and Periodic Treatment Process Control
Advanced Water Purification Facility
City of Oxnard

Process	Monitoring	Regulatory Requirement	Issue	Evaluation Approach	Operational Response	***RRT***
MF	Online filtrate turbidity	0.2 NTU.	A properly functioning MF should produce a filtrate with a turbidity of <0.2 NTU.	• Calibrate online meter using bench-scale results. • Examine trend turbidity with time, watch for increasing filtrate turbidity with time, indicative of loss of membrane performance.	• Shut down out of compliance train. Bring on redundant MF train if turbidity continues to exceed 0.2 NTU. • Reduce or shut down water production if insufficient MF capacity to meet turbidity standards. • Perform DIT and repair membranes.	Minutes to Hours
MF	Daily pressure decay testing (also called DIT)	Performance requirement of <0.8 psi/5min.	DIT failure suggests breach in MF, resulting in reduced a removal of particulates (including protozoa) by MF.	No evaluation, see Operational Response.	• Shut down out of compliance train. Bring on redundant train. • Reduce or shut down water production if insufficient MF capacity exists. • Repair membranes.	One day if DIT done daily. Shorter RRTs if DITs done more frequently.
RO	Online EC	• Either EC or TOC online monitoring required to document performance. • Log reduction of EC across RO can be used to prove pathogen credits.	Log reduction of EC across RO is trending down, indicating RO membrane decay or some other leak.	• Verify/calibrate online EC meters with bench-scale testing. • Profile RO vessels to find damaged membrane or seal.	Replace damaged RO membranes or seals.	Hours to Days
RO	Online or periodic TOC	• For the first 20 weeks of operation, ROP TOC must be ≤0.25 mg/L 95% of the time based upon weekly or more frequent sampling. • Subsequent to 20 weeks, ROP TOC must be ≤0.5 mg/L. • Log reduction of TOC can be used to continuously measure RO performance.	• High TOC in ROP suggests either a breach in the RO membrane or the existence of low molecular weight compounds that can pass through RO. • Log reduction of TOC across RO is trending down, indicating RO membrane decay or some other leak.	• Verify/calibrate online TOC meters with bench-scale testing. • Sample RO influent and ROP for analysis of a wide range of trace organic and regulated compounds. • Profile RO vessels to find damaged membrane or seal. Profile to be done using EC, as above.	Depending upon the results of the evaluation: • Replace damaged RO membranes or seals. • Implement a source control solution.	Days to Weeks
UV AOP	Online UVT	No set value. ROP typically has a UVT of 98 to 99%. The UV system is designed to provide a target dose based upon an assumed UVT value of 95%.	• Trending of UVT down suggests either the passage of low molecular weight organics through the RO or suggests damage to the RO process. • Reduced UVT will impact the ability of the existing UV system to deliver the proper UV dose.	• Verify/calibrate online UVT meter with bench-scale testing. • Sample RO influent and ROP for analysis of a wide range of trace organic and regulated compounds. • Profile RO vessels to find damaged membrane or seal. Profile to be done using EC, as above.	Depending upon the results of the evaluation: • Replace damaged RO membranes or seals. • Implement a source control solution.	Days to Weeks
UV AOP	NDMA LRV Based Upon a Target UVI/Q	UV intensity is used to measure the combined impact of lamp output decay and sleeve fouling. UV intensity can also be used as part of UV reactor dose control. For this project, the UVI/Q is recommended as a daily verification of performance to support the NDMA LRV-based operation.	Reduced UV intensity suggests one of several issues: • Aged lamps that must be replaced. • Fouled sleeves that must be cleaned. • Reduced UVT.	• Verify accuracy of online UVT meter (above). • Verify that UV intensity sensor is properly seated in sensor port. • Check UV intensity sensor accuracy with reference sensor(s). • Remove and replace UV intensity sensor with a standby sensor. • Pull representative quartz sleeve, clean, and replace. Alternatively, clean all sleeves. Recheck sensor intensity.	• Depending upon the results of the evaluation: • Replace sensor. • Clean all sleeves. • Replace lamp(s). • Calibrate UVT meter.	Hours to Days

Table 10 RRT Examples for Analytical Monitoring of AWPF and Monitoring Wells
Advanced Water Purification Facility
City of Oxnard

Location	Parameter	Frequency	Performance Requirement	Issue	Evaluation Approach	Operational Response	RRT
Monitoring Wells	Primary MCLs	Quarterly	Varies	Primary MCLs are typically met in secondary effluent. Detection of pollutants near, at, or above the MCLs suggests a high pollutant load at the OWTP and a lack of performance through the AWPF.	• Resample compliance point in question. • If detection was at the monitoring well, sample finished water at the AWPF. • Profile OWTP and AWPF systems as needed.	• Repair process components. • Evaluate other sources of pollutant that may be contributing to the pollutant at the monitoring well.	Sampling is quarterly. Response time, including repeat samples and analysis is a minimum of two weeks. Reasonable RRT is 16 weeks.
Monitoring Wells	Total Coliform	Quarterly (wells)	≤2 MPN/100mL	Total coliform detection at the AWPF is likely sample contamination or sampling from a line with regrowth. Legitimate breakthrough of total coliform suggests a large performance failure.	• Resample compliance point in question. • Concurrently sampling for fecal coliform. • Evaluate treatment processes for compliance with various operating criteria.	• Repair process components. • Evaluate other sources of pollutant that may be contributing to the pollutant at the monitoring well.	Sampling is quarterly for the monitoring wells. Response time, including repeat samples and analysis is a few days. Reasonable RRT is 13 weeks.
AWPF Finished Water	NDMA	Quarterly	≤10 ng/L	Values in excess of 10 ng/L suggest either reduced UV performance or increased levels of NDMA in the secondary effluent.	• Sample finished water at the AWPF. • Sample RO influent and RO permeate. • Determine if the problem is UV performance or increased NDMA at the OWTP.	Depending upon the results of the evaluation: • Shut down water production or bring redundant treatment processes online. • Evaluate NDMA formation in the OWTP or increased NDMA loadings in the collection system.	Sampling is quarterly. Response time, including repeat samples and analysis is a minimum of two weeks. Reasonable RRT is 16 weeks.
AWPF Finished Water	Total Coliform	Daily	ND-≤2.2 MPN/100mL	Total coliform should be removed after RO and after UV AOP. Existence of total coliform at the monitoring well suggests sample contamination or a much larger treatment process failure.	• Resample monitoring well. • Sample finished water at the AWPF. • Sample RO influent and RO permeate. • Concurrently sampling for fecal coliform.	Depending upon the results of the evaluation: • Shut down water production or bring redundant treatment processes online. • Evaluate other methods for total coliform contamination of the monitoring well.	Days
AWPF Finished Water	Total Nitrogen	Weekly	<10 mg/L	Maintaining TN <10 mg/L assures that nitrate levels are also <10 mg/L. Nitrate is an acute health concern.	• Resample monitoring well. • Sample finished water at the AWPF. • Sample RO influent and RO permeate.	• Shut down water production until TN<10 mg/L.	Sampling is twice weekly, no more than 3 days between sampling events. Response time, including repeat samples and analysis is a minimum of three weeks. Reasonable RRT is four weeks.

7.2 Water Quality Failure Decision Protocol

In the event of a suspected water quality failure, in which water was continuously produced and recharged into the groundwater basin that was suspected to be non-compliant (e.g., control system failure, alarm failure), or in the case of detections of pollutants in the groundwater monitoring wells, City staff will follow a detailed decision protocol to evaluate the situation and determine if the finished water quality presents a risk to public health.

The objectives of the decision protocol are as follows:

- Provide a mechanism to verify water quality in a rigorous and measured way. Effort also will minimize questions and concerns from City stakeholders and interested parties through effective communication of the sampling results and their implications.
- Have the City communicate with a single voice to deliver a clear and consistent message.
- Insure that the City is openly communicating water quality information.
- Provide an organized process for data evaluation and follow-up activities.

The first step in such a water quality situation is to shut down all water production for potable reuse (non-potable reuse would remain in operation as long as non-potable water quality standards are met). Figure 29 illustrates an example protocol that would follow cessation of production for potable water reuse[2]. Central to this protocol are two teams:

- The “Engineering/Operations Staff.”
- The “Decision Committee.”

This protocol will be adopted by the City prior for the production of recycled water for potable reuse.

7.3 Proposed RRT

The proposed RRT here is based upon responding to acute concerns, which are those associated with pathogens and a few chemical constituents (e.g., nitrate, nitrite). Thus, the proposed RRT can be calculated as follows:

> RRT = *Sample Collection (daily to twice per week[3]), Analysis and Regulatory Consultation Time (4 weeks) + Time to Provide Relief Measure or Alternative Source of Water (4 weeks) = 9 weeks.*

[2] Modeled after the SCVWD’s Water Quality Response Protocol. The City and Carollo appreciates the use of this information.
[3] DDW requirements for TN (which provides a conservative measure for nitrate) is twice per week.

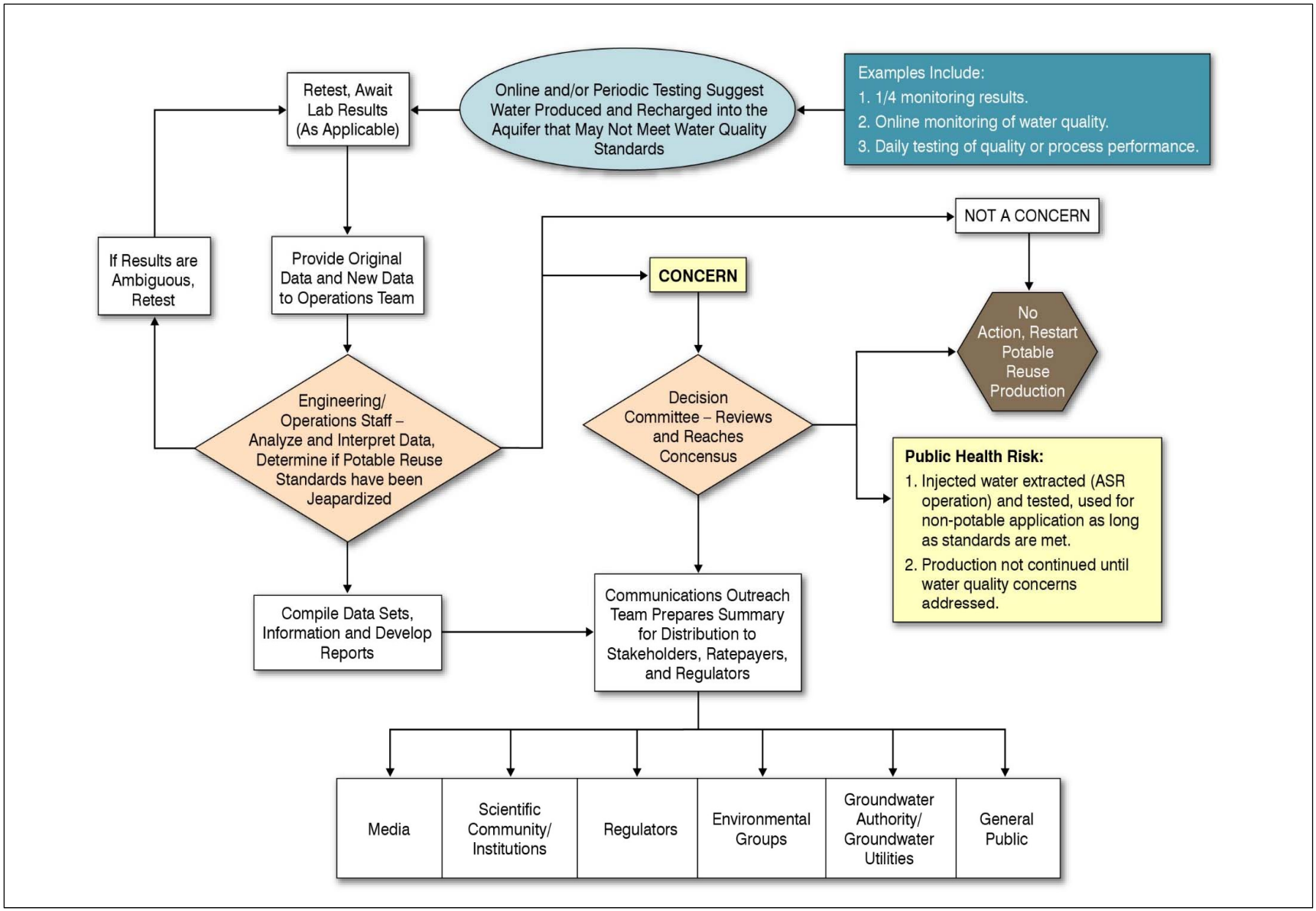

Figure 29 Emergency Response Schematic

As detailed in Hopkins (2016) and in accordance with CDPH (2014) Section 60320.224, groundwater residence/travel times to the nearest potable well are estimated at more than 2 years for the ASR application. As the ASR fill and draw times are controlled, and the proposed project will leave the water in the ground for a minimum of 3.1 months, the RRT of 9 weeks will be reliably met.

Upon commencement of the project, these travel and residence times will be demonstrated through the use of intrinsic or added tracers, potentially TDS, chloride, and sulfate. Further details on startup testing, which includes the groundwater residence time demonstrations, is included in Section 17 of this report.

8.0 NEED FOR ALTERNATIVE SOURCES OF WATER

Long-term sustainable capture and reuse of water supplies is the goal of the City. However, the City's short term water supply remains reliable and interruptions in the production of water from potable reuse do not constitute an emergency or short term problem. Thus, for failures in monitoring or process performance, or detection of pollutants in the groundwater monitoring network, the AWPF can be simply shut down and not produce water.

For ASR operations, if improperly treated water is injected into the aquifer, or if groundwater monitoring results do not meet regulatory limits, the water will be extracted from the ASR location, and one of the following will occur.

- If the water quality meets the requirements for non-potable reuse, the water will be sent off-site for non-potable reuse operations.
- If the water quality does not meet the requirements for non-potable reuse, well-head treatment will be employed to bring the non-compliant water to non-potable water reuse standards.

As the ASR wells are intended to extract the majority of injected water, and as the current groundwater analysis shows limited groundwater migration at the proposed ASR site, migration of injected water to off-site potable wells is not anticipated. With that said, DDW has requested that this report address such off-site migration. As illustrated in Hopkins (2016), the nearest potable water well to the proposed ASR location is City Well No. 20. In the event of contamination of that well, well-head treatment would be initiated, with the treatment based upon the type of contaminant. For pathogens, installation of a UV system and/or free chlorination could be employed. For trace pollutants, the use of activated carbon or advanced oxidation (which could be a UV-based process) could be employed. For nitrate contamination, ion exchange treatment would be employed.

9.0 POTABLE REUSE WATER QUALITY

There are no federal regulations pertaining to water reuse, and water reuse regulations are developed at the state level. The main regulatory agency for water reuse in the State of California is the SWRCB. The SWRCB is separated into nine different RWQCBs that regulate water reuse projects in conformance with the regulations adopted by the CDPH, which is now part of the SWRCB as the Division of Drinking Water (DDW). The City is located within the LARWQCB.

The water quality limits for groundwater recharge with recycled water and the projected water quality for the AWPF are reviewed below.

9.1 Water Quality Requirements

Tables 11 through 16 constitute the required water quality performance, consistent with CDPH (2014). The tables of constituents referenced in CDPH (2014) are found in CDPH (2014a). Within each table is a specific reference to the table within the regulation (e.g., Primary MCLs are listed in a table below and also found in Table 64431-A). In addition to the CDPH (2014) water quality requirements provided in the following tables, the advanced treated recycled water from the AWPF facility will be required to satisfy the discharge limits included in the revised GREAT permit (R4-2011-0079-A01 and R4-2008-0083-A01) prior to injection.

Table 11 Inorganics with Primary MCLs[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	Primary MCL (in mg/L)	Constituents	Primary MCL (in mg/L)
Aluminum	1.0	Fluoride	2
Antimony	0.2	Lead	0.015[4]
Arsenic	0.006	Mercury	0.002
Asbestos	7 (MFL)[2]	Nickel	0.1
Barium	1	Nitrate (as NO_3)	45
Beryllium	0.004	Nitrite (as N)	1
Cadmium	0.005	Total Nitrate/Nitrite (as N)	10
Hexavalent Chromium	0.010	Selenium	0.05
Copper	1.3[3]	Thallium	0.02
Cyanide	0.15		

Table 11 Inorganics with Primary MCLs[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	Primary MCL (in mg/L)	Constituents	Primary MCL (in mg/L)

Notes:

(1) Based on **Table 64431-A.**
(2) MFL = Million fibers per liter, with fiber lengths > 10 microns.
(3) Regulatory Action Level; if system exceeds, it must take certain actions such as additional monitoring, corrosion control studies and treatment, and for lead, a public education program; replaces MCL.
(4) The MCL for lead was rescinded with the adoption of the regulatory action level. The action level is like a MCL except it also requires additional testing. If more than 10% of samples collected at the point of delivery exceed the action level, the water distributor must take steps to reduce the corrosivity and/or lead concentrations of the delivered water and notify the public about steps they should take to protect their health.

Table 12 Constituents/Parameters with Secondary MCLs
Advanced Water Purification Facility
City of Oxnard

Constituents[1]	MCL (in mg/L)	Constituents[2]	MCL (in mg/L)
Aluminum	0.2	TDS	500
Color	15 (units)	Specific Conductance	900 *u*S/cm
Copper	1	Chloride	250
Foaming Agents (MBAS)	0.5	Sulfate	250
Iron	0.3		
Manganese	0.05		
Methyl-tert-butyl-ether (MBTE)	0.005		
Odor Threshold	3 (units)		
Silver	0.1		
Thiobencarb	0.001		
Turbidity	5 (NTU)		
Zinc	5		

Notes:

(1) Based on **Table 64449-A.**
(2) Based on **Table 6449-B.**

Table 13 Radioactivity[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	MCL (in pCi/L)	Constituents	MCL (in pCi/L)
Uranium	20	Gross Beta particle activity	50[2]
Combined radium-226 & 228	5	Strontium-90	8[2]
Gross alpha particle activity	15	Tritium	20,000[2]

Notes:
(1) Based on **Tables 64442 and 64443**.
(2) MCLs are intended to ensure that exposure above 4 millirem/yr does not occur.

Table 14 Regulated Organics[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	MCL (in mg/L)	Constituents	MCL (in mg/L)
Volatile Organic Compounds			
Benzene	0.001	Monochlorobenzene	0.07
Carbon Tetrachloride	0.0005	Styrene	0.1
1,2-Dichlorobenzene	0.6	1,1,2,2-Tetrachloroethane	0.001
1,4-Dichlorobenzene	0.005	Tetrachloroethylene	0.005
1,1-Dichloroethane	0.005	Toluene	0.15
1,2-Dichloroethane	0.0005	1,2,4 Trichlorobenzene	0.005
1,1-Dichloroethylene	0.006	1,1,1-Trichloroethane	0.2
cis-1,2-Dichloroethylene	0.006	1,1,2-Trichloroethane	0.005
trans-1,2-Dichloroethylene	0.01	Trichloroethylene	0.005
Dichloromethane	0.005	Trichlorofluoromethane	0.15
1,3-Dichloropropene	0.0005	1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2
1,2-Dichloropropane	0.005	Vinyl chloride	0.0005
Ethylbenzene	0.3	Xylenes	1.75
Methyl-tert-butyl ether (MTBE)	0.013		
SVOCs			
Alachlor	0.002	Hexachlorobenzene	0.001

Table 14 Regulated Organics[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	MCL (in mg/L)	Constituents	MCL (in mg/L)
Atrazine	0.001	Hexachlorocyclopentadiene	0.05
Bentazon	0.018	Lindane	0.0002
Benzo(a) Pyrene	0.0002	Methoxychlor	0.03
Carbofuran	0.018	Molinate	0.02
Chlordane	0.0001	Oxamyl	0.05
Dalapon	0.2	Pentachlorophenol	0.001
Dibromochloropropane	0.0002	Picloram	0.5
Di(2-ethylhexyl)adipate	0.4	Polychlorinated Biphenyls	0.0005
Di(2-ethylhexyl)phthalate	0.004	Pentachlorophenol	0.001
2,4-D	0.07	Picloram	0.5
Dinoseb	0.007	Polychlorinated Biphenyls	0.0005
Diquat	0.02	Simazine	0.004
Endothall	0.1	Thiobencarb	0.07/0.001[2]
Endrin	0.002	Toxaphene	0.003
Ethylene Dibromide	0.00005	2,3,7.8-TCDD (Dioxin)	$3x10^{-8}$
Glyphosate	0.7	2,4,5-TP (Silvex)	0.05
Heptachlor	0.00001		
Heptachlor Epoxide	0.00001		

Notes:
(1) Based on Table 64444-A.
(2) Second value is listed as a Secondary MCL.

Table 15 Disinfection By-Products[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	MCL (in mg/L)	Constituents	MCL (in mg/L)
Total Trihalomethanes	0.080	Bromate	0.010
Total haloacetic acids	0.060	Chlorite	1.0

Notes:
(1) Based on **Table 64533-A.**

Table 16 Constituents with Notification Levels[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	NL (in μg/L)	Constituents	NL (in μg/L)
Boron	1000	Manganese	500
n-Butylbenzene	260	Methyl isobutyl ketone (MIBK)	120
sec-Butylbenzene	260	Naphthalene	17
tert-Butylbenzene	260	N-Nitrosodiethylamine (NDEA)	0.01
Carbon disulfide	160	N-Nitrosodimethylamine (NDMA)	0.01
Chlorate	800	N-Nitrosodi-n-propylamine (NDPA)	0.01
2-Chlorotoluene	140	Propachlor**	90
4-Chlorotoluene	140	n-Propylbenzene	260
Diazinon	1.2	RDX	3
Dichlorodifluoromethane (Freon 12)	1000	Tertiary butyl alcohol (TBA)	12
1,4-Dioxane	1	1,2,3-Trichloropropane (1,2,3-TCP)	0.005
Ethylene glycol	14000	1,2,4-Trimethylbenzene	330
Formaldehyde	100	1,3,5-Trimethylbenzene	330
HMX	350	2,4,6-Trinitrotoluene (TNT)	1
Isopropylbenzene	770	Vanadium	50

Notes:
(1) Based on http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/notificationlevels/notificationlevels.pdf.
The web link above also contains the levels of the pollutants in this table that must result in a removal of the water source from service.

9.2 CEC Monitoring

SWRCB (2013) lists specific compounds for monitoring for groundwater injection projects (Table 17). The initial monitoring program is intended to be quarterly, followed by semi-annual monitoring for the duration of the project.

Table 17 Monitoring Trigger Levels for Groundwater Recharge, as Listed in SWRCB (2013) Advanced Water Purification Facility City of Oxnard			
Constituents	**Relevance/ Indicator Type/ Surrogate**	**Monitoring Trigger Level (in μg/L)**	**Removal Percentages (%)**
17B-estradiol	Health	0.0009	--
Caffeine	Health & Performance	0.35	>90
NDMA	Health & Performance	0.01	25-50, >80(1)
Triclosan	Health	0.35	--
DEET	Performance	--	>90
Sucralose	Performance	--	>90
Electrical Conductivity	Surrogate	--	>90
TOC	Surrogate	--	>90

Notes:

(1) 25 to 50 % removal by RO, >80% removal by RO followed by UV, depending upon the UV dose.

The LARWQCB requires specific monitoring for CECs. The Monitoring and Reporting Program of the revised GREAT permit will specify the monitoring program for this project.

9.3 Basin Plan

The Basin Plan Objectives for ground water quality for the LA region are divided into five groups: bacteria, chemical constituents and radionuclides, minerals, nitrogen, and taste and odor. Excluding the chemical constituents and radionuclides, the objectives are summarized as follows:

- **Bacteria -** Concentration of coliform organisms shall be < 1.1/100 mL over any 7-day period.
- **Minerals:** TDS - (1200 mg/L (confined aquifers), 3000 mg/L (unconfined aquifers), Sulfate (600 mg/L (confined aquifers), 1000 mg/L (unconfined aquifers), Chloride (150 mg/L (confined aquifers), 500 mg/l (unconfined aquifers), Boron (1 mg/L).
- **Nitrogen –** 10 mg/L (NO_3-N + NO_2-N), 45 mg/L (NO_3), 10 mg/L (NO_3-N), 1 mg/L (NO_2-N).
- **Taste and Odor -** Ground waters shall not contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

Additionally, the Basin Plan specifies compliance with Table 64431-A, Table 6444-A, and Tables 64442 and 64443 of CDPH (2014a). The constituents in these tables are provided in Tables 12, 14, and 15 of this report.

9.4 Current Water Quality

The City's AWPF is now in operation, producing high quality water for non-potable reuse. Detailed water quality and performance testing has been completed and is documented here. Secondary Effluent, RO permeate, and UV AOP final effluent were sampled for MCLs, NLs, Secondary MCLs and CECs, results are show in Tables 18 through 25. Consistent contaminant removal was seen throughout the MF/RO/UVAOP process, with the AWPF treatment train finished water meeting all health goals (MCLs, secondary MCLs, and NLs). CEC concentrations were either ND or below the recommended health levels according to literature sources. ***Of important note, only 8 contaminants tested for were detected above the health-based goal/limit in the secondary effluent (as highlighted in yellow in the tables below).*** All 8 constituents were fully removed to below the detection level or health target/limit in the finished water, and most were removed prior to UV AOP treatment, as demonstrated both by the RO effluent sampling, and the RO concentrate contaminant concentrations.

9.4.1.1 TOC

The CDPH (2014) requirement for total organic carbon (TOC) is a maximum of 0.5 mg/L, and new membranes are required to meet a value of 0.25 mg/L. Grab samples taken as part of the startup testing all resulted in RO permeate TOC levels below detection at <0.3 mg/L.

9.4.1.2 Total Nitrogen

The CDPH groundwater recharge requirement for total nitrogen (TN) is ≤10 mg/L. As listed in the tables above, the finished water has low nitrate + nitrite (as N) of <0.2 mg/L. Recent (6/22/2016) ammonia concentrations (RO feed = 33 mg/L, UV AOP feed = 2.8 mg/L, Finished water = 2.1 mg/L) coupled with the low nitrate and nitrite numbers indicate a low TN result of ~3 mg/L.

10.0 DILUENT WATER

No diluent water is proposed for the ASR project. The water that will be used for recharge will be 100 percent recycled water that has received advanced treatment (MF/RO/UV AOP). Any dilution in the subsurface (due to groundwater underflow) will not be counted toward TOC credits or for meeting pollutant or pathogen levels.

Table 18 MF/RO/UV AOP Finished Water Quality for MCLs- Inorganic Chemicals per Table 64431-A and Table 64432-A (DDW, 2015)
Advanced Water Purification Facility
City of Oxnard

Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 11/12/15	Finished Water 5/20/16	MCL/Action Level	MRL (units shown at far left)
Aluminum	ug/L	ND	87	ND	ND	200	20
Antimony	ug/L	ND	3.9	ND	ND	6	1
Arsenic	ug/L	1	8.1	ND	ND	10	1
Asbestos	MFL(2)	ND	ND	ND	ND	7	0.2
Barium	ug/L	18	120	ND	ND	1,000	2
Beryllium	ug/L	ND	ND	ND	ND	4	1
Cadmium	ug/L	ND	ND	ND	ND	5	0.5
Chromium	ug/L	1.2	5.9	ND	ND	50	1
Copper	ug/L	5.4	36	ND	ND	1,300 *(Action Level)*	2
Cyanide	mg/L	0.04	0.18	ND	ND	150	0.025
Fluoride	mg/L	0.78	3.6	ND	ND	2	0.05
Hexavalent Chromium(1)	ug/L	--	--	--	--	10	0.5
Lead	ug/L	ND	ND	ND	ND	15 *(Action Level)*	0.5
Mercury	ug/L	ND	ND	ND	ND	2	0.2
Nickel	ug/L	6.2	46	ND	ND	100	5
Nitrate (as NO_3)	mg/L	ND	ND	ND	0.12	45	0.013
Nitrite (as N)	mg/L	ND	ND	ND	0.072	1	0.013
Perchlorate	ug/L	32	200	ND	ND	6	2
Nitrate + Nitrite (as N)	mg/L	ND	ND	ND	0.192	10	0.055

Table 18 MF/RO/UV AOP Finished Water Quality for MCLs- Inorganic Chemicals per Table 64431-A and Table 64432-A (DDW, 2015)
Advanced Water Purification Facility
City of Oxnard

Constituent	Unit	RO INF 5/2/16	RO CONC 5/2/16	UV INF 11/12/15	Finished Water 5/20/16	MCL/Action Level	MRL (units shown at far left)
Selenium	ug/L	5.7	28	ND	ND	50	5
Thallium	ug/L	ND	ND	ND	ND	2	1

Notes:
(1) Laboratory error, hexavalent chromium not analyzed for.
(2) MFL = million fibers per liter longer than 10 *u*m.
(3) Hexavalent chromium was not tested due to a sampling error, however, total chromium was analyzed.

Table 19 MF/RO/UV AOP Finished Water Quality for MCLs- Radionuclides per Table 64442 AND 64443 (DDW, 2015)
Advanced Water Purification Facility
City of Oxnard

Constituent	Unit	RO INF 5/02/16	RO CONC 5/02/16	UV INF 5/02/16	Finished Water 5/20/16	MCL	MRL (units shown at far left)
Gross Alpha (including Radium-226 but not Radon and Uranium)	pCi/L	5.7	29.1		ND	15	1.5
Radium-226	pCi/L	<0.889	0.354	<0.733	ND	-	0.889
Radium-228	pCi/L	<0.661	<0.593	<0.804	ND	-	0.661
Combined Radium-226 and Radium-228 (*226 + 228*)	pCi/L	ND	0.354	ND	ND	5	
Strontium 90	pCi/L	<0.968	<1.92	<0.908	<0.654	8	0.968
Uranium	pCi/L	5.2	37	ND	ND	20	0.7
Tritium	pCi/L	<267	<265	<264	<279	20,000	267
Beta/Photon emitters (gross beta tested)	pCi/L	38	210	5.3	<1.80	4	2.42

Table 20 MF/RO/UV AOP Finished Water Quality for MCLs- Synthetic Organic Chemicals - SVOCS per Table 64444-A (DDW, 2015)
Advanced Water Purification Facility
City of Oxnard

Constituent	Unit	RO INF 5/02/16	RO CONC 5/02/16	UV INF 5/0216	Finished Water 5/20/16	MCL/Action Level	MRL(units shown at far left)
Alachlor	ug/L	ND	ND	ND	ND	2	0.05
Atrazine	ng/L	ND	9.3	ND	ND	1	5
Benzo(a)pyrene	ug/L	ND	ND	ND	ND	0.2	0.02
Carbofuran	ug/L	ND	ND	ND	ND	40	0.5
Chlordane	ug/L	ND	ND	ND	ND	2	0.1
Dalapon	ug/L	ND	1.1	ND	ND	200	1
Dibromochloropropane	ug/L	ND	ND	ND	ND	0.2	0.01
Dinoseb	ug/L	ND	ND	ND	ND	7	0.2
Dioxin(2,3,7,8-TCDD)	pg/L	ND	ND	ND	ND	3.00E-08	5
Diquat	ug/L	ND	0.65	ND	ND	20	0.4
Di(2-ethylhexyl) adipate	ug/L	ND	ND	ND	ND	400	0.6
Di(2-ethylhexyl) phthalate	ug/L	ND	ND	ND	ND	6	0.6
Endothall	ug/L	ND	ND	ND	ND	100	5
Endrin	ug/L	ND	ND	ND	ND	2	0.2
Ethylene Dibromide	ug/L	ND	ND	ND	ND	0.05	0.01
Glyphosate	ug/L	ND	ND	ND	ND	700	6
Heptachlor	ug/L	ND	0.033	ND	ND	0.04	0.01
Heptachlor epoxide	ug/L	ND	ND	ND	ND	0.02	0.01
Hexachlorobenzene	ug/L	ND	ND	ND	ND	1	0.05
Hexachlorocyclopentadiene	ug/L	ND	ND	ND	ND	50	0.05
Lindane	ug/L	ND	ND	ND	ND	0.2	0.04

Table 20 MF/RO/UV AOP Finished Water Quality for MCLs- Synthetic Organic Chemicals - SVOCS per Table 64444-A (DDW, 2015)
Advanced Water Purification Facility
City of Oxnard

Constituent	Unit	RO INF 5/02/16	RO CONC 5/02/16	UV INF 5/0216	Finished Water 5/20/16	MCL/Action Level	MRL(units shown at far left)
Methoxychlor	ug/L	ND	ND	ND	ND	40	0.1
Oxamyl(Vydate)	ug/L	ND	ND	ND	ND	200	0.5
Picloram	ug/L	ND	ND	ND	ND	500	0.1
Polychlorinated Biphenyls (TOTAL)(1)	ug/L	ND	ND	ND	ND	0.5	0.0005
Pentachlorophenol	ug/L	ND	ND	ND	ND	1	0.04
Simazine	ng/L	20	76	ND	ND	4	5
Toxaphene	ug/L	ND	ND	ND	ND	3	0.5
2,4-D	ug/L	0.25	2.3	ND	ND	70	0.1
2,4,5-TP Silvex	ug/L	ND	ND	ND	ND	50	0.2
Bentazon	ug/L	ND	0.78	ND	ND	18	0.5
Molinate	ug/L	ND	ND	ND	ND	20	0.1
Thiobencarb	ug/L	ND	ND	ND	ND	1	0.2

Notes:
(1) Polychlorinated Biphenyls (TOTAL) includes: PCB 1016, PCB 1221, PCB 1232, PCB 1242, PCB 1248, PCB 1254 and PCB 1260."

Table 21 MF/RO/UV AOP Finished Water Quality for MCLs- Volatile Organic Chemicals - VOCS per Table 64444-A (DDW, 2015)
Advanced Water Purification Facility
City of Oxnard

Constituent	Unit	RO INF 5/02/16	RO CONC 5/02/16	UV INF 5-02-16	Finished Water 5/2016	MCL/Action Level	MRL
Benzene	ug/L	ND	ND	ND	ND	1	0.5
Carbon tetrachloride	ug/L	ND	ND	ND	ND	0.5	0.5
cis-1,2-Dichloroethylene	ug/L	ND	ND	ND	ND	6	0.5
Dichloromethane	ug/L	ND	ND	ND	ND	5	0.5
Ethylbenzene	ug/L	ND	ND	ND	ND	300	0.5
Monochlorobenzene (Chlorobenzene)	ug/L	ND	ND	ND	ND	70	0.5
o-Dichlorobenzene	ug/L	ND	ND	ND	ND	600	0.5
p-Dichlorobenzene	ug/L	ND	ND	ND	ND	5	0.5
Styrene	ug/L	ND	ND	ND	ND	100	0.5
Tetrachloroethylene(PCE)	ug/L	ND	ND	ND	ND	5	0.5
Toluene	ug/L	ND	ND	ND	ND	150	0.5
trans-1,2-Dichloroethylene	ug/L	ND	ND	ND	ND	10	0.5
Trichloroethylene (TCE)	ug/L	ND	ND	ND	ND	5	0.5
Vinyl chloride	ug/L	ND	ND	ND	ND	0.5	0.3
Xylenes (total)	ug/L	ND	ND	ND	ND	1,750	0.5
1,1-Dichloroethylene	ug/L	ND	ND	ND	ND	6	0.5
1,1,1-Trichloroethane	ug/L	ND	ND	ND	ND	200	0.5
1,1,2-Trichloroethane	ug/L	ND	ND	ND	ND	5	0.5
1,2-Dichloroethane	ug/L	ND	ND	ND	ND	0.5	0.5

Table 21 MF/RO/UV AOP Finished Water Quality for MCLs- Volatile Organic Chemicals - VOCS per Table 64444-A (DDW, 2015)
Advanced Water Purification Facility
City of Oxnard

Constituent	Unit	RO INF 5/02/16	RO CONC 5/02/16	UV INF 5-02-16	Finished Water 5/2016	MCL/Action Level	MRL
1,2-Dichloropropane	ug/L	ND	ND	ND	ND	5	0.5
1,2,4-Trichlorobenzene	ug/L	ND	ND	ND	ND	5	0.5
1,1-Dichloroethane	ug/L	ND	ND	ND	ND	5	0.5
1,3-Dichloropropene	ug/L	ND	ND	ND	ND	0.5	0.5
Methyl-tert-butyl ether (MTBE)	ug/L	ND	ND	ND	ND	135 (Secondary MCL)	0.5
1,1,2,2-Tetrachloroethane	ug/L	ND	ND	ND	ND	1,200	0.5
Trichlorofluoromethane	ug/L	ND	ND	ND	ND	150	0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L	ND	ND	ND	ND	1,200	0.5

Table 22 MUF/RO/UV AOP Finished Water Quality for MCLs- Disinfection Byproducts per Table 64533-A (DDW, 2015)
Advanced Water Purification Facility
City of Oxnard

Disinfection Byproduct	Unit	RO INF 5/02/16	RO CONC 5/02/16	UV INF 5/02/16	Finished Water 5/20/16	MCL/Action Level	MRL
Total Trihalomethanes (TTHM)	ug/L	2.3	11	1.5	0.89	80	0.5
Haloacetic acids (five) (HAA5)(1)	ug/L	20	85	ND	ND	60	2
Bromate	ug/L	ND	1.8	ND	ND	10	1
Chlorite	mg/L	ND	ND	ND	ND	1.0	0.01
Chlorate	ug/L	350	1600	16	ND	800	10

Note:
(1) Haloacetic acids (five) includes: Bromoacetic Acid, Chloroacetic Acid, Dibromoacetic Acid, Dichloroacetic Acid and Trichloroacetic Acid.

Table 23 MF/RO/UV AOP Finished Water Quality for Secondary MCLs per Tables 64449-A and 64449-B (DDW, 2015)
Advanced Water Purification Facility
City of Oxnard

Secondary Constituent	Unit	RO INF 5/02/16	RO CONC 5/02/16	UV INF 5/02/16	Finished Water 5/20/16	MCL/Action Level (units shown at far left)	MRL (units shown at far left)
Color	ACU	40	300	ND	5	15 color units	3
Corrosivity (below)*:						Non-corrosive	
Langelier Index - 20 degrees C	-	-3	-4.9	-2.4	5.4	Non-corrosive	-
Langelier Index at 60 degrees C	-	NA	NA	NA	NA	Non-corrosive	-
Aggressiveness Index-Calculated	-	8.7	6.8	9.3	7.4	Non-corrosive	-
pH of CaCO3 saturation(25C)	Units	6.6	5	10	10	Non-corrosive	0.1
pH of CaCO3 saturation(60C)	Units	6.2	4.6	9.9	9.9	Non-corrosive	0.1
Bicarb. Alkalinity as HCO3, calc	mg/L	650	4200	ND	ND	Non-corrosive	3
Foaming agents (Surfactants)	mg/L	0.2	0.89	ND	ND	0.5	0.1
pH	Units	8	7.8	6.7	6.5	6.5-8.5	0.1
Hardness (as CaCO3)	mg/L	650	4,200	ND	ND	250	3
Odor (SM 2150B - Odor at 60 C (TON))	TON	200	200	3	ND	3 (Threshold Odor Number)	1
Total dissolved solids(TDS)	mg/L	2,000	11,000	68	64	500	10
Aluminum	ug/L	ND	87	ND	ND	50-200	20
Chloride	mg/L	610	3,700	26	17	250	1
Copper	ug/L	5.4	36	ND	ND	1,000	2
Fluoride	mg/L	0.78	3.6	ND	ND	2	0.05
Iron	mg/L	0.13	0.87	ND	ND	0.3	0.02
Manganese	ug/L	95	680	ND	ND	50	2
Silver	ug/L	ND	ND	ND	ND	100	0.5
Sulfate	mg/L	510	3400	ND	0.55	250	0.5
Turbidity	NTU	0.17	0.5	ND	0.14	5	0.1
Specific Conductance	umho/cm	3400	18,000	140	110	900	2
Zinc	ug/L	21	140	ND	ND	5,000	20

Table 24 MF/RO/UV AOP Finished Water Quality for Drinking Water NLs per DDW, 2015a
Advanced Water Purification Facility
City of Oxnard

Secondary Constituent	Unit	RO INF 5/02/16	RO CONC 5/02/16	UV INF 5/02/16	Finished Water 5/20/16	MCL/Action Level (units shown at far left)	MRL (units shown at far left)
Boron	mg/L	1.1	2.1	0.82	0.77	1	0.05
n-Butylbenzene	ug/L	ND	ND	ND	ND	260	0.5
sec-Butylbenzene	ug/L	ND	ND	ND	ND	260	0.5
tert-Butylbenzene	ug/L	ND	ND	ND	ND	206	0.5
Carbon disulfide	ug/L	ND	ND	ND	ND	160	0.5
Chlorate	ug/L	350	1,600	16	ND	800	10
2-Chlorotoluene	ug/L	ND	ND	ND	ND	140	0.5
4-Chlorotoluene	ug/L	ND	ND	ND	ND	140	0.5
Diazinon	ug/L	ND	ND	ND	ND	1.2	0.1
Dichlorodifluoromethane (Freon 12)	ug/L	ND	ND	ND	ND	1,000	0.5
1,4-Dioxane	ug/L	1.4	7	ND	ND	1	1
Ethylene glycol	mg/L	ND	ND	ND	ND	14	10
Formaldehyde	ug/L	36	100	20	17	100	5
HMX	ug/L	ND	ND	ND	ND	350	0.1
Isopropylbenzene	ug/L	ND	ND	ND	ND	770	0.5
Manganese	ug/L	95	680	ND	ND	500	2
Methyl isobutyl ketone (MIBK)	ug/L	ND	ND	ND	ND	120	5
Naphthalene	ug/L	ND	ND	ND	ND	17	0.5
N-Nitrosodiethylamine (NDEA)	ng/L	2.9	25	ND	ND	10	2
N-Nitrosodimethylamine (NDMA)	ng/L	33	90	32	5	10	2

Table 24 MF/RO/UV AOP Finished Water Quality for Drinking Water NLs per DDW, 2015a
Advanced Water Purification Facility
City of Oxnard

Secondary Constituent	Unit	RO INF 5/02/16	RO CONC 5/02/16	UV INF 5/02/16	Finished Water 5/20/16	MCL/Action Level (units shown at far left)	MRL (units shown at far left)
N-Nitrosodi-n-propylamine (NDPA)	ng/L	ND	ND	ND	ND	10	2
Propachlor**	ug/L	ND	ND	ND	ND	90	0.05
n-Propylbenzene 0.26	ug/L	ND	ND	ND	ND	260	0.5
RDX	ug/L	ND	ND	ND	ND	0.3	0.1
Tertiary butyl alcohol (TBA)	ug/L	2.1	19	ND	ND	12	2
1,2,3-Trichloropropane (1,2,3-TCP)	ug/L	ND	0.017	ND	ND	0.005	0.005
1,2,4-Trimethylbenzene	ug/L	ND	ND	ND	ND	330	0.5
1,3,5-Trimethylbenzene	ug/L	ND	ND	ND	ND	330	0.5
2,4,6-Trinitrotoluene (TNT)	ug/L	ND	ND	ND	ND	1	0.1
Vanadium	ug/L	ND	11	ND	ND	50	3

Table 25 MF/RO/UV AOP Finished Water Quality for CECs
Advanced Water Purification Facility
City of Oxnard

Constituent	Unit	RO INF 5/02/16	RO CONC 5/02/16	UV INF 5/02/16	Finished Water 5/2016	MRL
Gemfibrozil	ng/L	1200	16000	ND	ND	5
Naproxen	ng/L	130	230	ND	ND	10
Triclosan	ng/L	230	2000	12	ND	10
Ibuprofen	ng/L	ND	5200	ND	ND	10
Acetaminophen	ng/L	150	240	45	ND	5
Sucralose	ng/L	47,000	310,000	ND	ND	100
Triclocarban	ng/L	ND	ND	ND	ND	5
Sulfamethoxazole	ng/L	1,600	15,000	ND	ND	5
Atenolol	ng/L	320	3700	5.5	ND	5
Trimethoprim	ng/L	320	3500	ND	ND	5
Caffeine	ng/L	3500	31000	23	21	5
Fluoxetine	ng/L	35	220	ND	ND	10
Meprobamate	ng/L	ND	930	ND	ND	5
Carbamazepine	ng/L	140	1000	ND	ND	5
Primidone	ng/L	94	260	ND	ND	5
DEET	ng/L	94	260	ND	ND	5
TCEP	ng/L	200	1100	ND	ND	10
PFOA	ug/L	0.0057	0.035	ND	0.0051	0.0025
PFOS	ug/L	0.0042	0.035	ND	ND	0.0025
Estrone	ng/L	9.4	51	ND	ND	0.002
Estradiol	ng/L	ND	ND	ND	ND	5
Ethynylestradiol	ug/L	ND	0.0052	ND	ND	0.0009
Testosterone	ug/L	0.0019	0.0090	ND	ND	0.0001
Progesterone	ng/L	ND	ND	ND	ND	5

11.0 ASR FACILITIES

The proposed ASR concept is to inject highly-treated recycled water for a minimum period of 3.1 months and possibly for up to 6 months, hold the water in the designated aquifer for 3.1 months, and then withdraw the water from the same wells into which the water was injected for potable and/or non-potable use. The proposed ASR operation is summarized in Section 6 and detailed by Hopkins (2016).

12.0 GROUNDWATER BASINS

12.1 Existing Water Quality

At this time, the project team has extensive groundwater data provided by the UWCD for the "Lower Aquifer System," or LAS (shown in Figure 30 below). The LAS extends throughout the area and groundwater quality is anticipated to be similar underneath the proposed ASR location. Table 26 is lists local groundwater quality data obtained from UWCD.

Table 26 List of UWCD Groundwater Quality Advanced Water Purification Facility City of Oxnard

Constituent (mg/L unless otherwise stated)	Comparative Groundwater Quality Well IDs			Nearest Well to Proposed ASR Location (1N22W04F04)(1)
	01N22W03F05S	02N22W30F03S	02N22W20L03S	
Alk as CaCO3	213	484	608	520
Temperature (C)				
pH	7.38	7.40	7.46	7.6
TDS	996			958
Turbidity (NTUs)	0.04		0.42	
Nitrate-N				4.3
Potassium	5	7	5	6
Sodium	102	93	140	93
Magnesium	47	37	54	44
Calcium	141	135	155	135
Bicarbonate	239	255	286	249
Sulfate	470	435	594	418
Boron (µg/L)	700	600	620	600
Chloride	50	54	66	49
Fluoride	0.62	0.50	0.60	0.7

Notes:
(1) Data from 1960 to 1989.

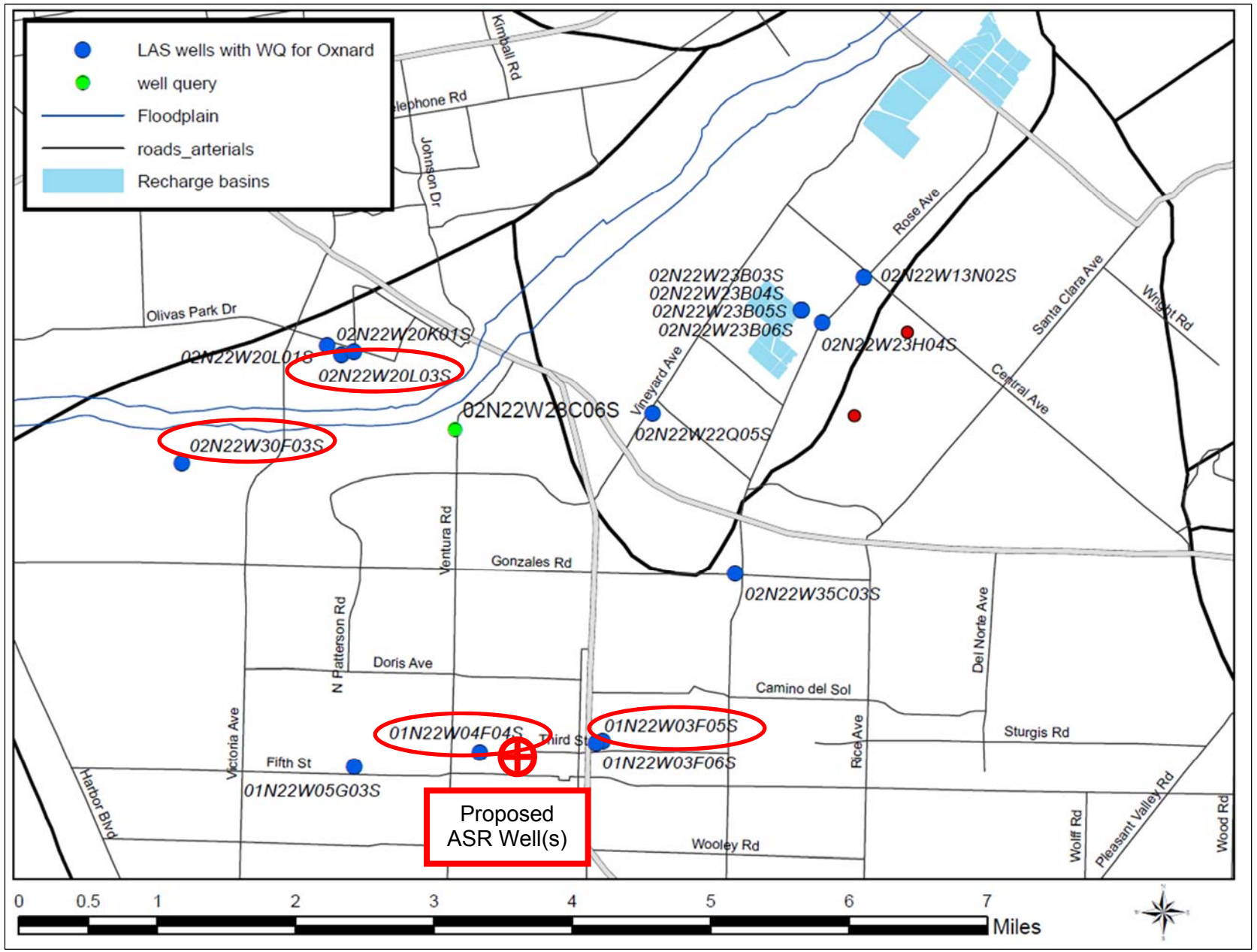

Figure 30 Oxnard Map of UWCD Well Locations (provided by UWCD)

12.2 Groundwater Model

No groundwater model exists for the project area.

13.0 DOMESTIC WATER SUPPLY PRODUCTION WELLS

13.1 Production Wells Near the Project

The Campus Park site is located within the City where all potable water is provided by the City municipal supply system. The nearest production well to the project is a domestic well located southeast of the site that is used for off-site irrigation. The next closest production wells are domestic wells located to the northwest of the site in the County. These wells, ***all in the UAS***, supply residential uses. The next closest wells are located to the east at City Blending Station No. 1. See Hopkins (2016) for more details.

13.2 Closest Domestic Supply Well

The closest existing domestic supply wells are located over 2,000 feet northwest of the site and are constructed in the Oxnard Aquifer, the uppermost member of the upper aquifer system. See Hopkins (2016) for more details.

13.3 Domestic Water Supply Production Wells – Water Quality

The water quality in regional water supply wells is summarized in Section 12.

14.0 GROUNDWATER RECHARGE IMPACTS

14.1 Regional Geologic and Hydrogeologic Framework

The subsurface geology that controls groundwater flow in the study area is differentiated into two primary geologic units that include; the Holocene and late Pleistocene alluvium, and the San Pedro Formation. The first unit is comprised largely of unconsolidated sedimentary deposits and includes all older and recent alluvial deposits. These shallower units are coarse-grained sand and gravel layers that form the Oxnard and Mugu Aquifers and comprise the UAS in the Oxnard Plain Basin (see Hopkins (2016), Appendix D, Plates 3, and 4). The San Pedro Formation consists of consolidated marine and nonmarine clay, silt, sand, and gravel deposits that comprise the Hueneme and Fox Canyon Aquifers that are designated as the LAS. The low permeability geologic formations underlying the San Pedro Formation are generally considered to be non-water-bearing and effectively define the base of fresh water.

The groundwater in the Oxnard Plain Basin LAS is isolated from overlying land uses by the laterally extensive aquitard (silt and clay) layers that separate and confine the Hueneme and Fox Canyon Aquifer zones. The conceptual subsurface profile (shown in Figure 11)

uses the geophysical survey (electric log) from the proximate (destroyed) City Well No. 13 to show the anticipated geology and aquifer zones beneath the Campus Park GRRP site. The aquifer zones shown in Figure 11 are discretely separated by clay layers that are laterally continuous and appear as marker beds in other well logs shown by Hopkins (2016) in Appendix D, Plates 3 and 4. The significance of the highly confined condition that results from the discretely layered aquifer system is that wells located in close proximity (50 feet apart) but producing from different aquifer layers, do not have hydraulic connectivity with each other (no interference).

Recharge into the LAS will store water in aquifer zones that receive significantly less groundwater recharge than the UAS because of the regional confined aquifer conditions. The UAS readily receives groundwater recharge derived from natural percolation of rainwater and Santa Clara River flows in the Oxnard Forebay Basin, as well as from river flow diversions into the engineered recharge facilities operated by UWCD.

14.1.1 Other Existing or Proposed GWRS Project that Could Impact the ASR

There are no other planned groundwater recharge projects in the vicinity.

14.1.2 Cumulative Impact on Water Quantity and Quality With and Without the Proposed GWRS Project

The water quality in the aquifer zones that will be used for replenishment in the LAS was previously described in Chapter 12. The groundwater is typically a calcium sulfate-barcarbonate chemical character with a TDS concentration of approximately 1,000 mg/l. Water quality degradation has been occurring in the overdrafted basin and results from poorer quality groundwater seeping out of the fine-grained silt and clay layers that are interbedded with the sand and gravel aquifer zones along with seawater intrusion. Without the project, regional groundwater quality will continue to degrade largely as a result of these 2 mechanisms.

With the project, the regional and local water quality impacts are beneficial. The regional benefit occurs when the aquifer is replenished and the groundwater levels rise. The rising water levels lessen any landward gradient and effectively slow the rate of seawater intrusion in the aquifer zones used for storage. This regional benefit remains until the stored volume is entirely removed. After removal there is no impact, in that the groundwater levels return to pre-recharge conditions.

The localized benefit to water quality will occur from flushing and mixing with the superior water quality of the purified water. Any water left behind will blend with the local native groundwater and improve its quality for downgradient users.

14.2 Predicted Recycled Water Retention Time

As detailed previously, the retention time is fully controlled by the City because of the ASR operation. The minimum retention time will be 3.1 months but can vary specifically as chosen by the City as long as all pathogen credit requirements are met.

14.3 Recycled Water Contribution

As there is no proposed dilution, the recycled water contribution (RWC) is 1.0, or 100 percent.

14.4 Antidegradation Assessment – Predicted Groundwater Quality Post Recharge and Utilization of Available Assimilative Capacity of Basin

14.4.1 MCLs, Secondary MCLs, NLs, and CECs

As detailed in WRD (2013), the purified recycled water from an AWPF is expected to improve groundwater quality and thus improve the assimilative capacity. Demonstration of such improved water quality, comparing the water quality at the proposed recharge locations with the water quality of the finished water from the AWPF, has not yet been done. Such work will be done as detailed in Section 17.

14.4.2 Recharge of Purified Water and Groundwater Chemistry Concerns

The LARWQCB has requested more information regarding the change in groundwater chemistry that can result from injection of a purified water. The following perspective comes from OCWD (2014).

- The finished water from Groundwater Replenishment System (GWRS) is stabilized prior to injection via decarbonation and lime addition. Initially the target pH was set at 9.0, but this has been progressively reduced to 8.0 in an effort to mitigate arsenic mobilization while also maintaining pipeline integrity. Ambient groundwater pH is approximately 7.5, and previous literature indicates elevated pH in laboratory experiments can mobilize certain arsenic species. More recent laboratory experiments conducted by Stanford University on behalf of OCWD have shown pH to be a secondary factor in mobilization behavior, with the relatively poorly-buffered finished GWRS water rapidly taking on the pH of the soil column. The effect of reducing the GWRS finished water pH on field-observed arsenic mobilization has been inconclusive to date.

- The literature indicates that low alkalinity and low ionic strength of the finished water may alter the surface charge of aquifer mineral surfaces, affecting arsenic sorption. However, recent laboratory experiments conducted by Stanford University on behalf of OCWD have indicated that neither of these parameters is of significant importance in shallow unconfined aquifer sediments collected near OCWDs recharge area;

instead the concentration of divalent cations, primarily magnesium and secondarily calcium, have been the most important inorganic controls on arsenic desorption.

- The high oxidation reduction potential (ORP) of the finished water may affect the oxidation state of arsenic and increase its solubility or release it via the oxidation of host minerals (e.g., iron sulfides) in the aquifer. This phenomena has been observed at some ASR project sites. In a second phase of work, Stanford University is currently conducting laboratory experiments on the addition of GWRS finished water to deep aquifer sediments collected from a geochemically reducing environment targeted for potential future injection.

- Field observations indicate a complex, non-linear relationship between the proportional GWRS water in the subsurface and resulting arsenic mobilization, governed by significant spatial and temporal variability. The majority of monitoring wells showing GWRS arrival demonstrate little or no mobilization of arsenic. A majority of those wells showing mobilization behavior have resulting arsenic concentrations below levels of regulatory concern (i.e., the 10 ug/L MCL) and/or have shown declining trends after an initial increase.

As part of this project, it is proposed to pilot test the ASR system and measure the impacts. The pilot test would include detailed monitoring of intrinsic tracers (dissolved minerals) as summarized in Section 17.

Because of the ASR operation, injected water will be extracted for both potable and non-potable reuse applications. If there are groundwater chemistry changes that are of public health significance for drinking water, the extracted water can be used exclusively for non-potable applications.

14.5 Impact of Groundwater Recharge Project on Contaminant Plumes

Groundwater recharge projects that utilize surface water spreading or injection in an unconfined groundwater basin can potentially effect the movement or cause movement of existing groundwater contamination. A preliminary search of the State operated GeoTracker web site indicated that there are 4 leaky underground storage tank sites located within 2,000 feet of the Campus Park site. The contamination was either contained in the soil or found in the shallow semi-perched aquifer zone which is isolated from the underlying Oxnard Aquifer by an extensive clay layer. The aquifer zones targeted by the ASR recharge project are isolated by multiple clay layers and aquifer zones beneath the semi-perched aquifer and prevent the project from having a potential impact on shallow groundwater contamination. Furthermore, all 4 sites have been remediated and are closed.

15.0 PROPOSED MONITORING AND REPORTING PROGRAM

This proposed monitoring and reporting program (MRP) was developed to conform to the DDW groundwater recharge regulations (CDPH, 2014).

15.1 General Monitoring Provisions

The following are general monitoring provisions:

- The City proposes to monitor the following according to the manner and frequency specified in this MRP:
  - Influent flow rate and quality to the AWPF.
  - AWPF finished water flow rate and quality.
  - Receiving groundwater quality, both background monitoring and monitoring after start of recharge project.
  - Production well (ASR wells) flow rate and quality.
- Compliance with the requirements of the LARWQCB WDRs will be evaluated based on the analytical monitoring data. Monitoring reports will include, but not be limited to, the following:
  - Analytical results.
  - Location of each sampling station where representative samples can be obtained, including a map that clearly identifies the locations of all injection wells, monitoring wells, and production wells (detailed in Hopkins, 2016).
  - Analytical test methods used and the corresponding method reporting limits (MRLs).
  - Name(s) of the laboratory that conducted the analyses.
  - Copy of the laboratory certifications by the DDW's Environmental Laboratory Accreditation Program (ELAP).
  - Quality assurance and control information.

15.1.1 Sampling and Analytical Protocols

Though not required to be included in the monitoring reports unless specifically requested by DDW or the LARWQCB, the City will have in place sampling protocols including procedures for handling, storing, testing, and disposing of purge and decontamination waters generated from sampling events.

For groundwater monitoring, the sampling protocols will outline the methods and procedures for: measuring water levels; purging wells; collecting samples; decontaminating equipment; containing, preserving, and shipping samples; and maintaining appropriate documentation.

The samples will be analyzed using analytical methods described in 40 CFR Part 141; or where no methods are specified for a given pollutant, by methods approved by the DDW, LARWQCB, and/or SWRCB. The City will select the analytical methods that provide MRLs lower than the limits prescribed in the WDR or as low as possible that will provide reliable data.

The City will instruct its contract laboratories to establish calibration standards so that the MRLs (or its equivalent if there is a different treatment of samples relative to the calibration standards) are the lowest calibration standard. At no time will analytical data derived from extrapolation beyond the lowest point of the calibration curve be used.

For all bacterial analyses, sample dilutions will be performed so the range of values extends from 1 to 800. The detection methods used for each analysis will be reported with the results of the analyses.

15.1.2 QA/QC Procedures

The LARWCB, DDW and the SWRCB Quality Assurance Program, may establish MRLs in any of the following situations:

- When the pollutant has no established method under 40 CFR 141.
- When the method under 40 CFR 141 for the pollutant has a MRL higher than the limit specified in the WDR.
- When the City proposes to use a test method that is more sensitive than those specified in 40 CFR Part 141.

For regulated constituents, the laboratory conducting the analyses will be certified by ELAP or approved by the DDW, LARWQCB, and/or SWRCB for a particular pollutant or parameter.

Samples will be analyzed within allowable holding time limits as specified in 40 CFR Part 141. All QA/QC analyses will be run on the same dates that samples are actually analyzed. The City will retain the QA/QC documentation in its files and make those files available for inspection and/or submit them when requested by the LARWQCB or the DDW. Proper chain of custody procedures will be followed and a copy of this documentation will be submitted with the quarterly report.

15.1.3 Unregulated Chemical Procedures

For unregulated chemical analyses, the City will select methods according to the following approach:

- Use drinking water methods, if available.
- Use DDW-recommended methods for unregulated chemicals, if available.
- If there is no DDW-recommended drinking water method for a chemical, then City staff will utilize the method that results in the lowest MRL for that chemical.
- If there is more than a single USEPA-approved method available, use the most sensitive of the USEPA-approved methods.
- If there is no USEPA-approved method for a chemical, and more than one method is available from the scientific literature and commercial laboratory, after consultation with DDW, use the most sensitive method.

- If no approved method is available for a specific chemical, the City's laboratory (or contract laboratory) may develop methods or use its own methods and will provide the analytical methods to DDW for review. Those methods may be used until DDW-recommended or USEPA-approved methods are available.

15.2 RO Permeate and AWPF Finished Water Monitoring Requirements

CDPH (2014) outlines a number of monitoring requirements for various process parameters and constituents that can determine performance of the system and compliance of the AWPF finished water in relation to the WDR. Section 60320.201 of CDPH (2014) states the following general requirements by process:

RO:

- On-going performance monitoring (EC or TOC) that indicates when the process has been compromised.
  - Online monitoring of EC in the RO permeate is proposed for this project, and the measurement of EC removal across RO will be determined at the AWPF.
  - DDW has requested that TOC monitoring also be used to determine TOC reduction across RO. Oxnard will install TOC metering upstream and downstream of the RO process.
- Minimum of one (1) form of continuous monitoring as well as associated surrogate and/or operational parameter limits and alarm settings that indicate when the integrity has been compromised.
  - As listed above, the RO permeate EC and log removal of EC across RO will be continuously monitored. The log removal of EC is a conservative surrogate for pathogen removal. Once the initial background log reduction of EC is established, a level below the background noise will be alarmed to indicate a reduction in RO performance. DDW, in a letter dated 12/5/2016, recommended setting alarm points similar to OCWD, with a blended EC target of 95 uS/cm and an individual train EC target of 110 uS/cm. As noted above, the baseline EC in the RO permeate will first be monitored before settling on specific EC targets.
  - As listed above, DDW has recommended the use of TOC as an additional monitoring method for RO performance. TOC meter(s) will be installed by the City.

Advanced Oxidation:

- Perform an occurrence study on municipal wastewater that includes indicator compounds and select a total of at least nine indicator compounds, with at least one from each of the functional groups. Or, as an alternative, demonstrate 0.5-log reduction of 1,4-dioxane by the AOP (in this case, UV AOP).
  - Demonstration testing of 1,4-dioxane destruction by AOP was performed at startup and was documented previously in this report.

- Occurrence study protocol, as well as subsequent results and chosen indicator compounds should be submitted for DDW review and approval.
  - 1,4-dioxane demonstration work was done in lieu of this requirement.
- During full-scale operation, the surrogate and or/operational parameter identified should be continuously monitored.
  - As detailed here, demonstration testing was done to show a correlation between the existing control philosophy (NDMA LRV) and 1,4-dioxane destruction.
- Monthly (grab or composite) samples representative of the finished water of the advanced treatment process will be analyzed for contaminants having MCLs and notification levels (NLs). After 12-consecutive months with no results exceeding MCL or NL, a reduction in monitoring frequency can be applied for (minimum quarterly). Monitoring conducted in this subsection can be used in lieu of monitoring (for the same contaminants) in CDPH (2014), Sections 60320.212 and 60320.220.

Table 27 provides more detail on the key analytical monitoring requirements specified in the DDW regulations (CDPH, 2014) as they pertain to the direct injection of purified water. This summary will serve as the basis for the monitoring and testing recommendations set forth within this MRP.

15.3 AWPF Influent Monitoring Requirements

OWTP effluent is the feed to the AWPF. Monitoring of OWTP quality allows for a better understanding of AWPF performance. OWTP effluent will be monitored in accordance with the current NPDES permit and based upon the Enhanced Source Control Program (Appendix A).

For this potable reuse project, recommended minimum monitoring of OWTP effluent is shown below in Table 28.

15.4 Advanced Treatment Online Monitoring

Online monitoring of process performance is critical to maintain the proper barrier to pathogens and trace pollutants. Table 9, presented earlier in this report provides information on the proposed monitoring and response procedures to produce high quality water and the necessary response retention time.

15.5 Reporting Requirements

The reporting requirements included in this section are proposed requirements and not the final requirements. The final reporting requirements for IPR will be specified in the revised Order.

Table 27 Master Table for Analytical Monitoring Requirements Required by CDPH (2014)
Advanced Water Purification Facility
City of Oxnard

Treatment Process	Parameter	Location		Frequency	Further Information	CDPH (2014) Reference
		Influent to Process	Effluent from Process			
RO	Electrical Conductivity	X	X	Continuous	Effluent concentration and log reduction.	60320.201 (b)
	Total Organic Carbon	X	X	Weekly (24-hour composite)	Effluent concentration only. TOC<0.25 mg/L 95% of the time for first 20 weeks. TOC<0.5 mg/L thereafter. City will be installing online TOC meters influent and effluent to RO.	60320.201 (b) / 320.218 (a)
UV AOP	1,4-dioxane	X		One-Time	Seeding and destruction of 1,4-dioxane, ≥ 0.5-log.	60320.201 (d)
	NDMA LRV control with UVI/Q inspections		X	Continuous	NDMA LRV based control system correlates well with 1,4-dioxane destruction, NDMA destruction, and pathogen disinfection	60320.201 (e)
	MCLs, NLs (Inorganics, Radionuclides, Organics, Disinfection By-Products, Lead and Copper)		X	Monthly for 12 months, then transition to Quarterly	Contaminants with MCLs and NLs.	60320.201 (i) / 60320.212 (a)
	Secondary MCLs		X	Yearly[2,3]	Secondary DW MCLs defined in Table 13.	60320.212 (c)
	CECs		X	Annually	CECs defined in Table 19.	60320.220 (d)
	Nitrogen Compounds		X	2 x week, 3 days apart	TN<10 in RO finished water.	60320.210 (a)
	Priority Toxic Pollutants		X	Quarterly	Chemicals listed in 40 CFR Part 131.38.	60320.220
	Chemicals analyzed as part of Source Control		X	Annually	Appendix A	60320.220 & 60320.206
Monitoring Wells		All Monitoring Wells		2 background samples before operation followed by Quarterly Samples	Chemicals listed in 40 CFR Part 131.38. Secondary DW MCLs. Total Nitrogen, nitrate, nitrite. Additional contaminants named by the Department.	60320.220 / 60320.226

Table 28 Influent Monitoring Requirements Advanced Water Purification Facility City of Oxnard			
Constituents	**Units**	**Type of Sample**	**Minimum Frequency of Analysis**
Total Flow	mgd	Online Recorder	Continuous(1)
pH	--	Online Recorder	Continuous(1)
Turbidity	NTU	Online Recorder	Continuous(1)
TSS	mg/L	24-hour comp	Daily
TDS	mg/L	24-hour comp	Daily
BOD_5, 20°C	mg/L	24-hour comp	Weekly
TOC	mg/L	24-hour comp	Weekly
EC	µS/cm	Online Recorder	Continuous(1)
NDMA	ng/L	Grab	Monthly

Notes:

(1) For those constituents that are continuously monitored, the City will report the monthly minimum, maximum, and daily average values.

15.5.1 Report Submittals

The City will submit the required compliance monitoring reports, as outlined in the following paragraphs to the SWRCB's GeoTracker database and to the DDW by the dates listed in Table 29.

Table 29 Summary of Compliance Report Submittals and their Due Dates Advanced Water Purification Facility City of Oxnard		
Report	**Description**	**Due**
Occurrence / Surrogate Study Report	Provide summary of occurrence study and subsequent surrogate monitoring effectiveness.	60 days after initial 12-months of monitoring during full-scale operation.
Quarterly Monitoring Reports	Provide discussion of previous quarter's analytical results and graphical and tabular summaries of monitoring data (see detailed description below).	May 15 (for Jan – Mar) Aug 15 (for Apr – Jun) Nov 15 (for Jul – Sep) Feb 15 (for Oct – Dec)
Annual Summary Report	Provide discussion of previous year's analytical results and graphical and tabular summaries of monitoring data (see detailed description below).	April 15 (for previous year).

Table 29 Summary of Compliance Report Submittals and their Due Dates Advanced Water Purification Facility City of Oxnard		
Report	**Description**	**Due**
Operations, Maintenance and Monitoring Plan	Description of operation, maintenance, and monitoring activities related to the AWPF.	Initial prior to operation Amended: After 6 months of operation.
Five-year Engineering Report	Provide and update to the Engineer's Report.	Every 5th year from date of approval of this Engineer's Report.
Notes: (1) All reports will be submitted to SWRCB's GeoTracker as well as to the DDW.		

15.5.2 Requirements for Reports

15.5.2.1 Analytical Reporting Details

For the purposes of reporting compliance with numerical limitations, analytical data will be reported using the following reporting protocols:

- Sample results greater than or equal to the MRL must be reported 'as measured' by the laboratory (i.e., the measured chemical concentration in the sample).
- Sample results less than the MRL, but greater than or equal to the laboratory's method detection limit (MDL), will be reported as "Detected, but not Quantified", "DNQ", or "J". The laboratory will write the estimated chemical concentration of the sample next to "DNQ" or "J."
- Sample results less than the laboratory's MDL will be reported as "Non-Detected," or ND.

If the City (or their consultants/contractors) samples and performs analyses (other than for process/operational control, startup, research or equipment testing) on any sample more frequently than required in this MRP using approved analytical methods, the results of those analyses will be included in the report. The results will be reflected in the calculation of the average used in the demonstrating compliance with average effluent limitations.

The quarterly report will be prepared by an engineer licensed in the State of California and experienced in the fields of wastewater treatment and public water supply.

The LARWQCB may request supporting documentation, such as daily logs of operations.

15.5.2.2 Occurrence / Surrogate Study Report

As detailed in Section 17, the performance of the system will be documented at startup, including the use of online surrogates for performance monitoring.

Within 60-days after completing the initial 12-months of monitoring during the full-scale operation, the City will submit a report to the DDW and LARWQCB that includes:

- The results of combined chlorine destruction monitoring across the UV AOP.
- The results on online EC reduction across RO.
- The results on online measurements of UV intensity and UVT.
- The results of MF DIT results and turbidity compliance.
- A description of actions taken, or those that would be taken, if the indicator compound removal did not meet the associated design criteria, the continuous surrogate monitoring failed to correspond to the indicator compound removal percentage, or the surrogate and/or operation parameter established was not met.

15.5.2.3 Quarterly Report

The quarterly compliance monitoring reports will, at a minimum, include the following information:

- The volume of recycled water used for non-potable and potable reuse applications. If no recycled water was used/spread/injected, the report shall so state.
- The date and time of all sampling and analyses.
- All analytical results of samples collected during the monitoring period, as listed in previously in this Section.
- Records of any operational problems, plant upset, and equipment breakdowns or malfunctions and any diversion(s) of off-specification recycled water and the location(s) of final disposal.
- Discussion of compliance, non-compliance, or violation of requirements.
- All corrective or preventative action(s) taken or planned with schedule of implementation, if any.
- Certification by the City that no groundwater for drinking water purposes has been pumped from wells within the boundary representing the greatest of the horizontal and vertical distances reflecting 3.1 months of RRT.
- Verification of compliance with the 20-week running average TOC in numerical graphic formats.
- Monitoring results associated with the evaluation of pathogenic microorganism removal as described in Section 5 of this Engineering Report.

15.5.2.4 Annual Report

The annual compliance monitoring reports will, at a minimum, include the following information:

- The volume of purified water used for non-potable and potable reuse applications. If no recycled water was used/spread/injected, the report shall so state.
- Tabular and graphical summaries of the monitoring data (influent, recycled water, and groundwater) obtained during the previous calendar year.
- A summary of compliance status, and for any non-compliance, a description of:
  - The date, duration, and nature of the violation.
  - A summary of any corrective actions and/or suspensions of surface and sub-surface application of recycled water resulting from a violation.
  - If uncorrected, a schedule for and summary of all remedial actions.
- Information pertaining to the vertical and horizontal migration of the recharge water plume.
- Observed trends in the monitoring wells.
- DDW drinking water quality data for the nearest domestic water supply well.
- A description of any changes in the operation of any unit processes or facilities.
- A description of any anticipated changes, along with an evaluation of the expected impacts of those changes on subsequent unit processes or facilities.
- A list of the analytical methods used for each test and associated laboratory quality assurance/quality control procedures; the report will identify the laboratories used by the City to monitor compliance with the WDR, their status of certification and provide a summary of proficiency test.
- A summary of measures taken by the City to comply with wastewater source control program and the effectiveness of the implementation measures.
- Evaluation of the ability of the City to comply with all regulations and provisions.
- List of current operating personnel, their responsibilities, and their corresponding grade of certification.

The annual report will be prepared by an engineer licensed in the State of California and experienced in the fields of wastewater treatment and public water supply.

15.5.2.5 Operations, Maintenance and Monitoring Plan

The Operations, Maintenance, and Monitoring Plan (OMMP) has been prepared under separate cover (KEH (2015)). The OMMP describes:

- Operation and control methodologies of the facility.
- Routine maintenance procedures.

- The monitoring and reporting plan (as included herein).
- Analytical methods for constituent analysis.

As detailed in Section 16, the OMMP needs to be updated prior to operation for potable water reuse. Looking forward, after 6-months of optimizing treatment processes during actual operation, the OMMP will be further updated and amended and will be submitted to the SWRCB's GeoTracker.

15.5.2.6 Five-Year Report

A five-year Engineering Report update will address any project changes and will include, but not be limited to:

- Evidence that the requirements associated with retention time in Section 60320.108, if applicable, and Section 60320.124 of CDPH (2014) have been met.
- A description of any inconsistencies between previous groundwater model predictions and the observed and/or measured values. For this requirement, the City will summarize the groundwater flow and transport including injection and extraction operations for the project during the previous five calendar years. This summary will also use the most current data for the evaluation of the transport of recycled water; such evaluations will include, at a minimum, the following information:
  - Total quantity of water injected into each major aquifer.
  - Estimates of the rate and path of flow of the injected water within each major aquifer.
  - Projections of the arrival time of the recycled water at the closest extraction well and the percent of recycled water at the wellheads.
  - Clear presentation on any assumptions and/or calculations used for determining the rates of flow and for projecting arrival times.
  - A discussion of the underground retention time of recycled water, a numerical model, or other methods used to determine the recycled water contribution to each aquifer.
  - A revised flow and transport model to match actual flow patterns observed within the aquifer if the flow paths have significantly changed.
  - Revised estimates, if applicable, on hydrogeologic conditions including the retention time and the amount of the recycled water in the aquifers and at the production well field at the end of that calendar year. The revised estimates will be based upon actual data collected during that year on recharge rates (including recycled water, native water, and potable water), hydrostatic head values, groundwater production rates, basin storage changes and any other data needed to revise the estimates of the retention time and the amount of the recycled water in the aquifers and at the production well field. Significant differences, and the reasons for such differences, between the original

estimates presented in the Engineer's Report, and the revised estimates, will be clearly presented. Additionally, the City will use the most recently available data to predict the retention time of recycled water in the substance.

The 5-year report will be prepared by an engineer licensed in the State of California and experienced in the fields of wastewater treatment and public water supply.

16.0 GENERAL OPERATIONS PLAN

Details of the AWPF operation, including chemical use and complimentary process details are provided in the Operations and Maintenance Management Plan (OMMP, KEH, 2015).

The DDW commented on this OMMP on February 19, 2015 (DDW, 2015); providing the following important comments, followed by responses from the City on April 14, 2015 (Oxnard, 2015). Prior to operational for potable water reuse, the OMMP needs to be updated to reflect these comments and recommended changes to system operation and monitoring (e.g., TOC implementation as one example).

- **DDW Comment (General)-** DDW "strongly encourages OWD to train additional staff on the operation of the AWPF to allow more flexibility in staffing…OWD shall not put an unnecessary strain on existing drinking water operations staffing…DDW requests more detail on the recycled water distribution staffing." **City Response:** The City is cross-training OWTP staff to assist the two current AWPF operators. The City also intends to limit AWPF operation, at this time, "to daytime hours when dedicated operators are manning the facility." The City intends to "add another position for a dedicated AWPF operator as well as increase Water Quality and Cross Connection staffing, by two."
- **DDW Comment (on IPR) -** "Conductivity will have a water quality trigger level at greater than 60 umho/cm. Will there be an alarm triggered instantly if this level is sustained for a period of time? What is the response time for the confirmation sample? Are operators able to respond afterhours quickly? What would their response time be?" **City Response:** "The SCADA system will be programmed to have a water quality conductivity levels above 60 umho/cm trigger an alarm after a sustained period of 10 minutes. If the AWPF is unmanned when an alarm is triggered, operators at the OWTP would respond. The OWTP has operates 24-hours per day that will be trained to respond to AWPF alarms. The response times would be less than 30 minutes. **Additional Comments based upon this Engineer's Report:** The recommended approach needs to be incorporated into the OMMP.
- **DDW Comment -** "The UV system is expected to achieve 0.9-log NDMA destruction. DDW comments on previous studies which show this corresponds to an EEO of approximately 0.20 kWhr/kgal." **City Response:** Comment Noted. **Additional Comments based upon this Engineer's Report:** Extensive startup work has been performed and documented in this report which illustrate the proper UV system

control to meet NDMA targets with a high degree of reliability. The recommended approach needs to be incorporated into the OMMP.

- **DDW Comment -** "Number four on the list of parameters monitored by SCADA is conductivity monitoring of the RO permeate. For IPR applications, DDW strongly encourages OWD to use an online TOC analyzer." **City Response:** "An online TOC analyzer will be added to the AWPF." **Additional Comments based upon this Engineer's Report:** At this time, no TOC analyzer has been added to the AWPF. The City intends to install a TOC meter, and the OMMP must then be amended to include TOC monitoring and calibration.
- **DDW Comment -** "Please explain what is meant by dose and how this set point is calculated. OMWD should propose a minimum EED." **City Response:** "A minimum EED will be identified…". **Additional Comments based upon this Engineer's Report:** See comment above regarding startup testing of the UV system. The recommended approach needs to be incorporated into the OMMP.
- **DDW Comment -** "The set point for the UV system should be…set [to] a level to always achieve 0.9-log NDMA destruction, which in previous studies corresponds to an EED of approximately 0.2 kWhr/kgal." **City Response:** Comment Noted. **Additional Comments based upon this Engineer's Report:** See comment above regarding startup testing of the UV system. The recommended approach needs to be incorporated into the OMMP.
- **DDW Comment -** OWD shall submit more details on tracer studies, monitoring wells, etc. as they become available. Additionally, please propose a detailed procedure for monitoring leakage between aquifers." **City Response:** Comment noted, the City will provide requested information to DDW. **Additional Comments based upon this Engineer's Report:** No further information in this Engineer's Report.

In the event of a process failure that impacts water quality (potentially or confirmed), the decision making process for protection of public health, detailed in Section 7, will be followed.

17.0 STARTUP TESTING

17.1 DDW Testing Requirements

In discussions with DDW, the City's engineering team reviewed how this project will not use dilution water and will use 100 percent recycled water for recharge. Additionally, the groundwater hydrogeology analyzed within this report is basic, with no tracer work yet performed. As such, extensive testing has been done on the AWPF, as detailed in Sections 5 and 9. These results demonstrate the ability of the AWPF to meet all regulated water quality standards, including for chemical pollutants and for pathogen log reduction.

The single missing information that still must be gathered is the travel time of injected water as it pertains to nearby drinking water wells (detailed in Hopkins, 2016). The analysis within this report of groundwater movement is simplistic. While the analysis methods are conservative, demonstration of groundwater movement (speed and direction) is required. For the ASR project, the ASR well will be put into temporary operation to track the movement of the injected water. Finished water and water from all monitoring wells will be sampled weekly (at a minimum) for TDS, chloride, and sulfate. The time of transport with these intrinsic tracers will be compared to the estimated values and the necessary RRT documented within this report.

The results from the testing above will be submitted to DDW and the RWQCB for review and approval prior to IPR operation.

17.2 LARWQCB Testing Requirements

Several key items must be demonstrated in advance of potable reuse:

- **Background Groundwater Quality –** Upon completion of the monitoring wells, the City will perform sampling required for regulated drinking water projects and the requirements in the Basin Plan for bacteria, minerals, nitrogen, and taste and odor. This testing will be done twice for each groundwater monitoring location. Results will be compared to the AWPF finished water quality detailed in Section 9.
- **Groundwater Chemistry Impacts –** The LARWQCB is concerned about changes in groundwater chemistry that may occur due to the addition of purified water into the groundwater basin. The primary example of this concern is the release of bound arsenic as a result of changes in groundwater chemistry (as reviewed in Section 14 of this report). Upon completion of the initial recharge demonstration period and the response retention, the groundwater will be recovered and placed into the recycled water system for irrigation uses. Groundwater will be sampled weekly for laboratory testing for potential contaminants of concern including for pH, alkalinity, arsenic, magnesium, calcium, and iron sulfides. In addition, water analyses for general minerals, metals, and radionuclides will be conducted on the recovered groundwater toward the beginning, the middle, and the end of the recovery period to assess its suitability as a potable supply.

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LIST OF ACRONYMS

-A-	
ASR	Aquifer Storage and Recovery
AWPF	Advanced Water Purification Facility
-B-	
bgs	below ground surface
BOD	Biological Oxygen Demand
-C-	
CEC	Constituents of Emerging Concern
CEQA	California Environmental Quality Act
City	The City of Oxnard
CIUs	Categorical Industrial Users
CMWD	Calleguas Municipal Water District
CWC	California Water Code
-D-	
DDW	Division of Drinking Water
DIT	Direct Integrity Test
-E-	
EC	Electrical Conductivity
EDCs	Endocrine Disrupting Compounds
ELAP	Environmental Laboratory Accreditation Program
-F-	
FCGMA	Fox Canyon Groundwater Management Authority
-G-	
GRPs	Groundwater Recharge Projects
GRRP	Groundwater Replenishment Reuse Project
GWRS	Groundwater Replenishment System
-H-	
H_2O_2	Hydrogen Peroxide
-I-	
IPR	Indirect Potable Reuse
-L-	
LARWQCB	Los Angeles RWQCB
LAS	Lower Aquifer System
LASAN	LA Sanitation
LPHO	Low-Pressure High-Output
-M-	
MCLs	Maximum Contaminant Levels
MDL	Method Detection Limit
MF	Microfiltration
MRP	Monitoring and Reporting Program

MWDSC	Metropolitan Water District of Southern California
-N-	
ND	Non-Detected
NLs	Notification Levels
NOV	Notice of Violation
NWRI	National Water Research Institute
-O-	
OMMP	Operations, Maintenance, and Monitoring Plan
ORP	Oxidation Reduction Potential
OVMWD	Ocean View Municipal Water District
OWTP	Oxnard Wastewater Treatment Plant
-P-	
PDT	Pressure Decay Test
PEIR	Program Environmental Impact Report
PHWA	Port Hueneme Water Authority
POTW	Publicly-Owned Treatment Works
PPCP(s)	Pharmaceuticals and Personal Care Products
-Q-	
QAPP	Quality Assurance Project Plan
-R-	
RO	Reverse Osmosis
ROP	RO Permeate
ROSA	Reverse Osmosis System Analysis
ROWD	Report of Waste Discharge
RRT	Response Retention Time
RWC	Recycled Water Contribution
RWQCB	Regional Water Quality Control Board
-S-	
SCVWD	Santa Clara Valley Water District
SIU(s)	Significant Industrial User(s)
SNMP(s)	Salt Nutrient Management Plan(s)
SWP	State Water Project
SWRCB	State Water Resources Control Board
-T-	
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TSP-SC	Technical Services Program – Source Control
TTO	Total Toxic Organics
-U-	
UAS	Upper Aquifer System
UV AOP	Ultraviolet Light and Hydrogen Peroxide

UVT	UV Transmittance
UWCD	United Water Conservation District's
-W-	
WDR(s)	Waste Discharge Requirement(s)
WRD	Water Replenishment District
WRR	Water Recycling Requirement

APPENDIX A – INDIRECT POTABLE REUSE ENHANCED SOURCE WATER CONTROL AND COLLECTION SYSTEM MONITORING PROGRAM

APPENDIX A - LOCATED IN VOLUME 2

APPENDIX B – PRELIMINARY HYDROGEOLOGICAL STUDY REPORT, CITY OF OXNARD GREAT PROGRAM, CAMPUS PARK GROUNDWATER REPLENISHMENT AND REUSE PROJECT

APPENDIX B - LOCATED IN VOLUME 2

APPENDIX C - LOCATED IN VOLUME 2

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CITY OF OXNARD CALIFORNIA

MARCH 2017

Advanced Water Purification Facility

Indirect Potable Reuse Engineering Report Appendices

VOLUME 2 OF 2

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CITY OF OXNARD

ADVANCED WATER PURIFICATION FACILITY

INDIRECT POTABLE REUSE
POTABLE REUSE ENGINEERING REPORT

FINAL
VOLUME 2 OF 2
March 2017

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CITY OF OXNARD
ADVANCED WATER PURIFICATION FACILITY

INDIRECT POTABLE REUSE
POTABLE REUSE ENGINEERING REPORT

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APPENDIX B - Preliminary Hydrogeological Study Report, City of Oxnard Great Program, Campus Park Groundwater Replenishment, and Reuse Project

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APPENDIX A – INDIRECT POTABLE REUSE ENHANCED SOURCE WATER CONTROL AND COLLECTION SYSTEM MONITORING PROGRAM

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CITY OF OXNARD

ADVANCED WATER PURIFICATION FACILITY

INDIRECT POTABLE REUSE ENHANCED SOURCE CONTROL AND COLLECTION SYSTEM MONITORING PROGRAM

SUPPLEMENTAL REPORT

DRAFT

March 2017

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CITY OF OXNARD

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INDIRECT POTABLE REUSE
ENHANCED SOURCE CONTROL AND COLLECTION
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APPENDIX B – Oxnard Wastewater Treatment plant NPDES Permit Regulations per Current Order R4-2013-0094

INDIRECT POTABLE REUSE ENHANCED SOURCE WATER CONTROL AND COLLECTION SYSTEM MONITORING PROGRAM

Acknowledgements: At the onset of this effort, Carollo and Oxnard staff reached out to the Orange County Sanitation District and the Los Angeles County Sanitation Districts for initial guidance on source control for potable water reuse. Their assistance was substantial and is appreciated.

The production of purified water starts with an effective source control program. This supplement goes beyond the existing approved source control program for Oxnard, hence the use of "Enhanced" in the title of this document. This Enhanced Source Control Program (ESCP) details the planned program to effectively monitor the industrial and municipal contributions to the Oxnard Wastewater Treatment Plant (OWTP) as it pertains to the forthcoming potable water reuse project. This document is intended as guidance to the City with proposed methods to monitor in numerous locations and proposed methods to trace pollutants to their source. Some changes to the monitoring and response recommendations will occur as the City gains more experience and moves forward with their forthcoming project.

Much of this ESCP details sampling efforts currently employed as part of the existing source control program and sampling efforts that are already required by DDW for finished water quality monitoring. This document is not recommending duplication of those efforts, but instead presents the overall collection and use of data to optimize source control.

1.0 DDW REGULATIONS

The regulatory requirements for wastewater source control are defined in the California Code of Regulations Section 60320.206 of the regulations for groundwater recharge with recycled water (DDW2014). For this project, the City must administer an industrial pretreatment and pollutant source control program. The City must implement and maintain a program that includes, at a minimum:

A. An assessment of the fate of chemicals and contaminants that are specified by the Department of Drinking Water (Department) and Regional Water Quality Control Board, Los Angeles Region (RWQCB) through the wastewater and recycled municipal wastewater treatment systems (addressed in Section 7).

B. Chemical and contaminant source investigations and monitoring that focuses on Department-specified and RWQCB-specified chemicals and contaminants (addressed in Sections 3 and 4).

C. An outreach program to industrial, commercial, and residential communities within the portions of the sewage collection agency's service area that flows into the water reclamation plant subsequently supplying the groundwater replenishment reuse project (GRRP), for the purpose of managing and minimizing the discharge of chemicals and contaminants at the source (addressed in Sections 5 and 6).

D. A current inventory of chemicals and contaminants identified pursuant to this section, including new chemicals and contaminants resulting from new sources or changes to existing sources, that may be discharged into the wastewater collection system (addressed in Section 5).

E. Is compliant with the effluent limits established in the wastewater management agency's RWQCB permit (addressed in Section 4).

This document is intended to address each of these items to the satisfaction of the Division of Drinking Water (DDW).

2.0 COLLECTION SYSTEM AND SECONDARY EFFLUENT SOURCE MONITORING PROGRAMS

The main purpose of any source control monitoring program is to protect public health. With potable reuse systems, it is even more imperative that all steps used to protect public health are taken. Title 22 requires a source monitoring and control program be implemented upstream of potable reuse systems. The City's current source water control program has been recently upgraded to include more stringent discharge limits and monitoring in the collection system. Suggestions to enhance the current collection system monitoring plan are included in this document.

While collection system pre-treatment programs and monitoring are important, secondary effluent is the source water to be used for IPR. The proposed enhanced source control program includes a specific contaminant inventory to be monitored in the secondary effluent as well as in the purified water. An action plan detailing when and how to trace contaminants back through the wastewater treatment plant and potentially into the collection system can be found in Section 5.

A generic example of how to trace industrial discharges from their source to the AWPF, based upon different constituent groups, is shown in Figure 1. Monitoring parameters vary by location, with more constituents being tested in the secondary effluent and purified water.

An effective enhanced source control program will have a monitoring and data analysis plan that starts with the first discharge of wastewater into the collection system all the way through to the final purification step at the AWPF. Key to this success is having a dedicated

staff member heading up the program as the Source Control Program Manager (SCPM). A further job description for the SCPM is provided later in this document.

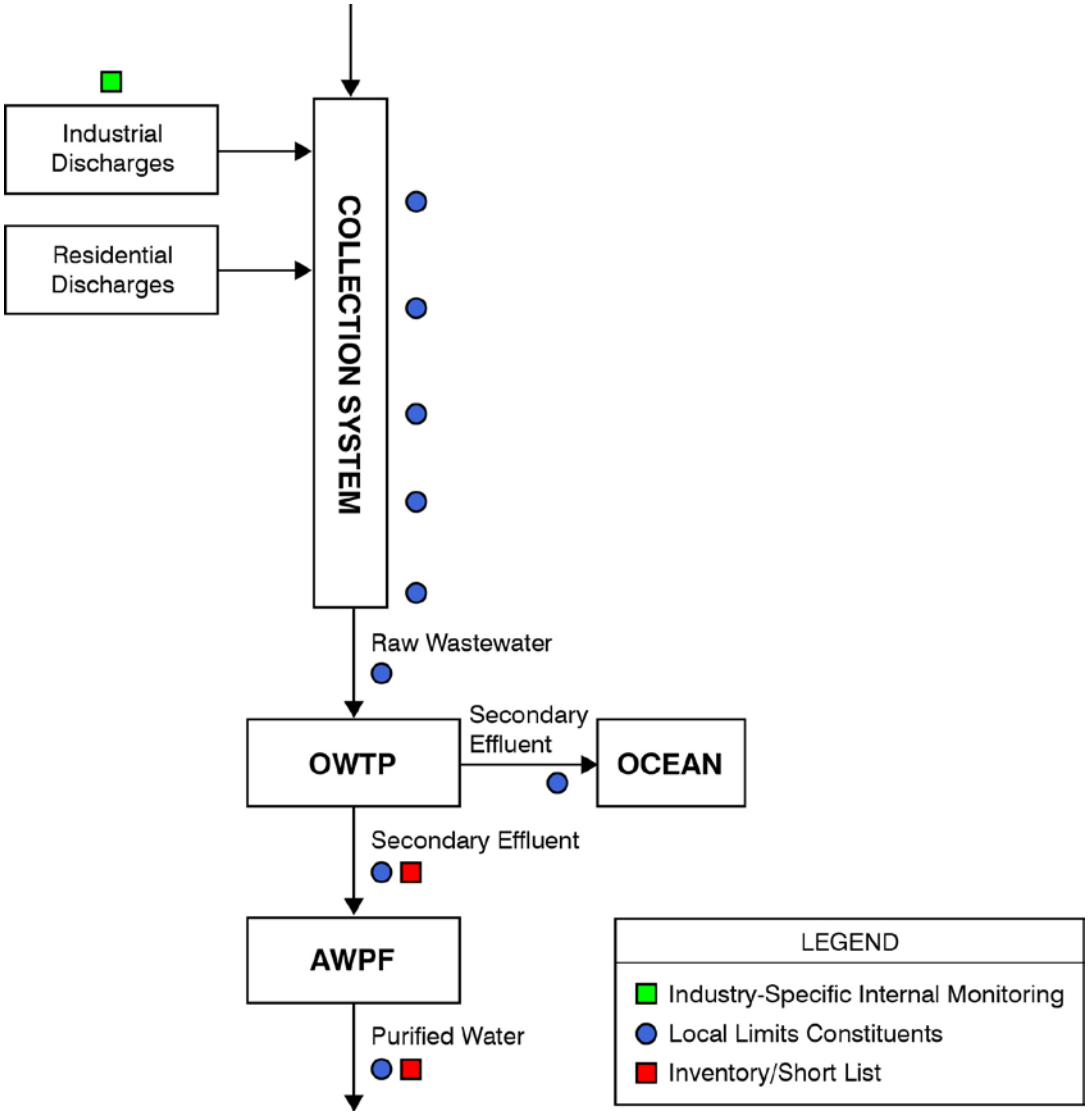

Figure 1 Dischargers, Sampling Locations and Monitoring Constituents Across the Collection and Treatment System.

3.0 EXISTING INDUSTRIAL PRETREATMENT AND COLLECTION SYSTEM SOURCE CONTROL PROGRAM OVERVIEW

The OWTP is permitted under Waste Discharge Requirements Order No. R4-2013-0094 (National Pollutant Discharge Elimination System [NPDES] No. CA0054097), issued to the City in June 2013, and operates an Environmental Protection Agency (EPA)-approved industrial pretreatment program. That program is operating based upon an approved Local Limits program (from 1999). Oxnard is now updating that Local Limits program. The City is

undertaking such an effort in accordance with the permit, and will submit the proposed limits to the Los Angeles office of the RWQCB for approval. As part of this new Local Limits effort, the City and their contractors have performed detailed sampling efforts of the various industrial users and across the OWTP and the AWPF. The sampling plan included different sewer sampling sites for residential sampling as well as additional sites for industrial and commercial business sampling. A draft local limits report is now under evaluation by the City.

Elements of, and updates to, the City's current source control program are provided below.

3.1 Description of Industrial Users

The OWTP treats wastewater from the City and Port Hueneme as well as the Point Mugu Naval Base, Ventura County. Approximately 75 percent of this collected flow is residential. The remaining 25 percent is from industrial users.

Categorical Industrial Users (CIUs) are defined by the federal government and subject to categorical pretreatment standards established in the Code of Federal Regulations. Their discharge requirements are applicable nationwide and are based on best available technology. CIUs, by definition, are also defined as Significant Industrial Users (SIUs). There are typically other SIUs which may not be CIUs.

An industrial user is classified as a SIU if it meets any of the following:

- Is subject to categorical pretreatment standards under 40 CFR 403.6 and 40 CFR Section I, Subsection N.
- Discharges an average of 25,000 gpd or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blowdown wastewater).
- Contributes a process waste stream that makes up 5 percent or more of the average dry-weather hydraulic or organic capacity of the POTW treatment plant.
- Is designated as such by the POTW on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

There are thirty-five industries in the service area identified as SIUs discharging into the OWTP collection system, as shown in Table 1. Included in Table 2 are several dischargers not defined as SIUs, but are regulated under the Oxnard Local Limits program. For each discharger shown in the table below, pertinent details are included, such as Regulatory Classification, Wastewater Type, Type of Pretreatment, Potential Contaminants, Average Daily Flow (ADF), Location, and Oxnard permit number. Figure 2 shows the location of these customers within the Oxnard wastewater collection system.

Table 1 Industrial Dischargers to OWTP
Advanced Water Purification Facility
City of Oxnard

	Regulatory Classification	Categorical Standard[1]	Wastewater Type	Type of Pretreatment	Potential Contaminants[2]	ADF, kgal (Permit)	Address	Permit #
Aluminum Precision	SIU with Local Limits	Aluminum Forming	Aluminum Forming for Aerospace Automotive and Military Industries	Metals Precipitation, Filter Press, Ultra-Filtration and pH Adjustment	Cd, Cr, Cu, CN, Pb, Ni, O&G, pH, TTO, Zn, Flow	7	1001 McWayne Blvd.	74162
Arcturus	SIU with Local Limits	Aluminum Forming	Ferrous & Non-Ferrous Metals Forming	Settling Pond, Oil Skimming, pH Adjustment with H2SO4	Cd, Cr, Cu, CN, Pb, Ni, O&G, pH, TTO, Zn, Flow	25	6001 Arcturus Ave.	308
Boskovich Farms, Inc.	SIU with Local Limits	N/A	Food Processor; wash, cool, package	Screenings & Filtration	BOD, H2S, O&G, TSS, Flow	250	711 Diaz Ave.	23035
Cal Sun	SIU with Local Limits	N/A	Strawberry Food Processor	Activated Sludge	BOD, H2S, pH, TSS, Flow	32	511 Mountain View Ave.	87549
City of Oxnard Desalter	SIU with Local Limits	N/A	Water Treatment	None	TDS, pH, TSS, Flow	1,500	251 S. Hayes Ave.	23233
Coastal Green Vegetables	SIU with Local Limits	N/A	Food Processor; wash, cool, package, freeze	Activated Sludge	BOD, H2S, O&G, pH, TSS, Flow	220	605 Buena Vista Ave.	94108
Coastal Metal Finishing *(now owned by Limons Metal Finishing)*	Local Limits Only	Metal Finishing	Metal Finishing	Batch Treatment: pH Adjustment, Filtration, Ion Exchange, Evaporation, Solids Dewatering	Ag, CN, Cr, Cu, Pb, Ni, pH, TTO, Zn	4	1160 Mercantile St.	86037
Consolidated Precision Products	SIU with Local Limits	Metal Molding and Casting (Foundries)	Metal Molding & Casting	pH Adjustment	Cd, Cr, Cu, Pb, Ni, Ag, Zn, O&G, pH, TSS, TTO, Flow	30	705 Industrial Ave.	OC-25
Crestview Municipal Water Company	SIU with Local Limits	N/A	Filter Backwash	None	BOD, TSS, pH	Not Operating	602 Valley Vista	OC-5
Deardorf Farms	SIU with Local Limits	N/A	Food Processor; wash, cool, package	Clarifier	BOD, H2S, O&G, TSS, pH, Flow	10	400 N. Lombard	24330
Duda Farms	SIU with Local Limits	N/A	Food Processor	Screening	BOD, H2S, TSS, pH, Flow	37	860 Pacific Ave.	87287
EF Oxnard	SIU with Local Limits	Steam Electric Power Generating	Steam Electric Power Generation; cooling tower blowdown, reverse osmosis reject	None	Cd, Cr, Cu, Pb, Ni, O&G, pH, TTO, Zn, Flow	15	550 Diaz	85723
Elite	SIU with Local Limits	Metal Finishing	Metal Finishing	Batch Treatment: pH Adjustment, Filtration, Ion Exchange, Evaporation, Solids Dewatering	Ag, CN, Cr, Cd, Cu, Pb, Ni, pH, TTO, Zn	14	540 Spectrum Circle	69418
Frozsun Foods, Inc. *(Sunrise Growers 3rd St.)*	SIU with Local Limits	N/A	Food Processor	Rotating Hydrosieve, Biological	BOD, H2S, pH, TSS, O&G, Flow	350	808 E. Third St.	60905
Frozsun, Inc. *(Sunrise Growers Sturgis)*	SIU with Local Limits	N/A	Food Processor; wash, cook, pack	Bio Reactors, Clarification, pH Adjustment	BOD, H2S, TSS, pH, Flow	40	2640 Sturgis Rd.	103247
Gills Onions	SIU with Local Limits	N/A	Food Processor; onion washing, cutting and packaging	Screening, Biological Treatment, Settling/Clarification	BOD, H2S, O&G, TSS, pH, Flow	250	901 Pacific Ave.	57277
Harris Water Conditioning	SIU with Local Limits	N/A	Water Softener Regenerator	Gravity Separator, Settling Tanks	BOD, H2S, O&G, pH, TSS, TDS, Flow	138	1025 S. Rose	2072
Herzog	SIU with Local Limits	N/A	Winery	Gravity Separator, pH Adjustment	BOD, H2S, pH, TSS, Flow	11	3201 Camino Del Sol	84360
J.M. Smuckers Co.	SIU with Local Limits	N/A	Food Processor; wash, process, package	Activated Sludge	BOD, H2S, pH, TSS, Flow	148	800 Commercial Ave.	88262
Limons Metal Finishing, Inc.	SIU with Local Limits	Metal Finishing	Metal Finishing	Batch Treatment: pH Adjustment, Filtration, Ion Exchange, Evaporation, Solids Dewatering	Ag, CN, Cr, Cu, Pb, Ni, pH, TTO, Zn	4	1160 Mercantile St.	26531
Mission Linen	SIU with Local Limits	N/A	Commercial Laundry	pH Adjustment, Gravity Separation, DAF and Filtration	BOD, O&G, pH, TSS, Flow, H2S, Temperature	39	505 Maulhardt	533
Naval Base Ventura Cty - Point Mugu Facility	SIU with Local Limits	N/A	Domestic/Commercial	Settling	BOD, Cd, Cu, Pb, O&G, H2S, pH, TSS, TTO, Zn, Flow	382	Bldg. 64, Point Mugu	OC-2
Naval Base Ventura Cty - Port Hueneme Facility	SIU with Local Limits	N/A	Domestic/Commercial	None	BOD, Cd, Cr, Ag, Cu, Pb, Ni, O&G, H2S, pH, TSS, TTO Zn, Flow	650	Mills Road Bldg. 1430, Port Hueneme	OC-04
New Indy	SIU with Local Limits	Pulp, Paper and Paperboard	Pulp, Paper, and Paperboard Processing	Activated Sludge	BOD, H2S, O&G, pH, TSS, TTO, Flow, PCP, TCP	309	5936 Perkins Rd.	100024
Oxnard Lemon Co.	SIU with Local Limits	N/A	Food Processor; wash, process, package	Activated Sludge, Clarification	BOD, H2S, O&G, pH, TSS, Flow	35	2001 Sunkist Circle	13266
Pacific Ridge Farms *(now owned by Frozsun)*	Local Limits Only	N/A	Food Processor; wash, cool, pack	Bio Reactors, Clarification, pH Adjustment	BOD, H2S, TSS, pH, Flow	30	2640 Sturgis Rd.	96073
Parker Hannafin	SIU with Local Limits	N/A	Membrane and Filter Manufacturing	Reverse Osmosis, Vacuum Distillation and UV Advanced Oxidation	BOD, TTO, O&G, pH, TSS, Zn	26	2340 Eastman	88211

Table 1 Industrial Dischargers to OWTP
Advanced Water Purification Facility
City of Oxnard

	Regulatory Classification	Categorical Standard[1]	Wastewater Type	Type of Pretreatment	Potential Contaminants[2]	ADF, kgal (Permit)	Address	Permit #
Port Hueneme Water Agency	SIU with Local Limits	N/A	Water Treatment	None	TDS, pH, TSS, Flow	650	5751 Perkins Rd.	56788
Proctor and Gamble	SIU with Local Limits	Pulp, Paper and Paperboard	Pulp, Paper and Paperboard Processing	Gravity Separation, Filtration, Dewatering, Equalization, Neutralization	BOD, H2S, O&G, pH, TSS, TTO, Flow, PCP, TCP	1,376	800 N. Rice	4438
Puretec Industrial	SIU with Local Limits	N/A	Water Softener Regenerator	pH Adjustment	BOD, H2S, O&G, pH, TSS, Flow	100	3151 Sturgis Rd.	56690
Raypak	SIU with Local Limits	Metal Finishing	Metal Finishing	Chemical Precipitation, Neutralization, Settling/Clarification, Filter Press, Filtration	O&G, Cd, Cr, Cu, CN, Pb, pH, Ni, Ag, TTO, Zn	11	2151 Eastman	64517
Saticoy Lemon	SIU with Local Limits	N/A	Food Processor; wash lemons, box and package	Biological Control, Clarification, Aeration, Screening	BOD, H2S, O&G, TSS, pH, Flow	50	600 E. Third St.	1345
Scarborough Farms, Inc.	SIU with Local Limits	N/A	Food Processor; vegetable washing, packaging	None	BOD, H2S, pH, TSS, Flow	17	731 Pacific Ave.	57313
Seaboard Produce	SIU with Local Limits	N/A	Food Processor	Settling, Clarification	BOD, H2S, O&G, TSS, Flow	6	601 Mountain View	9866
Seminis	SIU with Local Limits	N/A	Seed Processing	Batch Treatment, Precipitation, Clarification, pH Adjustment, Solids Removal, Ozone	BOD, H2S, TSS, pH, Flow, Zn, TTO, COD, O&G	19	2700 Camino Del Sol	47449
Simba Cal	SIU with Local Limits	Metal Finishing	Metal Finishing	None	Cd, Cr, Cu, Pb, Ni, Ag, Zn, CN, TTO, pH	0.75	1680 Universe Circle	32321
Terminal Freezers (Del Mar, Sun Coast, Tree Top)	SIU with Local Limits	N/A	Food Processor	Activated Sludge, Hydrosieve	BOD, H2S, pH, TSS, O&G, Flow	730	1300 E. Third St.	98242
Ventura Pacific	SIU with Local Limits	N/A	Food Processor; (processing & packaging of lemons)	Activated Sludge, Screening and Clarification	BOD, H2S, O&G, TSS, pH, Flow	70	245 E. Colonia Rd.	26979

Notes:
(1) N/A indicates the industry is not federally regulated.
(2) All TTOs required for monitoring are included in Table 3, with corresponding federal categorical standards, where applicable. TTO requirements for non-federally regulated industries are determined by the POTW and will be updated with the Local Limits study.

Table 2 Industrial Discharge Customers and Corresponding Numbers to Figure 2 Advanced Water Purification Facility City of Oxnard	
INDUSTRIAL CUSTOMERS	
No.	Name
1	Aluminum Precision Products
2	Arcturus Manufacturing
3	Automobile Racing Products
4	Boskovich Farms
5	Cal Sun Produce
6	City of Oxnard Blending Station 3
7	City of Oxnard Desalter
8	Coastal Green Vegetable Company
9	Coastal Metal Finishing
10	Consolidated Precision Products
11	Crestview Municipal Water Company
12	Deardorf Farms
13	Duda Farm Fresh Foods
14	EF Oxnard
15	Elite Metal Finishing
16	Frozsun Foods
17	Frozsun Inc
18	Gill's Onions
19	Harris Water Conditioning
20	Herzog Wine Cellars
21	J.M. Smucker Co.
22	Limons Metal Finishing, Inc.
23	Mission Linen Supply
24	Naval Base Ventura County - Point Mugu Facility
25	Naval Base Ventura County - Port Hueneme Facility
26	New Indy
27	Oxnard Lemon Co.
28	Pacific Ridge Farms
29	Parker Hannifin
30	Port Hueneme Water Agency
31	Proctor and Gamble
32	Puretec Industrial Water
33	Raypak

Table 2 Industrial Discharge Customers and Corresponding Numbers to Figure 2 Advanced Water Purification Facility City of Oxnard	
INDUSTRIAL CUSTOMERS	
No.	Name
34	Santa Clara Waste Water Co.(1)
35	Saticoy Lemon #4
36	Scarborough Farms
37	Seaboard Produce Distributors
38	Seminis
39	Simba Cal
40	Terminal Freezer
41	Ventura Pacific Co.
Notes: (1) Santa Clara Waste Water Co.'s permit is suspended.	

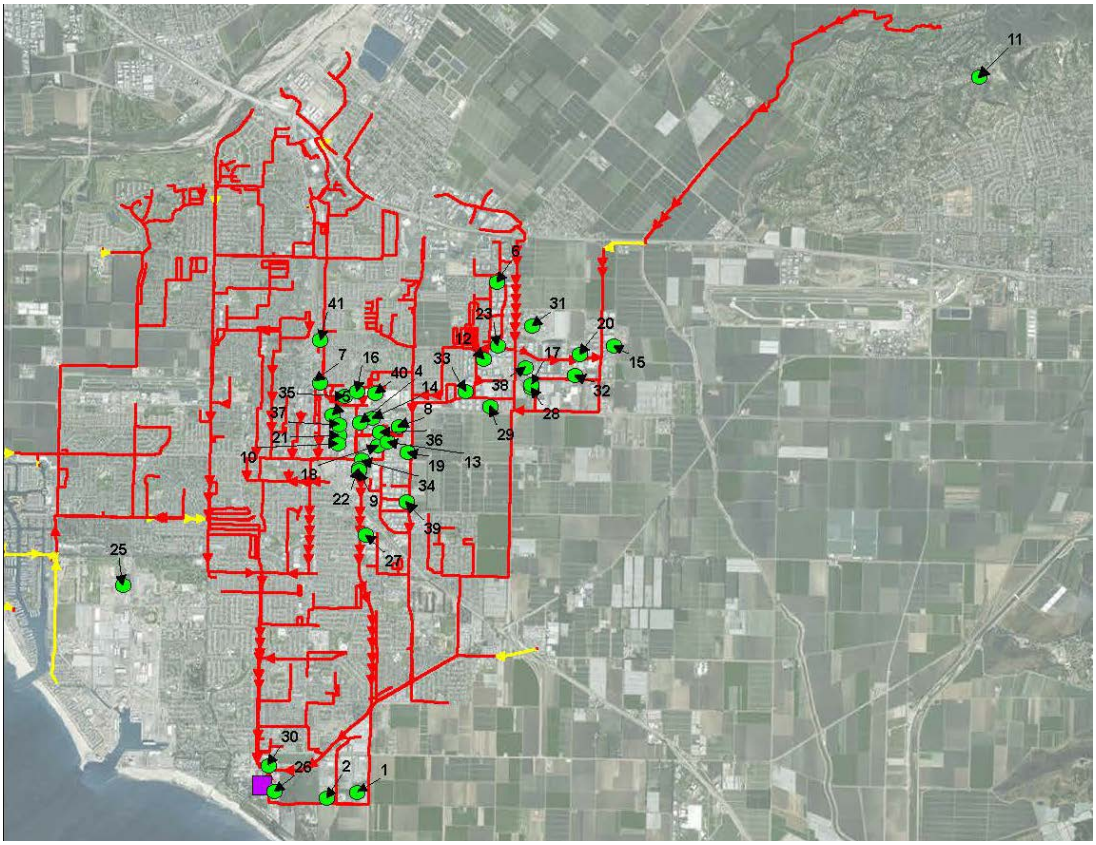

Figure 2 Oxnard Collection System with SIUs

3.2 Source Control Program Description

Oxnard's Source Control Program was established as part of the City's industrial pretreatment program, to prevent contaminants from entering the sewer system that could negatively impact the wastewater treatment process or reclaimed water quality. The source control program was also designed to protect the public and environment as well as OWTP personnel from harmful industrial waste. To achieve these goals, the City adopted a Sewer Ordinance within Section 19, Article 1 of the Oxnard Code of Ordinances. *Although not specifically designed to address potable water reuse, Oxnard's existing source control program is intended to protect OWTP effluent, which is the source to the AWPF.* The proposed source control program specifically tailored to potable water reuse is detailed further on in this document.

3.2.1 Local Limits Evaluation

A Local Limits Evaluation Report was created in 1999 to determine allowable contaminant concentrations in industrial wastewater. The Local Limits Evaluation Report is now being updated (September 2015 Draft).

3.2.2 Permitting of Industrial Users

All SIUs are required to obtain an Industrial Wastewater Discharge Permit from the Oxnard City Manager. Permits are issued for up to five-year periods and contain both effluent limits and sampling requirements. These limits can be both local and federal. SIUs are required to submit their permit application at least 90 days before any proposed discharge. Table 2, above, includes all industrial dischargers permitted by the City.

3.2.3 Industrial Waste Monitoring

Oxnard's monitoring program provides necessary information for evaluating industry compliance, assessing OWTP loading and operation, and determining illicit discharges. SIUs are monitored via three mechanisms: self-monitoring, monitoring by the City, and surveillance sampling.

Self-monitoring is required for each SIU. The Industrial Wastewater Discharge Permits mandate daily flow monitoring as well as bi-monthly contaminant sampling. Each month the SIU must submit a Surveillance Monitoring Report to the City. Typical parameters for which dischargers must sample include: Biological Oxygen Demand (BOD), TSS, Total Toxic Organics (TTO), Oil and Grease, and pH. Industry specific metal monitoring is often also mandated. Monthly TTO monitoring may not be required if TTO samples contain less than 1.0 mg/L, and in this case, only yearly samples are necessary. The following Table 3 contains a list of all TTOs and the corresponding industry category that requires monitoring.

Table 3 Industrial Discharge Monitoring Requirements for TTOs
Advanced Water Purification Facility
City of Oxnard

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
1,1,1-trichloroethane		X	X	X		
1,1,2,2-Tetrachloroethane		X		X		
1,1,2-trichloroethane		X		X		
1,12-benzoperylene (benzo(ghi) perylene)		X		X		
1,1-dichloroethane		X		X		
1,1-dichloroethylene		X		X		
1,2,4-trichlorobenzene		X		X		
1,2,5,6-dibenzanthracene (dibenzo(a,h)anthracene)		X		X		
1,2-benzanthracene (benzo(a) anthracene)		X		X		
1,2-dichlorobenzene		X		X		
1,2-dichloroethane		X		X		
1,2-dichloropropane		X		X		
1,2-dichloropropylene (1,3-dichloropropene)				X		
1,2-diphenylhydrazine	X	X		X		
1,2-trans-dichloroethylene		X		X		
1,3-dichlorobenzene		X		X		
1,3-Dichloropropylene (1,3-dichloropropene)		X				
1,4-dichlorobenzene		X		X		
11,12-benzofluoranthene (benzo(b) fluoranthene)				X		
11,12-Benzofluoranthene (benzo(k)fluoranthene)		X				
2,3,4,6-tetrachlorophenol					X	
2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD)		X		X		
2,4,5-trichlorophenol					X	
2,4,6-trichlorophenol		X	X	X	X	X
2,4-dichlorophenol		X		X		
2,4-dimethylphenol		X	X	X		
2,4-dinitrophenol		X		X		
2,4-dinitrotoluene	X	X		X		
2,6-dinitrotoluene		X		X		
2-chloroethyl vinyl ether (mixed)		X		X		
2-chloronaphthalene		X		X		
2-chlorophenol	X	X		X		
2-nitrophenol		X		X		
3,3-dichlorobenzidine		X		X		
3,4,5-trichlorocatechol					X	
3,4,5-trichloroguaiacol					X	
3,4,6-trichlorocatechol					X	
3,4,6-trichloroguaiacol					X	
3,4-Benzofluoranthene (benzo(b) fluoranthene)	X	X		X		

Table 3 Industrial Discharge Monitoring Requirements for TTOs
Advanced Water Purification Facility
City of Oxnard

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
4,4-DDD (p,p-TDE)		X		X		
4,4-DDE (p,p-DDX)		X		X		
4,4-DDT		X		X		
4,5,6-trichloroguaiacol					X	
4,6-dinitro-o-cresol		X		X		
4-bromophenyl phenyl ether		X		X		
4-chlorophenyl phenyl ether		X		X		
4-nitrophenol		X		X		
Acenaphthene	X	X	X	X		
Acenaphthylene	X	X		X		
Acrolein		X		X		
Acrylonitrile		X		X		
Aldrin		X		X		
Alpha-BHC		X		X		
Alpha-endosulfan		X		X		
Anthracene	X	X	X	X		
Antimony				X		
Arsenic				X		
Asbestos				X		
Benzene		X	X	X		
Benzidine		X		X		
benzo (a)anthracene (1,2-benzanthracene)			X			
Benzo(a)pyrene (3,4-benzo-pyrene)	X	X	X	X		
benzo(ghi)perylene	X					
Benzo(k)fluoranthene	X					
Beryllium				X		
Beta-BHC		X		X		
Beta-endosulfan		X		X		
Bis (2-chloroethoxy) methane		X		X		
Bis (2-chloroethyl) ether		X		X		
Bis (2-chloroisopropyl) ether		X		X		
Bis (2-ethylhexyl) phthalate	X	X	X	X		X
Bromoform (tribromomethane)		X		X		
Butyl benzyl phthalate		X	X	X		
Cadmium				X		
Carbazole						X
Carbon tetrachloride (tetrachloromethane)		X		X		
Chlordane (technical mixture and metabolites)		X		X		
Chlorobenzene		X	X	X		

Table 3 Industrial Discharge Monitoring Requirements for TTOs
Advanced Water Purification Facility
City of Oxnard

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
Chlorodibromomethane		X		X		
Chloroethane		X		X		
Chloroform (trichloromethane)		X	X	X		
Chromium				X		
Chrysene	X	X	X	X		
Copper				X		
Cyanide, Total				X		
Delta-BHC (PCB-polychlorinated biphenyls)		X		X		
dibenzo(a,h)	X					
Dichlorobromomethane		X		X		
Dieldrin		X		X		
Diethyl Phthalate	X	X	X	X		
Dimethyl phthalate		X		X		
Di-N-Butyl Phthalate	X	X	X	X		
Di-n-octyl phthalate		X		X		
Endosulfan sulfate	X	X		X		
Endrin	X	X		X		
Endrin aldehyde	X	X		X		
Ethylbenzene	X	X		X		
Fluoranthene	X	X	X	X		X
Fluorene	X	X	X	X		
Gamma-BHC (lindane)		X		X		
Heptachlor		X		X		
Heptachlor epoxide (BHC-hexachlorocyclohexane)		X		X		
Hexachlorobenzene		X		X		
Hexachlorobutadiene		X		X		
Hexachlorocyclopentadiene		X				
Hexachloroethane		X		X		
Hexachloromyclopentadiene				X		
Indeno (,1,2,3-cd) pyrene (2,3-o-pheynylene pyrene)	X			X		
Indeno(1,2,3-cd) pyrene (2,3-o-phenlene pyrene)		X				
Isophorone	X	X		X		
Lead				X		
Mercury				X		
Methyl bromide (bromomethane)		X		X		
Methyl chloride (chloromethane)		X				
Methyl chloride (dichloromethane)				X		
Methylene chloride (dichloromethane)		X	X	X		
Naphthalene	X	X	X	X		

Table 3 Industrial Discharge Monitoring Requirements for TTOs
Advanced Water Purification Facility
City of Oxnard

Total Toxic Organics (TTOs)	Aluminum Forming	Metal Finishing	Metal Molding and Casting (Foundries)	Steam Electric Power Generating	Pulp, Paper and Paperboard	Centralized Waste Treatment
n-Decane						X
Nickel				X		
Nitrobenzene		X		X		
N-nitro sodi phenyl amine	X					
N-nitrosodimethylamine		X		X		
N-nitrosodi-n-propylamine		X		X		
N-nitrosodiphenylamine		X		X		
n-Octadecane						X
o-Cresol						X
Para-chloro meta-cresol (p-chloro-m-cresol)	X	X	X	X		
PCB-1016 (Arochlor 1016)	X	X		X		
PCB-1221 (Arochlor 1221)	X	X		X		
PCB-1232 (Arochlor 1232)	X	X		X		
PCB-1242 (Arochlor 1242)	X	X		X		
PCB-1248 (Arochlor 1248)	X	X		X		
PCB-1254 (Arochlor 1254)	X	X		X		
PCB-1260 (Arochlor 1260)	X	X		X		
p-Cresol						X
Pentachlorophenol		X		X	X	
Phenanthrene	X	X	X	X		
Phenol	X	X	X	X		
Pyrene	X	X	X	X		
Selenium				X		
Silver				X		
TCDD					X	
TCDF					X	
Tetrachlorocatechol					X	
Tetrachloroethylene	X	X	X	X		
Tetrachloroguaiacol					X	
Thallium				X		
Toluene	X	X	X	X		
Toxaphene		X		X		
Trichloroethylene	X	X	X	X		
Trichlorophenol					X	
Trichlorosyringol					X	
Vinyl chloride (chloroethylene)		X		X		
Zinc				X		

To help ensure the validity of self-monitoring results, sampling and analyses for required chemicals must be performed by a California state-certified laboratory, acceptable to the City's Technical Services Program – Source Control (TSP-SC), in accordance with 40 CFR, Part 136.

In addition to industry self-monitoring, the City conducts facility sampling twice per year. The sampling location is outlined in each SIU's permit.

To facilitate detection of illegal discharges of prohibited materials into the collection system, surveillance monitoring is also conducted. Such monitoring is performed if the City suspects illegal dumping or if there are complaints.

3.2.4 Slug Control

A slug load or slug discharge is defined as any discharge which would cause a violation of the industrial pretreatment program, either by a flow violation or an exceedance of contaminant concentration limit. Slug loads can be caused by accidental spills or batch discharges of irregular nature, causing a drastic increase in contaminant concentration (slug) to occur in the collection system. Slug loads by definition are not routine or predictable. If an event occurs that may cause a slug discharge, the industrial user must notify the city manager immediately. The City Manager is then responsible for assessing the severity of the load and once identified, taking appropriate measures to ensure public safety and optimal operations. This may involve diverting the wastewater treatment plant effluent flow or purified water flow until the slug load has been processed appropriately.

It is recommended that the City should require all SIUs to develop and submit a Slug Discharge Control (SDC) Plan. The slug control plan would be reviewed and updated by the source control program manager as needed.

3.2.5 Inspection of Industries

Annual SIU inspections are conducted by City staff. Such inspections allow for the investigation of SIU permit compliance. These inspections also help identify if a SIU is responsible for treatment plant upsets. Additionally, the inspections act as industrial outreach efforts and help disseminate information on technical issues such as permit requirements and pollution prevention opportunities.

3.2.6 Centralized Waste Treatment

Oxnard has one of the largest centralized waste treatment (CWT) facilities in California within their service area (Santa Clara Wastewater). CWTs treat hazardous and nonhazardous wastes (e.g. industrial tank residuals called "tank bottoms", oil field operations wastes, etc.). They are regulated under 40 CRF 437, and are managed by POTWs through their industrial pretreatment programs. The major issue surrounding the acceptance by POTWs of the discharge from CWT facilities, especially Subcategory D

facilities that accept multiple wastestreams, is their potential impact on water reuse programs. An explosion occurred at the Santa Clara Wastewater facility, a CWT that receives hauled waste from many sources, treats those wastes, then discharges them into the Oxnard collection system. The cause of the accident has been attributed to the unsafe mixture of specific chemicals with domestic sewage.

In response to the explosion event, Carollo prepared Best Management Practices (BMP) policy for CWTs on behalf of the City, which, were then endorsed by the California Association of Sanitation Agencies (CASA). Carollo surveyed six POTWs regarding CWTs in their service areas. Carollo contacted and received help from POTWs that have CWTs; including OCSD, LACSD, City of LA, the City of San Jose, and Oxnard. The BMP for CWTs is attached as Appendix A to this document. Oxnard has implemented this BMP for any CWT within its collection system. Key elements of the BMP are:

- Waste Receiving Requirements - including manifests for haulers, testing of hauled waste before disposal, prohibition of specific activities, and allowance for random sampling.
- Treatment Requirements - treatment meeting EPA standards under 40 CFR 437, emergency shutoff, treatment reliability and redundancy, prohibition of holding tanks for dilution, and recording of treatment system operations details.
- Effluent Discharge and Sampling/Testing Requirements - continuous discharge prohibited, batch tanks continuously mixed, sampling and analysis before discharge required, reprocessing if necessary.
- Recommended Certification and Documentation Requirements - requirements for certifications, plans, procedures, O&M, treatment system details, documentation of all waste haulers, and testing and monitoring requirements.

3.2.7 Enforcement

The 2013 OWTP Annual Pretreatment Report identified 42 total industrial dischargers having 49 total violations (with zero penalties or legal action required), and 3 industrial dischargers with significant non-compliance necessitating public notification. If an SIU violated its permit, a written Notice of Violation (NOV) is sent to the SIU. The SIU then has 10 days to submit an explanation of violation and a plan for correction. For BOD and TSS limit violations, the SIU is surcharged based on a predetermined formula. For other exceedances, increasing enforcement action is taken as necessary. Such actions can include discontinuing sewer or water service, a cease and desist order, issuance of a fine, or termination of permission to discharge to the system. Sections 19, Article 1, Divisions 8 through 10 of Oxnard's Municipal Code outline all the allowable enforcement actions.

4.0 COLLECTION SYSTEM AND OWTP WATER QUALITY RESULTS

4.1 Industrial Sampling Program

As a requirement of their local limits update, the City conducted an extensive wastewater sampling program to characterize pollutant loadings and process removals to develop scientifically-based local limits in Fall 2015. In addition to this study, the City performed routine monitoring for NPDES permit requirements as well as industrial discharge constituents. OWTP's routine influent monitoring is conducted at the headworks of the plant, which is downstream of plant recycled flows.

4.1.1 Prior Incident of Pass-Through with Gross Beta Radioactivity

On September 4th, 2014 analytical results showed an exceedance of the OWTPs gross-beta NPDES defined permit limit. The gross-beta sample concentration was 94 pCi/L and the permit requirement was 50 pCi/L. The sample was taken one month prior on August 5th during a routine semiannual sampling event at the OWTP. Oxnard's Technical Services Program found hydraulic fracturing fluids to be a potential source of gross-beta contaminant. Wastewater staff then collected wastewater samples at City Water Yard and SCWW (both known to discharge this type of contaminants) on Wooley Road. Following analytical results reported on October 14, 2014, monitoring staff were informed that the Santa Clara Wastewater (SCWW) sample port had a gross-beta concentration of 4400 pCi/L. The next day on October 15, 2014, the staff convened a meeting to determine an action plan.

On October 16, 2014 additional samples were taken upstream of the SCWW site to track the source of the gross-beta discharge into the Santa Clara collection system. Green Compass, the parent company of SCWW, was identified as the responsible discharger, stating that Vintage Productions, an industrial customer of SCWW, was the point source into their facility. A Cease and Desist order was issued to Green Compass, who immediately complied with the order. Continuous gross-beta monitoring was conducted near the sampling site for the following months, and a NOV was issued to SCWW for violations on sample dates 9/24, 10/16, 10/22 and subsequently 10/28, 11/6, and 11/13.

Shortly thereafter (11/2014), the aforementioned accident at the SCWW occurred and the Oxnard City Manager issued a suspension of discharge permit and prohibited SCWW from discharging any wastewater into the Oxnard Collection System.

4.2 Industry Water Quality Results

Industrial pretreatment programs are in place and additional pretreatment and auditing programs are recommended as part of this enhanced source control program as detailed in Section 5. Table 4 contains a list of detected industrial discharge contaminants from 2013-2014. The permit limits for these industries are being updated (Local Limits Report),

Table 4 **Industry Water Quality Data 2013-2014 for all Industrial Dischargers to the City of Oxnard WWTP Advanced Water Purification Facility City of Oxnard**

Industry Name	2013 ADF	Avg BOD	Avg pH	Avg TSS	Avg H2S	Avg O&G	TDS	TTO	Cd	Cr	Cu	Pb	Zn	Ni	Ag	CN-	As	Sb	Ar	Co	Hg	Sn	Ti	V
	gpd	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Industries																								
Alliance Finishing & Manufacturing	--																							
Aluminum Precision Products	7,000	N/A	7.8	9	NA	4	2,063		0.0023	0.007	0.021	0.0075	0.21	0.0118		0.004								
Arcturus Manufacturing	25,000	N/A	8.3	NA	NA	14	N/A		0.004	0.01	0.04	0.009	0.008	0.065		0.004								
Automotive Racing Products*																								
Boskovich Farms	250,000	364	N/A	176	0.10	6	N/A																	
Cal Sun Produce	32,000	171	7.3	135	0.1	7	N/A																	
Coastal Green Vegetable Co.	220,000	219	7.2	300	0.02	5	N/A																	
Coastal Metal Finishing/Limons Metal Finishing	1,000	N/A	7.8	N/A			N/A	1	0.0200	0.2000	0.5000	0.0800	0.6000	1.3000	0.0200	0.0050	0.1000							
Consolidated Precision Products	11,907																							
Deardorff Family Farms	10,000	31	7.9	46	0.1	6	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Duda Farm Fresh Foods	37,000	507	7.3	156	0.02	9	N/A																	
EF Oxnard	15,000	N/A	7.7	N/A	0.20	4	2,842		0.0103	0.0403	0.0245	0.0528	0.1841	0.0263										
Elite Metal Finishing	14,000	N/A	8.1	N/A	NA	NA	N/A		0.01	0.06	0.1	0.03	0.14	0.15	0.01	0.03								
Frozsun Foods	350,000	371	7.2	119	0.10	N/A	N/A																	
Gill's Onions	250,000	185	7.5	53	0.38	5	N/A																	
Harris Water Conditioning	138,000	2	6.9-8.5	19	0.10	3	20,883	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Herzog Wine Cellars	10,000	2,187	7.2	190	0.5	6	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
J.M. Smucker Co.	148,000	139	7.7	224	0.12	4	N/A	na																
Mission Linen Supply	39,000	217	7.4	134	0.02	41	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
New Indy	300,000	28	7.4	26	0.04	5	3,390	0.67	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Oxnard Lemon Co.	35,000																							
Pacific Ridge Farms	30,000	559	6.9	322	0.25	6	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Parker Hannifin	26,000	995	6.8	8	NA	5	N/A	0.037					0.05											
Proctor and Gamble	1,400,000	112	6.2-9.3	214	0.02	23	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Puretec Industrial Water	100,000	14	6.3-9.3	43	0.02	5	N/A	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Raypak	11,000	N/A	6.8-9.9	N/A	NA	6	N/A	0.03	0.02	0.06	0.02	0.05	0.12	0.04		0.031								
Saticoy Lemon #4	50,000	131	8.3	214	0.1	15	N/A																	
Scarborough Farms	17,000	25	7.2	432	0.1	NA	N/A																	
Schlumberger Technology																								
Seaboard Produce Distributors	25000																							
Seminis	19,000	156	8.1	455	0.1	17	N/A	0.46					0.29											
Simba Cal	750	N/A	9.3	N/A	NA	NA	N/A	<1 mg/l	0.01	0.052	0.67	0.05	0.21	0.027	0.013	0.005								

Table 4 Industry Water Quality Data 2013-2014 for all Industrial Dischargers to the City of Oxnard WWTP
Advanced Water Purification Facility
City of Oxnard

Industry Name	2013 ADF	Avg BOD	Avg pH	Avg TSS	Avg H2S	Avg O&G	TDS	TTO	Cd	Cr	Cu	Pb	Zn	Ni	Ag	CN-	As	Sb	Ar	Co	Hg	Sn	Ti	V
	gpd	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Terminal Freezer (Del Mar, Suncoast, Tree Top)	730,000	84	8.0	102	N/A		N/A																	
Ventura Pacific Co.	70,000	408	7.6	88	0.12	13																		
Other Agencies																								
City of Oxnard Desalter	1,500,000	N/A	7.2	5	N/A	N/A	1,580																	
Crestview Municipal Water Co.	0																							
NBVC Point Mugu	223,722																							
NBVC Port Hueneme	452,807																							
Port Hueneme Water Agency	347,947																							
Santa Clara Waste Water Co.	150,000	185	7.7	26	0.02	5	N/A	0.34	<0.01	0.01	0.02	0.03	0.06	0.01	0.01			<0.05	<0.01	<0.005	<0.005	0.01	0.01	0.03

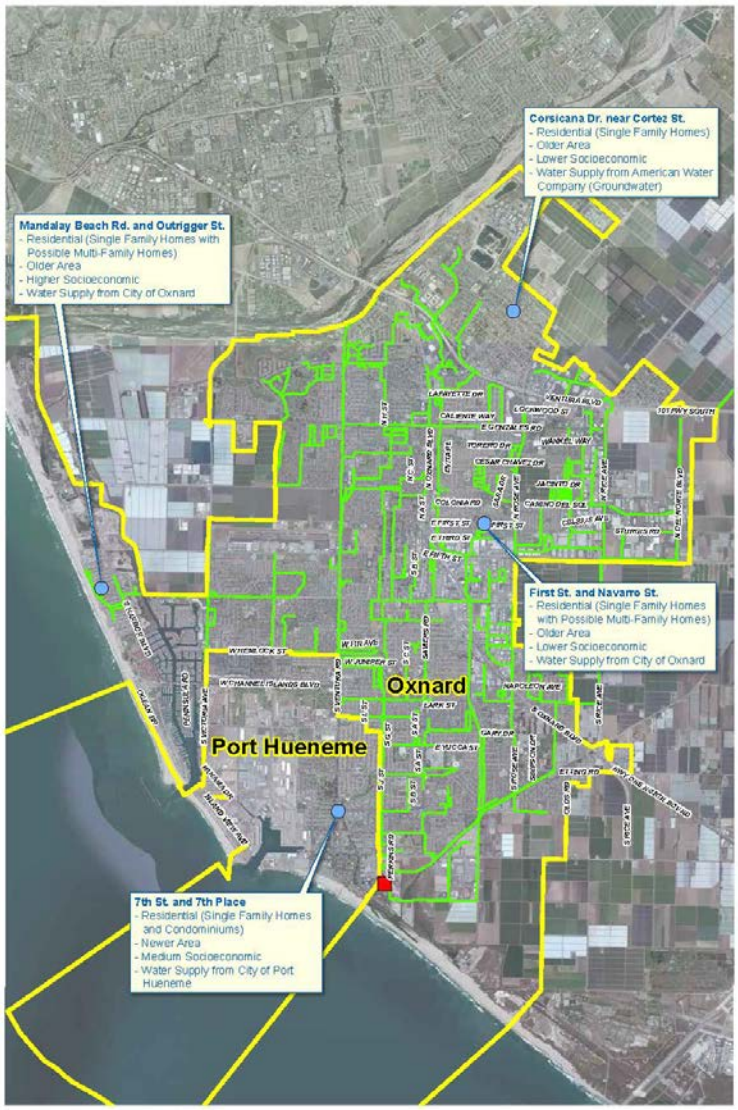

Figure 3 Four Residential Sampling Locations Included in the Local Limits Study

and for some more stringent limits are to follow. All collection system monitoring samples are tested for the constituents listed, however, many of the industries do not produce or use these contaminants in their processes as shown by the blank cells. Internal monitoring program data is also available in the Local Limits study and internal auditing can take place by the SCPM when collection system monitoring data does not align.

4.3 Residential (only) Water Quality Results

The domestic/residential sectors of the service area had not been sampled in over 15 years prior to the recent Local Limits study. Four sampling locations were chosen for the study, based on collection system discharges and trunk lines (Figure 3). Concentrations from residential dischargers for a limited set of constituents tested are shown in Table 5, below.

These results provide baseline concentrations for OWTP influent monitoring, allowing the isolation of industrial and domestic discharge inputs.

Table 5 Residential Wastewater Concentrations from 4 Sampling Locations Listed in Figure 3
Advanced Water Purification Facility
City of Oxnard

Constituent	Units	Average	Geometric Mean
Ammonia Nitrogen	mg/L	39	38
Antimony Total	ug/L	1.011	1.009
Arsenic Total	ug/L	2.31	2.09
Barium Total	ug/L	45.46	40.1
Beta, Gross	pCi/L	21.96	21.04
Biochemical Oxygen Demand	mg/L	258	248
Boron Total	mg/L	0.77	0.76
Cadmium Total	ug/L	0.505	0.504
Calcium Total	mg/L	98	88
Chloride	mg/L	123.1	116.8
Chromium Total	ug/L	1.39	1.24
Copper Total	ug/L	89.04	75.48
Fixed Dissolved Solids	mg/L	839	776
Fluoride	mg/L	0.54	0.53
Gross Alpha	pCi/L	3.55	3.44
Iron Total	mg/L	0.93	0.56
Lead Total	ug/L	1.81	1.54
Magnesium Total	mg/L	34.1	30.4
Manganese Total	mg/L	0.043	0.037
Mercury	ng/L	23.43	6.08
Molybdenum Total	ug/L	10.53	9.45
Nickel Total	ug/L	6.99	6.68
Potassium Total	mg/L	21.7	21.3
Selenium Total	ug/L	5.4	5.35
Silica	mg/L	27.8	26.5
Silver Total	ug/L	0.508	0.507
Sodium Total	mg/L	151.4	148.5
Specific Conductance	umho/cm	1689	1659
Strontium	mg/L	0.91	0.81
Sulfate	mg/L	325.4	284.7
Total Dissolved Solids	mg/L	1252	1187
Total Kjeldahl Nitrogen	mg/L	61	59
Total phosphorus as P	mg/L	7.3	7
Total Suspended Solids	mg/L	241	211
Uranium	ug/L	5.07	4.3
Zinc Total	ug/L	177.46	161.77

Notes: Concentrations were averaged for all 5 sampling locations for all dates tested.

4.4 Raw Wastewater Water Quality Results

As part of the Local Limits discharge update study, raw wastewater was tested for regulated, industrial and NPDES contaminants. Results are included in the Local Limits study. ***It is important to note that although many contaminants were tested for, few were found at detectable concentrations in the raw wastewater.*** This provides a further level of confidence for downstream treatment and secondary effluent source protection.

5.0 PROPOSED ENHANCED SOURCE CONTROL PROGRAM FOR POTABLE REUSE

Title 22 Regulations require a source control program to be in place prior to operating an IPR facility. As previously discussed, Oxnard's current source control program meets all of the requirements, however, an enhanced source control program (ESCP) is recommended as an additional barrier for producing purified water from IPR. An ESCP would build on an existing source control program in place, with increased monitoring frequency and an additional location, secondary effluent. The following section provides a framework for an ESCP, which could be implemented in Oxnard.

5.1 Source Control Program Manager

The current structure of the source control program at the City of Oxnard includes multiple points of contact covering the collection system, wastewater treatment plant, drinking water treatment plant and groundwater injection. In order to ensure all data is reported, logged and analyzed, a Source Control Program Manager (SCPM), acting as a single point of contact should be hired into a full-time position and charged with the following tasks:

- Collect and log all data from the collection system, OWTP, AWPF and groundwater monitoring program.
- Analyze online data for trends indicating potential upsets in the treatment process.
- Report any concerns, issues, and violations to City management. Any finished water violations would be reported by other City staff to the RWQCB.
- Plan and facilitate all industrial stakeholder workshops.
- Plan and oversee all residential outreach efforts.
- Ensure staffing needs are met for industrial audits, collection system sampling and outreach efforts.
- Update any new industrial dischargers or housing developments to source control program.
- Ensure all SIUs report monthly and annual TTO monitoring results.
- Annual review of slug discharge control plans from SIUs.

Data collected and provided to the SCPM will be analyzed under the supervision of this person to create baseline trends and identify when there are outliers, events, or a constituent is slowly increasing in the treatment process. All information from the pretreatment program, wastewater, AWPF, drinking water and compliance/permitting processes must go through the SCPM. The SCPM should have a second in command who is knowledgeable about the status of the source control program in the event the SCPM is not available. Having a single point of contact will contribute to risk mitigation by allowing for early detection of trends, monitoring efforts and process upsets.

5.2 Recommended Parameters, Detection Levels, and Methods

Monitoring wastewater influent, secondary treated wastewater, RO concentrate and AWPF water in one program can pose challenges due to analytical methods. The same contents could be monitored in each water type, but will likely require at least 2 different methods, if not 4. Methods for detecting all Title 22 monitored constituents in RO concentrate (very low water quality) and purified water (very high water quality) exist, but prove to be challenging due to their unique water qualities. Current analytical monitoring practices are described in detail below.

5.2.1 General Monitoring Provisions

General monitoring provisions proposed by the City include flow rate and water quality of the secondary effluent, AWPF finished water, receiving groundwater supply and production (ASR) wells. This enhanced source control document focuses on secondary effluent and AWPF finished water quality.

Compliance with RWQCB waste discharge requirements (WDRs) will be evaluated based on the analytical monitoring data. Monitoring reports produced by the SCPM will include at a minimum:

- Analytical results across the collection system through AWPF finished water (see Section 7.2).
- A clear map identifying the location of each sampling station, including groundwater monitoring and production wells (details following permit approval)
- Analytical test methods used and corresponding method report limits (MRLs).
- Name(s) and copies of laboratory certifications granted by the DDW's Environmental Laboratory Accreditation Program (ELAP).
- Quality assurance and control information.

Brief details about analytical testing methods and reporting are included in subsequent sections.

5.2.2 Sampling and Analytical Protocols

Though not required to be included in the monitoring reports unless specifically requested by DDW or the RWQCB, the City will have in place sampling protocols including procedures for handling, storing, testing, and disposing of purge and decontamination waters generated from sampling events. For groundwater monitoring, the sampling protocols will outline the methods and procedures for: measuring water levels; purging wells; collecting samples; decontaminating equipment; containing, preserving, and shipping samples; and maintaining appropriate documentation such as Chain of Custody (COC).

All wastewater samples and industrial wastewater samples will use the methods and QA/QC procedures contained in 40 CFR Part 136. All purified water samples will be analyzed and use the QA/QC procedures included in 40 CFR Part 141.

Where no methods are specified for a given pollutant, by methods approved by the DDW, RWQCB, and/or SWRCB. The City will select the analytical methods that provide MRLs lower than the limits prescribed in the WDR or as low as possible that will provide reliable data.

The City will instruct outside contract laboratories to establish calibration standards so that the MRLs (or its equivalent if there is a different treatment of samples relative to the calibration standards) are the lowest calibration standard. At no time will analytical data extrapolated from below the calibration curve be used.

5.2.3 QA/QC Procedures

The RWQCB, DDW and the SWRCB Quality Assurance Program may specify maximum MRLs in any of the following situations:

- When the pollutant has no established method under 40 CFR 141.
- When the method under 40 CFR 141 for the pollutant has a MRL higher than the limit specified in the WDR.
- When the City proposes to use a test method that is more sensitive than those specified in 40 CFR Part 141.

For regulated constituents, the laboratory conducting the analyses will be certified by ELAP or approved by the DDW, LARWQCB, and/or SWRCB for a particular pollutant or parameter.

Samples will be collected with method specific containers and preservatives and analyzed within defined holding time limits as specified in 40 CFR Part 141. All QA/QC analyses will be run simultaneously with collected samples. The City SCPM will retain the QA/QC documentation in its files and make those files available for inspection and/or submit them when requested by the RWQCB or the DDW. Proper chain of custody procedures will be followed and a copy of this documentation will be submitted with the quarterly report.

5.2.4 Unregulated Chemical Procedures

For unregulated chemical analyses, the City will select methods according to the following approach:

- Use drinking water methods, if available and matrix appropriate.
- Use DDW-recommended methods for unregulated chemicals, if available and matrix appropriate.
- If there is no DDW-recommended or approved drinking water method for a chemical, then City staff will use the method that results in the lowest MRL for that chemical in the applicable matrix.
- If there is more than a single USEPA-approved method available, the most sensitive of the USEPA-approved methods for the applicable matrix will be used.
- If there is no USEPA-approved method for a chemical in the applicable matrix, and more than one method is available from the scientific literature and commercial laboratory, after consultation with DDW, use the most sensitive method.
- If no approved method is available for a specific chemical, the City's laboratory (or contract laboratory) may develop methods or use its own methods and will provide the analytical methods to DDW for review. Those methods may be used until DDW-recommended or USEPA-approved methods are available. This option is likely to be used when an unregulated contaminant needs to be traced back through the collection system and no raw wastewater matrix method exists or when sampling RO concentrate for the unregulated contaminant.

5.2.5 Online and Benchtop Constituent Monitoring

Online monitoring data from the OWTP and the AWPF will be reported to the SCPM and analyzed to create a baseline for nominal concentrations and process performance. Total Organic Carbon (TOC), Electrical Conductivity (EC), BOD, Turbidity, and UV Transmittance (UVT) are all relevant monitoring parameters and will be continuously collected to award pathogen log removal (LRV) credits across the OWTP and AWPF. The online data trends used for LRV information will be directly applied to contaminant removal correlations. If a new contaminant or a slug load is detected, a process upset or unusual online data trend is observed, an intervention into the responsible process can be identified and responded to promptly to prevent further contaminant loading.

Accuracy and confidence in monitoring tools is important. Benchtop measurements are not necessarily more accurate that online monitors, however they provide an independent measure of the parameters being tracked. Therefore, benchtop measurements should be conducted frequently to compare online meter measurements and discrepancies should be evaluated, and calibrations on either benchtop or online meters should be performed immediately. Benchtop measurements as well as calibration dates and times should be

well-documented and reported to the SCPM weekly. Online sampling parameters and benchtop verification frequencies are shown in Table 6.

Table 6 Online Sampling Parameters and Benchtop Verification Frequencies for the Potable Reuse Enhanced Source Control Program Advanced Water Purification Facility City of Oxnard

Online Monitoring Parameters	Location and Frequency of Sampling				
	OWTP	Secondary Effluent	RO Influent	RO Permeate	Purified Water
TOC			Online	Online	
Bench			Bi-weekly	Bi-weekly	Bi-weekly
EC	Online	Online	Online	Online	Online
Bench	2 X daily	2 X daily	2 X daily	2 X daily	2 X daily
BOD					
Bench	Daily	Daily			
Turbidity	Online	Online	Online		
Bench	Daily	Daily	Daily		
UVT		Online	Online	Online	Online
Bench	Daily	Daily	4 X Daily	4 X Daily	4 X Daily

5.2.6 Regulated and Unregulated Constituents

Tables 7 through 12 constitute the required water quality performance, consistent with CDPH (2014). The tables of constituents referenced in CDPH (2014) are found in CDPH (2014a). Within each table is a specific reference to the table within the regulation (e.g., Primary MCLs are listed in Table 7 below and also found in Table 64431-A).

SWRCB (2013) lists specific compounds for monitoring for groundwater injection projects (Table 13). The initial monitoring program is intended to be quarterly, followed by semi-annual monitoring for the duration of the project.

The RWQCB requires specific monitoring for CECs. This list, provided to our team by Elizabeth Erickson on 10/29/2014. This list is provided below as Table 14.

5.3 Monitoring and Enforcement Programs

As part of this enhanced source control monitoring plan for potable reuse, regulated and unregulated constituents will be monitored with the same frequency (for the first year of operation) and given equal scrutiny for detection and available health criteria in the source water (OWTP secondary effluent) and the purified effluent of the AWPF. All regulated MCLs and unregulated contaminants (Secondary MCLs, NLs and CECs) are provided in Tables 7 through 14.

Table 7 Inorganics with Primary MCLs[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	Primary MCL (in mg/L)	Constituents	Primary MCL (in mg/L)
Aluminum	1.0	Fluoride	2
Antimony	0.2	Lead	0.015[4]
Arsenic	0.006	Mercury	0.002
Asbestos	7 (MFL)[2]	Nickel	0.1
Barium	1	Nitrate (as NO_3)	45
Beryllium	0.004	Nitrite (as N)	1
Cadmium	0.005	Total Nitrate/Nitrite (as N)	10
Hexavalent Chromium	0.010	Perchlorate	0.006
Copper	1.3[3]	Selenium	0.05
Cyanide	0.15	Thallium	0.02

Notes:

(1) Based on **Table 64431-A.**
(2) MFL = Million fibers per liter, with fiber lengths > 10 microns.
(3) Regulatory Action Level; if system exceeds, it must take certain actions such as additional monitoring, corrosion control studies and treatment, and for lead, a public education program; replaces MCL.
(4) The MCL for lead was rescinded with the adoption of the regulatory action level described in footnote 'd'.

Table 8 Radioactivity[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	MCL (in pCi/L)	Constituents	MCL (in pCi/L)
Uranium	20	Gross Beta particle activity	50[2]
Combined radium-226 & 228	5	Strontium-90	8[2]
Gross alpha particle activity	15	Tritium	20,000[2]

Notes:

(1) Based on **Tables 64442 and 64443**.
(2) MCLs are intended to ensure that exposure above 4 millirem/yr does not occur.

Table 9 Regulated Organics[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	MCL (in mg/L)	Constituents	MCL (in mg/L)
Volatile Organic Compounds			
Benzene	0.001	Monochlorobenzene	0.07
Carbon Tetrachloride	0.0005	Styrene	0.1
1,2-Dichlorobenzene	0.6	1,1,2,2-Tetrachloroethane	0.001
1,4-Dichlorobenzene	0.005	Tetrachloroethylene	0.005
1,1-Dichloroethane	0.005	Toluene	0.15
1,2-Dichloroethane	0.0005	1,2,4 Trichlorobenzene	0.005
1,1-Dichloroethylene	0.006	1,1,1-Trichloroethane	0.2
cis-1,2-Dichloroethylene	0.006	1,1,2-Trichloroethane	0.005
trans-1,2-Dichloroethylene	0.01	Trichloroethylene	0.005
Dichloromethane	0.005	Trichlorofluoromethane	0.15
1,3-Dichloropropene	0.0005	1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2
1,2-Dichloropropane	0.005	Vinyl chloride	0.0005
Ethylbenzene	0.3	Xylenes	1.75
Methyl-tert-butyl ether (MTBE)	0.013		
SVOCs			
Alachlor	0.002	Hexachlorobenzene	0.001
Atrazine	0.001	Hexachlorocyclopentadiene	0.05
Bentazon	0.018	Lindane	0.0002
Benzo(a) Pyrene	0.0002	Methoxychlor	0.03
Carbofuran	0.018	Molinate	0.02
Chlordane	0.0001	Oxamyl	0.05
Dalapon	0.2	Pentachlorophenol	0.001
Dibromochloropropane	0.0002	Picloram	0.5
Di(2-ethylhexyl)adipate	0.4	Polychlorinated Biphenyls	0.0005
Di(2-ethylhexyl)phthalate	0.004	Pentachlorophenol	0.001
2,4-D	0.07	Picloram	0.5
Dinoseb	0.007	Polychlorinated Biphenyls	0.0005
Diquat	0.02	Simazine	0.004
Endothall	0.1	Thiobencarb	0.07/0.001[2]
Endrin	0.002	Toxaphene	0.003
Ethylene Dibromide	0.00005	2,3,7.8-TCDD (Dioxin)	$3x10^{-8}$
Glyphosate	0.7	2,4,5-TP (Silvex)	0.05
Heptachlor	0.00001		
Heptachlor Epoxide	0.00001		

Notes:

(1) Based on Table 64444-A.
(2) Second value is listed as a Secondary MCL.

Table 10 Disinfection By-Products[1]
Advanced Water Purification Facility
City of Oxnard

Constituents	MCL (in mg/L)	Constituents	MCL (in mg/L)
Total Trihalomethanes	0.080	Bromate	0.010
Total haloacetic acids	0.060	Chlorite	1.0

Notes:
(1) Based on **Table 64533-A.**

Table 11 Constituents/Parameters with Secondary MCLs
Advanced Water Purification Facility
City of Oxnard

Constituents[1]	MCL (in mg/L)	Constituents[2]	MCL (in mg/L)
Aluminum	0.2	TDS	500
Color	15 (units)	Specific Conductance	900 *u*S/cm
Copper	1	Chloride	250
Foaming Agents (MBAS)	0.5	Sulfate	250
Iron	0.3		
Manganese	0.05		
Methyl-tert-butyl-ether (MBTE)	0.005		
Odor Threshold	3 (units)		
Silver	0.1		
Thiobencarb	0.001		
Turbidity	5 (NTU)		
Zinc	5		

Notes:
(1) Based on **Table 64449-A.**
(2) Based on **Table 64449-B.**

Table 12 Constituents with Notification Levels[1,2]
Advanced Water Purification Facility
City of Oxnard

Constituents	NL (in μg/L)	Constituents	NL (in μg/L)
Boron	1000	Manganese	500[2]
n-Butylbenzene	260	Methyl isobutyl ketone (MIBK)	120
sec-Butylbenzene	260	Naphthalene	17
tert-Butylbenzene	260	N-Nitrosodiethylamine (NDEA)	0.01
Carbon disulfide	160	N-Nitrosodimethylamine (NDMA)	0.01
Chlorate	800	N-Nitrosodi-n-propylamine (NDPA)	0.01
2-Chlorotoluene	140	Propachlor**	90
4-Chlorotoluene	140	n-Propylbenzene	260
Diazinon	1.2	RDX	3
Dichlorodifluoromethane (Freon 12)	1000	Tertiary butyl alcohol (TBA)	12
1,4-Dioxane	1	1,2,3-Trichloropropane (1,2,3-TCP)	0.005
Ethylene glycol	14000	1,2,4-Trimethylbenzene	330
Formaldehyde	100	1,3,5-Trimethylbenzene	330
HMX	350	2,4,6-Trinitrotoluene (TNT)	1
Isopropylbenzene	770	Vanadium	50

Notes:

(1) Based on http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/notificationlevels/notificationlevels.pdf.

(2) The web link above also contains the levels of the pollutants in this table that must result in a removal of the water source from service.

Table 13 Monitoring Trigger Levels for Groundwater Recharge, as Listed in SWRCB (2013)
Advanced Water Purification Facility
City of Oxnard

Constituents	Relevance/ Indicator Type/ Surrogate	Monitoring Trigger Level (in μg/L)	Removal Percentages (%)
17B-estradiol	Health	0.0009	--
Caffeine	Health & Performance	0.35	>90
NDMA	Health & Performance	0.01	25-50, >80(1)
Triclosan	Health	0.35	--
DEET	Performance	--	>90
Sucralose	Performance	--	>90
Electrical Conductivity	Surrogate	--	>90
TOC	Surrogate	--	>90

Notes:
(1) 25 to 50 % removal by RO, >80% removal by RO followed by UV, depending upon the UV dose.

Table 14 CECs Required for Monitoring by LARWQCB(1)
Advanced Water Purification Facility
City of Oxnard

Constituents	Sample Type	Reporting Level, ng/L
17-alpha-estradiol	Composite	0.5
Caffeine	Composite	10
DEET	Composite	10
Iodinated Contrast Media (Iopromide)	Composite	10
Triclosan	Composite	10
NDMA	Composite	10
Sucralose	Composite	100

Notes:
(1) Information provided by Elizabeth Erickson to the project team on 10/29/2014.

Each class of constituent (regulated, CECs, etc.), monitoring location and proposed monitoring frequency are shown in Table 15. Following acceptable monitoring performance during the first year of operation, the sampling frequency in the secondary effluent will decrease for select classes of constituents.

Table 15 Class of Constituents, Location and Frequency Monitoring Plan Advanced Water Purification Facility City of Oxnard			
	Monitoring Plan(1)		
Class of Constituents	**Collection System**	**Secondary Effluent**	**Purified Water**
Industrial Discharge	Monthly and Internally (by permit requirement)	Monthly	Monthly
Local Limits	Monthly	Monthly (year 1) and Quarterly (starting year 2)	Monthly
NPDES Permit	Monthly	Monthly	Monthly
Regulated (MCLs)		Monthly (year 1) and Quarterly (starting year 2)	Monthly
Secondary Treatment Goals MCLs		Monthly (year 1) and Quarterly (starting year 2)	Monthly
Notification Levels		Monthly (year 1) and Quarterly (starting year 2)	Monthly
Contaminants of Emerging Concern (CECs)		Monthly (year 1) and Quarterly (starting year 2)	Monthly

Note:
(1) Monitoring frequency for industrial dischargers will be determined by flow, as outlined in each industry permit.

5.3.1 Finished Water Monitoring and Enforcement

At a minimum, pursuant to Section 60320.201 of Title 22 (CDPH 2014), the AWPF purified water effluent must be analyzed for all MCLs and NLs monthly for the first year. For subsequent years, a permit change can be granted with the monitoring frequency reduced to a minimum of quarterly. The monitoring and enforcement plans currently required by Title 22 for IPR finished water are shown as Figure 4 through 7. This sampling pertains to finished water quality for potable water reuse; and is not an added sampling effort for the ESCP. However, the data obtained as part of this required sampling is a useful component of the ESCP.

The proposed ESCP will be including secondary MCLs and a SRWQCB approved list of CECs to this monitoring plan for both monthly and quarterly sampling of the secondary effluent. The ESCP program calls for continuous monthly sampling of the purified water, with no decrease in frequency following the first year of operation, regardless of acceptable plant process performance.

An ESCP action and enforcement plan for purified water is provided in Figure 8. Mimicking Titile 22 requirements for potable reuse source control plans, the finished water plan is based on two response procedures, regulated and unregulated contaminants. An additional step in the ESCP requires a more rigorous response to regulated contaminant detection, where a detected regulated contaminant (above or below the action level) will require

resampling and subsequent *tracking through both the wastewater treatment plant and collection system*. Where unregulated contaminants are detected and reported above the health action level, the same response plan as regulated contaminants reported below their corresponding action level will be enforced.

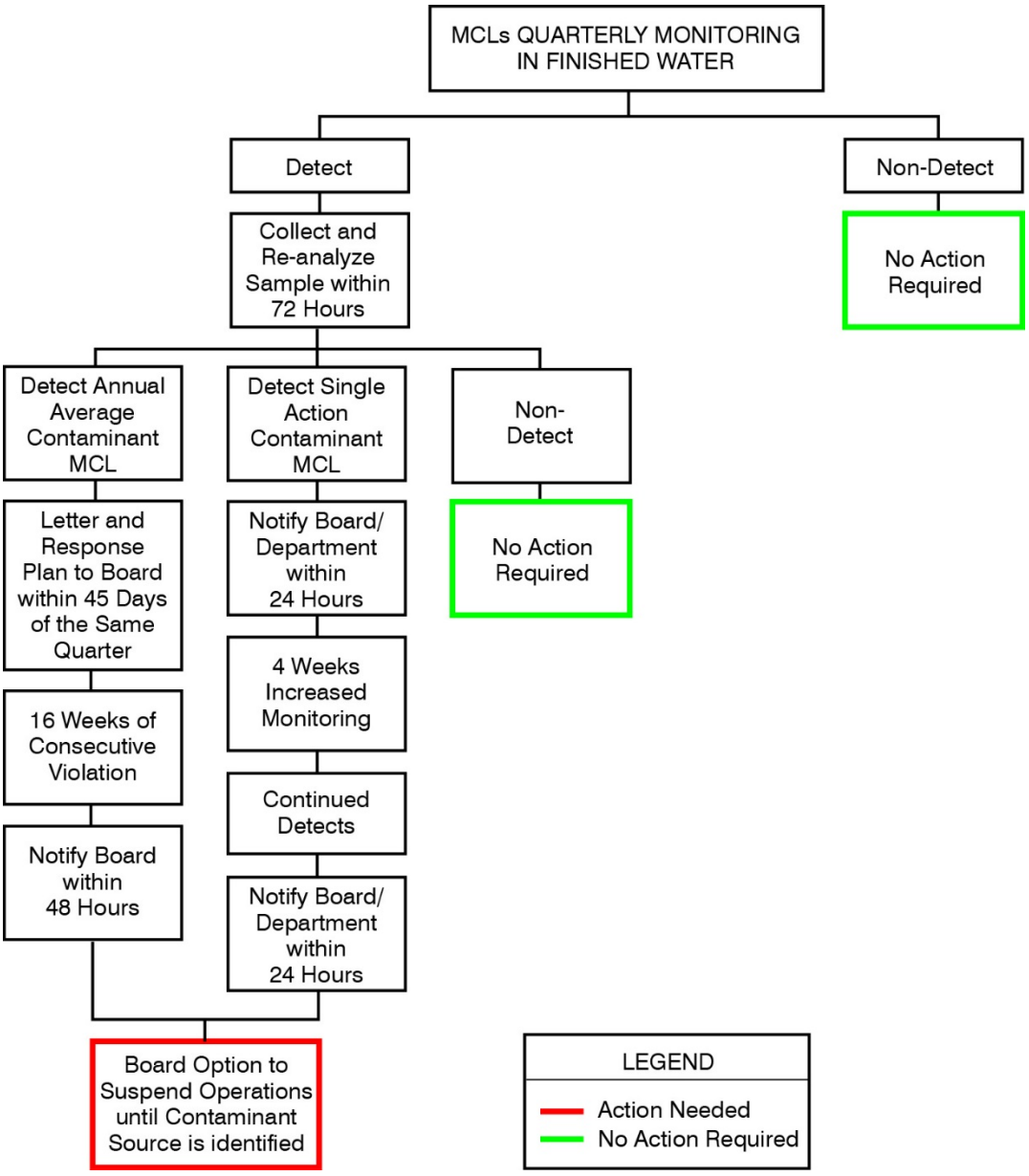

Figure 4 Title 22 MCL Monitoring Requirements and Action Plan for IPR Finished Water.

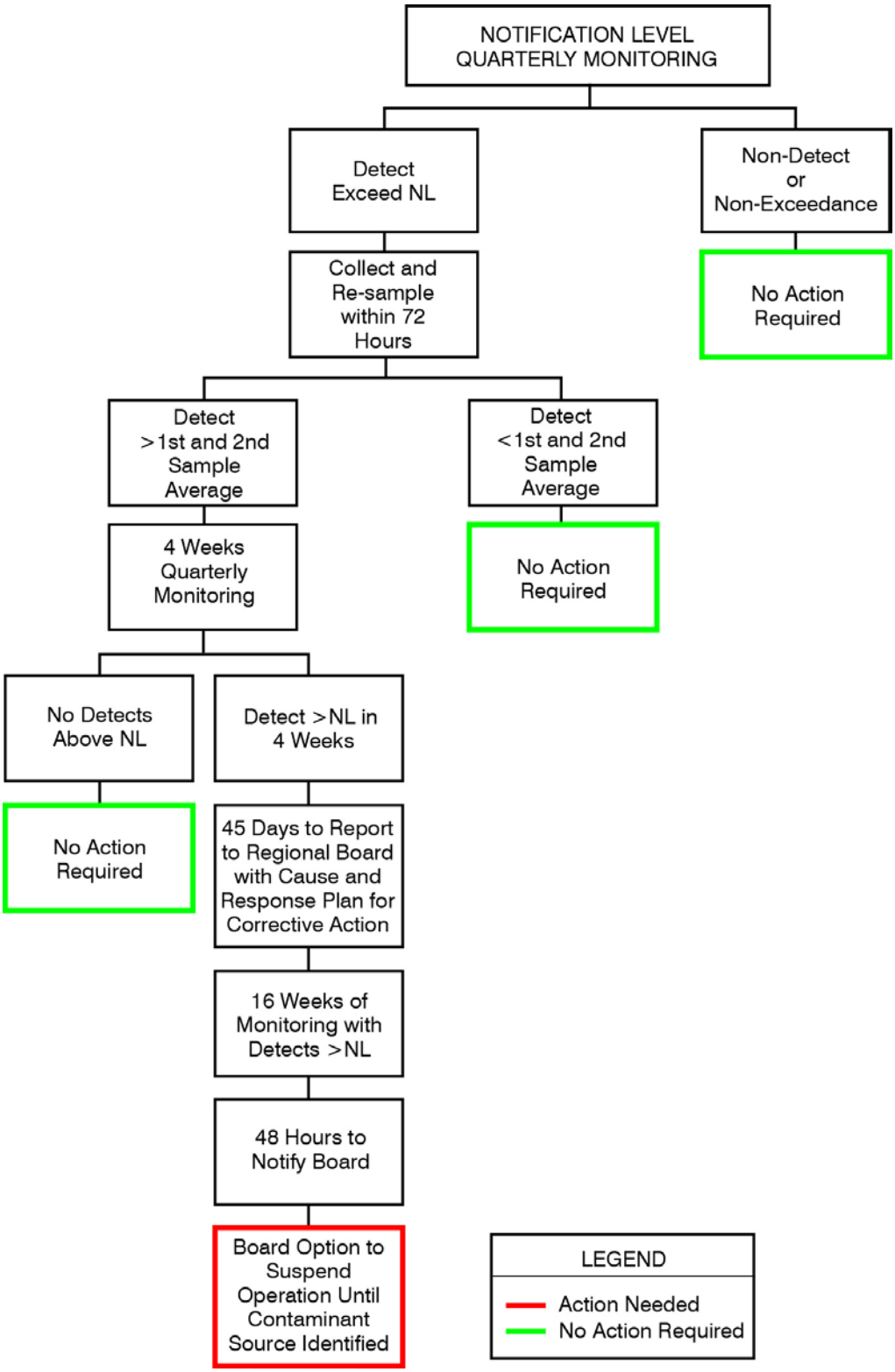

Figure 5 Title 22 Notification Levels Monitoring Requirements and Action Plan for IPR Finished Water.

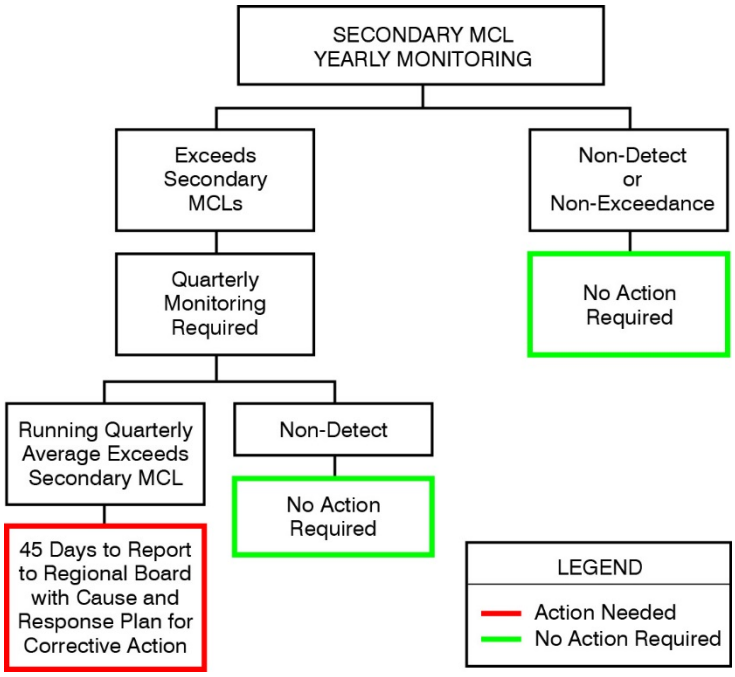

Figure 6 Title 22 Secondary MCL Monitoring Requirements and Action Plan for IPR Finished Water.

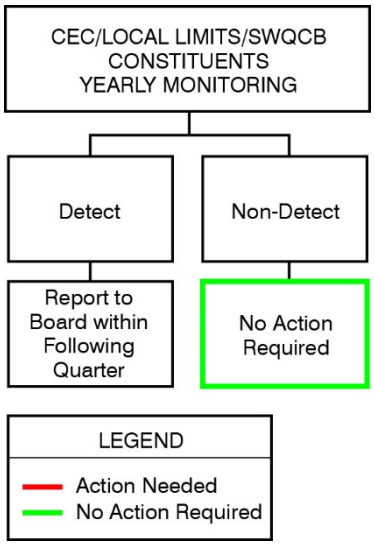

Figure 7 Title 22 CEC, Local Limits and Board RequiredContaminants Monitoring and Action Plan for IPR Finished Water.

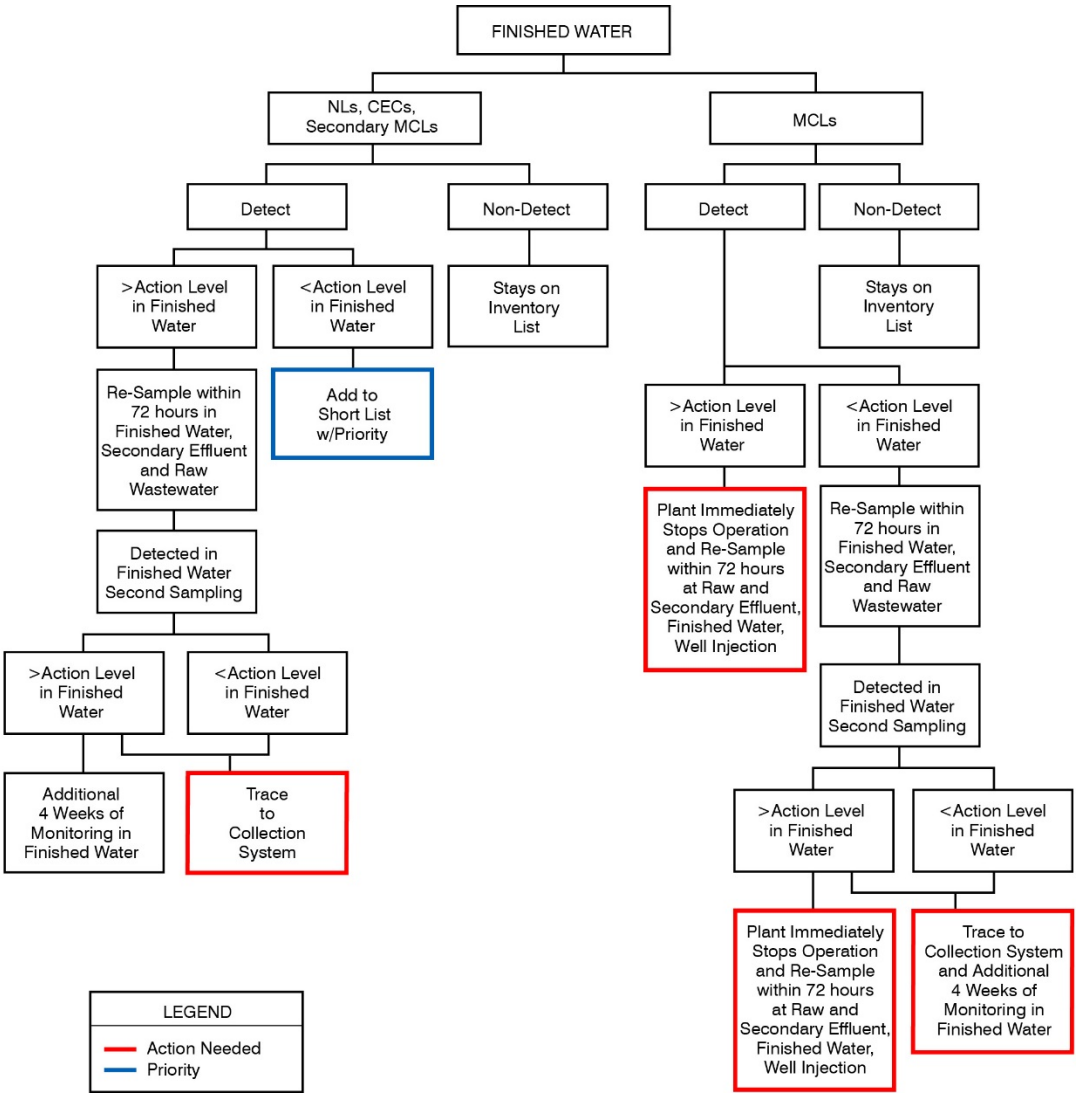

Figure 8 Finished Water Monitoring Response Plan for Proposed ESCP

5.3.2 Secondary Effluent Monitoring and Enforcement

This proposed enhanced source control program includes monitoring of the secondary effluent source water, matching the schedule of the purified water sampling frequency for the first year. Monitoring action plans tailored to secondary effluent sampling are included in Figures 9 and 10. *Secondary effluent sampling constituents are broken into two lists, Short List and Inventory List, which correspond to varying monitoring frequencies.*

A full list of all regulated and unregulated contaminants sampled for are included in the "Inventory List." All detected contaminants will be put into a more frequent monitoring registry called the "Short List." The "baseline" percent removal for wastewater treatment and contaminant removal corresponds to the contaminant removal percentage through secondary wastewater treatment measured during the Local Limits evaluation.

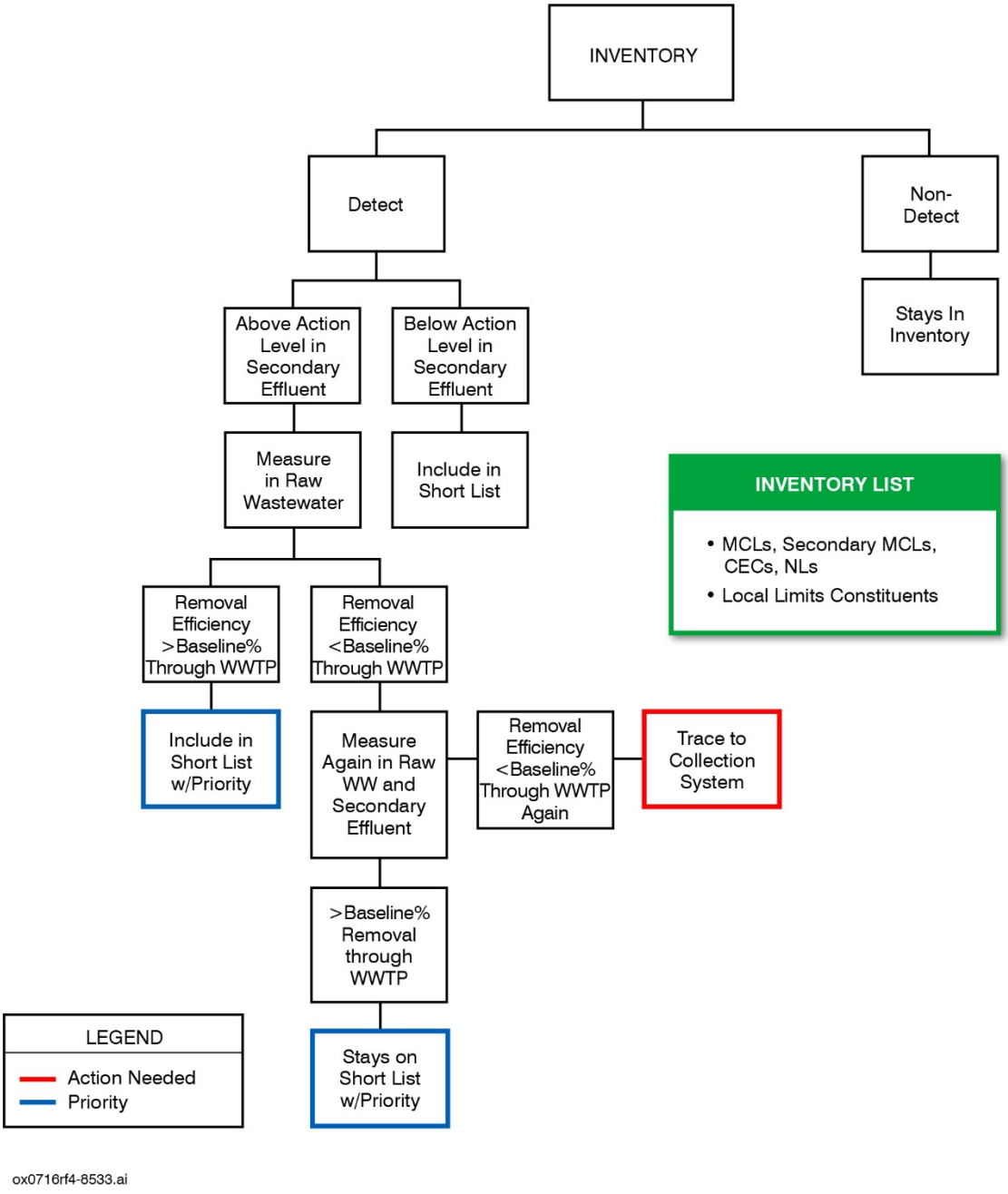

Figure 9 Secondary Effluent Source Inventory Monitoring Action Plan for Proposed ESCP

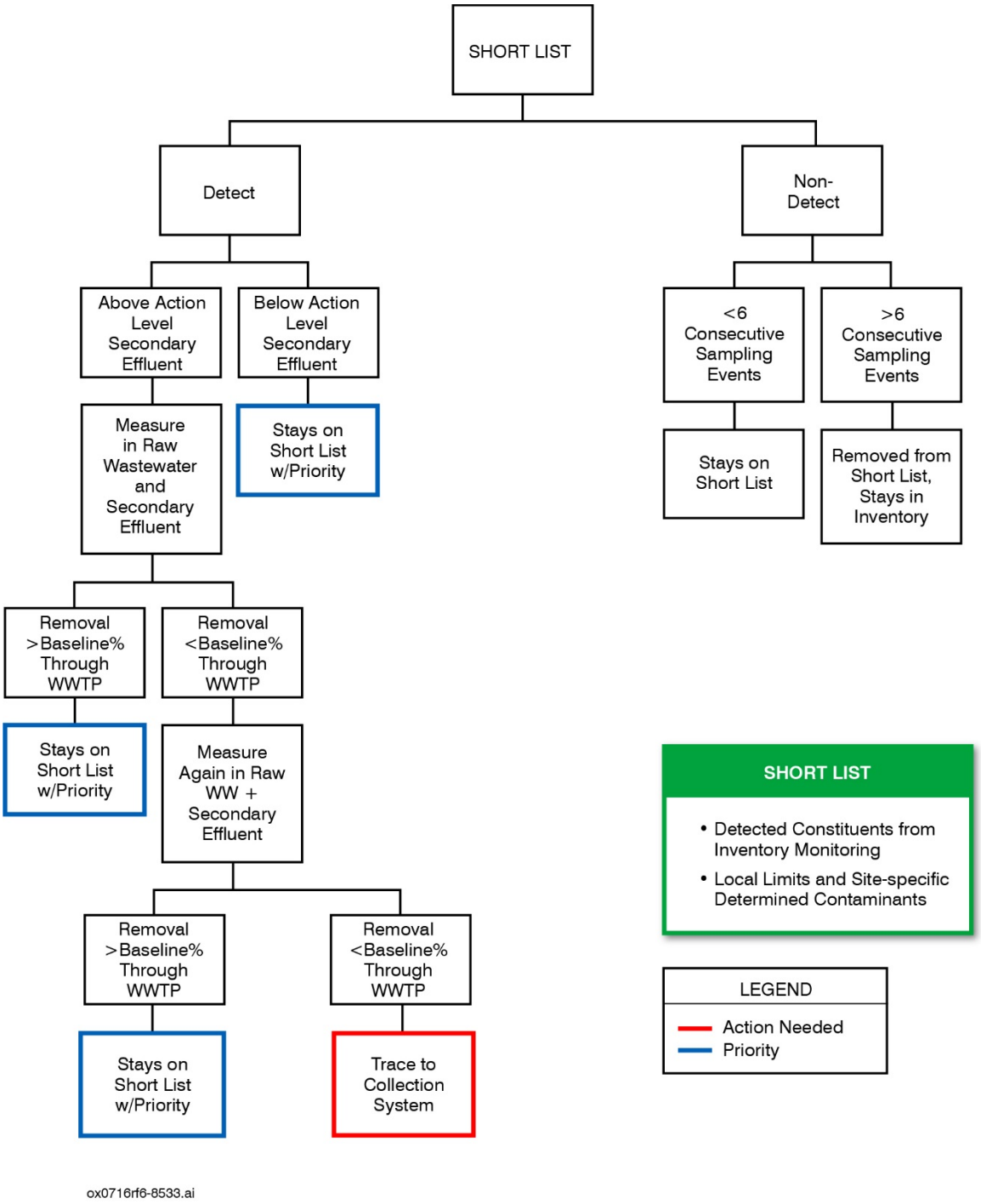

Figure 10 Secondary Effluent Source Short List Monitoring Action Plan

The Short List contains all detected contaminants from Inventory monitoring and any additional Local Limits constituents. Monitoring parameters on the Short List are revolving and contaminants can be added due to routine monitoring or a new discharge permit. If a contaminant is detected in the routine Inventory List, thereby going on the Short List, and no longer detected during monthly sampling of the Short List for 6 consecutive sampling

events (6 months), the contaminant will then be removed from the frequently monitored list and monitored quarterly.

A contaminant added to the Short List with Priority, will be closely monitored for changes during the subsequent sampling periods and the detections will be noted during the Industrial Source Control Workshops held quarterly by the SCPM.

5.4 Source Mapping Strategy

The City currently has a collection system tracing strategy that has proven effective by the "gross-beta" incident. For enhanced source control monitoring, a defined area strategy is proposed. This strategy includes defining areas of the collection system from which all major trunks meet and allows for increased isolation between domestic and industrial dischargers. Example mapping areas are shown below in Figure 11 as (M1 - M6). Each area will be monitored at the major junctions on a monthly basis for the Local Limits contaminants, and as needed for priority events where mapping contaminants through the system is necessary.

The initial discharge area in M4 will be monitored as a "baseline" for collection system contaminant accumulation. This will provide information about loading rates through each sampling event. Industry measured contaminant discharge data and flow rates will be used to create a mass balance for industry-specific loading rates. If these loading rates remain within a +/- (TBD by City)% margin, the loading rates will be acceptable. If out of this range, all industrial dischargers known to discharge this specific contaminant will be contacted. Household dischargers could also be responsible for contributing to this difference in industrial contaminant discharge. This approach is not meant to replace downstream monitoring of industrial discharge by the City for confirmation of each industry, only to provide a larger data set for long-term monitoring and a first look at monthly data trending for increasing dischargers in the service area. This will also provide confirmation of residential input, not only industry input.

To reduce the likelihood that harmful pollutants enter the OWTP, a monitoring and enforcement response plan similar to the SCWW "gross-beta incident" must be implemented. Monitoring and sampling effluent wastewater on a semiannual basis (to analyze for radioactivity) allows for early detection of contaminants. If a contaminant is found, research should be conducted to locate the source. Once locations are identified, samples should be taken from several locations - upstream, downstream, onsite and adjacent to suspected violators. If unacceptable concentrations of contaminants are found, proper action by the City should be taken to control the problem. This can include an order to Cease-and-Desist discharge, a Notice of Violation, and/or suspension of Industrial Waste Discharge Permit that would prohibit the discharge of any wastewater by the violators to the Oxnard Collection System.

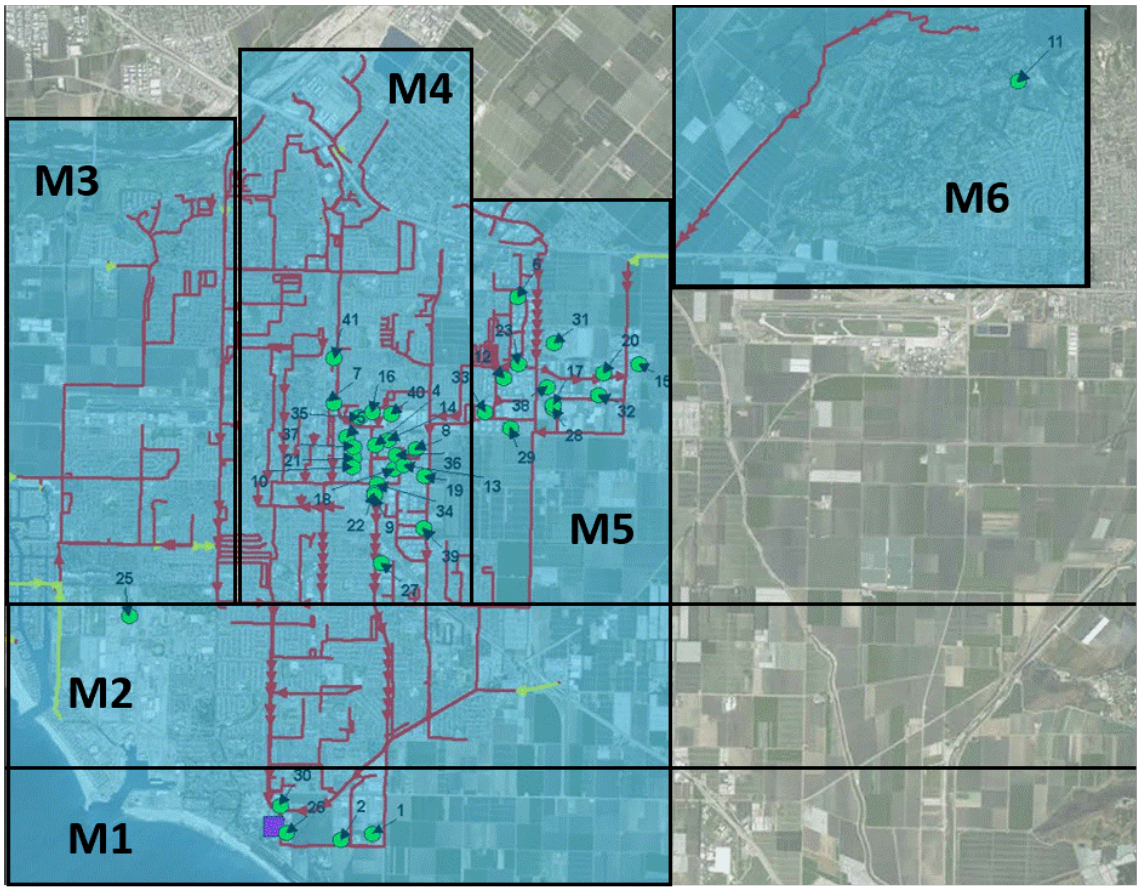

Figure 11 Proposed Collection System Strategic Monitoring Strategy for Both Routine Monitoring and Action Plan Response.

The City of Oxnard has a mostly residential section of town and another section that contains significant numbers of industrial dischargers. If a household is discharging a contaminant of concern, it will be difficult to pinpoint which house is causing the violations. In order to minimize painstaking contaminant tracking through the sewage discharge lines, a heavy emphasis will be put on household outreach and education. Additionally, the City will provide a hazardous waste disposal program where the public can bring medications, pesticides, and other hazardous waste items to the landfill for treatment, recovery, or burial. The plans for public outreach can be found in Section 6.3.

5.5 Hospital Discharge Program

Hospital waste discharge monitoring is not currently required in source control programs. The City of Oxnard has several hospitals, including animal hospitals, shown in Figure 12. There are many pharmaceuticals and personal care products monitored for in the Inventory List of contaminants and if an unexplained detection of these contaminants is found in the secondary effluent or purified water when tested, the compound will move to the Short List. If the action plan indicates the pharmaceutical contaminant should be traced back into the collection system (Figure 12), previously determined sampling locations downstream of the

hospital dischargers will be utilized. Facilities with the highest discharge flow will be targeted first.

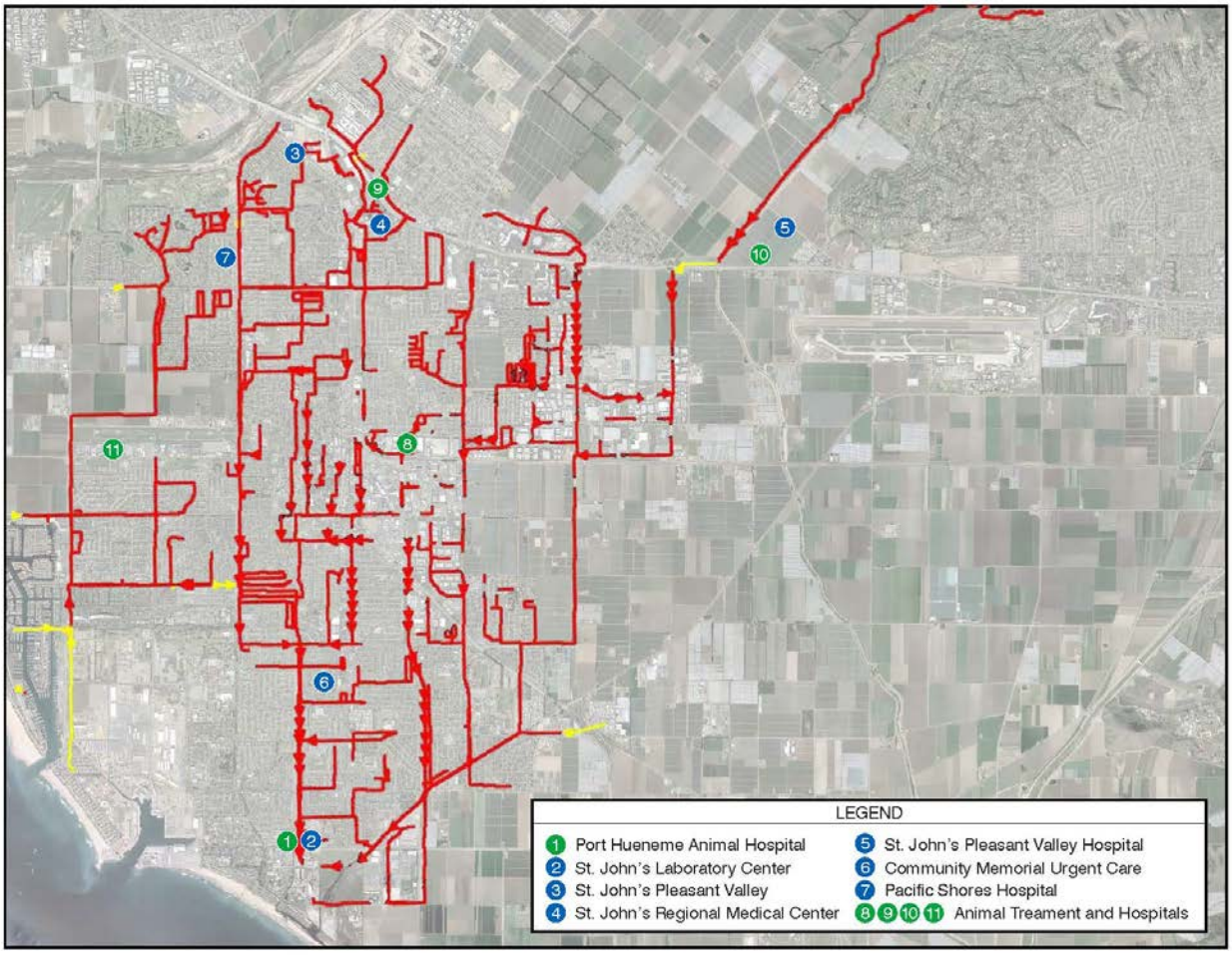

Figure 12 Short List of Human and Animal Hospitals Discharging to OWTP

5.5.1 Iohexol Hospital Discharge Indicator

Distinguishing hospital discharge versus residential discharge can prove challenging. Iohexol can be used as a potential indicator with which to identify hospital discharge locations and determine their contributions to the total flow. Iohexol is introduced into the wastewater collection system almost exclusively through the urine of patients in hospitals that have undergone medical imaging. Iohexol acts as a contrasting agent for medical imaging, and is designed to have no impact on human or animal health. Advanced oxidation processes efficiently remove Iohexol, and the compound is typically completely degraded in secondary treated wastewater. If incorporating a hospital discharge program into the ESCP becomes necessary, Iohexol should be used to help track medical dischargers.

6.0 OUTREACH PROGRAMS

6.1 Industrial Outreach

Meetings with all dischargers in groups will take place as described in the Local Limits Study. During these meetings, each discharger will be given their new discharge limits for all registered constituents. The rollout of the industrial discharge outreach program will be included in these meetings, where a clear plan will be made with each industrial discharger for what to do in the event of any constituent release changes. Changes could include a slug discharge event, a new contaminant introduced into production and needing to be added to the inventory list, removing a contaminant from a discharge list, and others.

Industrial dischargers will be reminded of the changes taking place downstream of them, and the effects discharging waste in violation of their permit could have on downstream potable reuse treatment and subsequent public consumption. The outreach plan will include 30 minutes to 1 hour monthly webinars to provide updates on their discharge statuses to each other and the City can provide the latest monitoring data and any updates or changes to the source control program. Monthly webinars will include information on any program updates, questions asked and answered by other dischargers during that time period and potable reuse monitoring information.

Quarterly 3-hour meetings will take place with all industries to send 1 representative to an update meeting in lieu of the monthly webinar. An example agenda for this meeting is shown as Figure 13. These meetings will be led by the SCPM with support from Oxnard staff. All industrial dischargers should participate with a short update on their recent monitoring and discharge information.

To encourage further engagement by industries, a yearly award will be given to those companies who have not had a discharge violation during audits or routine collection system monitoring. The "Enhanced Source Control Responsible Partner Award" is a yearly reminder to all industries that public health protection is a partnership with the community and water treatment system operations Figure 14.

6.2 Periodic Industry Reviews

In addition to educational outreach and coordinated industry discharger meetings, site audits currently run through the City's pre-treatment program will continue. The auditors will submit all data, reports, and meeting summaries directly to the SWPM immediately following site visits. The SWPM will then compile the data and files to ensure each industry is being properly monitored.

City of Oxnard Quarterly Source Control Dischargers Meeting

Meeting Month Day, Year

8:00 AM - 11:00 AM

Meeting Location

Welcome and Introductions (SCPM)	8:00 - 8:20
Source Control Program Updates (SCPM)	8:20 - 8:45
OWTP Monitoring Trends from Quarter (Oxnard Staff)	8:45 - 9:15
Individual Discharger Updates (Industry Representative)	9:15 - 10:30
Discussion and Q&A (Everyone)	10:30 - 10:50
Set Next Meeting Date and Agenda Items (SCPM)	10:50 - 11:00

SAMPLE

Figure 13 Example Quarterly Industrial Dischargers Source Control Meeting Agenda

Figure 14 ESCP Responsible Partner Award Certificate (Example)

If a violation is found during a site audit, the current enforcement plan for pre-treatment violations will apply, unless a more stringent enforcement plan is needed during audits in the future. Any violations reported or recorded will be discussed during the quarterly and monthly industry outreach meetings that include representatives from each industry.

In the event of a new discharge license being issued by the City, a source control review will be triggered. This review will be discussed and integrated into the industry discharger partnership attending monthly and quarterly meetings. All business licenses for dischargers will be reviewed annually by the industry's assigned auditor. The licenses are required to be within expiration date, show proper fees have been paid to the City for the annual time period, and no new constituents or major changes have been made to the discharge matrices.

6.3 Residential Outreach

Household outreach and education is the major residential source control strategy for most communities. Due to the increased risk involved in potable reuse, the residents should be strongly educated as to where their waste is going and the potential impacts to the communities drinking water supply. An outreach plan for public acceptance purposes is already planned for this project, and the discharge information could be rolled out along with this initiative upfront. Providing a proactive awareness program for household discharges prior to the operation of IPR in the community can provide increased confidence to the City in their residential source water control strategy.

Contaminant discharges causing unwanted impact to the water supply cannot be tracked easily in residual areas due to the quantity of individual dischargers with low-volume inputs. In order to prevent unwanted discharges from households in the sewer line, educational tools and disposal centers will be used for the public to have options for disposing of unwanted items.

Discharge information will address a list of household items that would potentially be detrimental to the wastewater and water purification process, and alternative disposal options for the residents provided by the City or otherwise available. Educational materials will include a website developed to address safe disposal practices. For example, the public would be educated that flushing leftover antibiotics or pharmaceuticals is unsafe, however, household cleaners are acceptable. A detailed list with brand examples will be made available to ensure public understanding of the issue. An example of a public outreach website for residential discharge was developed by the San Francisco Public Utilities Commission (SFPUC). The website offers top things not to flush, and a flyer you can print with the title "Think Before You Flush". The website can be accessed here: http://sfwater.org/index.aspx?page=151

The majority of households in Oxnard primarily speak Spanish, therefore it is imperative that bilingual educational materials are developed alongside of materials in English. The

SFPUC in the above example provides 4 language options (English, Spanish, Mandarin and Tagalog) to cater to that city's demographics. To direct residents to the informational website, a link and description will be highly visible on their monthly water bills mailed, or in their water bills provided online. Provided internet is not available in the household, annual residential source control program meetings will be organized by the SWPM to provide another educational option for City residents.

7.0 OWTP AND AWPF WATER QUALITY RESULTS

7.1 Secondary Effluent Water Quality Standards and Results

In order for AWPF effluent to be used for indirect potable reuse, the water must first meet the existing NPDES OWTP effluent regulations and Los Angeles Region Basin Plan (Basin Plan) objectives. Since secondary effluent is the influent source for AWPF treated water, the higher the secondary effluent water quality, the higher our source water quality is for IPR.

7.1.1 NPDES Permit Regulations

The NPDES Permit for the OWTP includes regulations for major wastewater constituents such as 5-day biological oxygen demand (BOD_5) and total suspended solids (TSS), marine aquatic life contaminants, and contaminants relevant to human health (both carcinogens and non-carcinogens). A complete list of the NPDES permit water quality requirements is provided in Appendix B.

Per the NPDES permit, Oxnard already does periodic monitoring (quarterly) of the plant influent.

- Flow - continuous.
- pH, TSS, BOD - daily.
- Oil & Grease - weekly.
- Benzedrine, Heptachlor epoxide, PCBs, TCDD equivalents - quarterly.
- Everything else - semiannually.

7.1.2 Relevant Basin Plan Objectives

The Basin Plan was adopted in 1994 and outlines water quality requirements for waters in the Los Angeles region of which Oxnard is a part. All Basin Plan objectives pertaining to water designated for human consumption, are consistent with DDW requirements.

7.2 OWTP and AWPF Wastewater Quality

The OWTP has been in full compliance with its NPDES permit. Historical effluent data for BOD, TSS, turbidity, residual chlorine, pH, ammonia, oil and grease, and settleable solids are continuously measured in the OWTP effluent. Historical values for these parameters are provided in Tables 16 through 18. A summary of data for metals and trace pollutants in the OWTP effluent is shown in Table 17, including new data collected as part of the 2015 Local limits evaluation. The data provided in Tables 16 and 17 indicate that the OWTP provides high quality secondary-treated effluent suitable for advanced treatment and potable reuse. Further, the high beta radioactivity has been addressed through the source control program with the cease of all discharge from Santa Clara Wastewater, as demonstrated with the low beta radioactivity shown in Table 17.

The OWTP data collected to date was intended to demonstrate compliance with the existing NPDES permit and to address the local limits evaluation, and was not intended to address future potable reuse water quality standards. However, the OWTP secondary effluent data (Table 18) shows for any contaminant monitored under Title 22, the measured secondary effluent data meets or exceeds Title 22 maximum contaminant concentrations, with the exception of one event, where subsequent sampling consistently showed a much lower concentration. As discussed in the subsequent section, additional analytical testing of secondary effluent, ROP, and UV AOP effluent will be done during the startup of the AWPF and the production of non-potable recycled water, which will be done in the summer of 2016.

Table 16 Effluent Regulatory Limits and OWTP Data - Typical Wastewater Constituents
Advanced Water Purification Facility
City of Oxnard

Parameter	Units	NPDES Permit Limit		OWTP Data[1]
		Discharge Limit	Criteria	
BOD_5	mg/L	30	Monthly Average	14 - 22
		45	Weekly Average	11 - 28
	lbs/day	7,900	Monthly Average	2,326 - 3,621
		12,000	Weekly Average	1,880 - 4,403
TSS	mg/L	30	Monthly Average	5.8 - 10.4
		45	Weekly Average	4.6 - 19.1
	lbs/day	7,900	Monthly Average	965 - 1,696
		12,000	Weekly Average	760 - 3,063
Turbidity	NTU	75	Monthly Average	2.9 - 6.8
		100	Weekly Average	2.7 - 12.9
		225	Daily Maximum	20.7
Total Residual Chlorine	mg/L	0.085	Monthly Performance Goal	0.01 - 0.04
	lbs/day	23		1.4 - 7.2
pH		6.0 - 9.0	Instantaneous Minimum to Maximum	7 - 7.9[2]
Ammonia Nitrogen	mg/L	25	Monthly Performance Goal	25 - 34
	lbs/day	6,600		4,259 - 5,781
Oil and Grease	mg/L	25	Monthly Average	4.9 - 4.9
		40	Weekly Average	4.9 - 5.1
	lbs/day	6,630	Monthly Average	782 - 827
		10,600	Weekly Average	769 - 850
Settleable Solids	ml/L	1	Monthly Average	0.01 - 0.016
		1.5	Weekly Average	0.01 - 0.036
		3	Daily Maximum	0.10

Notes:
(1) Based on 2013 Data.
(2) From daily grab samples.

Table 17 Effluent Regulatory Limits and OWTP Data – Other Pollutants Advanced Water Purification Facility City of Oxnard					
		Effluent Limitations		Title 22 Contaminant Action Levels[1] and OWTP Discharge Goals	
Contaminant	Units	Average Monthly	Maximum Daily	Annual Average or Single Action	OWTP Data[2]
Marine Aquatic Life Toxicants					
Arsenic	ug/L	-	-	10	0.7
Cadmium	ug/L	-	-	5	<0.5
Chromium VI	ug/L	-	-	10	<0.3
Copper	ug/L	-	-	1300	28
Lead	ug/L	-	-	15	<5
Mercury	ug/L	-	-	2	<0.2
Nickel	ug/L	-	-	100	5
Selenium	ug/L	-	-	50	2.4
Silver	ug/L	-	-	100	1
Zinc	ug/L	-	-	5000	19
Cyanide	ug/L	-	-	0.15	-
Phenolic Compounds (non-chlorinated)[3]	ug/L	-	-	5[4]	<23
Phenolic Compounds (chlorinated) [3]	ug/L	-	-	0.42[4]	<5
Endosulfan[3]	ug/L	-	-	0.05[4]	<0.03
HCH[3]	ug/L	-	-	0.1[4]	-
Endrin	ug/L	-	-	2	<0.01
Chronic Toxicity[3]	Tuc	-	99	-	-
Radioactivity					
Alpha Radioactivity	Pci/L	-	15	15	1.67 ± 0.24
Beta Radioactivity	Pci/L	-	50	50	94 ± 3.939[5,6]
Combined Radium-226 & Radium-228	Pci/L	-	5	5	-
Tritium	Pci/L	-	20000	20000	-
Strontium-90	Pci/L	-	8	8	-
Uranium	Pci/L	-	20	20	-
Human Health Toxicants - Non Carcinogens					
Acrolein[3]	ug/L	-	-	10[4]	<5
Antimony	ug/L	-	-	6	<2
Bis (2-chloroethoxy) methane[3]	ug/L	-	-	25[4]	<1
bis (2-Chloroisopropyl) ether[3]	ug/L	-	-	10[4]	<1
Chlorobenzene[3]	ug/L	-	-	2.5[4]	<1

Table 17 Effluent Regulatory Limits and OWTP Data – Other Pollutants
Advanced Water Purification Facility
City of Oxnard

Contaminant	Units	Effluent Limitations		Title 22 Contaminant Action Levels[1] and OWTP Discharge Goals	OWTP Data[2]
		Average Monthly	Maximum Daily	Annual Average or Single Action	
Chromium (III)	ug/L	-	-	50	<5
Di-N-Butyl phthalate[3]	ug/L	-	-	0.19[4]	<1
Dichlorobenzenes	ug/L	-	-	260	<3
Diethyl phthalate	ug/L	-	-	63	<1
Dimethyl phthalate[3]	ug/L	-	-	10[4]	<1
2-Methyl-4,6-dinitrophenol[3]	ug/L	-	-	25[4]	<5
2,4-Dinitrophenol[3]	ug/L	-	-	25[4]	<10
EthylBenzene	ug/L	-	-	600	<1
Fluoranthene[3]	ug/L	-	-	0.039[4]	<1
Hexachlorocyclopentadiene	ug/L	-	-	5	<1
Nitrobenzene[3]	ug/L	-	-	5[4]	<1
Thallium	ug/L	-	-	2	<2
Toluene	ug/L	-	-	150	<1
Tributyltin[3]	ug/L	-	-	0.0263[4]	<0.005
1,1,1-Trichloroethane	ug/L	-	-	200	<1
Human Health Toxicants - Carcinogens					
Acrylonitrile[3]	ug/L	-	-	10[4]	<2
Aldrin[3]	ug/L	-	-	0.025[4]	<0.005
Benzene	ug/L	-	-	1	<1
Benzedrine	ug/L	0.0068	-	-	<10
Beryllium	ug/L	-	-	4	<0.5
Bis (2-chloroethyl) ether[3]	ug/L	-	-	5[4]	<1
Bis (2-ethylhexyl) phthalate[3]	ug/L	-	-	50[4]	10
Carbon Tetrachloride	ug/L	-	-	0.5	<1
Chlordane	ug/L	-	-	2	<0.01
Chlorodibromomethane[3]	ug/L	-	-	0.61[4]	<.001
Chloroform[3]	ug/L	-	-	1.2[4]	<1
DDT[3]	ug/L	-	-	0.25[4]	<0.01
1,4-Dichlorobenzene[3]	ug/L	-	-	0.041[4]	<1
3,3-Dichlorobenzidine[3]	ug/L	-	-	25[4]	<5
1,2-Dichloroethane	ug/L	-	-	5	<1
1,1-Dichloroethylene	ug/L	-	-	6	<1
Bromodichloromethane[3]	ug/L	-	-	2.5[4]	<1

Table 17 Effluent Regulatory Limits and OWTP Data – Other Pollutants
Advanced Water Purification Facility
City of Oxnard

Contaminant	Units	Effluent Limitations		Title 22 Contaminant Action Levels[1] and OWTP Discharge Goals	OWTP Data[2]
		Average Monthly	Maximum Daily	Annual Average or Single Action	
Dichloromethane	ug/L	-	-	5	<1
1,3-Dichloropropene	ug/L	-	-	0.5	<2
Dieldrin[3]	ug/L	-	-	0.05[4]	<0.01
2,4-Dinitrotoluene[3]	ug/L	-	-	25[4]	<1
Azobenzene (1,2-Diphenylhydrazine)[3]	ug/L	-	-	5[4]	<1
Halomethanes	ug/L	-	-	80	<4
Heptachlor	ug/L	-	-	0.04	<0.01
Heptachlor epoxide	ug/L	0.002	-	0.02	<0.01
Hexachlorobenzene	ug/L	-	-	1	<1
Hexachlorobutadiene[3]	ug/L	-	-	5[4]	<1
Hexachloroethane[3]	ug/L	-	-	5[4]	<1
Isophorone[3]	ug/L	-	-	5[4]	<1
N-Nitrosodimethylamine (NDMA)	ug/L	-	-	10	<1
N-Nitrosodi-N-propylamine (NDPA)	ug/L	-	-	10	<1
N-Nitrosodiphenylamine	ug/L	-	-	10	<1
PAHs[3]	ug/L	-	-	0.097[4]	<19
PCBs	ug/L	0.0019	-	0.5	<17.5
Total 2,3,7,8-TCDD Equivalence[3]	ug/L	0.00000039	-	-	<0.00001
1,1,2,2-Tetrachloroethane	ug/L	-	-	1200	<1
Tetrachloroethylene	ug/L	-	-	5	<1
Toxaphene	ug/L	-	-	3	<2.5
Trichloroethylene	ug/L	-	-	5	<1
1,1,2-Trichloroethane	ug/L	-	-	5	<1
2,4,6-Trichlorophenol[3]	ug/L	-	-	0.35[4]	<1
Vinyl chloride	ug/L	-	-	0.5	<1

Notes:

(1) OWTP not regulated according to Title 22 MCL, NL, Secondary MCL or action levels.
(2) Based on August 2014 Data. "<" values are below the reporting limit.
(3) No Title 22 sampling or enforcement requirement.
(4) When not listed under Title 22, OWTP discharge goals are used.
(5) Recent sampling for this pollutant showed RO permeate levels <2 Pci/L.
(6) The source of the gross-beta was found to be Santa Clara Wastewater, and they are no longer allowed to discharge to the City collection system or OWTP. Subsequent testing has demonstrated very low gross-beta results and compliance with the NPDES permit.

Table 18 AWPF Removal Efficiencies (Local Limits Constituents)
Advanced Water Purification Facility
City of Oxnard

Constituent	Units	Secondary Effluent	Finished Water	Removal Efficiency[1]
Ammonia	mg/L	33.9	1.67	95.1%
Antimony	ug/L	0.84[2]	<1	40.5%
Arsenic	ug/L	2.09[2]	<1	76.0%
Barium Tot	ug/L	23.0	<2	95.7%
Beta, Gross	pCi/L	5.96[2]	<3	74.8%
Biochemical Oxygen Demand, total	mg/L	6.91[3]	2.31[3]	66.6%
Boron	mg/L	1.09	0.74	31.9%
Cadmium	ug/L	<0.5	<0.5	--
Calcium	mg/L	164	7.52	95.4%
Chloride	mg/L	548	18.7	96.6%
Chromium	ug/L	0.52[4]	<1	4.2%
Copper	ug/L	7.16	<2	86.0%
Fixed Dissolved Solids	mg/L	1,603	1.14[4]	99.9%
Fluoride	mg/L	0.70	0.02	96.4%
Gross Alpha	pCi/L	26.5	<3	94.3%
Iron Total	mg/L	0.30	0.01[4]	96.2%
Lead Total	ug/L	<0.5	<0.5	--
Magnesium	mg/L	67.8	0.23	99.7%
Manganese	mg/L	0.11	<0.002	99.1%
Mercury	ng/L	6.01[2]	1.52	74.7%
Molybdenum	ug/L	16.4	<2	93.9%
Nickel	ug/L	6.57[2]	<5	62.0%
Potassium	mg/L	35.1	1.43	95.9%
Selenium	ug/L	8.05[2]	<5	69.0%
Silica	mg/L	30.8	1.01	96.7%
Silver Total	ug/L	<0.5	<0.5	--
Sodium	mg/L	397	17.4	95.6%
Specific Conductance	umho/cm	3,346	141	95.8%
Strontium	mg/L	1.55	0.01[4]	99.6%
Sulfate	mg/L	543	1.27	99.8%
Total Dissolved Solids	mg/L	1,869	69.9	96.3%
Total Kjeldahl Nitrogen	mg/L	34.3	1.70	95.0%
Total phosphorus as P	mg/L	1.45	0.03	97.8%
Total Suspended Solids	mg/L	5.32[2]	<10	6.1%
Uranium	ug/L	8.49	<1	94.1%
Zinc Total	ug/L	17.3[2]	<20	42.2%

Table 18	AWPF Removal Efficiencies (Local Limits Constituents) Advanced Water Purification Facility City of Oxnard

Notes:
(1) Where the reported value is < reporting limit, the removal efficiency was calculated assuming the reported value equaled one half of the reporting limit.
(2) Some data points in this dataset were extrapolated below reporting limit based on other reported data at the sampling location. These datasets had three or more data points above the reporting limit to allow regression analysis for extrapolating concentrations below the level of detection.
(3) BOD data were collected on 9 days from 6/11/15 through 8/30/15.
(4) These datasets had less than three data points above the reporting limit which makes a regression analysis inaccurate. Thus, a geometric mean of all data points was used. Data reported below the reporting limit were assumed to be one half the reporting limit for calculating the geometric mean.

8.0 SUMMARY

An ESCM Program framework has been proposed in this document, building on the existing source control program already in place at the City of Oxnard. The proposed ESCM for the City of Oxnard will include:

- A source control program manager overseeing all data collection and regulatory issues relating to discharge from the first user to groundwater wells.
- More frequent sampling than currently required of the secondary effluent and AWPF finished water, including for regulated, unregulated and industry-specific constituents.
- Use of historical and online monitoring data currently required for operation to create baselines and predict trends in process performance.
- Substantial industrial and residential outreach programs for potable reuse education and discharge initiatives.
- Mapping strategies for fast-acting collection system tracing of detected contaminants of health concern.
- Optional additions to discharge mapping, including hospitals.

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ACRONYMS

-A-	
ASR	Aquifer Storage and Recovery
AWPF	Advanced Water Purification Facility
-B-	
bgs	below ground surface
BOD	Biological Oxygen Demand
-C-	
CEC	Constituents of Emerging Concern
CEQA	California Environmental Quality Act
City	The City of Oxnard
CIUs	Categorical Industrial Users
CMWD	Calleguas Municipal Water District
CWC	California Water Code
-D-	
DDW	Division of Drinking Water
DIT	Direct Integrity Test
-E-	
EC	Electrical Conductivity
EDCs	Endocrine Disrupting Compounds
ELAP	Environmental Laboratory Accreditation Program
-F-	
FCGMA	Fox Canyon Groundwater Management Authority
-G-	
GRPs	Groundwater Recharge Projects
GRRP	Groundwater Replenishment Reuse Project
GWRS	Groundwater Replenishment System
-H-	
H_2O_2	Hydrogen Peroxide
-I-	
IPR	Indirect Potable Reuse
-L-	
LARWQCB	Los Angeles RWQCB
LAS	Lower Aquifer System
LASAN	LA Sanitation
LPHO	Low-Pressure High-Output
LRV	Log-Removal Value
-M-	
MCLs	Maximum Contaminant Levels
MDL	Method Detection Limit
MF	Microfiltration
MRP	Monitoring and Reporting Program
MWDSC	Metropolitan Water District of Southern California
-N-	
ND	Non-Detected
NLs	Notification Levels
NOV	Notice of Violation

NWRI	National Water Research Institute
-O-	
OMMP	Operations, Maintenance, and Monitoring Plan
ORP	Oxidation Reduction Potential
OVMWD	Ocean View Municipal Water District
OWTP	Oxnard Wastewater Treatment Plant
-P-	
PDT	Pressure Decay Test
PEIR	Program Environmental Impact Report
PHWA	Port Hueneme Water Authority
POTW	Publicly-Owned Treatment Works
PPCP(s)	Pharmaceuticals and Personal Care Products
-Q-	
QAPP	Quality Assurance Project Plan
-R-	
RO	Reverse Osmosis
ROP	RO Permeate
ROSA	Reverse Osmosis System Analysis
ROWD	Report of Waste Discharge
RRT	Response Retention Time
RWC	Recycled Water Contribution
RWQCB	Regional Water Quality Control Board
-S-	
SCVWD	Santa Clara Valley Water District
SIU(s)	Significant Industrial User(s)
SNMP(s)	Salt Nutrient Management Plan(s)
SWP	State Water Project
SWRCB	State Water Resources Control Board
-T-	
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TSP-SC	Technical Services Program – Source Control
TTO	Total Toxic Organics
-U-	
UAS	Upper Aquifer System
UV AOP	Ultraviolet Light and Hydrogen Peroxide
UVT	UV Transmittance
UWCD	United Water Conservation District's
-W-	
WDR(s)	Waste Discharge Requirement(s)
WRD	Water Replenishment District
WRR	Water Recycling Requirement

APPENDIX A – BEST MANAGEMENT PRACTICES (BMPS) FOR CENTRALIZED WASTE TREATMENT (CWT)

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CALIFORNIA ASSOCIATION OF SANITATION AGENCIES (CASA)

BEST MANAGEMENT PRACTICES
FOR
CENTRALIZED WASTE TREATMENT (CWT) FACILITIES
(SUBCATEGORY D MULTIPLE WASTESTREAM)
October 12, 2015

Purpose

These Best Management Practices (BMPs) have been endorsed by several major POTW's in California that currently accept CWT waste discharges. These major California POTWs have developed and adopted these BMPs to serve as guidance, and to help assure uniform compliance among POTWs in California with their mandates under the U.S. EPA pretreatment program requirements.

These requirements are designed to protect POTW wastewater treatment processes and conveyance systems; to assure compliance with the regulations governing discharge of treated effluent, water reuse, biosolids disposal/reuse, and air emissions; and to protect worker and public safety and the environment.

Acknowledgement

The following agencies participated in the development and review of this BMP.

- City of Oxnard
- County Sanitation District of Los Angeles
- City of San Jose (SJ/SC Water Pollution Control Plant)
- City of Los Angeles
- Orange County Sanitation District

Background

Centralized Waste Treatment (CWT) facilities are defined in Rule 40 CFR 437 as those that accept hazardous or non-hazardous industrial metal-bearing wastes, oily wastes and organic-bearing wastes received from off-site for pretreatment processing before discharge to a water of the U.S., or to a Publically Owned Wastewater Treatment (POTW) facility. Specifically, CWT Subcategory D dischargers are those that receive for treatment a combination of two of more any of the following three major categorical waste streams: metal-bearing wastes, oily wastes, and organic-bearing wastes.

CWTs are required to be permitted and to comply with all federal and local rules and regulations set by Rule 40 CFR 437. They are also required to meet those rules and regulations set by the local agency that owns and operates the POTW facility and administers the POTWs pretreatment program, if the CWT discharges to a POTW.

The EPA's guidance document labeled "Small Entity Compliance Guide, Centralized Waste Treatment (CWT) Effluent Limitations and Guidelines and Pretreatment Standards (40 CFR 437) (EPA 821-B-01-003; June 2001; Version 3.0) "sets guidance for businesses that are subject to the Rule in complying with the national regulations and limitations set forth in the Rule." A Subcategory D discharger must establish that its facility provides "equivalent treatment" in terms of comparable pollutant removals to the applicable treatment technologies used as the basis for the federal limitations and pretreatment standards (40 CFR 437.2).

Best Management Practices

The following summarizes the recommended Best Management Practices (BMPs) for CWT facilities discharging to California POTWs. These recommended BMPs are organized based on the following topical headings:

- Waste Receiving Requirements
- Treatment Requirements
- Effluent Discharge and Sampling/Testing Requirements
- Recommended Certification and Documentation Requirements.

1. Waste Receiving Requirements

a. The waste hauler bringing waste to a CWT shall submit a Waste Manifest to the CWT upon arrival at the CWT processing facility. The Waste Manifest shall include the following minimum information:
   i. Information as defined in Chapter 5 of Small Entity Compliance Guide, Centralized Waste Treatment (CWT) Effluent Limitations and Guidelines and Pretreatment Standards (40 CFR 437) (EPA 821-B-01-003; June 2001; Version 3.0). This shall include a date and time stamp.

b. The following mandatory tests shall be performed for confirmation of the Waste Manifest in accordance with 40 CFR 403 General Pretreatment Regulations and the analytical methods and sampling techniques stipulated in 40 CFR 136:
   i. Heavy Metals
   ii. Cyanides
   iii. Total Phenol
   iv. Sulfides
   v. Volatile Organic Compounds
   vi. Oil and Grease
   vii. Total Toxic Organics (TTOs)
   viii. BOD and TSS

c. Combining waste from multiple location into one tank truck (i.e. "Milk Runs") is prohibited.
d. Additional random sampling of waste haulers by the CWT may be requested by the POTW to confirm the waste characteristics are as described in the Waste Manifest.

2. Treatment Requirements

a. The minimum required treatment shall be as specified in 40 CFR 437, and as described in the Small Entity Compliance Guide, Centralized Waste Treatment (CWT) Effluent Limitations and Guidelines and Pretreatment Standards (40 CFR 437) (EPA 821-B-01-003; June 2001; Version 3.0).
b. Emergency shutoff and re-routing procedures must be in place.
c. Treatment reliability and redundancy requirements must meet. As a minimum, those that are established by the most recent version of the '*Ten-State Standards' (Board of State and Provincial Public Health and Environmental Managers, Health Research, Inc., Health Education Services Division).*
d. Holding tanks for the purpose of dilution will not be allowed.
e. A logbook shall be maintained of the operating parameters of the treatment process.

3. Effluent discharge and sampling/testing requirements.

a. Batch discharge will be required. Continuous discharge is not permitted.
b. The batch tanks will be continuously mixed.
c. A representative sample will be taken and analyzed by a POTW approved, State certified laboratory, before a decision is made to discharge to the POTW sewer system. Testing shall, as a minimum, be for the following:
    i. Local Limits as established by the POTW.
    ii. Applicable 40 CFR 437 Categorical Limits, adjusted by the combined waste stream formula if non-regulated waste streams are discharged at the compliance point.
    iii. Toxicity as determined by Specific Oxygen Uptake Rate (SOUR), Method 1683, EPA-821-R-01-014.
    iv. Any other limits imposed by the POTW.
d. The batch discharge will only be allowed if the above test results meet the applicable discharge limits.
e. Adequate emergency shut-off/rerouting procedures must be established. Incoming wastes must be halted or diverted to storage if an emergency shutdown of the treatment system is required.
f. If the federal or local discharge limitations are not met for a parameter other than pH, then the tank contents shall to be returned to the beginning of the treatment process train for reprocessing. If the federal or local pH limits are not met based on pH only, then the CWT Facility can add an acid or base to bring the pH into the allowable range before discharge. The POTW may have restrictions on the acid or base chemical that can be used for pH adjustment.
g. Installation of flow metering of the discharge to the POTW is required and must be maintained and calibrated routinely by a qualified professional.

4. Recommended General Certification and Documentation Requirements

Documents must be developed and submitted to the POTW, and be available for the POTW to review at the CWT site all times.

Note that all documents, forms, and other submittals must be certified and stamped by a registered professional engineer in California with expertise in industrial treatment. This list includes, but is not limited to the following.

1. Initial Certification Statement.

a. Submit initial Certification Statement to the POTW in accordance with 40 CFR 437.41.
b. The initial Certification Statement must be reviewed and approved by the POTW before a Permit to Discharge is granted to the CWT by the POTW.

2. Plans/Procedures

a. Monitoring, Sampling and Testing Plan (MSTP). The MSTP shall specify: location, frequency, and methodology for all monitoring/sampling of waste received, treatment processes and performance, and treated effluent discharged to the POTW.
b. Monitoring Plan Reporting: Monthly and annual reports shall be submitted summarizing all mandatory and self-monitoring data results.
c. Slug Discharge Control Plan.
d. Spill Containment plan.
e. Flow Metering Plan.
f. Rainwater and Stormwater Management Plan (Note: stormwater cannot be commingled with received and/or treated CWT wastes).
g. Solvent Management Plan.
h. Waste Minimization Plan.

5. Treatment Process/Facility Information.

a. O&M Manual
    i. Routine O&M Procedures
    ii. Emergency Response, Bypass, and Storage O&M Procedures
    iii. O&M Logbook
b. Unit process sizing and design criteria. Information shall be sufficient for independently assessing the rated treatment capacity of all unit operations, including physical dimensions, and process design criteria (e.g. hydraulic detention times, overflow rates, pollutant removals, etc.).
c. Engineering Design Drawings (100% Design Drawings/As-built).
d. Process and Instrumentation diagram. This shall show the following information:
    i. Process flows for all major unit operations (routine and emergency conditions). This shall include identification of all flow and recycle streams for each treatment process
    ii. Process monitoring parameters (location and metrics). As a minimum these shall include:
        a. Flow rates
        b. pH
        c. Temperature
        d. Others as recommended by the POTW.

e. Wastewater Treatment Operator Requirements.
f. Water Usage. Copies of historical water bills and/or local well records showing water usage for a five-year (5) period.
g. Operating Records. All plant operating and performance records relating to wastewater discharge and waste manifests for up to five (5) years, including all monitoring, testing, and analytical results (See Testing and Monitoring *Information*, below).

6. Received Waste Documentation

a. Comprehensive list of all generators accepted by the CWT.
b. Waste Hauler Reports.
c. Logbook of all prequalification for each of the CWTs clients, this includes;
   i.. Generator information
   ii. Initial Sample information
   iii. Requalification tests
d. Customer Laboratory Treatability Information.

7. Testing and Monitoring Information

a. All sampling, testing and laboratory analyses must be performed by an independent testing laboratory that is licensed and certified in California.
b. All laboratory analytical results, including QA/QC information, shall be submitted monthly, and records maintained for a five-year period.
c. Effluent pH recordings from the previous 180 days
d. Flow Meter Calibration and Maintenance Reports (Note: must be signed and stamped by a registered professional engineer in California).
   i. Flow meter locations
   ii. Flow meter descriptions
   iii. Flow meter system details
   iv. Calibration methods/results
   v. Corrective measures
   vi. Discharge log (with signature(s) from responsible party at time of release from CWT facility to the POTW system.)
   vii.. Time, date, and volume of when the contents from the tank are discharged to the sewer
   viii. Signature from responsible operator
   ix Other observations
e. Chain of custody forms for monitoring samples with signatures.
f. All other sampling reports.

8. Compliance Paperwork

a. On-site Compliance Paperwork, as required by 40 CFR Part 437.47(a)(4)
b. Periodic Certification of equivalent treatment statement in the Self-Monitoring Report 40 CFR Part 437.41(b)
c. Facility shall continue to submit application information on a five-year cycle, with all applicable documentation and any information pertaining to changes planned for the future years. The information provided must include changes in the nature or volume of the discharge, or anticipated customers.

APPENDIX B – OXNARD WASTEWATER TREATMENT PLANT NPDES PERMIT REGULATIONS PER CURRENT ORDER R4-2013-0094

APPENDIX B – OXNARD WASTEWATER TREATMENT PLANT NPDES PERMIT REGULATIONS PER CURRENT ORDER R4-2013-0094

Table B.1 - Oxnard WWTP Permit Regulations		
Constituent	**Units**	**Average Monthly Limitation**
BOD	mg/L	30
TSS	mg/L	30
pH	Standard	6.0-9.0
Oil & Grease	mg/L	25
Setteable Solids	ml/L	1.0
Turbidity	NTU	75
Marine Aquatic life Toxicants(1)		
Arsenic	µg/L	2.0
Cadmium	µg/L	1.0
Chromium (VI)	µg/L	8.0
Copper	µg/L	30
Lead	µg/L	23
Mercury	µg/L	0.3
Nickel	µg/L	8.0
Selenium	µg/L	4.7
Silver	µg/L	1.9
Zinc	µg/L	36
Cyanide	µg/L	25
Chlorine Residual	mg/L	0.13
Ammonia as N	mg/L	32
Phenolic compounds (non-chlorinated)	µg/L	5.0
Phenolic compounds (chlorinated)	µg/L	0.42
Endosulfan	µg/L	0.05
HCH	µg/L	0.1
Endrin	µg/L	0.05
Chronic toxicity	TUc	99(2)
Radioactivity(2)		
Gross alpha	PCi/L	15
Gross beta	PCi/L	50
Combined Radium-226 & Radium-228	PCi/L	5.0

Table B.1 - Oxnard WWTP Permit Regulations		
Constituent	**Units**	**Average Monthly Limitation**
Tritium	PCi/L	20,000
Strontium-90	PCi/L	8.0
Uranium	PCi/L	20
Human Health Toxicants – Non Carcinogens[(1)]		
Acrolein	µg/L	10
Antimony	µg/L	2.5
Bis(2-chloroethoxy) methane	µg/L	25
Bis(2-chloroisopropyl) ether	µg/L	10
Chlorobenzene	µg/L	2.5
Chromium (III)	µg/L	8.0
Di-n-butyl-phthalate	µg/L	0.19
Dichlorobenzenes	µg/L	2.5
Diethyl phthalate	µg/L	10
Dimethyl phthalate	µg/L	10
2-Methyl-4,6-dinitrophenol	µg/L	25
2,4-Dinitophenol	µg/L	25
Ethyl benzene	µg/L	2.5
Fluoranthene	µg/L	
Hexachlorocyclopentadiene	µg/L	25
Nitrobenzene	µg/L	5
Thallium	µg/L	5
Toluene	µg/L	2.5
Tributylin	µg/L	0.0263
1,1,1-Trichloroethane	µg/L	2.5
Human Health Toxicants - Carcinogens		
Acrylonitrile	µg/L	10
Aldrin	µg/L	0.025
Benzene	µg/L	2.5
Benzidine	µg/L	0.0068
Beryllium	µg/L	2.5
Bis(2-chloroethyl) ether	µg/L	5.0
Bis(2-ethylhexyl)phthalate	µg/L	50
Carbon tetrachloride	µg/L	2.5
Chlordane	µg/L	0.5
Chlorodibromomethane	µg/L	0.61

Table B.1 - Oxnard WWTP Permit Regulations		
Constituent	**Units**	**Average Monthly Limitation**
Chloroform	µg/L	1.2
DDT	µg/L	0.25
1,4-Dichlorobenzene	µg/L	0.041
3,3'-Dichlorobenzidine	µg/L	25
1,2-Dichloroethane	µg/L	2.5
1,1-Dichloroethylene	µg/L	2.5
Bromodichloromethane	µg/L	2.5
Dichloromethane	µg/L	2.5
1,3-Dichloropropene	µg/L	2.5
Dieldrin	µg/L	0.05
2,4-Dinitrotoluene	µg/L	25
1,2-Diphenylhydrazine	µg/L	5
Halomethanes	µg/L	4.4
Heptachlor	µg/L	0.05
Heptachlor epoxide	µg/L	0.002
Hexachlorobenzene	µg/L	5
Hexachlorobutadiene	µg/L	5
Hexachloroethane	µg/L	5
Isophorone	µg/L	5
N-Nitrosodimethylamine	µg/L	5
N-Nitrosodi-N-propylamine	µg/L	25
N-Nitrosodiphenylamine	µg/L	5
PAHs	µg/L	0.097
PCBs	µg/L	0.0019
TCDD equivalents	µg/L	3.9×10^{-7}
1,1,2,2-Tetrachloroethane	µg/L	2.5
Tetrachloroethylene	µg/L	2.5
Toxaphene	µg/L	2.5
Trichloroethylene	µg/L	2.5
1,1,2-Trichloroethane	µg/L	2.5
2,4,6-Trichlorophenol	µg/L	0.35
Vinyl chloride	µg/L	2.5

Notes:
(1) Values reflect monthly performance goals.
(2) Maximum daily limitation.

APPENDIX B – PRELIMINARY HYDROGEOLOGICAL STUDY REPORT, CITY OF OXNARD GREAT PROGRAM, CAMPUS PARK GROUNDWATER REPLENISHMENT AND REUSE PROJECT

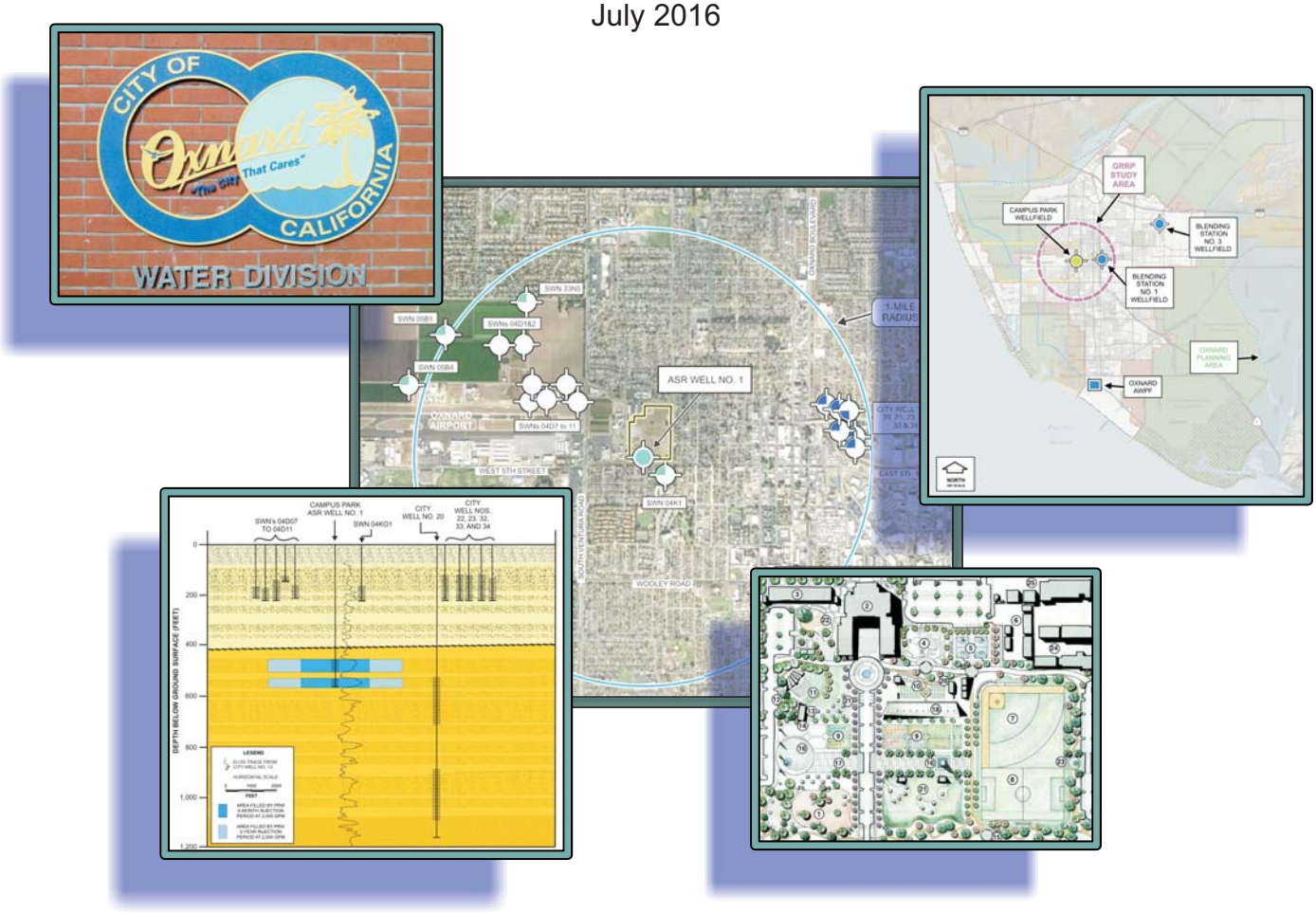
HOPKINS GROUNDWATER CONSULTANTS, INC.

PRELIMINARY HYDROGEOLOGICAL STUDY

CITY OF OXNARD GREAT PROGRAM CAMPUS PARK GROUNDWATER REPLENISHMENT AND REUSE PROJECT OXNARD, CALIFORNIA

Prepared for:
City of Oxnard

July 2016



HOPKINS
GROUNDWATER
CONSULTANTS, INC.
THE WATER RESOURCE SPECIALISTS

July 26, 2016
Project No. 01-011-09E

City of Oxnard
305 West Third Street, Second Floor, East Wing
Oxnard, California 93030

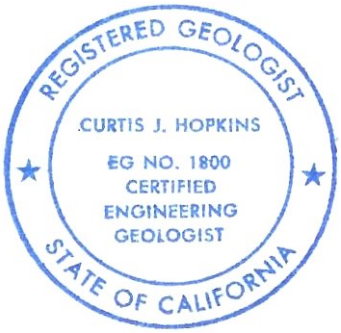
Attention: Mr. Daniel Rydberg
Public Works Director

Subject: Preliminary Hydrogeological Study, City of Oxnard Great Program, Campus Park Groundwater Replenishment Reuse Project, Oxnard, California.

Dear Mr. Rydberg:

Hopkins Groundwater Consultants, Inc. (Hopkins) is pleased to submit this final report summarizing the findings, conclusions, and recommendations developed from a preliminary study evaluating the feasibility of a Groundwater Replenishment Reuse Project (GRRP) that is proposed as part of the City of Oxnard Groundwater Recovery Enhancement and Treatment (GREAT) Program. The study findings indicate that the Campus Park GRRP site proposed for Indirect Potable Reuse is a feasible location and that the replenishment and recovery of groundwater with an improved quality could be achieved by the project for Indirect Potable Reuse. The study provides detailed hydrogeological findings in compliance with Groundwater Replenishment Using Recycled Water regulations designated DPH-14-003E, dated June 18, 2014, to augment the Indirect Potable Reuse engineering report required for the project, and to facilitate discussion with State regulatory agencies, local groundwater management agencies, and stakeholder groups that may have a direct interest in the project.

As always, Hopkins is pleased to be of service. If you have questions or need additional information, please give us a call.



Sincerely,

HOPKINS GROUNDWATER CONSULTANTS, INC.

Curtis J. Hopkins
Principal Hydrogeologist
Professional Geologist PG 5695
Certified Hydrogeologist HG 114
Certified Engineering Geologist EG 1800

C:\HGC\JOB FILES 2016\01-011-09E\FINAL REPORT REVISED JULY 2016\COVER LETTER 7-26-16.DOCX

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APPENDICES

APPENDIX A – GROUNDWATER ELEVATION CONTOUR MAPS

ACRONYM LIST

AFY – Acre-Feet Per Year

ASR – Aquifer Storage and Recovery

AWPF – Advanced Water Purification Facility

BGS – Below Ground Surface

BS-1 – Blending Station No. 1

BS-3 – Blending Station No. 3

CDPH – California Department of Public Health

CRWQCB – California Regional Water Quality Control Board

DDW – California Department of Drinking Water

FCGMA – Fox Canyon Groundwater Management Agency

GPM – Gallons Per Minute

GREAT – Groundwater Recovery Enhancement and Treatment

GRRP – Groundwater Replenishment Reuse Project

GRURW – Groundwater Replenishment Using Recycled Water

IPR – Indirect Potable Reuse

LAS – Lower Aquifer System

MSL – Mean Sea Level

MG/L – Milligrams Per Liter

PRW – Purified Recycled Water

PSI – Pounds Per Square Inch

TDS – Total Dissolved Solids

UAS – Upper Aquifer System

UWCD – United Water Conservation District

VCWPD – Ventura County Watershed Protection District

CITY OF OXNARD GREAT PROGRAM
CAMPUS PARK GROUNDWATER
REPLENISHMENT AND REUSE PROJECT

INTRODUCTION

GENERAL STATEMENT

Presented in this report are the findings, conclusions, and recommendations developed from a preliminary hydrogeological study conducted by Hopkins Groundwater Consultants, Inc. (Hopkins) to assist the City of Oxnard (City) in evaluating the feasibility of a Groundwater Replenishment Reuse Project (GRRP) using purified recycled water (PRW). This hydrogeological study was conducted to support the City's Groundwater Recovery Enhancement and Treatment (GREAT) Program by developing an aquifer storage and recovery (ASR) project that will provide Indirect Potable Reuse (IPR) of the PRW produced at the City's Advanced Water Purification Facility (AWPF).

The proposed City GRRP includes developing a sustainable program for groundwater replenishment and IPR of PRW using aquifer units located in the Oxnard Plain Groundwater Basin. The proposed GRRP is intended to augment the City's potable water system by; 1) improving the delivered water quality, 2) increasing the available supply, and 3) providing greater reliability through source redundancy. The GRRP study area is indicated on Figure 1 – Study Area Location Map.

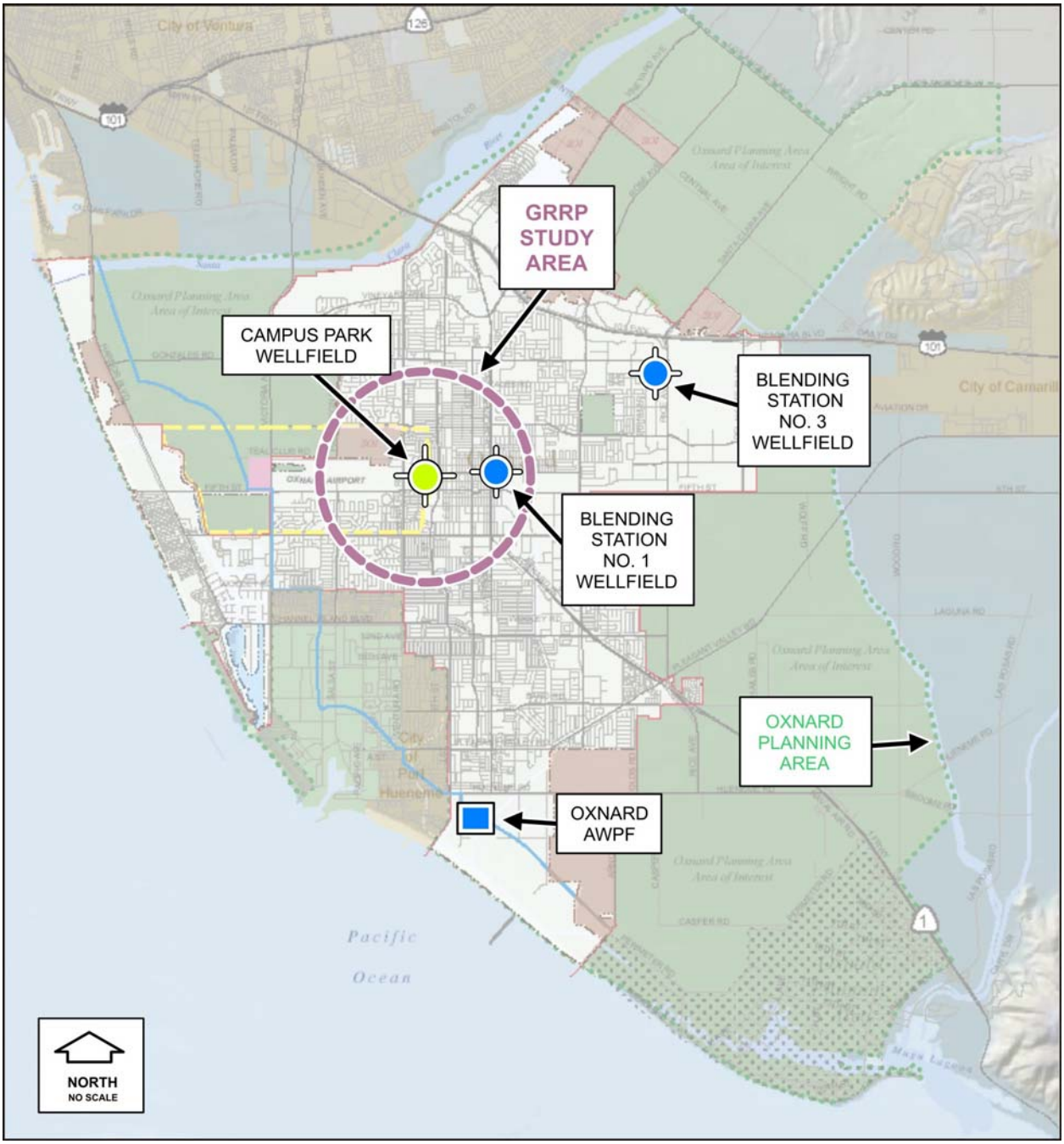
BACKGROUND

The present City water supply is a combination of sources including; a) imported water from the State Water Project, b) groundwater produced by the United Water Conservation District (UWCD), and c) groundwater produced by the City wellfields at Blending Station Nos. 1 and 3 (BS-1 and BS-3). Historically, the City has improved the quality of its municipal supply by blending the higher quality imported water with its local groundwater supplies. The recent construction of the brackish groundwater desalter facilities located at BS-1 has provided the City with the means to further improve its water quality through the desalination of poor quality groundwater. During the desalination process, approximately 20 percent of the produced groundwater feeding the desalter is lost as brine reject that is discharged to the sewer ocean outfall.

The present operation of the City's groundwater desalter has allowed the City to shift groundwater production from the higher quality aquifer zones in the Lower Aquifer System (LAS) to the poorer quality aquifer zones in the Upper Aquifer System (UAS). This shift of

pumping was designed to comply with the most recent groundwater management strategies of the Fox Canyon Groundwater Management Agency (FCGMA).

Figure 1 – Study Area Location Map



The GREAT Program was originally developed at a time when recycled water regulations treated all recycled water in the same manner. State regulations required onerous project development studies, monitoring and reporting programs, and dilution requirements utilizing another potable supply. Soil and aquifer treatment criteria could require extended retention times and travel distances through an aquifer to provide additional treatment prior to beneficial potable reuse. With these regulations, the City believed the best approach was to inject the PRW into the local aquifer system at a location that optimized basin management strategies, and extract a like amount of native groundwater from another area of the basin for municipal use. Consistent with this approach, the City proposed the direct use of the PRW for permissible agricultural purposes. Subsequently, a transfer of the unused groundwater would be provided to the City for municipal uses. Both of these strategies would provide the City with a source of potable groundwater in exchange for its recycled water.

This original approach required that the City purify a greater portion of the groundwater with a desalter and resulted in additional treatment costs and a loss of approximately 20 percent of the produced groundwater supply. The present approach for IPR would eliminate the additional step of desalting groundwater by allowing the indirect reuse of the high quality PRW. This will conserve energy and prevent wasting 20 percent of the supply as part of the redundant treatment process. The stored and recovered PRW by the GRRP can be blended with lower quality groundwater to achieve the City's water quality objectives.

Since construction of the GREAT Program AWPF, Federal and State recycled water regulations have been updated to the present Groundwater Replenishment Using Recycled Water (GRURW) regulations designated DPH-14-003E, dated June 18, 2014. These regulations accommodate the use of highly treated effluent produced by the PRW process by reducing or eliminating the requirement for soil/aquifer treatment. The State has recognized that the threat to public health is significantly lower after municipal wastewater receives advanced purification and disinfection using reverse osmosis, advanced oxidation, and ultraviolet radiation treatment processes. Because of the PRW extreme high quality, the new GRURW regulations significantly reduce the requirements for IPR compared to wastewater treated to secondary or tertiary standards.

PURPOSE

The purpose of this hydrogeological assessment of the proposed GRRP is to provide specific information to comply with the GRURW regulations pursuant to section 60320.200(h) and permit the preliminary investigation to develop site specific information that is required for the GRRP Title 22 engineering report. The findings of this study are also intended to further define the conceptual components of the ASR program that will be necessary to implement the IPR of PRW as a municipal supply in accordance with regulation provisions.

As part of the GRRP, the City proposes a project that:

1) utilizes (to the extent practicable) existing pipelines and facilities to control potential costs,

2) recharges aquifer zones that preserve the water quality during underground storage,

3) minimizes the risk to other potable well facilities,

4) is consistent with the FCGMA and UWCD groundwater management strategies,

5) has operational flexibility to adapt to changing system demands and aquifer conditions,

6) demonstrates the ASR capacity of the Oxnard Plain LAS,

7) can be increased to facilitate future AWPF expansion, and

8) can simplify monitoring and reporting to UWCD, the FCGMA, the California State Water Resources Control Board Division of Drinking Water (DDW), and the California Regional Water Quality Control Board (CRWQCB).

This hydrogeological study utilizes the City GREAT Program Update, dated June 25, 2012, as the guide for the anticipated capacity of the AWPF and the initial availability of PRW. This study is intended to provide the mandatory hydrogeological assessment to accompany the engineering report required pursuant to section 60323 of the Title 22, California Code of Regulations, GRURW regulations for a new GRRP.

Additionally, this hydrogeological assessment is intended to provide operational criteria based on aquifer parameters estimated from historical well data, which will define the range of ASR capacity that can be reasonably anticipated from the underlying aquifer system. Subsequently, a conceptual GRRP operational schedule can be developed for the ASR operations to comply with the response retention time requirements of the GRURW regulations for IPR that is based on reasonable expectations of the natural aquifer system constraints.

Sources of available data and published information that were used for the study include; a) City data and reports, b) UWCD data and reports, c) United States Geological Survey, and d) Ventura County Watershed Protection District (VCWPD) databases.

HYDROGEOLOGICAL CONDITIONS

The City recognizes that the threat of seawater intrusion is a regional issue. The City has historically complied with FCGMA regulations and participated in UWCD groundwater supply

management programs. Implementation of the GREAT Program is intended to continue this cooperative management effort and the beneficial use of the local groundwater resources in the vicinity of the City. The proposed GRRP using PRW includes ASR wells constructed in aquifer zones that comprise the LAS. Recharge into the LAS will store water in aquifer zones that receive significantly less groundwater recharge than the UAS because of the regional confined aquifer conditions. The UAS readily receives groundwater recharge derived from natural percolation of rainwater and Santa Clara River flows in the Oxnard Forebay Basin, as well as from river flow diversions into the engineered recharge facilities operated by UWCD.

The GRRP ASR Well will be designed to inject PRW into discrete aquifer zones in the LAS and subsequently facilitate groundwater extraction after the response retention time is achieved and regulatory approval is granted. The proposed ASR Well No. 1 is anticipated to be constructed with a completion depth of about 580 feet below ground surface (bgs) and with a screened interval limited to a discrete aquifer zone(s) in the LAS. The well will be designed for an injection capacity of up to 2,000 gallons per minute (gpm). Plate 1 – Preliminary ASR Well No. 1 Design Drawing provides preliminary design details that reflect the anticipated hydrogeology and comply with the VCWPD sealing zone requirements.

Water to be injected during initial testing is proposed to be 100 percent PRW. Initially, the water may be conveyed to the ASR well from the City recycled water system using temporary piping. The initial phase of aquifer testing will determine the percentage of recovery that occurs prior to evidence of native groundwater mixing with the PRW along with any change in the PRW chemistry that could occur as it travels through the aquifer matrix. During the test period, PRW that is extracted from the ASR well will be discharged back into the recycled water transmission main and subsequently used for irrigation.

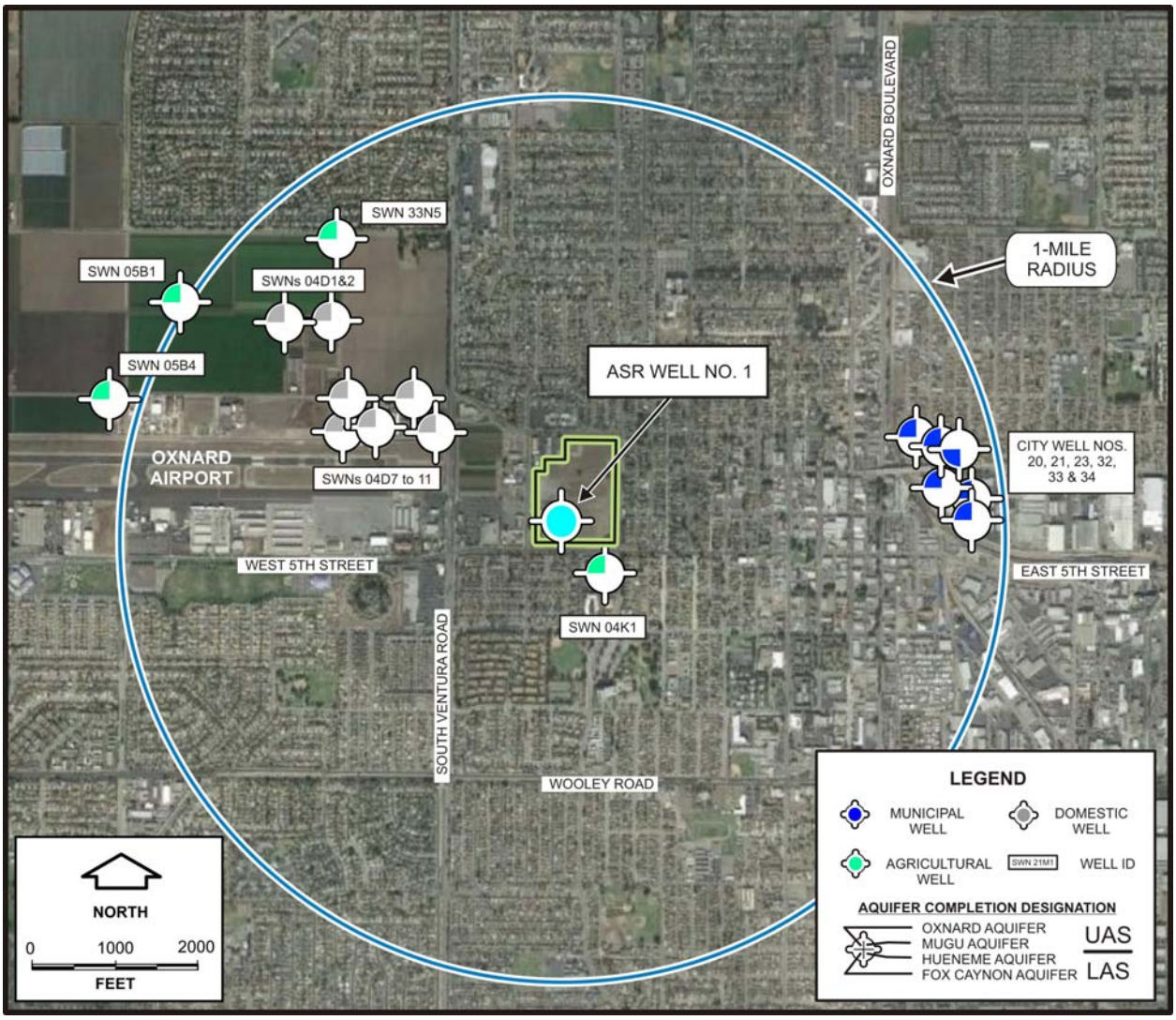
The ASR demonstration program, as developed, will comply with GRURW regulations and last for an anticipated period of between 2 and 4 months. During the initial demonstration period, monitoring well data and water quality samples will be collected and analyzed to verify the preliminary estimations of aquifer parameters, groundwater storage volumes, and groundwater travel times effectuated by PRW recharge. These data will be utilized to finalize the permit application required for full-scale project operation using the PRW generated by the AWPF.

The proposed GRRP would ultimately be sized to accommodate the first phase of the AWPF, providing the ability to store and reuse up to 1,500 acre-feet per year (AFY). The GRRP location identified for groundwater recharge wells is indicated in Figure 2 – Proposed GRRP ASR Well Site Location Map. This location serves to isolate City groundwater facilities within the City boundaries where it has control of surrounding land uses and future groundwater development.

Figure 2 – Proposed GRRP ASR Well Site Location Map

The property selected for installation and operation of the GRRP ASR Well is owned by the City and had an existing City well proximately located and constructed in the LAS (City Well No. 13). While the old City well has since been destroyed, several smaller wells are presently active in the unincorporated area north of the Oxnard Airport along the western City limit. Figure 3 – Existing Well Location Map shows all the active wells within a 1-mile-radius of the GRRP ASR well location.

Figure 3 – Existing Well Location Map



As shown, many proximate wells are constructed in the UAS and as such will not be hydraulically connected with the LAS aquifer zones proposed for use by the GRRP. Review of available data indicates that the nearest well constructed in the LAS is almost 1 mile away and is

a municipal supply well owned by the City. The closest existing LAS well is City Well No. 20 located at BS-1. As such, the City ASR well location appears to provide more than a sufficient distance from existing LAS wells to allow GRRP operations without interference.

HYDROGEOLOGY AND AQUIFER DELINEATION

Geology

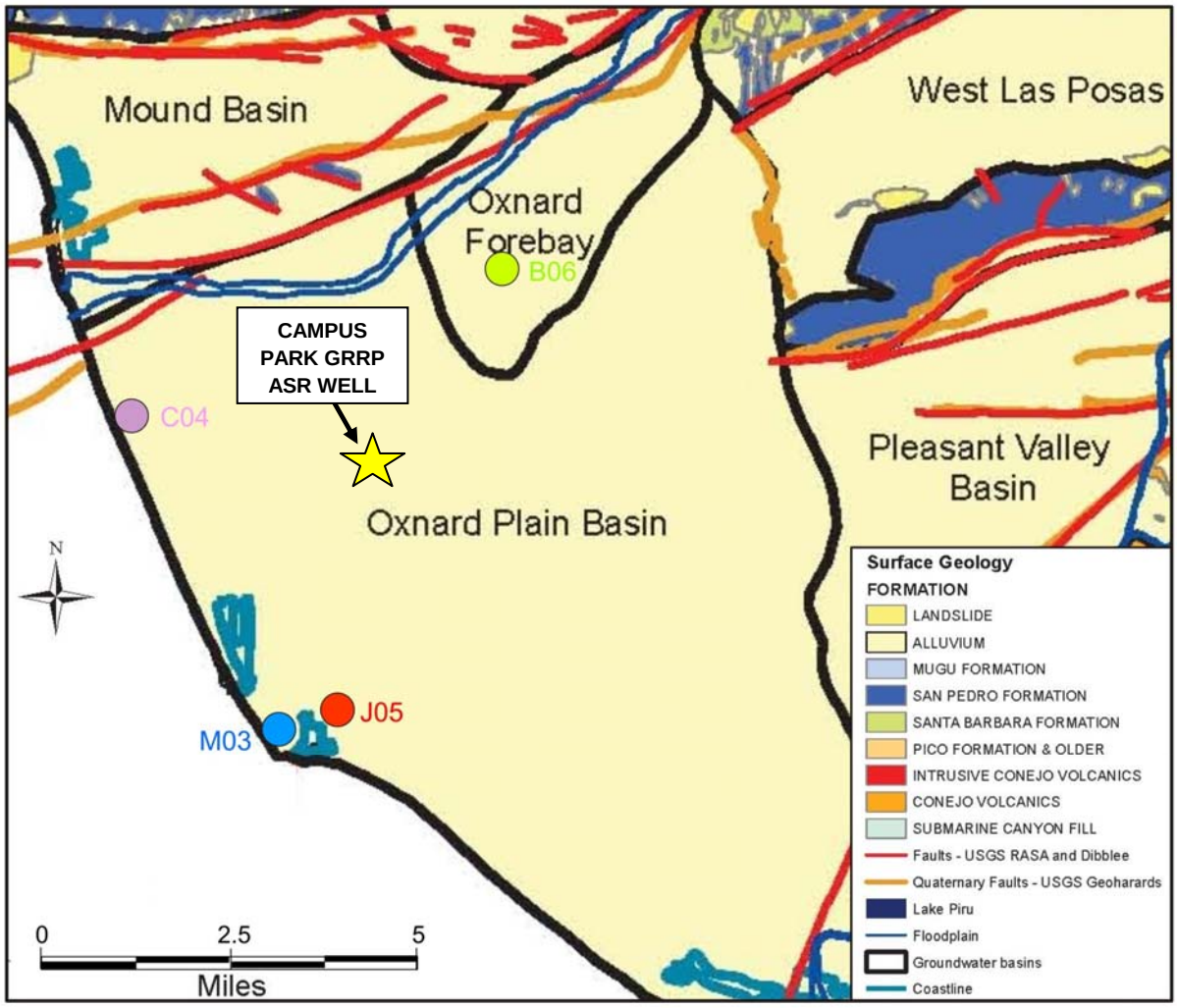
The proposed City project is located in the Oxnard Plain Groundwater Basin, which is part of the Transverse Ranges geologic/geomorphic province and defined by a number of geologic structures and features that separate it from the adjacent groundwater basins. The geology of the Oxnard Plain Basin has been described in detail by several authors including the California State Water Resources Board (SWRB, 1953), Turner (1975), and UWCD (2012). Figure 4 – Generalized Geologic Map and Oxnard Plain Basin Boundaries shows the project location in relation to the adjacent boundaries of the Oxnard Plain Basin with the Mound, Oxnard Forebay, West Las Posas, and Pleasant Valley Basins.

Plate 2 – Hydrogeological Cross-Section Location Map shows the location of cross-sections constructed from available well data to illustrate the subsurface profiles of the geological formations that comprise the underlying aquifer systems. Plate 2 also shows the location of wells that provided geophysical data near the Campus Park GRRP site. Plates 3 and 4 – Hydrogeological Cross-Section A-A' and B-B', respectively, provide an interpretation of the hydrostratigraphy in the study area. This conceptual understanding of the confined Oxnard Plain Basin aquifer system is key to the understanding of how the GRRP potential impacts are limited by natural conditions. It also illustrates how the GRRP was developed to utilize discrete aquifer zones that will allow rotation of the three phases of project operations; 1) injection/recharge of the PRW produced from the AWPF, 2) storage/response retention time, and 3) recovery and reuse/IPR.

Aquifer Zone Designation

The subsurface geology that controls groundwater flow in the study area is differentiated into two primary geologic units that include; the Holocene and late Pleistocene alluvium, and the San Pedro Formation. The first unit is comprised largely of unconsolidated sedimentary deposits and includes all older and Recent alluvial deposits. These shallower units are coarse-grained sand and gravel layers that form the Oxnard and Mugu Aquifers and comprise the UAS in the Oxnard Plain Basin (see Plates 3 and 4). The San Pedro Formation consists of consolidated marine and nonmarine clay, silt, sand, and gravel deposits that comprise the Hueneme and Fox Canyon Aquifers that are designated as the LAS. The low permeability geologic formations underlying the San Pedro Formation are generally considered to be non-water-bearing and effectively define the base of fresh water.

Figure 4 – Generalized Geologic Map and Oxnard Plain Basin Boundaries

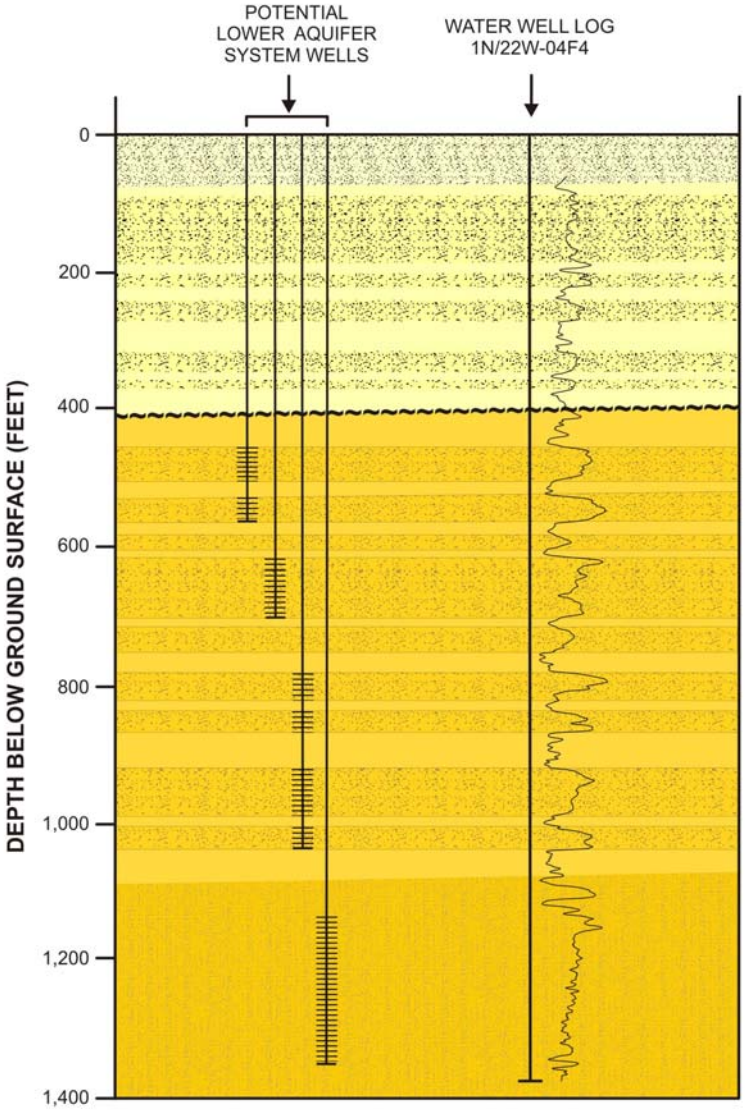


FROM UWCD, 2012

The groundwater in the Oxnard Plain Basin LAS is isolated from overlying land uses by the laterally extensive aquitard (silt and clay) layers that separate and confine the Hueneme and Fox Canyon Aquifer zones. The conceptual subsurface profile shown in Figure 5 – Discrete Aquifer Zone Delineation uses the geophysical survey (electric log) from the proximate City Well No. 13 to show the anticipated geology and aquifer zones beneath the Campus Park GRRP site. The aquifer zones shown in Figure 5 are discretely separated by clay layers that are laterally continuous and appear as marker beds in other well logs shown in Plates 3 and 4. The significance of the highly confined condition that results from the discretely layered aquifer system is that wells located in close proximity (50 feet apart) but producing from different aquifer layers, do not have hydraulic connectivity with each other.

Figure 5 shows a series of proposed wells that could be designed to utilize the storage capacity of discrete aquifer units while being effectively isolated from each other by the natural confining clay layers. This concept can allow the design and use of discrete aquifer zones as individual storage units, as demonstrated by Well Nos. 28, 29, 30, and 31 located at City BS-3. One aquifer zone can be filled without affecting wells that are competently constructed in other aquifer zones. The benefit of this natural condition to the GRRP is that multiple wells can be operated on the same site with a rotating schedule which allows discrete recharge, storage (response retention time), and recovery from separate aquifer zones.

Figure 5 – Discrete Aquifer Zone Delineation

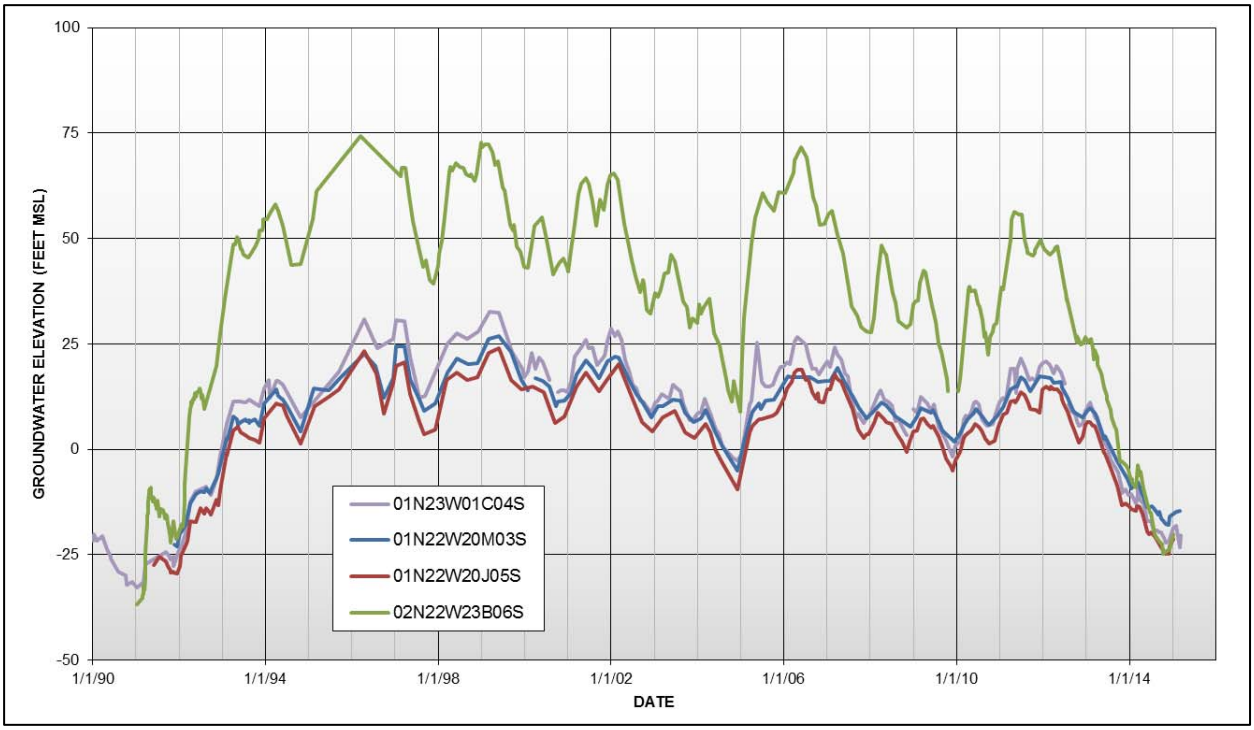


The proposed GRRP utilizes this natural confined aquifer condition to develop an operational scenario that is unique in its application. It can satisfy the GRURW regulations that require a minimum 2-month retention response time, while optimizing the proposed ASR well facilities at a single site. It can operate independent of groundwater flow direction and serve to minimizing the potential risk and consequence of PRW treatment violations (to be explained in following sections).

Groundwater Levels

Groundwater elevations in the Oxnard Plain Basin vary over time. Figure 6 – Groundwater Elevation Hydrograph shows the fluctuation of water levels in the upper Hueneme Aquifer zones in LAS. These data are from discretely screened monitoring wells in aquifer zones that correlate to the aquifer zones proposed for use by ASR Well No. 1. The location of the wells is shown on Figure 4 using the same color for the well symbols as is used for the water levels in the Figure 6 graph. Three of the wells are coastal monitoring wells, and one is located in the Oxnard Forebay where the upper Hueneme Aquifer zones lie unconformably beneath the overlying alluvium of the UAS. The Oxnard Forebay Basin is the primary source of recharge to the LAS.

Figure 6 – Groundwater Elevation Hydrograph



The groundwater elevation in the LAS proximate to the GRRP study area has dropped to approximately 25 feet below mean sea level (msl) during the 1986 to 1990 drought and has risen as high as 20 to 25 feet above msl in wet years. These available data indicate that seasonal fluctuations in the Oxnard Plain Basin groundwater levels are typically around 5 to 10 feet. Dry climatic conditions result in consecutive annual declines in the coastal water levels of up to 45 feet (see Figure 6). These same dry climatic conditions result in water level declines in the Oxnard Forebay Basin on the order of 100 feet. These groundwater level conditions indicate that ASR well operation may require the ability to operate/inject under pressure during high water level conditions while gravity-flow injection operations may be sustained during dry climatic periods.

Combining these water level conditions with the depth to the top of the proposed aquifer units, an injection pressure of 20 pounds per square inch (psi) should be allowable without adverse consequences. The deeper the aquifer zone(s), the greater the operational pressure that is allowable for recharge without creating the potential for adverse effects.

Groundwater Gradient and Flow Velocity

Utilizing data provided by the UWCD, the groundwater elevations in the vicinity of the GRRP were contoured quarterly for 2011 and 2013. These years are believed representative of normal to wet groundwater conditions (2011) and dry year groundwater conditions (2013). Water level data from August 2014 were also contoured and represent groundwater flow conditions after multiple dry years. A series of quarterly groundwater elevation contour maps for the years selected are provided in Appendix A – Groundwater Elevation Contour Maps. Table 1 – Groundwater Gradient and Flow Direction summarizes the results of groundwater gradient estimations using the maps in Appendix A.

For the purpose of the Campus Park GRRP study, the use of the groundwater gradients provided by these data are believed sufficient for understanding the seasonal and climatic changes that occur to the groundwater gradient and the approximate prevailing flow directions in the upper Hueneme Aquifer zones of the LAS.

Table 1 – Groundwater Gradient and Flow Direction

OBSERVATION PERIOD	ASR WELL NO. 1	
	FLOW DIRECTION	GRADIENT
JANUARY 2011	S 43º W	0.0008
APRIL 2011	S 41º W	0.0011
JULY 2011	S 44º W	0.0011
OCTOBER 2011	S 43º W	0.0009
JANUARY 2013	S 44º W	0.0004
APRIL 2013	S 47º W	0.0004
JULY 2013	S 67º W	0.0003
OCTOBER 2013	N 74º W	0.0002
AUGUST 2014	N 04º E	0.0002

TABLE DATA DISPLAYED GRAPHICALLY ON PLATES IN APPENDIX A

As shown, during normal and wet years, recharge in the Oxnard Forebay Basin is significant and establishes a predominant southwesterly groundwater flow direction in the Oxnard Plain Basin (see Appendix A). During the Spring of 2011, the upper Hueneme Aquifer groundwater gradient was generally 0.0011 (dimensionless) and the flow direction was S 41º W as shown on Figure 7 - LAS Groundwater Elevation Contour Map April 2011. The fall gradient in October 2011 was observed to flatten out to a value of 0.0009 (see Table 1).

During dry years like 2013, the groundwater flow direction was observed to be roughly the same as 2011 but the gradient continued to flatten out and the groundwater elevations were closer to sea level. This prevailing flow pattern continues until inland pumping causes water levels to fall below sea level. The lack of recharge during repeated dry years can result in inland groundwater elevations that are substantially below sea level. Figure 8 – LAS Groundwater Elevation Contour Map August 2014 shows the groundwater elevations and flow direction that developed under a 3-year-drought condition.

Figure 7 – LAS Groundwater Elevation
Contour Map April 2011

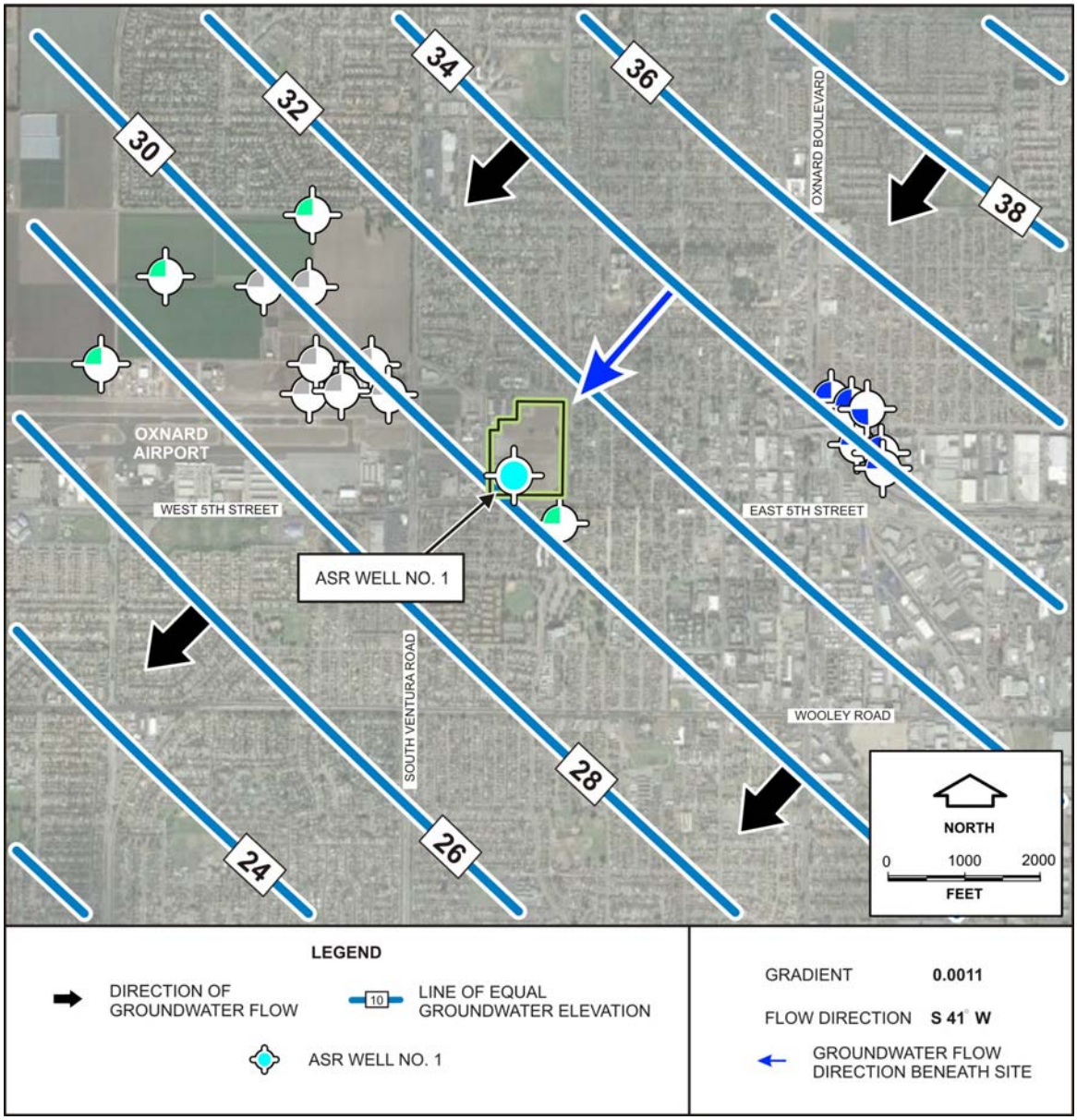
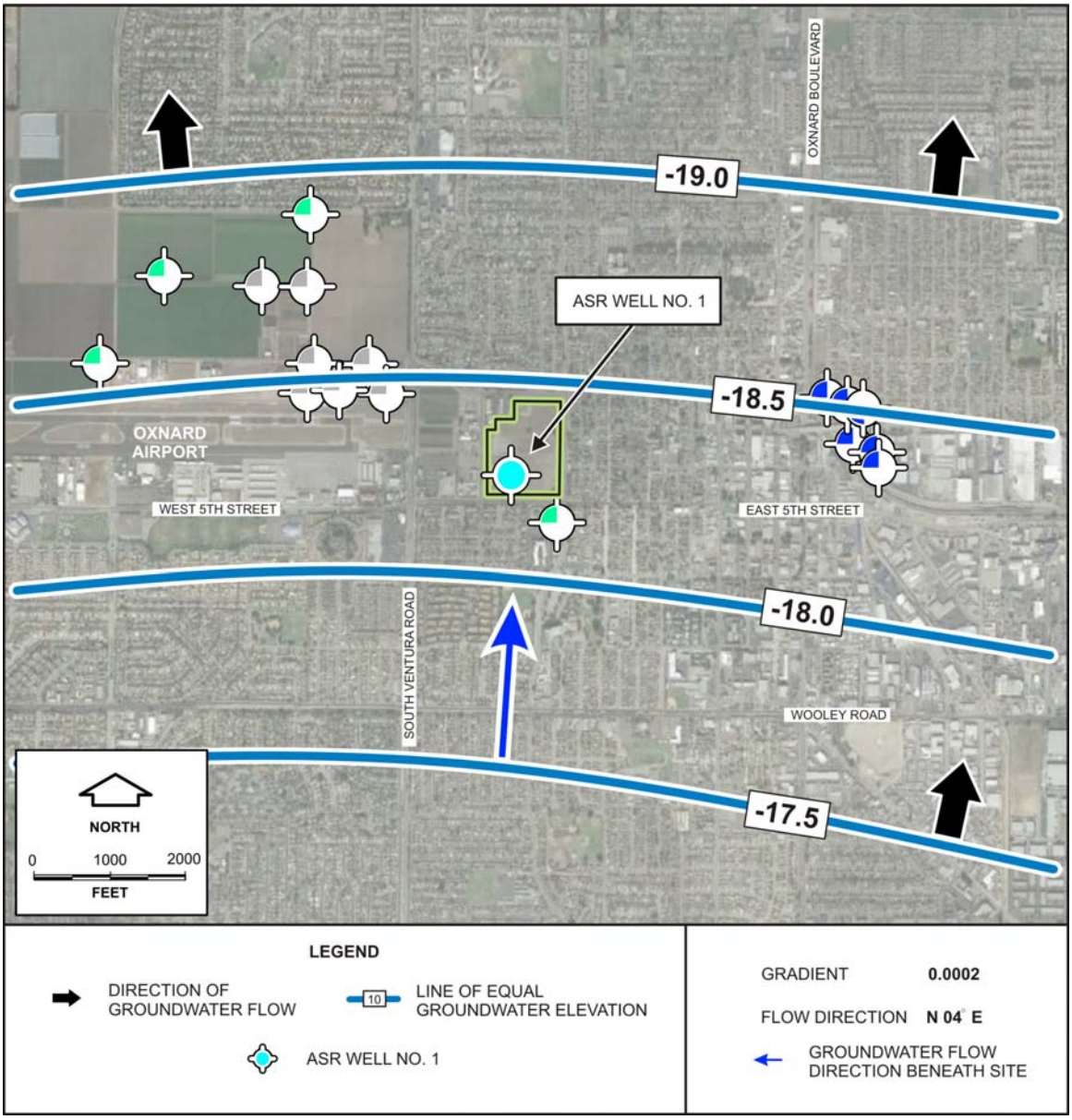


**Figure 8 – LAS Groundwater Elevation
Contour Map August 2014**



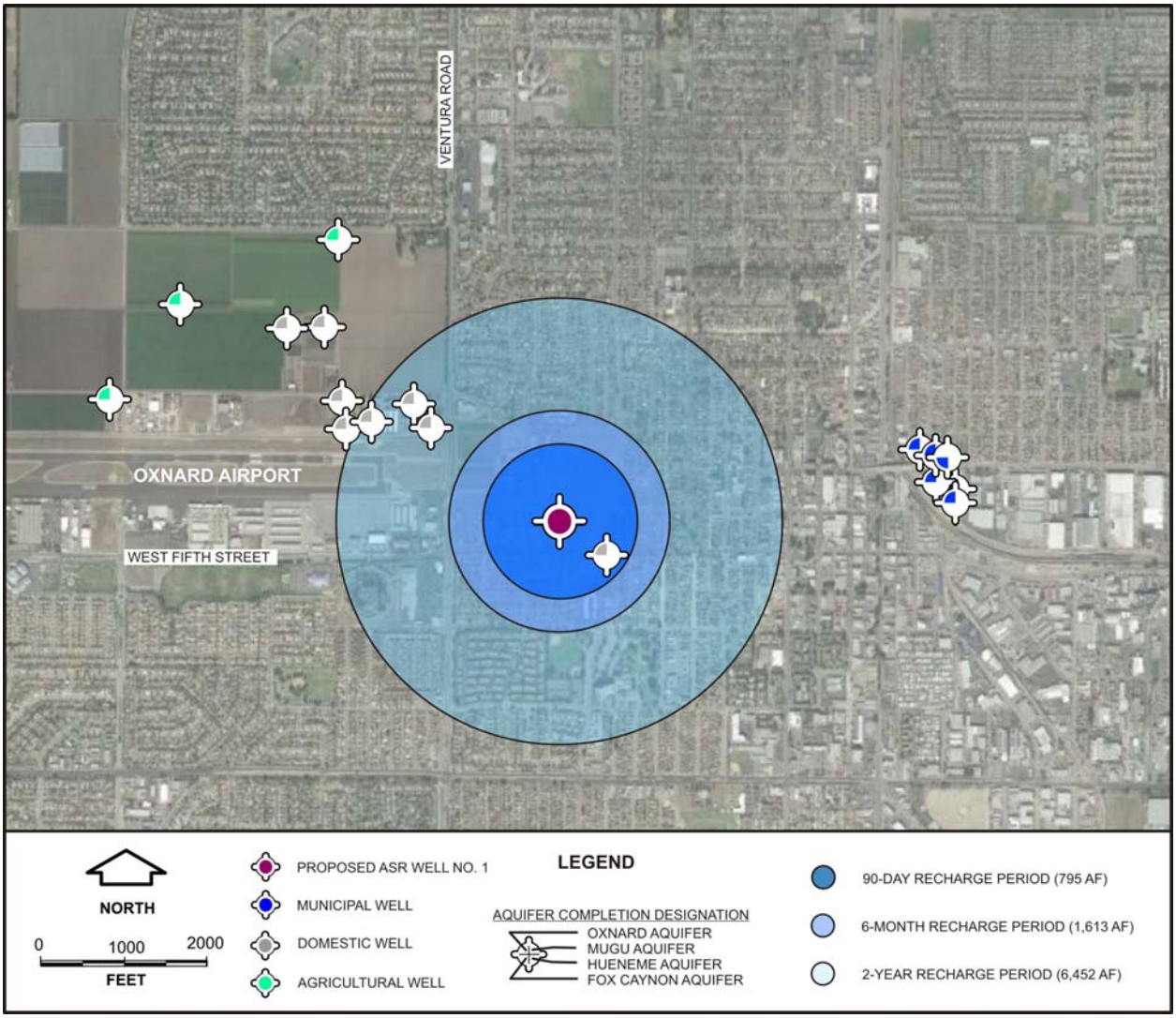
Aquifer Recharge and Retention

The area potentially influenced by recycled water recharge in the vicinity of the ASR well is determined by the aquifer area filled with the PRW during injection and the rate and direction of groundwater flow while it is in storage. The aquifer area filled by PRW replenishment was estimated by using;

- a discrete aquifer thickness of 85 feet,
- radial flow in the aquifer away from the center of recharge, and
- an average aquifer porosity of 15 percent (to be conservative).

The resulting aquifer area filled after injection of PRW at a rate of 2,000 gpm for a period of; 90 days (795 AF), 6 months (1,613 AF) and a period of 2 years (6,452 AF) is shown in Figure 9 – Aquifer Area Filled With Purified Recycled Water.

Figure 9 – Aquifer Area Filled With Purified Recycled Water



The aquifer area filled by these injection volumes would be proportionally less than those shown in Figure 9 as the porosity of the aquifer increases. Table 2 – Radial Distance Calculations shows the magnitude of change in the size of the recharge bubble within a range of typical aquifer porosity values.

Table 2 – Radial Distance Calculations

POROSITY	30-DAY RADIAL DISTANCE (FEET)	60-DAY RADIAL DISTANCE (FEET)	90-DAY RADIAL DISTANCE (FEET)	6-MONTH RADIAL DISTANCE (FEET)	2-YEAR RADIAL DISTANCE (FEET)
15 %	537	759	930	1,324	2,649
20%	465	658	806	1,147	2,294
25%	416	588	720	1,026	2,052
30%	380	537	658	937	1,873

AQUIFER THICKNESS IS 85 FEET AND THE INJECTION RATE IS 2,000 GPM

While the proposed City ASR operation will recharge the aquifer for a period of up to 3-months, a 6-month and 2-year-period of recharge were provided for comparison of potential project impacts. The estimated aquifer area filled with PRW in Figure 9 is believed conservative because a larger porosity value is highly likely. As shown, the nearest drinking water supply well (municipal well) constructed in the LAS is the City's and is beyond the 2-year aquifer replenishment area.

To approximate the area potentially influenced by PRW as it flows away from the point of recharge under the local groundwater gradient, the linear groundwater flow velocity was estimated by using;

- an average hydraulic conductivity value estimated from City Well No. 13 production test data (125 feet/day),
- the groundwater gradient at representative points in time (see Table 1),
- an average aquifer porosity of 15 percent (to be conservative), and
- the average linear flow velocity equation:

$$V = K\ I/\eta$$

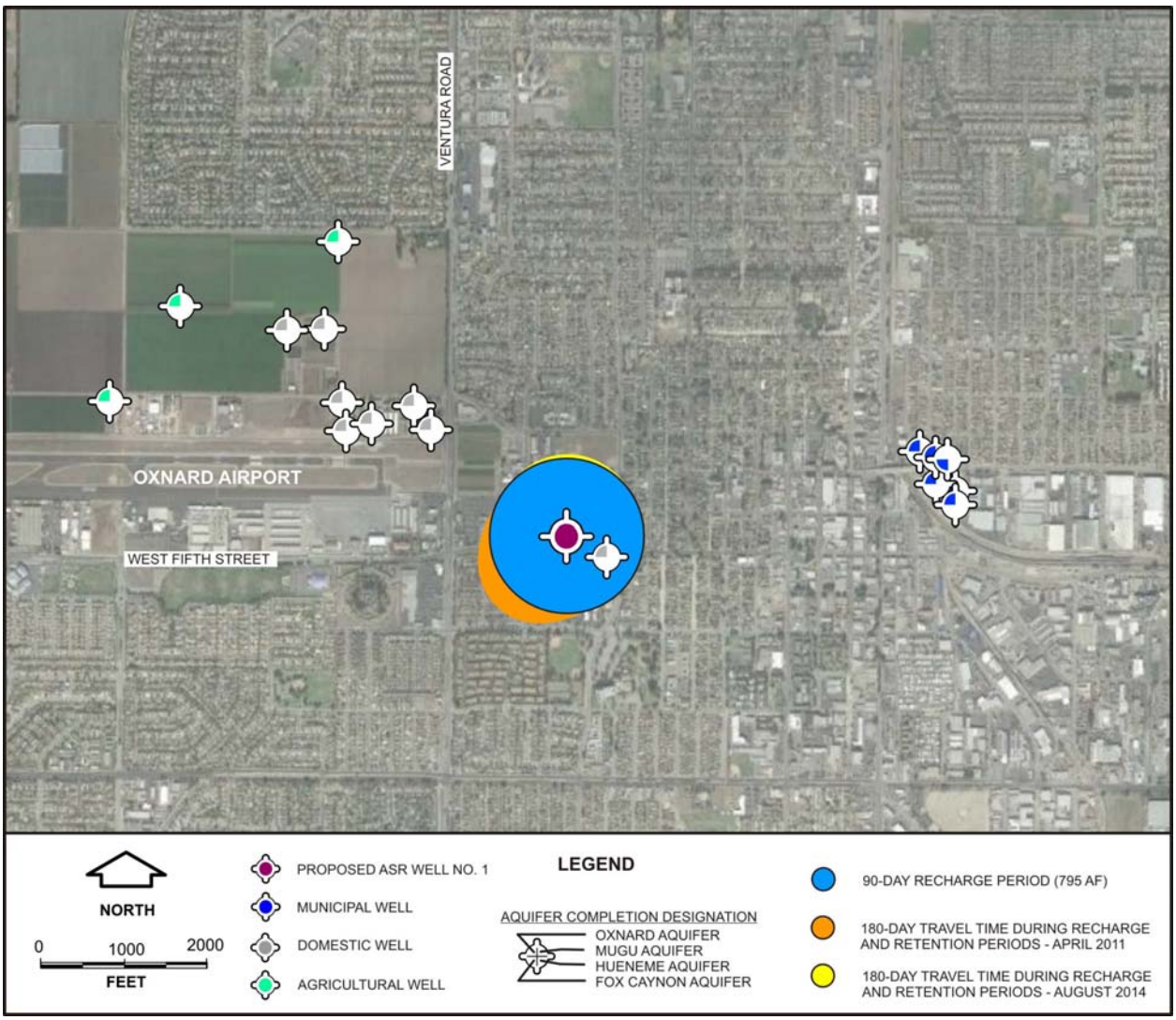
V	=	GROUNDWATER FLOW VELOCITY
K	=	AQUIFER HYDRAULIC CONDUCTIVITY
I	=	GROUNDWATER GRADIENT
η	=	AQUIFER POROSITY

The hydraulic conductivity of the upper Hueneme Aquifer zones was estimated from well production test data provided from City Well No. 13 combined with our experience and knowledge of wells in the Oxnard Plain Basin. The hydraulic conductivity of the aquifer zones that are proposed for ASR Well No. 1 was estimated to be 125 feet per day (ft/d). Using this hydraulic conductivity value and the range of groundwater gradients that are shown in Table 1, results in groundwater flow velocity estimates that range between 0.17 ft/d and 0.92 ft/d. Applying these two linear groundwater flow velocities over a 6-month period that includes the 3-month recharge period and the 3-month retention time, results in groundwater movement of a total distance between 30 feet and 165 feet.

The relative movement of the PRW from the ASR well during these 2 extreme conditions (April 2011 and August 2014) is shown in Figure 10 – Range of Purified Recycled Water Movement From ASR Well Location. These extremes are believed to bracket the actual anticipated movement of the recharge bubble in these aquifer zones. Because the quarterly groundwater measurements indicate a gradient of less than approximately 0.0011 exists a majority of the time (see Table 1), the transient groundwater gradient and flow direction will likely result in a cumulative movement that is between the two extremes indicated in Figure 10.

The result of this analysis indicates that the volume of water proposed for cyclical storage in the upper Hueneme Aquifer zone(s) of the LAS at the Campus Park GRRP well site will not have an adverse effect on any existing wells. Because of the assumptions stated above, these estimates are believed to be conservative and the area filled by PRW would likely be smaller. Based on the proposed cyclical recovery of the PRW for IPR, the distance of movement from the ASR well location could be significantly shorter. These factors indicate that the potential area of impact from the proposed GRRP presents little risk to existing well facilities.

Figure 10 – Range of Purified Recycled Water Movement From ASR Well Location



Water Quality

Review of historical water quality data indicate that groundwater in the LAS is generally a calcium sulfate chemical character of fair to poor quality with total dissolved solids (TDS) concentrations in the range of 900 to 1,300 milligrams per liter (mg/l) and sulfate concentrations that range from 400 to 650 mg/l. These historical data indicate that the storage of the proposed recycled water will improve the general mineral quality of groundwater in the LAS (a beneficial impact) and that injection water chemistry can likely be controlled (buffered) to be compatible with native groundwater and avoid degradation.

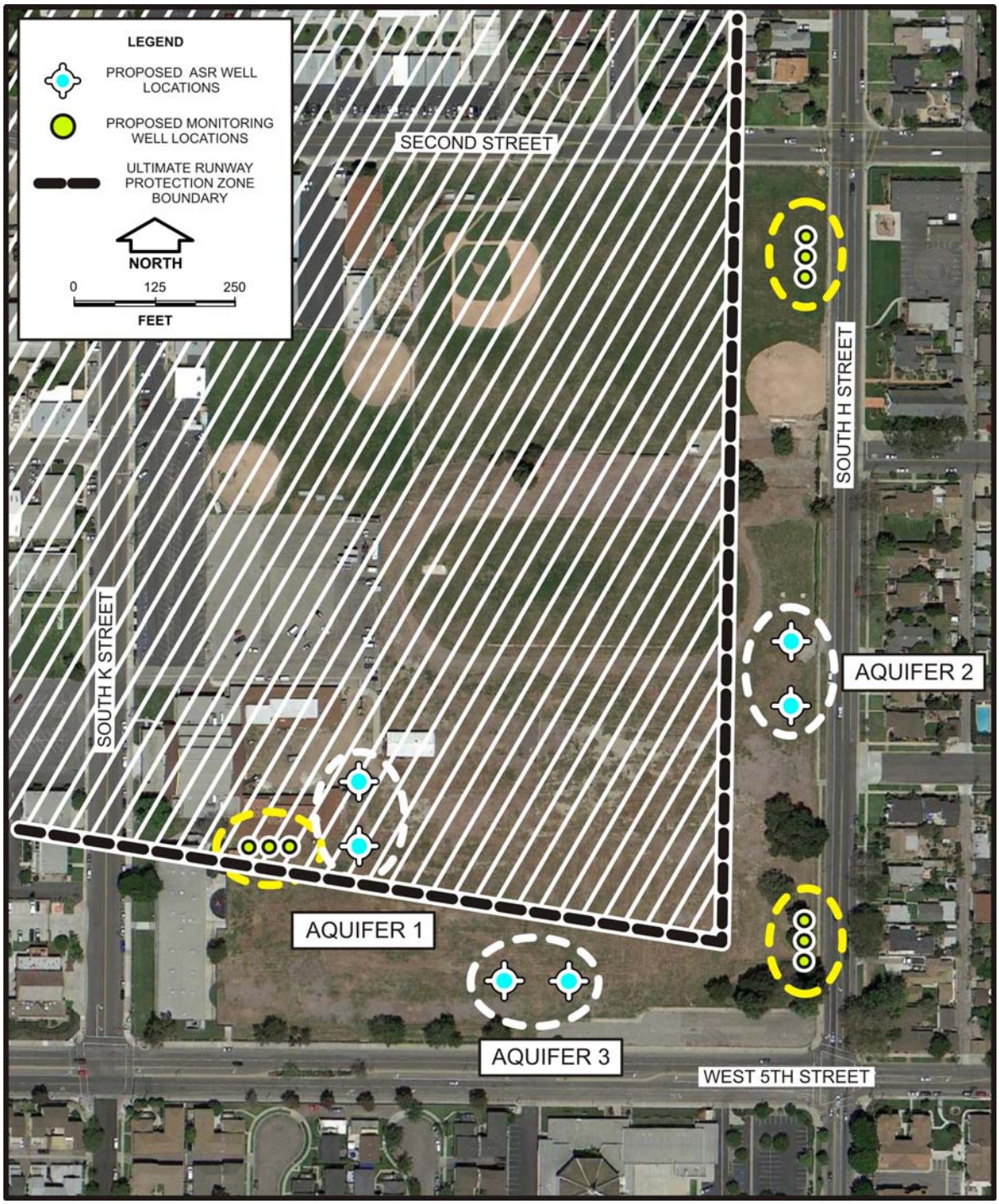
SITE LAYOUT AND FACILITIES DESIGN

To fully develop the Campus Park GRRP location, the City will utilize ASR well facilities that are constructed in discrete aquifer zones. These facilities will be used to conduct the demonstration testing required for final permitting of the IPR GRRP. The site specific groundwater data generated will further define the groundwater gradient, the aquifer materials, the site specific hydrogeology available for GRRP operations, local water quality, and ultimately the aquifer replenishment potential at the ASR well location. Initially, the proposed upper Hueneme Aquifer zone ASR well will be constructed along with 3 monitoring wells to develop information that establishes site specific data. Figure 11 – Proposed Campus Park ASR Wellfield Location Map shows the approximate location of the proposed ASR Wells and Monitoring Wells as they are positioned in the proposed City park development plan.

The proposed well locations were selected to construct facilities that will accomplish wellfield construction and data collection that complies with GRURW regulations and still be within the City property on the Campus Park site. As shown on Figure 11, the well locations are designed to be outside the ultimate runway protection zone boundary proposed by the County of Ventura Department of Airports for Federal Aviation Administration approval. This wellfield layout is designed to accommodate present and future conditions that may restrict the use of the Campus Park Property where drilling equipment of up to 60 feet high may be allowed to operate.

As shown, it is ultimately anticipated that a minimum of two wells will be required in each discrete aquifer zone(s) to achieve the full recharge and extraction capacities desired by the City. ASR Well No. 1 is located in the group labeled Aquifer 1 (see Figure 11). Aquifer 2 is the designated site for the wells that will utilize an aquifer(s) immediately below the Aquifer 1 wells. Accordingly, Aquifer 3 will utilize a deeper aquifer(s) to provide the final ASR capacity required for the recharge, retention, and recovery cycle to support continuous utilization of PRW produced from the AWPF. The initial demonstration ASR well location (see Figure 2) is within the Aquifer 1 area and the 3 monitoring wells are located within each of the monitoring well locations at variable distances from the ASR well.

Figure 11 – Proposed Campus Park ASR Wellfield Location Map



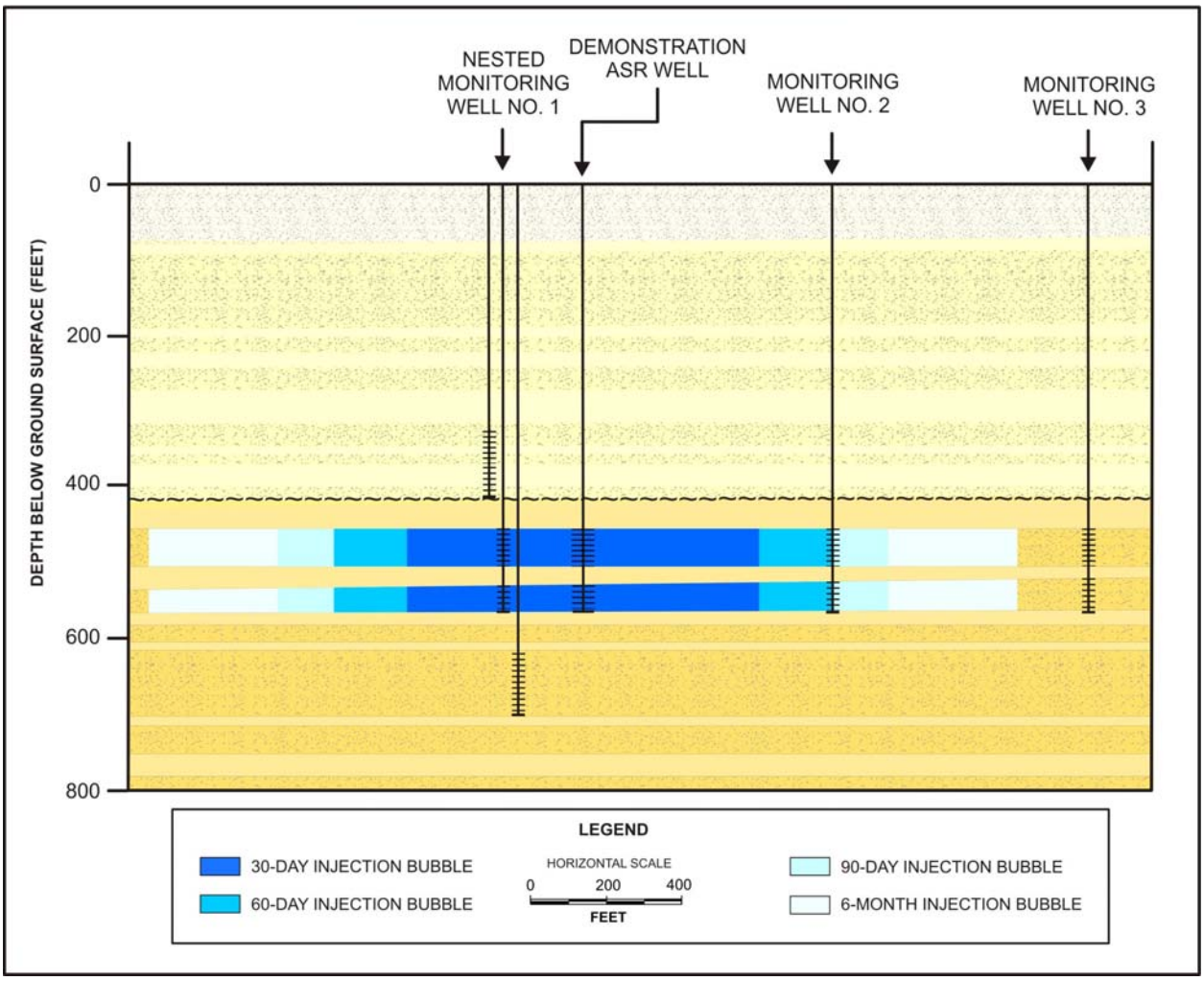
Well construction will be conducted by drilling and logging a pilot hole to select the aquifer(s) to be utilized by the ASR well(s). Based on these data, the final design of the demonstration ASR well and monitoring wells will be provided in the uppermost aquifer unit. The monitoring well locations selected are designed to test the aquifer properties and confirm groundwater travel time estimates at the Campus Park site in compliance with the GRURW regulations. Upon completion of well construction, groundwater tracer testing using an intrinsic tracer will be conducted to satisfy regulation provisions and obtain a CRWQCB permit for operation of the GRRP. Additional analyses to be conducted during the site investigation will include evaluating the geochemical compatibility of the PRW with the native groundwater and with the lithology of aquifer materials through direct sample analysis of the PRW during the recovery phase of the initial recharge cycle.

The locations of the monitoring wells are designed to; a) be far enough apart to collect water levels that will define the site specific groundwater gradient, b) be close enough to comply with GRURW regulation monitoring well requirements for GRRP permitting including a travel time of greater than 2 weeks and less than 6 months, and c) utilize the City owned parcel and minimize impacts to airport operations and future park development to be planned. The location of the demonstration ASR well is presently on the periphery of the future park property and positioned to allow the additional ASR wells to be constructed on the site.

Figure 12 – Subsurface Profile of PRW Travel Time Estimates shows the radial distances estimated that will be filled with PRW during replenishment in the discrete aquifer zones identified for storage using Campus Park ASR Well No. 1. These estimations were calculated using an aquifer porosity of 20 percent (which is believed a reasonable value for this purpose) and a test injection rate of 2,000 gpm. Variations in aquifer porosities will either decrease or increase the estimated travel time proportionally as shown in Table 2. As shown, the displacement volume from ASR Well No. 1 replenishment is anticipated to fill the aquifer at radial distances that will reach Monitoring Well No. 1 within approximately 2 weeks and Monitoring Well No. 2 in approximately 60 days. The estimated displacement volume from the proposed injection rate is not anticipated to reach Monitoring Well No. 3 for over 6 months and would likely be on the order of 9 months.

Based on the regional groundwater gradient, the travel time of PRW will be primarily dominated by the rate of injection and the displacement of native groundwater in the aquifer and not by the background flow of groundwater through Aquifer No. 1. Because the GRRP Wellfield is located within an area of the City where it has control over water well permitting, a prohibition of private wells constructed in the LAS can be implemented and prevent potential impacts to private well owners during the lifetime of the project. This condition effectively establishes the required isolation zone for future well construction.

Figure 12 – Subsurface Profile of PRW Travel Time Estimates



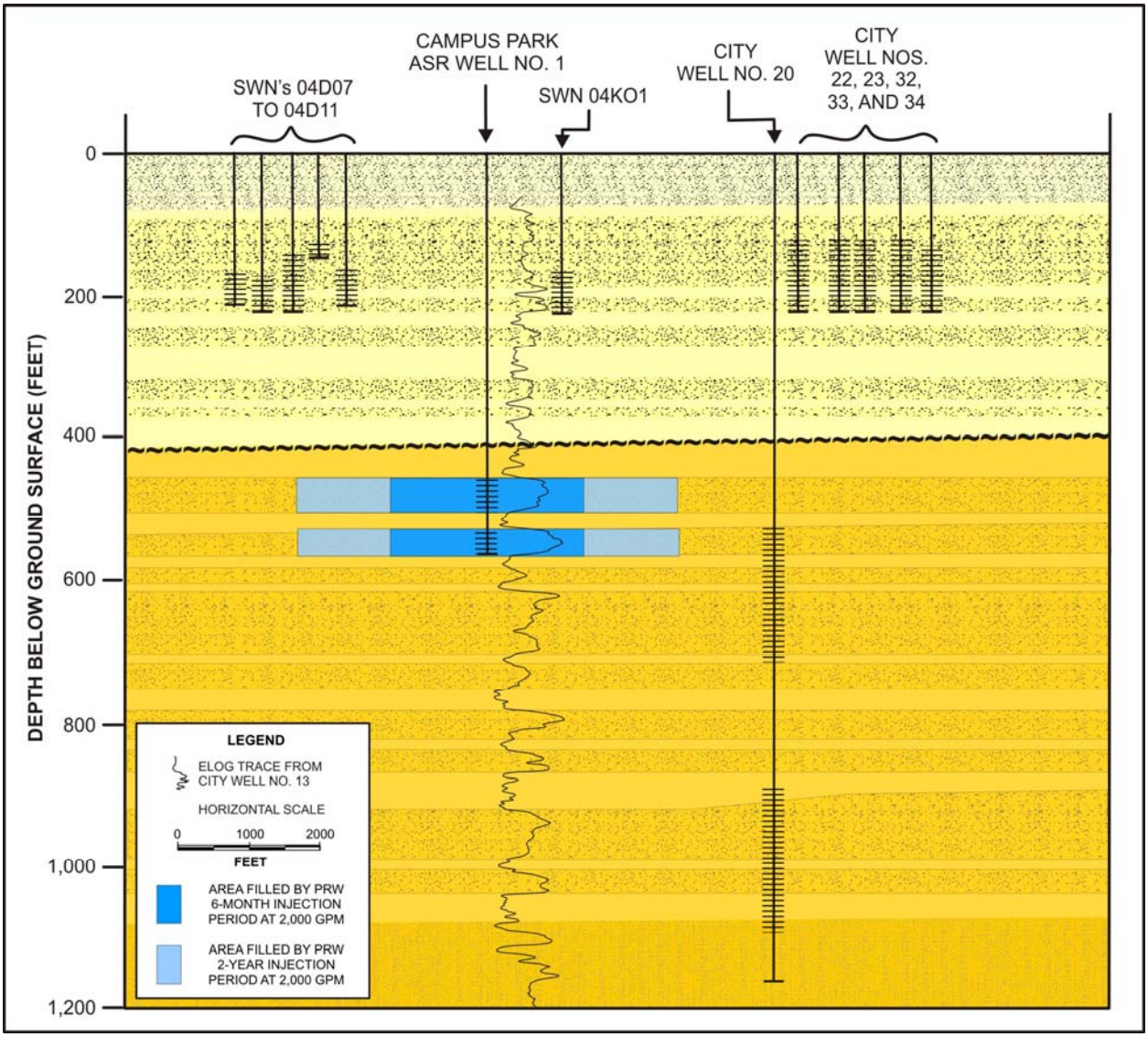
GRRP OPERATION AND VIOLATION MITIGATION

GRRP OPERATIONS

The conceptual design of the GRRP includes the cyclical recharge and storage of PRW in the discrete aquifer zones utilized by each ASR well. While it is anticipated that the majority of the recycled water produced by the AWPF during the first phase of production will be sold for in-City uses or for agricultural purposes, winter season demand will likely require injection and storage of the PRW to prevent plant shutdown or discharge to the ocean. The proposed use of

the well is cyclical in nature, however, the actual amount that will be required for storage under full plant capacity is unknown and operational flexibility is always desirable. This study evaluated the merit of a 6-month and 2-year recharge/storage cycle (see Figure 9). The results indicated that these volumes can be accommodated if required, without adverse impacts to proximal well facilities. Figure 13 – Profile of Existing Wells shows the closest wells to the Campus Park site along with their approximate distance and completed depth. As indicated, City Well No. 20 is the only well within a mile of the site that is constructed in the LAS.

Figure 13 – Profile of Existing Wells



The injection volumes shown on the scaled drawing represent the radii of a 6-month and 2-year recharge period. This clearly indicates the low risk of the 3-month ASR cycle proposed. In addition, it illustrates the multiple confining layers and aquifer zones between the proposed ASR well constructed in the upper Hueneme Aquifer and the existing shallow 200- to 230-foot-deep wells constructed in the Oxnard Aquifer.

Preliminary analysis of the GRURW regulation requirements for treatment credits was performed by the City to understand the ability of the designed AWPF treatment process to satisfy the minimum 12-log reduction of enteric virus, 10-log reduction of Giardia cyst, and 10-log reduction of Cryptosporidium oocyst. The findings of that review indicated that the treatment process is capable of achieving the credits required for an IPR project for Giardia and Cryptosporidium, but is approximately 3-log reduction short of the requirement for enteric virus. Because of this finding, the aquifer used for storage may also be used for soil aquifer treatment to obtain the additional credit required for virus removal to achieve the IPR requirement (if no other treatment process is added to obtain additional credit). Based on the information in Table 60320.208 in the GRURW regulations, the necessary retention time will be approximately 3 months. The primary assessment of this hydrogeological study was to accommodate planned ASR operations on a 3-month cycle until treatment process improvements are implemented.

For initial GRRP operations, the City proposes to recharge the well for approximately 3 months with PRW. Upon completion of the recharge cycle, the City will allow a 3-month retention time (or less if additional treatment is provided) where the PRW will continue to move through the aquifer under the influence of the regional groundwater gradient (whichever direction that may be) and receive soil aquifer treatment throughout the retention time. Upon completion of the retention time necessary to achieve the required 3-log reduction credit, the stored water will be produced over an approximate 2- to 3-month recovery period. During recovery of the PRW, the well will discharge into the recycled water system and the recovered groundwater will be utilized for irrigation. Upon approval of use for IPR purposes, the groundwater will be recovered and conveyed to BS-1 for blending and use in the City municipal system.

Additional wells can be added to accommodate greater recharge and storage volumes or achieve higher retention time, as desired.

WATER QUALITY VIOLATION MITIGATION

The proposed GRRP is designed to allow rapid response and mitigation in the event of a AWPF treatment failure resulting in a water quality violation. Because the GRRP is designed to recapture the stored PRW at the point of replenishment, the ability for recapture of all of the water has a high level of certainty regardless of changes in the groundwater gradient direction. The steps toward mitigation at the time of violation detection would include the following components:

1. Stop aquifer recharge into the specific well(s) receiving the unsuitable water upon immediate discovery of a violation.

2. Address the treatment plant problem and supplement the recycled system, if necessary, with a potable supply.

3. Immediately begin removal/recapture of the tainted groundwater (if necessary) and discharge to a location other than the municipal water supply system until all the water has been removed from the aquifer system. The recovered water would be discharged either back into the recycled water system and used for irrigation (if suitable) or discharged to the sewer for disposal.

4. Initiate injection into another ASR well after the AWPF treatment problem has been solved and until the tainted groundwater in the previously active well has been remediated.

5. Allow the stored volume of water to remain in the aquifer for a greater response/retention time to receive additional soil aquifer treatment for the required time necessary based on the specific violation prior to subsequent removal and reuse.

Well discharge can be conducted until the affected aquifer zone is completely purged. Discharge from the affected well(s) can be directed to the most beneficial use allowable for its determined quality. City facilities provide multiple locations for discharge of the inadequately treated water, which include the City:

- sanitary sewer

- recycled water system for permitted irrigation reuse

- IPR after additional response retention time or aquifer travel time (soil aquifer treatment) has been achieved to mitigate the violation.

CONCLUSIONS AND RECOMMENDATIONS

In June 2014, the DDW released the final GRURW regulations that reflect its current thinking on the regulation for replenishing groundwater with PRW and the subsequent reuse as a potable supply. Based on the findings of this study, we conclude that available data indicate the proposed GRRP is feasible and that replenishment and recovery of groundwater with an improved quality could be accomplished in this portion of the Oxnard Plain Basin that would be consistent with the current GRURW regulations.

It is anticipated that properly designed and constructed ASR wells located at the proposed Campus Park GRRP site will provide operational well capacities beneficial for the proposed IPR program. Injection into the LAS in the Oxnard Plain Basin will require multiple wells that will likely be capable of sustained injection rates between 1,500 to 2,000 gpm. While the initial proposed demonstration project includes a single ASR well to achieve permitting, and a total of 3 ASR wells to achieve cycling for continual operation, additional wells can be added to facilitate a higher capacity GRRP operation in each of the aquifer storage units.

The City's review of the DDW regulations indicates that IPR operations may require a response retention time that achieves a 3-log removal credit for enteric virus and that the retention time of the PRW in the aquifer will likely be 3 months prior to reuse until additional treatment at the AWPF is provided. We conclude that it is feasible to inject PRW over a 3 to 6-month period into any discrete aquifer zone(s) and expect a high percentage of recovery after a 3-month retention period that allows full compliance with permit conditions. The proposed GRRP has direct control over the response retention time in that the ASR well facility that replenishes the aquifer(s) will remain off until the specified retention time has been achieved. Recovery of the final portion of the PRW will likely produce a component of groundwater with a reduced quality as a result of mixing with the native groundwater. Recovery percentages can be improved with the establishment of a buffer zone around the recharge bubble by originally using a greater quantity of the PRW than planned for recovery.

We conclude that while zone specific water level data from the Campus Park site are not available, the prevailing groundwater conditions indicated by available data in the Oxnard Plain Basin support the ability for effective capture and reuse of the higher quality recharge water from the Campus Park ASR Wellfield. As designed, the project does not rely on horizontal movement through an aquifer in any specific direction to allow capture at some distance away from the point of recharge. The point of capture is anticipated to be near the center of the PRW recharge bubble. We also conclude that in the event of a water quality violation where non-compliant water is injected in the aquifer system, the GRRP design will allow immediate mitigation and, as necessary, recapture of the non-compliant volume of PRW. There are no drinking water wells constructed in the LAS within ¾ of a mile of the proposed GRRP location. The only potable well in the LAS within a mile of the Campus Park is City Well No. 20.

Anticipated travel time to the nearest potable water supply well is greater than 2 years, if the PRW is not recovered for IPR. Because the City is the permitting agency and can control well construction within its limits, the proposed IPR operation has an effectively established isolation zone from future well construction.

We recommend the City drill a pilot borehole to a depth of 580 feet to define the site specific aquifer zone depths for use in final design of the GRRP ASR Well No. 1 in the upper Hueneme Aquifer zones (see Plate 1). We also recommend the City construct 3 monitoring wells at the designated locations which are preliminarily identified on Figures 2 and 11 to allow collection of groundwater data in compliance with the GRURW regulation pursuant to section 60320.200(h)(4). We recommend Monitoring Well No. 1 be constructed as a nested monitoring well to allow monitoring of the aquifer zones above and below the depths of Aquifer Storage Unit No. 1 during the operation of ASR Well No. 1.

PERSONNEL QUALIFICATIONS

The assessment of hydrogeological conditions for the proposed GRRP was conducted by and under the direction of Mr. Curtis J. Hopkins, Principal Hydrogeologist with Hopkins Groundwater Consultants, Inc. Mr. Hopkins is the company's president and is certified as a Professional Geologist (PG 5695), Certified Engineering Geologist (EG 1800) and Certified Hydrogeologist (HG 114) in the State of California. Mr. Hopkins has over 27 years of work experience on groundwater development projects performed throughout the Southern and Central California area and specifically, the Oxnard Plain Basin. Mr. Hopkins has extensive experience with water supply studies to establish municipal wellfields and with design and management of well construction projects.

CLOSURE

This report has been prepared for the exclusive use of the City of Oxnard and its agents for specific application to the City of Oxnard GREAT Program utilization of PRW treated at the AWPF and properly applied at the proposed Campus Park GRRP site for IPR. The findings, conclusions, and recommendations presented herein were prepared in accordance with generally accepted hydrogeological planning and engineering practices. No other warranty, express or implied is made.

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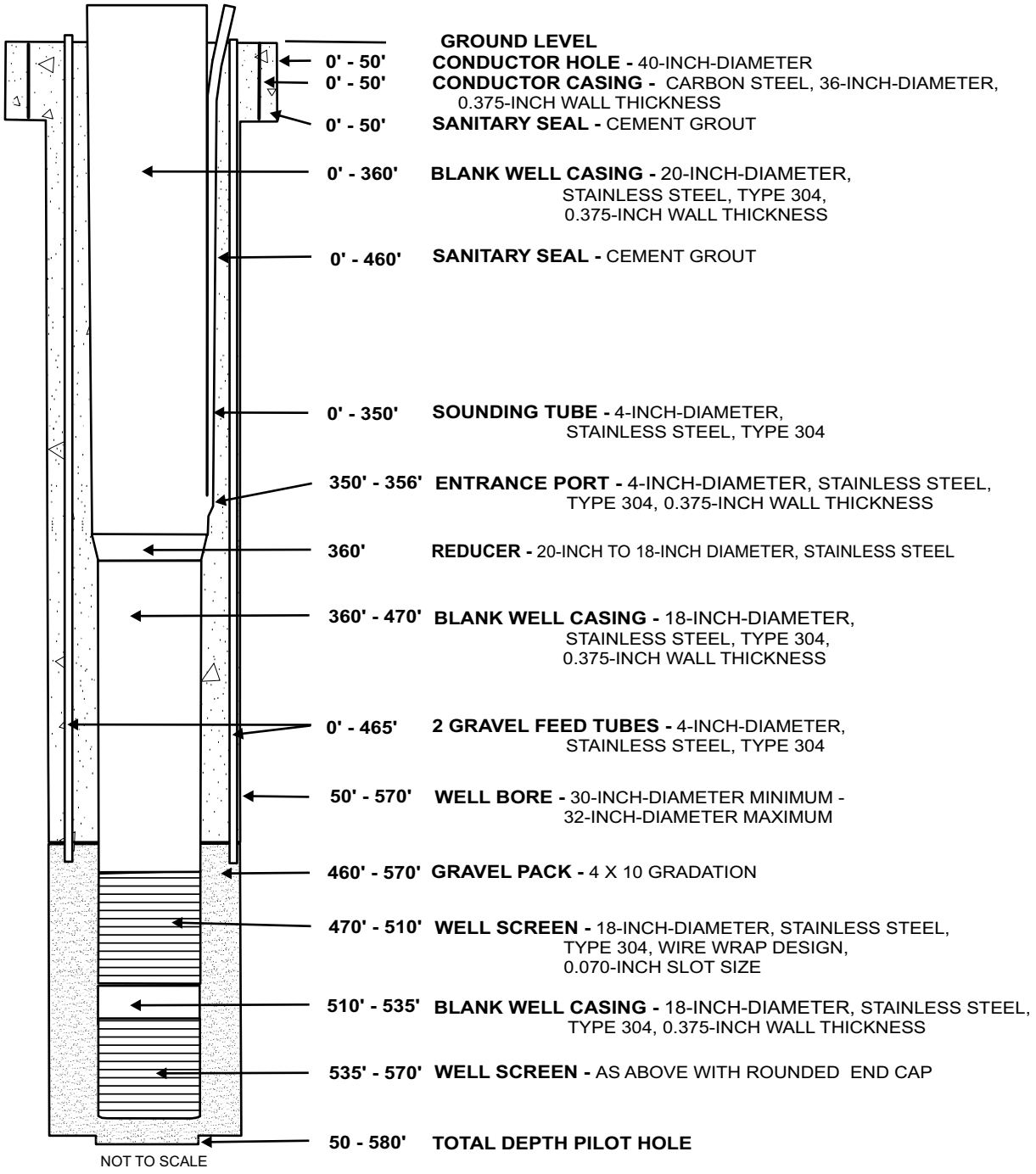
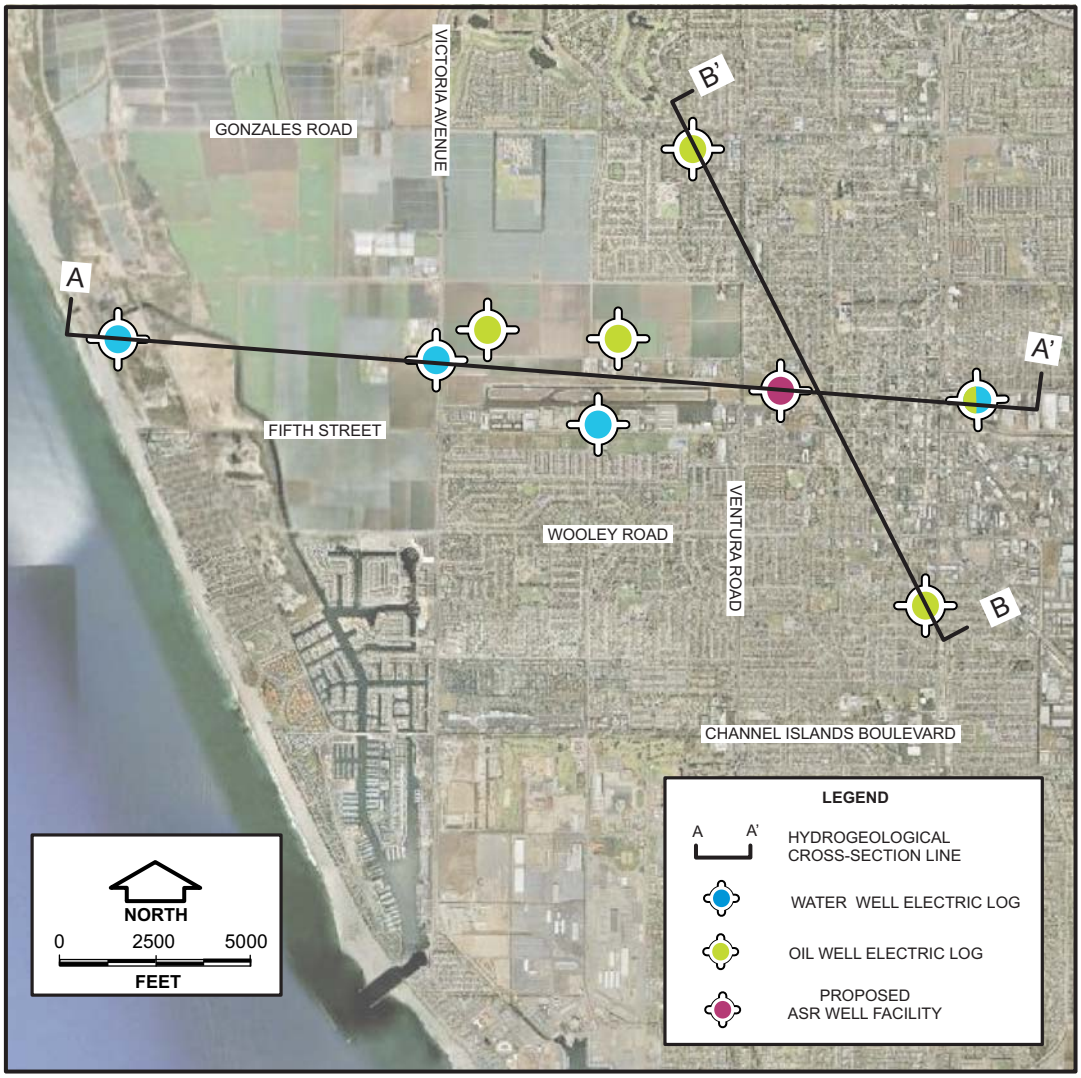
PLATES



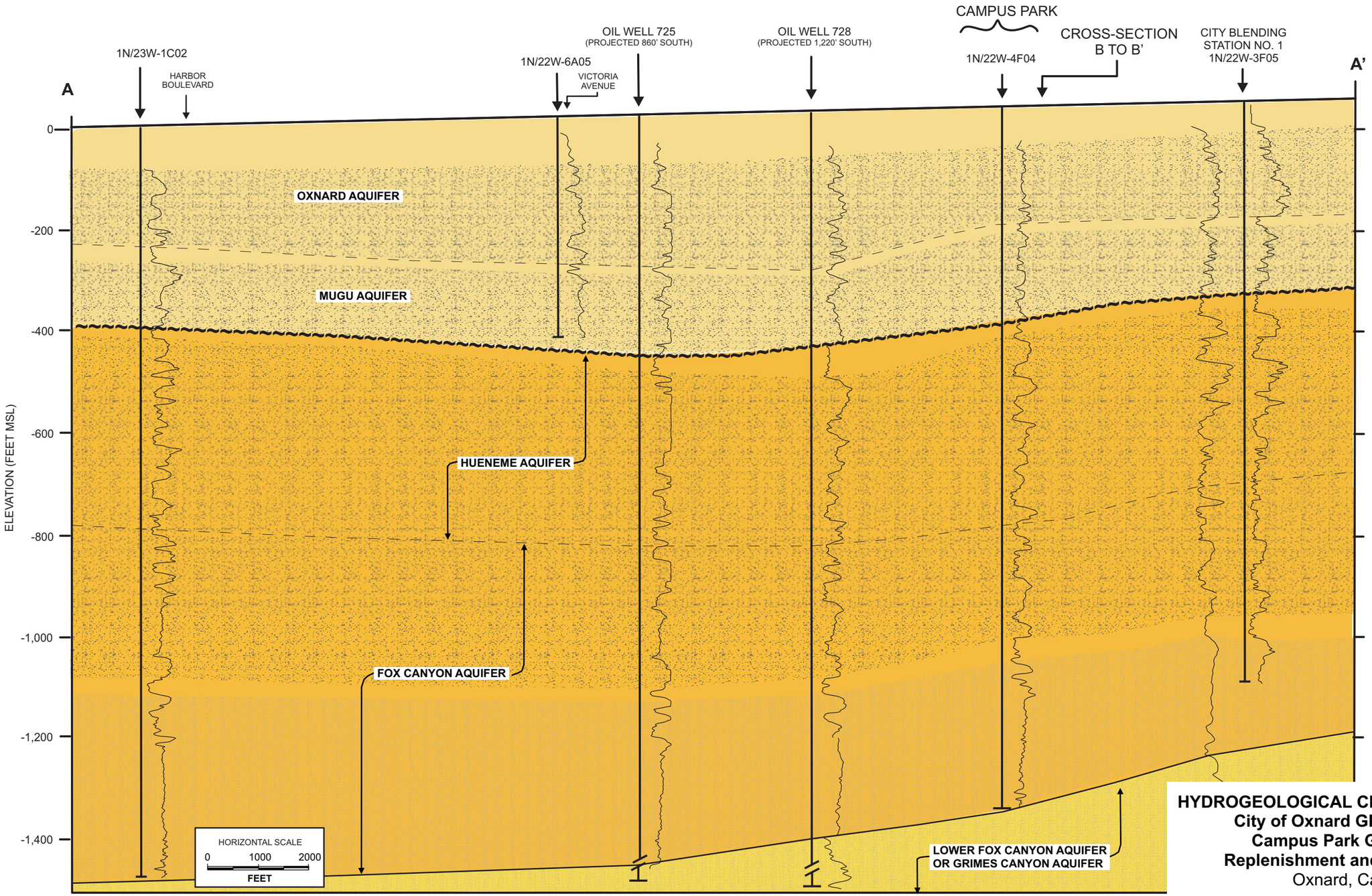
PRELIMINARY ASR WELL NO. 1 DESIGN DRAWING
City of Oxnard GREAT Program
Campus Park Groundwater
Replenishment and Reuse Project
Oxnard, California

PLATE 1



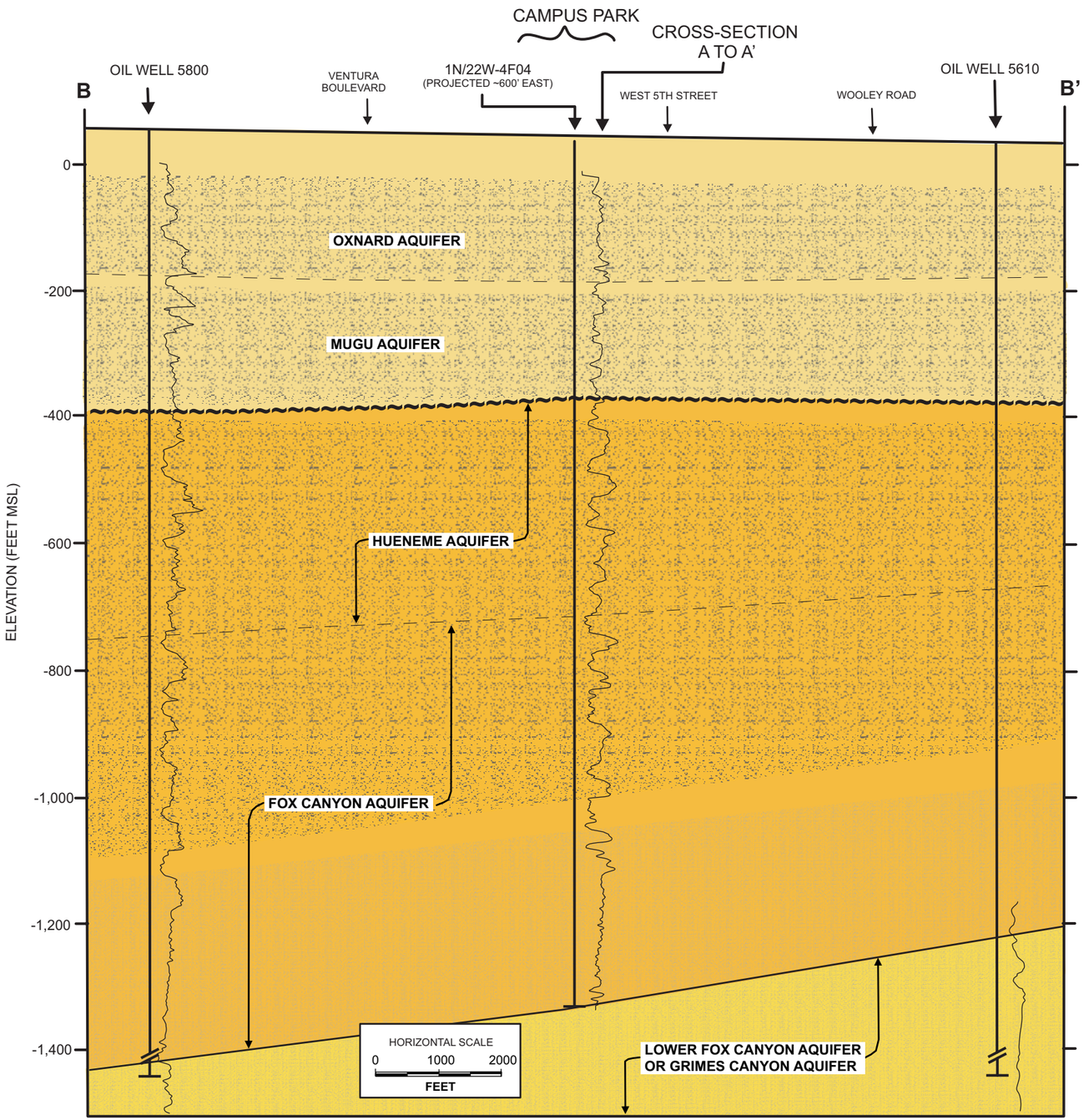
HYDROGEOLOGICAL CROSS-SECTION LOCATION MAP
City of Oxnard GREAT Program
Campus Park Groundwater
Replenishment and Reuse Project
Oxnard, California

PLATE 2



HYDROGEOLOGICAL CROSS-SECTION A - A'
City of Oxnard GREAT Program
Campus Park Groundwater
Replenishment and Reuse Project
Oxnard, California

PLATE 3



LEGEND

QUATERNARY — HOLOCENE

Qoa — **UN-DIFFERENTIATED OLDER AND YOUNGER ALLUVIUM -** older alluvial gravel, and silt/clay

PLEISTOCENE

QTs — **SAUGUS FORMATION -** weakly consolidated alluvial deposits, light gray to light brown gravel composed of pebbles and small cobbles mostly of white to light gray granitic rocks, in coarse sandy matrix; weakly indurated sand, and fossiliferous sand, silt, and clay

Qtlp / Qsb — **LAS POSAS SAND OR SANTA BARBARA FORMATION -** weakly indurated, fine to medium grained sand, in Las Posas Hills contains thin lenses of calcareous fossilliferous pebbly sandstone; unconformity at base

SYMBOLS

Formation contact - dashed where inferred or indefinite

Unconformable formation contact

Electric Log Trace of Resistivity Curve

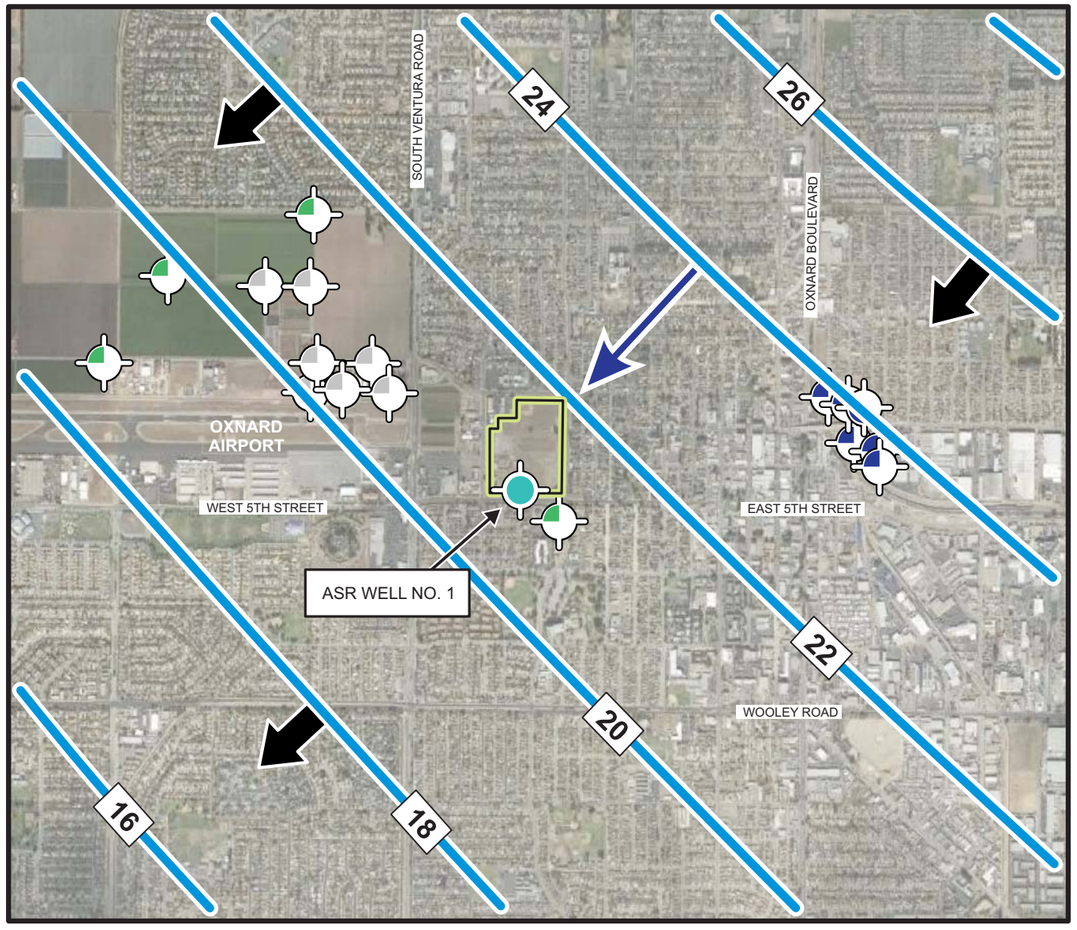
Location of Historical Water or Oil Well

Geology from: THOMAS W. DIBBLEE

HYDROGEOLOGICAL CROSS-SECTION B - B'
City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE 4

APPENDIX A
GROUNDWATER ELEVATION
CONTOUR MAPS



JANUARY 2011

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0008**

FLOW DIRECTION **S 43° W**

NORTH

0 1000 2000

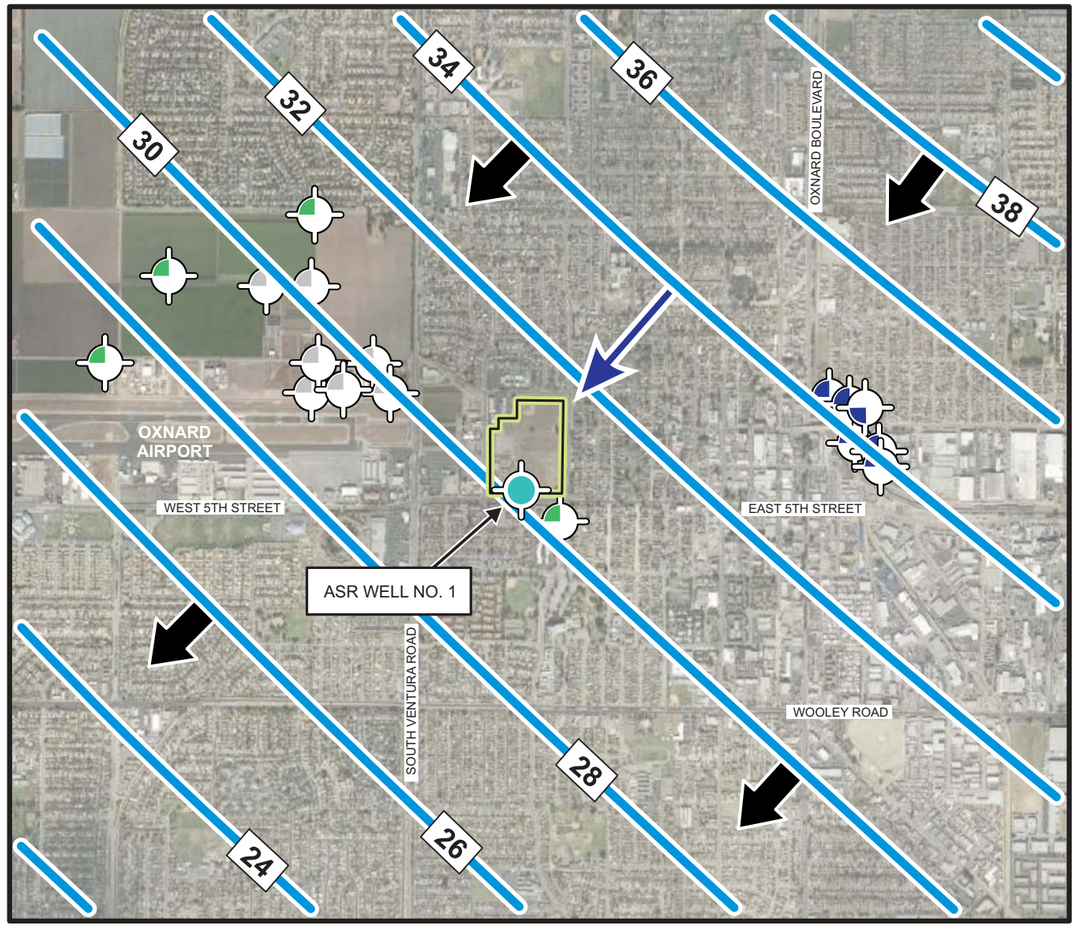
FEET

WELL LEGEND

- MUNICIPAL WELL
- DOMESTIC WELL
- AGRICULTURAL WELL
- SWN 21M1 — WELL ID

AQUIFER COMPLETION DESIGNATION

- OXNARD AQUIFER — UAS
- MUGU AQUIFER
- HUENEME AQUIFER
- FOX CAYNON AQUIFER — LAS



APRIL 2011

GROUNDWATER LEGEND

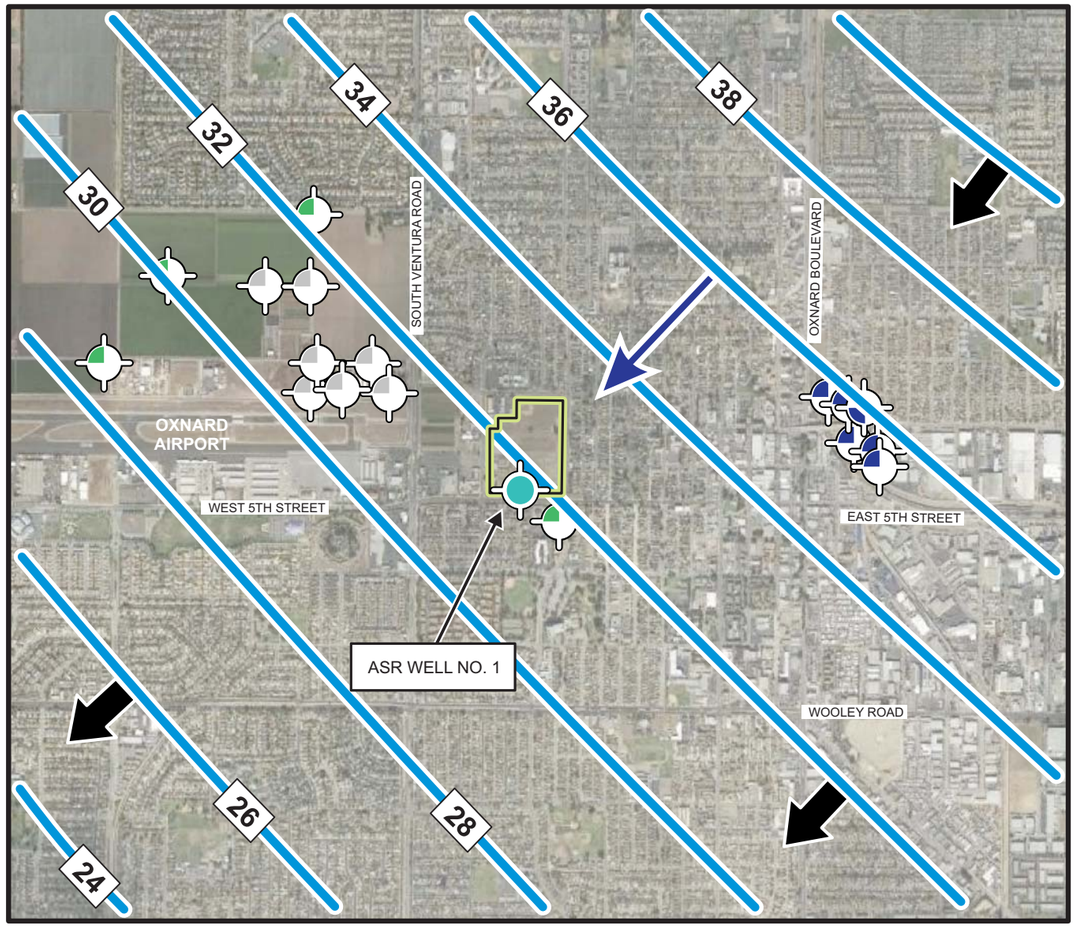
- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0011**

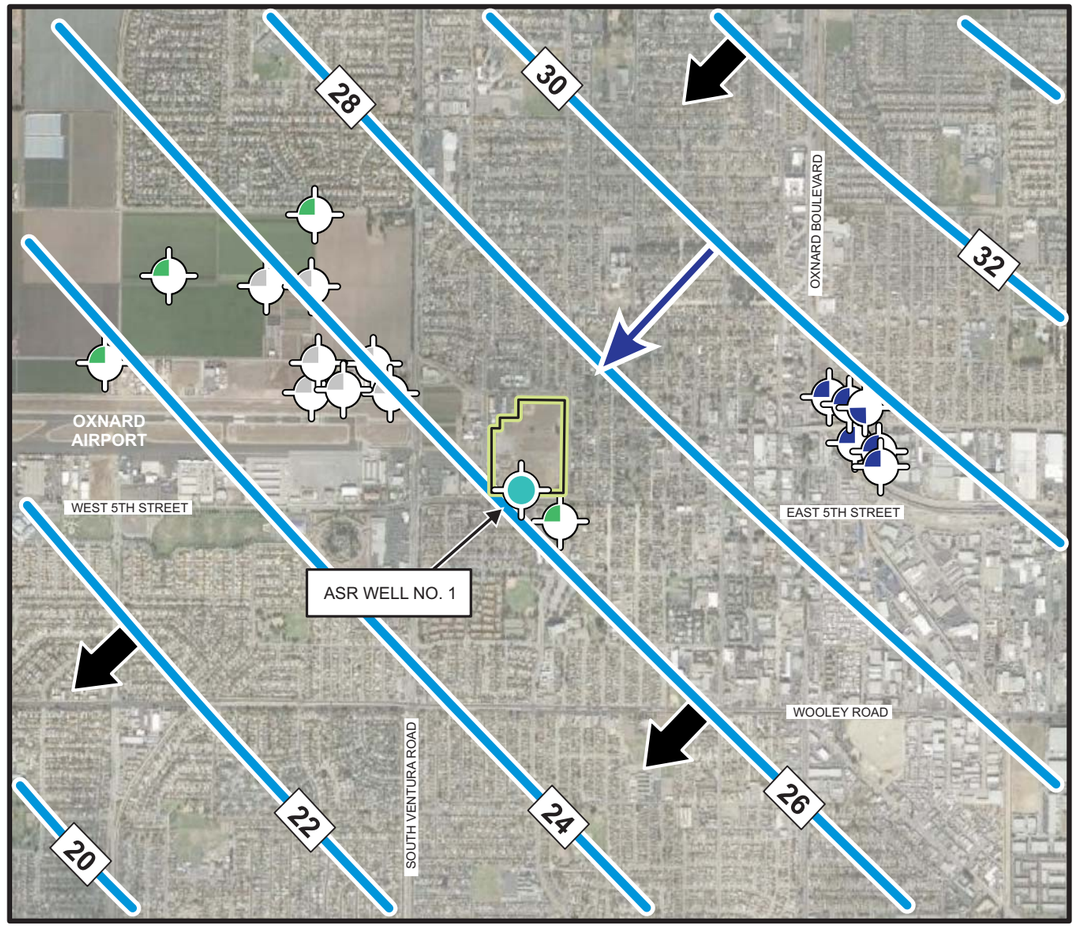
FLOW DIRECTION **S 41° W**

GROUNDWATER ELEVATION CONTOUR MAPS
JANUARY AND APRIL 2011
City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE A1



JULY 2011



OCTOBER 2011

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0011**

FLOW DIRECTION **S 44° W**

NORTH

0 1000 2000

FEET

WELL LEGEND

- MUNICIPAL WELL
- DOMESTIC WELL
- AGRICULTURAL WELL
- SWN 21M1 — WELL ID

AQUIFER COMPLETION DESIGNATION

- OXNARD AQUIFER
- MUGU AQUIFER
- HUENEME AQUIFER
- FOX CAYNON AQUIFER

UAS

LAS

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

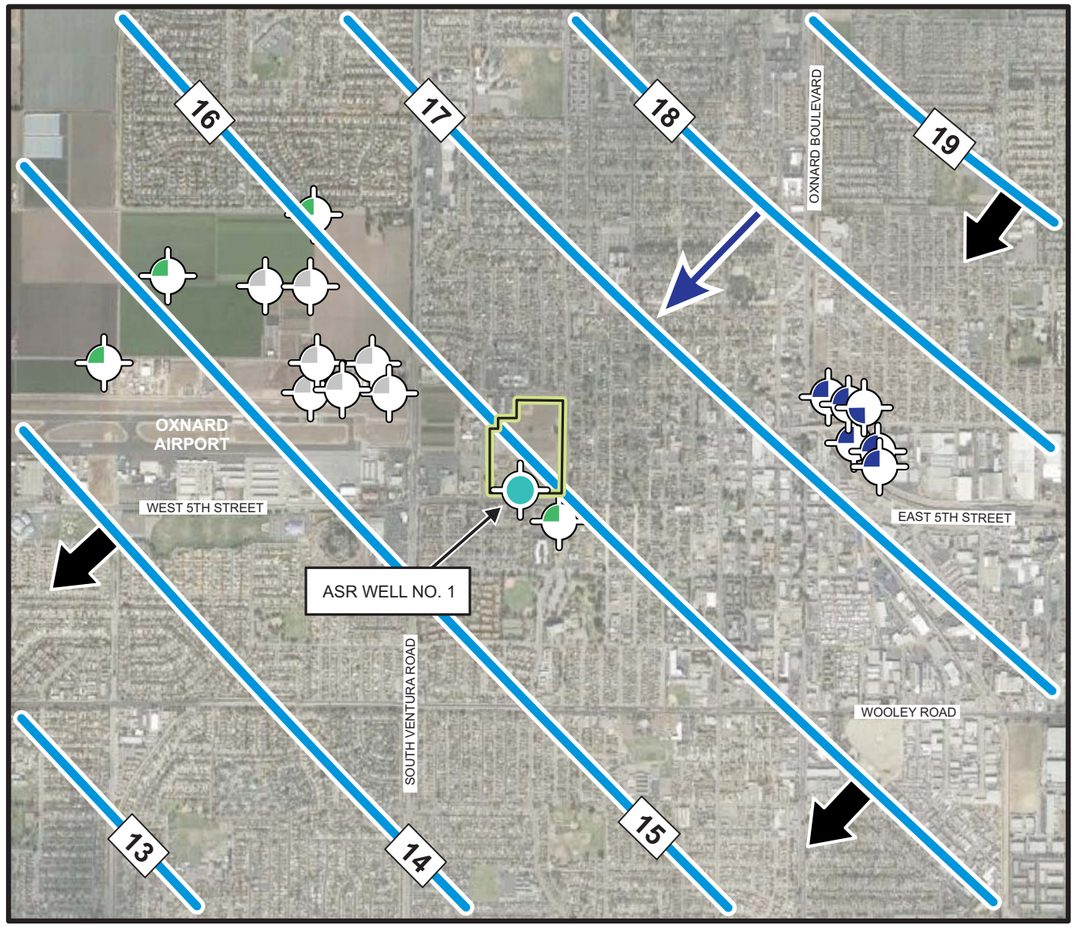
GRADIENT **0.0009**

FLOW DIRECTION **S 43° W**

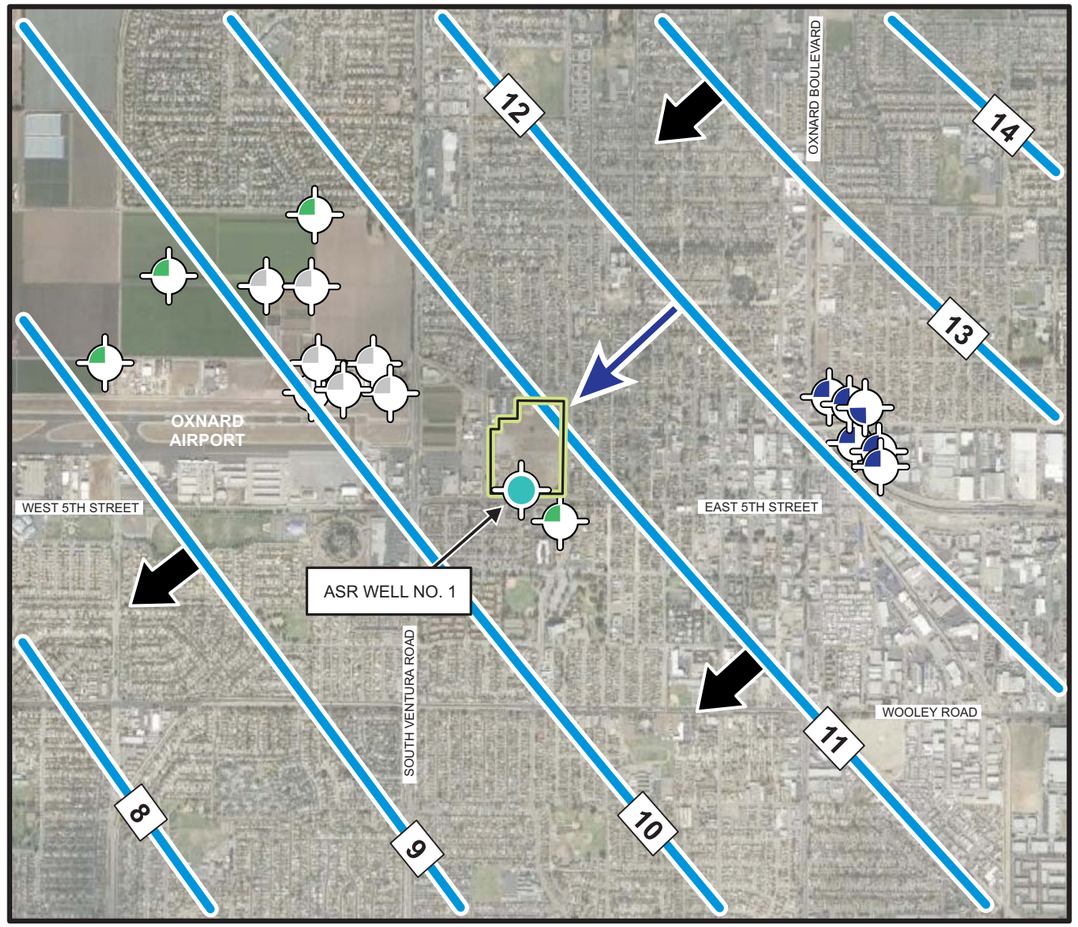
GROUNDWATER ELEVATION CONTOUR MAPS JULY AND OCTOBER 2011

City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE A2



JANUARY 2013



APRIL 2013

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0004**

FLOW DIRECTION **S 44° W**

NORTH

0 1000 2000

FEET

WELL LEGEND

- MUNICIPAL WELL
- DOMESTIC WELL
- AGRICULTURAL WELL
- SWN 21M1 — WELL ID

AQUIFER COMPLETION DESIGNATION

- OXNARD AQUIFER
- MUGU AQUIFER
- HUENEME AQUIFER
- FOX CAYNON AQUIFER

UAS / LAS

GROUNDWATER LEGEND

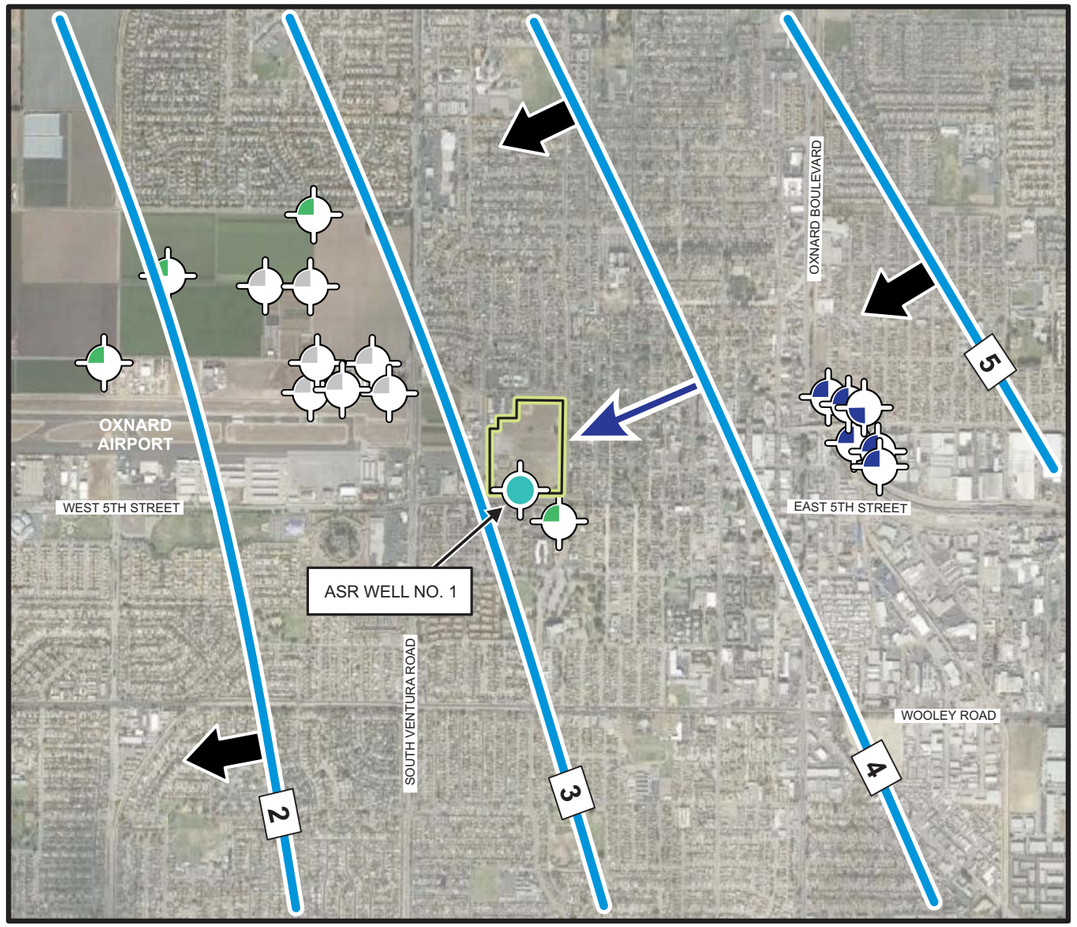
- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0004**

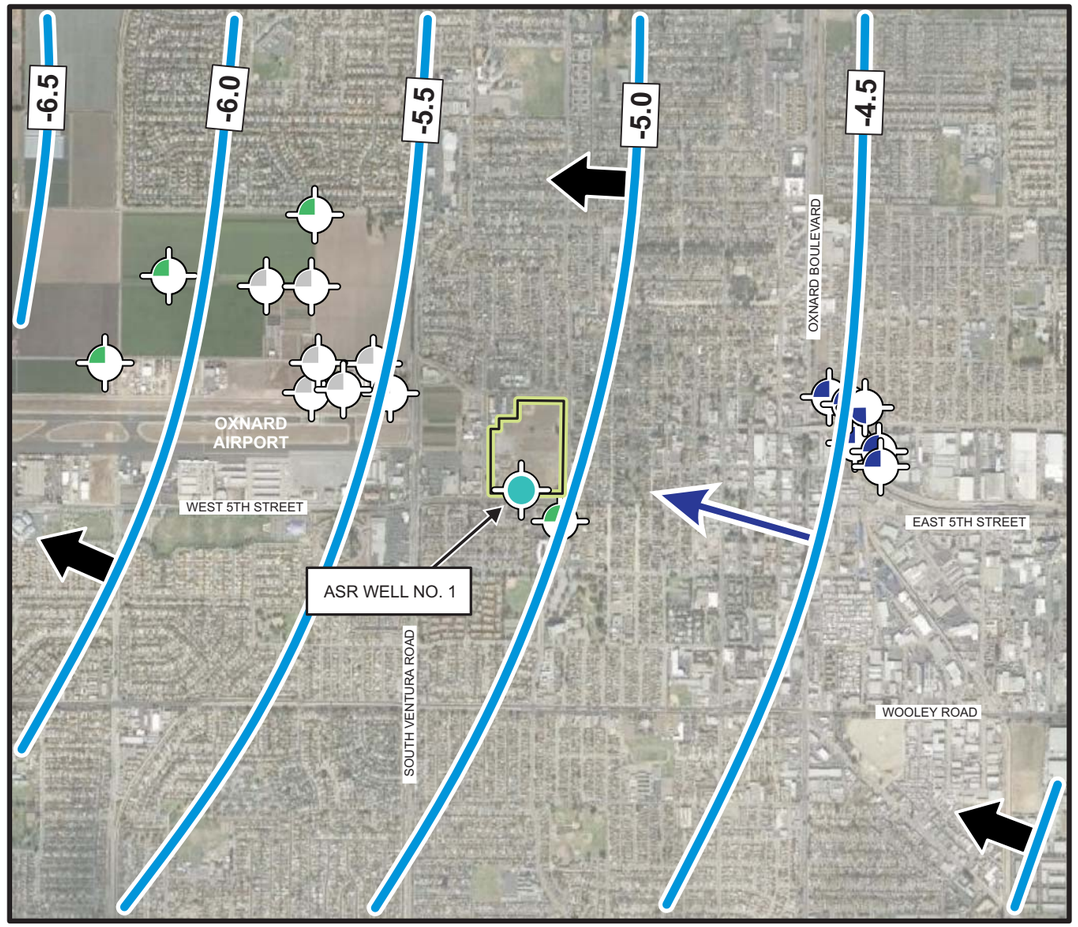
FLOW DIRECTION **S 47° W**

GROUNDWATER ELEVATION CONTOUR MAPS JANUARY AND APRIL 2013
City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE A3



JULY 2013



OCTOBER 2013

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0003**

FLOW DIRECTION **S 67° W**

NORTH

0 1000 2000

FEET

WELL LEGEND

- MUNICIPAL WELL
- DOMESTIC WELL
- AGRICULTURAL WELL
- SWN 21M1 — WELL ID

AQUIFER COMPLETION DESIGNATION

- OXNARD AQUIFER
- MUGU AQUIFER
- HUENEME AQUIFER
- FOX CAYNON AQUIFER

UAS / LAS

GROUNDWATER LEGEND

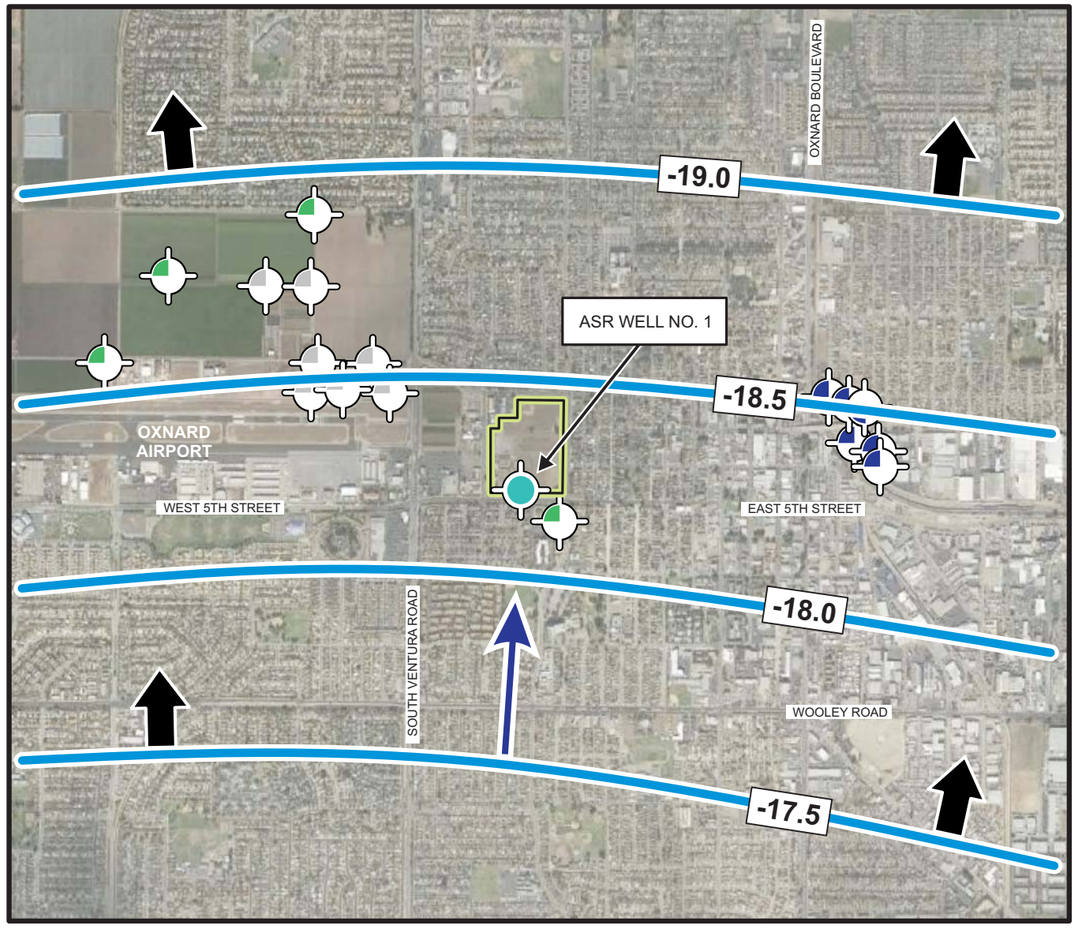
- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE

GRADIENT **0.0002**

FLOW DIRECTION **N 74° W**

GROUNDWATER ELEVATION CONTOUR MAPS
JULY AND OCTOBER 2013
City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE A4



AUGUST 2014

GROUNDWATER LEGEND

- 10 — LINE OF EQUAL GROUNDWATER ELEVATION
- DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER FLOW DIRECTION BENEATH SITE
- GRADIENT **0.0002**
- FLOW DIRECTION **N 04° E**

NORTH

0 1000 2000

FEET

WELL LEGEND

- MUNICIPAL WELL
- DOMESTIC WELL
- AGRICULTURAL WELL
- SWN 21M1 — WELL ID

AQUIFER COMPLETION DESIGNATION

- OXNARD AQUIFER
- MUGU AQUIFER
- HUENEME AQUIFER
- FOX CAYNON AQUIFER

UAS / LAS

GROUNDWATER ELEVATION CONTOUR MAPS
AUGUST 2014
City of Oxnard GREAT Program
Campus Park Groundwater Replenishment and Reuse Project
Oxnard, California

PLATE A5

APPENDIX C – PALL MF PDT/LRV ANALYSIS

Pall Corporation

Resolution and LRV Calculations for Direct Integrity Testing Using the MFGM Method for Water Treatment Plant at 01.00106 Oxnard, CA

Objectives

The objective is to determine (1) the testing pressure required to meet the resolution criterion of 3 μm or less as specified in the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), (2) the pressure decay value (PDR) corresponding to required Log Reduction Value (LRV) for particles with the size of 3 μm at plant design conditions.

Calculation for Resolution and Sensitivity of the Membrane System

1. Determining Testing Pressure for Required Resolution (≤3 μm)

   The testing pressure can be calculated per Equation (4.1)

$$P_{test} = (0.193 * \kappa * \sigma * \cos\theta) + BP_{\max} \qquad \text{Equation (4.1)}$$

Table 1. Calculation Variables (P_{test})

Item	Description	Unit	Value
P_{test}	Test pressure for required resolution	psi	17.47
k	Shape correction factor	dimensionless	1
σ	Surface tension of water @ 5 °C	dynes/cm	74.97
θ	Water contact angle of membrane medium	degree	0.00
BP_{max}	Sum of backpressure and static head	psid	3

Since the testing pressure to be used is 25 psi or above and the pressure decay is anticipated lower than 1 psi during the duration of the test for Pall MF system, the resolution criterion is satisfied.

2. Calculating Sensitivity (LRV_{DIT})

The LRV calculation is performed by using Equation (4.9) in USEPA's Membrane Filtration Guidance Manual (USEPA, 2005):

$$LRV_{DIT} = \log\left(\frac{Q_p * ALCR * P_{atm}}{\Delta P_{test} * V_{sys} * VCF}\right)$$ Equation (4.9)

The air-liquid conversion ration (ALCR) is calculated using Darcy Equation by assuming that the hollow fiber breaks completely at the interface of potting layer, which results in a shortest flow path for bypass flow. The calculation also uses the highest trans-membrane pressure (TMP) during a filtration cycle. This results in a conservative result that has a low LRV.

Air-to-liquid-conversion ratio (ALCR):

$$ALCR = 170 * Y * \sqrt{\frac{(P_{test} - BP)(P_{test} + P_{atm})}{(460 + T) * TMP}}$$ Equation (C.4)

$$Y \propto \left[\frac{1}{\frac{(P_{test} - BP)}{(P_{test} + P_{atm})}}, K\right]$$ Equation (C.5)

K: resistant coefficient

$$K = f * \frac{L}{d_{fiber}}$$ Equation (C.6)

The parameters used in the LRV calculation are presented in Table 2.

Table 2. Parameters Used for LRV Calculation

Item	Description	Unit	Value
Q_p	design (instantaneous) flow per rack	gpm	1,554
VCF [a]	volumetric concentration factor	dimensionless	1.00
ΔP_{test}	The smallest pressure decay rate associated w/ a breach	psi/min.	0.06
V_{sys} [b]	system hold-up volume	ft^3	44.17
P_{atm}	Atmospheric pressure	psi	14.7
BP [b,c]	back-pressure during pressure decay test	psi	0
T [b]	Temperature	^oF	80.6
TMP [b]	terminal trans-membrane pressure during filtration	psi	40
f	friction factor	dimensionless	0.025
L [c]	the length of flow path for breach	M	0.06
D	diameter of hollow fiber lumen	M	0.00064
P_{test} [b]	testing pressure for pressure decay test	psi	25.0

Note: a - *Dead-end filtration*

b - *Based on the design data*

c - *Assume worst-case fiber breakage (at the top potting layer)*

Find K:

$$K = f * \frac{L}{d_{fiber}} \qquad \text{Equation (C.6)}$$

f: friction factor

L: the length of flow path of the breach (equal to the potting thickness)

d_{fiber} lumen diameter of the fiber.

$$K = 0.025 * \frac{0.06}{0.00064}$$

Find Y value using the chart on page A-22 from Crane:

$$Y \propto \left[\frac{1}{\frac{(P_{test} - BP)}{(P_{test} + P_{atm})}}, K \right]$$

Substitute Y into Equation (C.4):

Substitute ALCR into Equation (4.9):

Table 3. Additional Parameters Used for LRV Calculation

Item	Description	Unit	Value
K	Resistant coefficient	dimensionless	2.34
Y	Net expansion factor	dimensionless	0.63
$ALCR$	Air to liquid conversion ratio	dimensionless	22.84
LRV_{dit}	Sensitivity of direct integrity test	log	4.4

Therefore, the sensitivity of direct integrity testing is = LRV_{dit} in Table 3.

1. Calculate Upper Control Limit (UCL) and Alert Level (AL) for Direct Integrity Testing. The UCL for direct integrity testing, the pressure decay rate corresponding to the required LRV, is determined by rearranging Equation (4.9):

$$UCL = \frac{Q_p \bullet ALCR \bullet P_{atm}}{10^{LRC^*} \bullet V_{sys} \bullet VCF} \qquad \text{Equation (4.17)}$$

Where: UCL - upper control limit for pressure decay rate, psi/min.
LRC^* - required LRV for the membrane system

If the required LRV for the membrane system is 4-logs, substitute $LRC^* = 4$ and

the same parameters in Table 2:

The plot of LRV as a function of pressure decay rate is presented in Figure 1 in which the UCL is marked with red dotted line.

Table 4. Results of UCL Calculation

Item	Description	Unit	Value
UCL	Upper control limit	dimensionless	0.16

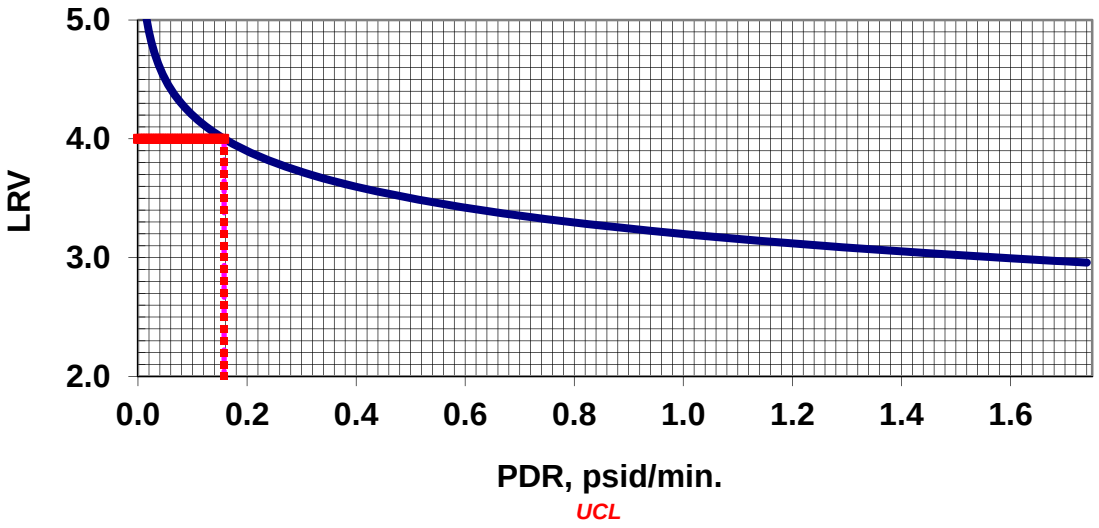


Figure 1: LRV as a function of pressure-decay rate (PDR)

UCL is indicated on the graph corresponding to LRV of 4-logs.

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Appendix B

Notice of Preparation and Scoping Meeting

STATE OF CALIFORNIA

Governor's Office of Planning and Research

State Clearinghouse and Planning Unit

Edmund G. Brown Jr.
Governor

Ken Alex
Director

Notice of Preparation

July 27, 2016

To: Reviewing Agencies

Re: Public Works Integrated Master Plan
SCH# 2016071078

Attached for your review and comment is the Notice of Preparation (NOP) for the Public Works Integrated Master Plan draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Steve Brown
City of Oxnard
PO Box 381
Roseville, CA 95661

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Attachments
cc: Lead Agency

Document Details Report
State Clearinghouse Data Base

SCH# 2016071078
Project Title Public Works Integrated Master Plan
Lead Agency Oxnard, City of

Type NOP Notice of Preparation

Description Note: Review Per Lead

The purpose of the PWIMP is to provide a central planning document to guide improvements to the City's water infrastructure through the planning horizon (2040). Specifically, the PWIMP addresses future planning needs including infrastructure additions and upgrades for City's water, wastewater, recycled water, and stormwater utilities. The PWIMP builds upon previous planning efforts using a coordinated methodology, which will allow the City to take full advantage of potential linkages and synergies between the four water utility systems. In addition, the PWIMP is also coordinated with a streets plan in an attempt to allow timing of future streets upgrades to be tied together with infrastructure upgrades.

Lead Agency Contact

Name Steve Brown
Agency City of Oxnard
Phone 916-517-2189 **Fax**
email
Address PO Box 381
City Roseville **State** CA **Zip** 95661

Project Location

County Los Angeles, Ventura
City Oxnard
Region
Cross Streets
Lat / Long
Parcel No.
Township **Range** **Section** **Base**

Proximity to:

Highways
Airports
Railways
Waterways
Schools
Land Use

Project Issues

Reviewing Agencies Resources Agency; California Coastal Commission; Department of Parks and Recreation; Department of Water Resources; Department of Fish and Wildlife, Region 5; State Lands Commission; Native American Heritage Commission; Office of Emergency Services, California; California Highway Patrol; Caltrans, District 7; State Water Resources Control Board, Divison of Financial Assistance; State Water Resources Control Board, Division of Drinking Water; State Water Resources Control Board, Division of Drinking Water, District 6; Regional Water Quality Control Board, Region 4

Date Received 07/27/2016 **Start of Review** 07/27/2016 **End of Review** 09/02/2016

Note: Blanks in data fields result from insufficient information provided by lead agency.

NOP Distribution List

County: Ventura **SCH#** 2016071078

Resources Agency

- [x] **Resources Agency**
  Nadell Gayou
- [ ] **Dept. of Boating & Waterways**
  Denise Peterson
- [x] **California Coastal Commission**
  Elizabeth A. Fuchs
- [ ] **Colorado River Board**
  Lisa Johansen
- [ ] **Dept. of Conservation**
  Elizabeth Carpenter
- [ ] **California Energy Commission**
  Eric Knight
- [ ] **Cal Fire**
  Dan Foster
- [ ] **Central Valley Flood Protection Board**
  James Herota
- [ ] **Office of Historic Preservation**
  Ron Parsons
- [x] **Dept of Parks & Recreation**
  Environmental Stewardship Section
- [ ] **California Department of Resources, Recycling & Recovery**
  Sue O'Leary
- [ ] **S.F. Bay Conservation & Dev't. Comm.**
  Steve McAdam
- [x] **Dept. of Water Resources**
  Resources Agency
  Nadell Gayou

Fish and Game

- [ ] **Depart. of Fish & Wildlife**
  Scott Flint
  Environmental Services Division
- [ ] **Fish & Wildlife Region 1**
  Curt Babcock
- [ ] **Fish & Wildlife Region 1E**
  Laurie Harnsberger
- [ ] **Fish & Wildlife Region 2**
  Jeff Drongesen
- [ ] **Fish & Wildlife Region 3**
  Craig Weightman
- [ ] **Fish & Wildlife Region 4**
  Julie Vance
- [x] **Fish & Wildlife Region 5**
  Leslie Newton-Reed
  Habitat Conservation Program
- [ ] **Fish & Wildlife Region 6**
  Tiffany Ellis
  Habitat Conservation Program
- [ ] **Fish & Wildlife Region 6 I/M**
  Heidi Calvert
  Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Wildlife M**
  Becky Ota
  Marine Region

Other Departments

- [ ] **Food & Agriculture**
  Sandra Schubert
  Dept. of Food and Agriculture
- [ ] **Depart. of General Services**
  Public School Construction
- [ ] **Dept. of General Services**
  Cathy Buck/George Carollo
  Environmental Services Section
- [ ] **Delta Stewardship Council**
  Kevan Samsam
- [ ] **Housing & Comm. Dev.**
  CEQA Coordinator
  Housing Policy Division

Independent Commissions,Boards

- [ ] **Delta Protection Commission**
  Michael Machado
- [x] **OES (Office of Emergency Services)**
  Monique Wilber
- [x] **Native American Heritage Comm.**
  Debbie Treadway
- [ ] **Public Utilities Commission**
  Supervisor
- [ ] **Santa Monica Bay Restoration**
  Guangyu Wang
- [x] **State Lands Commission**
  Jennifer Deleong
- [ ] **Tahoe Regional Planning Agency (TRPA)**
  Cherry Jacques

Cal State Transportation Agency CalSTA

- [ ] **Caltrans - Division of Aeronautics**
  Philip Crimmins
- [ ] **Caltrans – Planning HQ LD-IGR**
  Terri Pencovic
- [x] **California Highway Patrol**
  Suzann Ikeuchi
  Office of Special Projects

Dept. of Transportation

- [ ] **Caltrans, District 1**
  Rex Jackman
- [ ] **Caltrans, District 2**
  Marcelino Gonzalez
- [ ] **Caltrans, District 3**
  Eric Federicks – South
  Susan Zanchi - North
- [ ] **Caltrans, District 4**
  Patricia Maurice
- [ ] **Caltrans, District 5**
  Larry Newland
- [ ] **Caltrans, District 6**
  Michael Navarro
- [x] **Caltrans, District 7**
  Dianna Watson
- [ ] **Caltrans, District 8**
  Mark Roberts
- [ ] **Caltrans, District 9**
  Gayle Rosander
- [ ] **Caltrans, District 10**
  Tom Dumas
- [ ] **Caltrans, District 11**
  Jacob Armstrong
- [ ] **Caltrans, District 12**
  Maureen El Harake

Cal EPA

Air Resources Board

- [ ] Airport & Freight
  Cathi Slaminski
  - [ ] Transportation Projects
    Nesamani Kalandiyur
  - [ ] Industrial/Energy Projects
    Mike Tollstrup
- [x] **State Water Resources Control Board**
  Regional Programs Unit
  Division of Financial Assistance
- [x] **State Water Resources Control Board**
  Cindy Forbes – Asst Deputy
  Division of Drinking Water
- [x] **State Water Resources Control Board**
  Div. Drinking Water # 6
- [ ] **State Water Resources Control Board**
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [ ] **State Water Resouces Control Board**
  Phil Crader
  Division of Water Rights
- [ ] **Dept. of Toxic Substances Control**
  CEQA Tracking Center
- [ ] **Department of Pesticide Regulation**
  CEQA Coordinator

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1**
  Cathleen Hudson
  North Coast Region (1)
- [ ] **RWQCB 2**
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] **RWQCB 3**
  Central Coast Region (3)
- [x] **RWQCB 4**
  Teresa Rodgers
  Los Angeles Region (4)
- [ ] **RWQCB 5S**
  Central Valley Region (5)
  - [ ] **RWQCB 5F**
    Central Valley Region (5)
    Fresno Branch Office
  - [ ] **RWQCB 5R**
    Central Valley Region (5)
    Redding Branch Office
- [ ] **RWQCB 6**
  Lahontan Region (6)
  - [ ] **RWQCB 6V**
    Lahontan Region (6)
    Victorville Branch Office
- [ ] **RWQCB 7**
  Colorado River Basin Region (7)
- [ ] **RWQCB 8**
  Santa Ana Region (8)
- [ ] **RWQCB 9**
  San Diego Region (9)

- [ ] **Other** _____
- [ ] _____
  Conservancy

Last Updated 4/25/2016

2016071078

Governor's Office of Planning & Research

JUL 26 2016
after 1p.m.
STATE CLEARINGHOUSE

NOTICE OF PREPARATION

PROGRAMMATIC ENVIRONMENTAL IMPACT REPORT
CITY OF OXNARD PUBLIC WORKS INTEGRATED MASTER PLAN

Pursuant to the California Environmental Quality Act (CEQA), the City of Oxnard (City) plans to prepare a Programmatic Environmental Impact Report (PEIR) on its Public Works Integrated Master Plan (PWIMP, Project, and/or Proposed Project). The City will be the lead agency under CEQA. In addition, the City is seeking grant and loan funds from the State Revolving Fund (SRF) Loan Program that is administered by the State Water Resources Control Board (State Board) on behalf of the U.S. Environmental Protection Agency (USEPA). As a result, if the Proposed Project is to receive funds under the State Board's SRF Program, the State Board will be responsible, on behalf of the USEPA, for ensuring that the project adheres to federal environmental regulations, including the Endangered Species Act, the National Historic Preservation Act (NHPA) and the General Conformity Rule for the Clean Air Act (CAA), among others. The USEPA has chosen to use the CEQA as the compliance base for California's SRF Loan Program, in addition to compliance with ESA, NHPA, and CAA. Collectively, the State Board calls these requirements CEQA-Plus. As such, this PEIR is intended to be prepared to CEQA-Plus Standards in order to aid in the City's pursuit of obtaining SRF funds.

Project Location and Background

The City is located along the Pacific Ocean coastline in Southern California, just northwest of Los Angeles. 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 its nearly 200,000 citizens and numerous industrial and commercial users.

The City's Public Works Department oversees the water, wastewater, recycled water, and stormwater utilities throughout the City and faces many challenges in managing these four utilities and its future water resources. These challenges include identifying the best response to immediate drought conditions while planning for long-term water needs, reducing dependence on 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 managing the ongoing loss of seasoned staff and personnel.

Given the City's challenges and opportunities to meet them, the PWIMP develops long-term recommendations for policies, programs, and goals that successfully address the challenges and opportunities in a holistic and integrated way. Opportunities to meet these challenges range from institutional and non-structural approaches (policies and programs) to technical and structural approaches (capital projects). The PWIMP will help the City respond to planned population increase, challenges from new regulatory requirements, drought conditions, aging infrastructure, and reliability concerns. In addition, the PWIMP 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 resources management.

Proposed Project Description

A comprehensive summary of the City's PWIMP is located on the City's website at

www.oxnard.org. The purpose of the PWIMP is to provide a central planning document to guide improvements to the City's water infrastructure through the planning horizon (2040). Specifically, the PWIMP addresses future planning needs including infrastructure additions and upgrades for City's water, wastewater, recycled water, and stormwater utilities. The PWIMP builds upon previous planning efforts using a coordinated methodology, which will allow the City to take full advantage of potential linkages and synergies between the four water utility systems. In addition, the PWIMP is also coordinated with a streets plan in an attempt to allow timing of future streets upgrades to be tied together with infrastructure upgrades.

Scope and Contents of the EIR

As part of the environmental review process, the City would like to know the views of you and/or your agency as to the scope and content of the environmental information, which is germane to your interests or your agency's statutory responsibilities in connection with the Proposed Project. If you are representing an agency, your agency may need to use this PEIR when considering your permit authority or approval of the Proposed Project. Whether you are a public agency, stakeholder, rate payer, adjacent landowner, and/or interested member(s) of the general public, you are encouraged to help participate in the preparation of the PEIR by attending the scoping meetings and/or providing written comments as further discussed below.

Scoping Meetings. Two scoping meetings will be conducted to seek public and agency input on alternatives, environmental issues and concerns to be addressed in the PEIR. The schedule and location of the scoping meetings are as follows:

Date:	August 24, 2016
Time:	2:00pm to 3pm and again from 7:00pm to 8pm
Location:	City of Oxnard H.R. Activity Room 300 West Third Street Oxnard, CA 93030

Written Comments. In addition to the opportunity to provide input during the scoping meetings, written comments on the scope, content, alternatives, and the environmental issues to be addressed in the EIR are also encouraged. Due to the time limits mandated by state law, your written response needs to be received by **September 2, 2016**. Please send your written comments to:

Steve Brown
SMB Environmental, Inc.
P.O. Box 381
Roseville, CA 95661

Please make sure that you provide your name, agency you are representing, title, as well as your address and phone number so that we can contact you and keep you informed throughout the PEIR/CEQA process. If you should have any questions or need additional information, please call Steve Brown at 916-517-2189.

Governor's Office of Planning & Re...
JUL 2...
STATE C...

City of Oxnard
Public Works Integrated Master Plan

Scoping Meeting
Programmatic Environmental Impact Report

August 24, 2016

Welcome

* Purpose of the Scoping Meeting
  * To provide information on the EIR Process
  * To give you a brief overview of the project
  * To get your input on the SCOPE OF THE EIR
    * To get your feedback on the list of topics to be analyzed in the EIR
    * To get your feedback on the alternatives to be analyzed in the EIR
* Additional meetings Will Be Held Once a Draft EIR is Prepared

Agenda

* Introductions
* Format for Today's Meeting
* Overview of the CEQA Process
* Overview of the Proposed Project
  * Goals and Objectives
  * Project Description Summary
* Preliminary Scope of the EIR
* Public Input on the Scope of the EIR
* Adjournment

Format for Today's Meeting

* Please make sure that you have signed in
* We will provide a 15-20 minute overview and then turn over the meeting to you to hear your comments, issues and/or concerns
* Please fill out Speaker Card if you wish to make any verbal comments tonight
* Please keep your comments focused on the pertinent aspects of the Proposed Project
  * Proposed Project Description
  * Environmental Analysis
  * Suggested Alternatives
* We are hear to listen to your comments, issues, concerns and/or suggestions

Overview of the CEQA/EIR Process

* An Informational Document Designed to Inform the Public and Decision-makers About Potential Environmental Impacts of a Project
* A Problem Solving Document That Identifies Ways to Avoid or Lessen Impacts:
  * Mitigation Measures
  * Alternatives
* Environmental Impacts Are Just One of the Factors Considered by the Decision-Makers When Deciding Whether or Not to Approve a Project

Role of the EIR Consultant

* To work with City staff to prepare a technical document that analyzes the environmental impacts of the project, identifies ways to lessen impacts, and which clarifies the environmental issues and choices
* The EIR Consultant is not an advocate for a particular decision

Our Goal

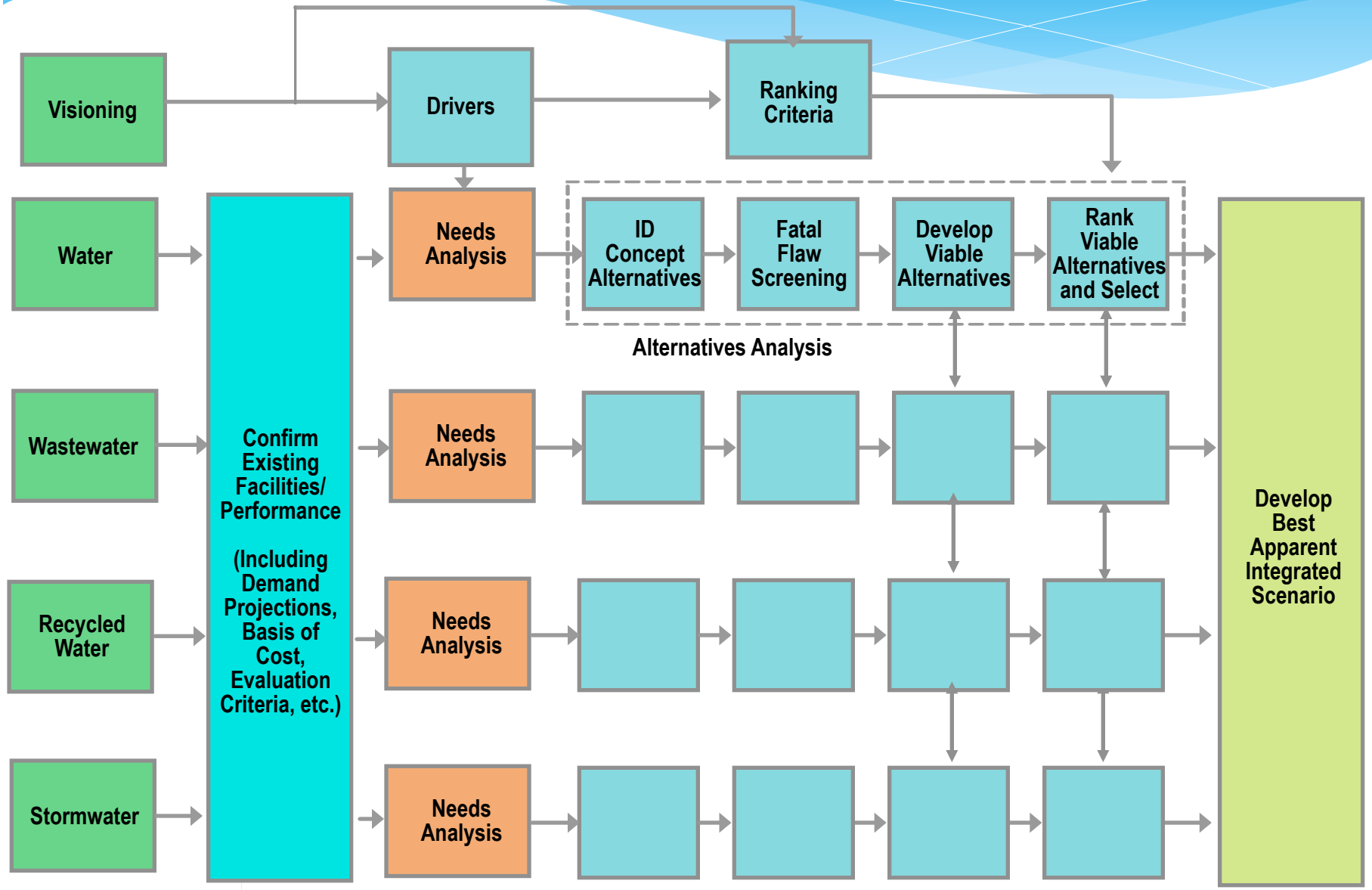
* To produce and EIR which accurately assesses the potential impacts of the project;
* Identifies mitigation measures, to reduce impacts;
* Identifies impact-reducing alternatives;
* Addresses community comments and concerns;
* And, provides the City's decision-makers with the information necessary to understand the environmental consequences of the project, and the environmental trade-offs associated with the project and the alternatives.

Project Description Overview

Goals and Objectives of the Proposed Project

* The purpose of the PWIMP is to provide a central planning document to guide improvements to the City's water infrastructure through the planning horizon (2040)
  * Addresses future planning needs including infrastructure additions and upgrades for City's utilities
    * Water
    * Wastewater
    * Recycled water
    * Stormwater

Master Planning Process Overview



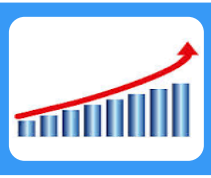
Plan Drivers

Regulatory

- Meet/Exceed Regulatory Requirements

Repair/Rehabilitate (Condition)

- To assure reliable performance and extend useful life



Growth

- Provide capacity for new users

Performance

- Reduce life-cycle cost and increase reliability

Resource Sustainability

- Energy initiatives, resource recovery, sustainable design

Goals and Objectives

- Provide compliant, reliable, resilient, and flexible systems
- Integrate grey and green infrastructure, emphasizing energy efficiency
- Manage assets effectively (economic sustainability)
- Integrate community interests and develop communication processes
- Mitigate impacts of climate change
- Protect environmental resources
- Enhance environmental sustainability

Water System

Water: Improvement Overview

Regulatory

Repair/Rehabilitate (Condition)

- Cathodic protection
- Select water main replacement due to age and fire flow needs
- Routine maintenance on blend stations
- Automatic meter reader devices
- Security needs

Growth

- New potable wells
- Upgraded pipelines to meet projected demand
- Pressure zone separation

Performance

- Electrical rehabilitation
- Generator and ATS service
- Turnout service
- **Additional desalting capacity to improve water quality**
- **Pressure zone separation**

Resource Sustainability

Water: Improvement Overview

Main Water Drivers

Regulatory

Repair/Rehabilitate (Condition)

- Cathodic protection
- Select water main replacement due to age and fire flow needs
- Routine maintenance on blend stations
- Automatic meter reader devices
- Security needs

Growth

- New potable wells
- Upgraded pipelines to meet projected demand
- Pressure zone separation

Performance

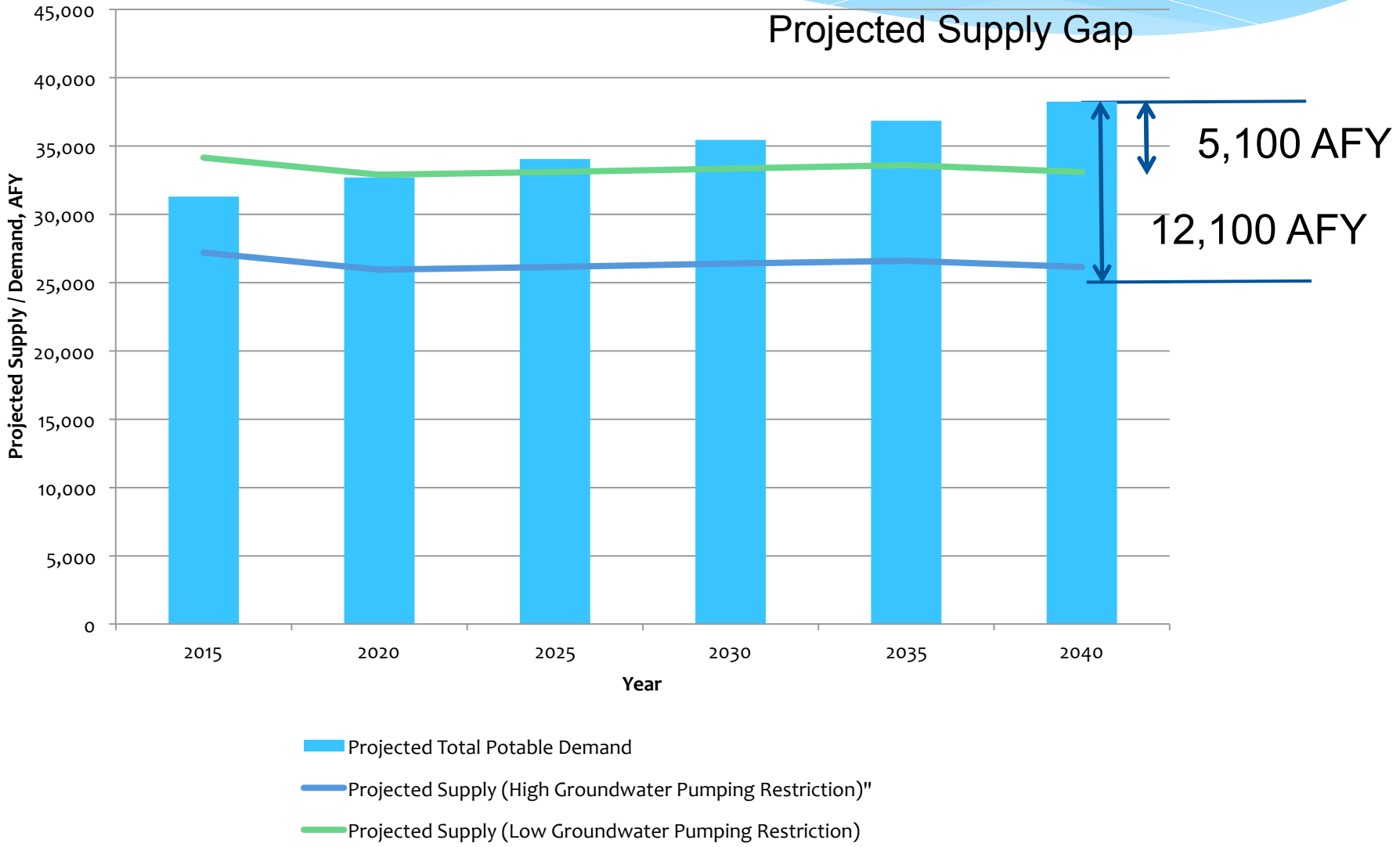
- Electrical rehabilitation
- Generator and ATS service
- Turnout service
- **Additional desalting capacity to improve water quality**
- **Pressure zone separation**

Resource Sustainability

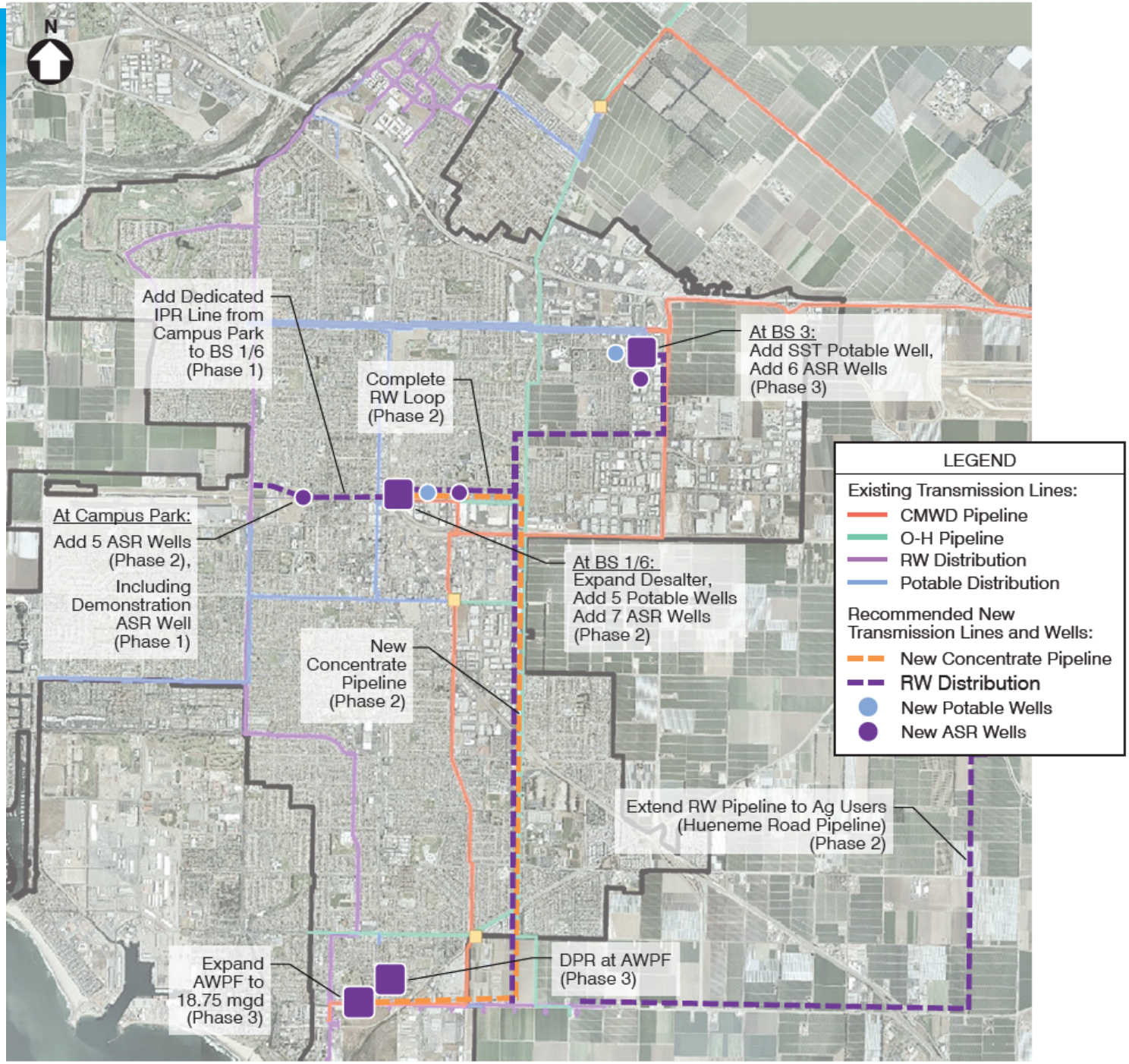
Water Quality Concerns

* Groundwater supplies water with a high level of hardness
* Due to this many customers run their own softeners, which increases salt concentration entering the WWTP and AWPF
* Target hardness level of 100 mg/L

Water Supply and Demand Forecast



Water Supply Facilities



Recycled Water System

Recycled Water: Improvement Overview

Regulatory

Repair/Rehabilitate (Condition)

- Minor improvements to the advanced water purification facility

Growth

- Expansion of the AWPF
- Addition of aquifer storage and recovery wells
- Addition of recycled water distribution force mains

Performance

- Addition of diurnal storage and booster pumping

Resource Sustainability

Recycled Water: Improvement Overview

Main Recycled Water Drivers

Regulatory

Repair/Rehabilitate (Condition)

- Minor improvements to the advanced water purification facility

Growth

- Expansion of the AWPF
- Addition of aquifer storage and recovery wells
- Addition of recycled water distribution force mains

Performance

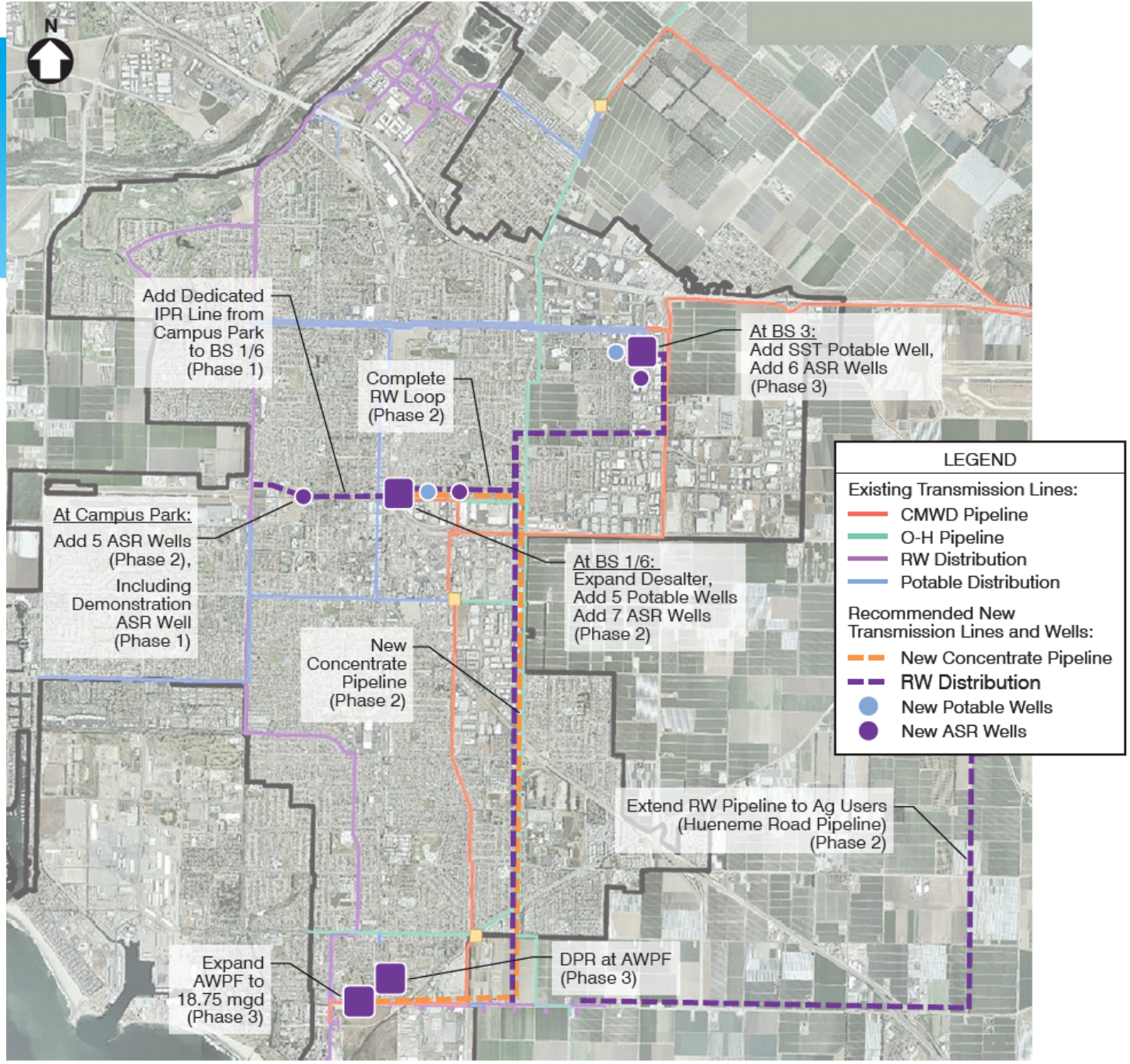
- Addition of diurnal storage and booster pumping

Resource Sustainability

Key Component of Water Supply Reliability is Indirect Potable Reuse (IPR)

* Three components to the recycled water system expansion:
  * Treatment
    * Expansion of the AWPF
    * Eventual DPR (possibly)
  * Recycled Water Distribution
    * Recycled water loop
    * Hueneme Pipeline
  * Indirect Potable Reuse
    * ASR demo well
    * Additional ASR wells

Recycled Water Supply



Wastewater System

Wastewater: Improvement Overview

Regulatory

- Potential addition of nitrification/denitrification

Repair/Rehabilitate (Condition)

- Repair/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

Growth

- Solids process expansion
- Expansion of select sewer pipelines

Performance

- Biotower removal
- Interstage pumping reconfiguration

Resource Sustainability

- Blower and cogeneration replacement
- FOG receiving station
- Solar cells
- Membrane bioreactor (MBR)
- UV/AOP
- Seawall

Wastewater: Improvement Overview

Main Wastewater Drivers

Regulatory

- Potential addition of nitrification/denitrification

Repair/Rehabilitate (Condition)

- Repair/replacement needed on almost every treatment plant process
- Seismic/structural upgrades needed on several facilities
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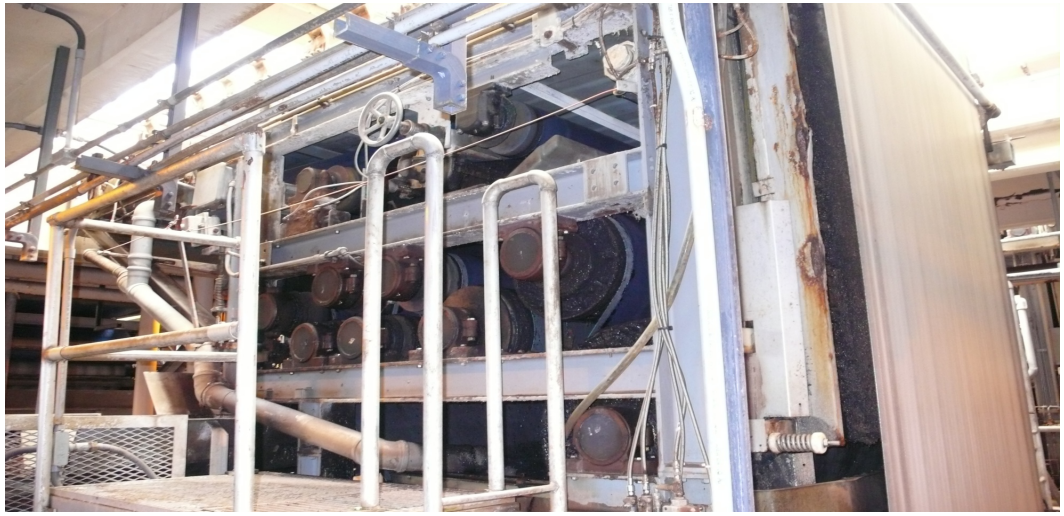
- Interstage pumping reconfiguration

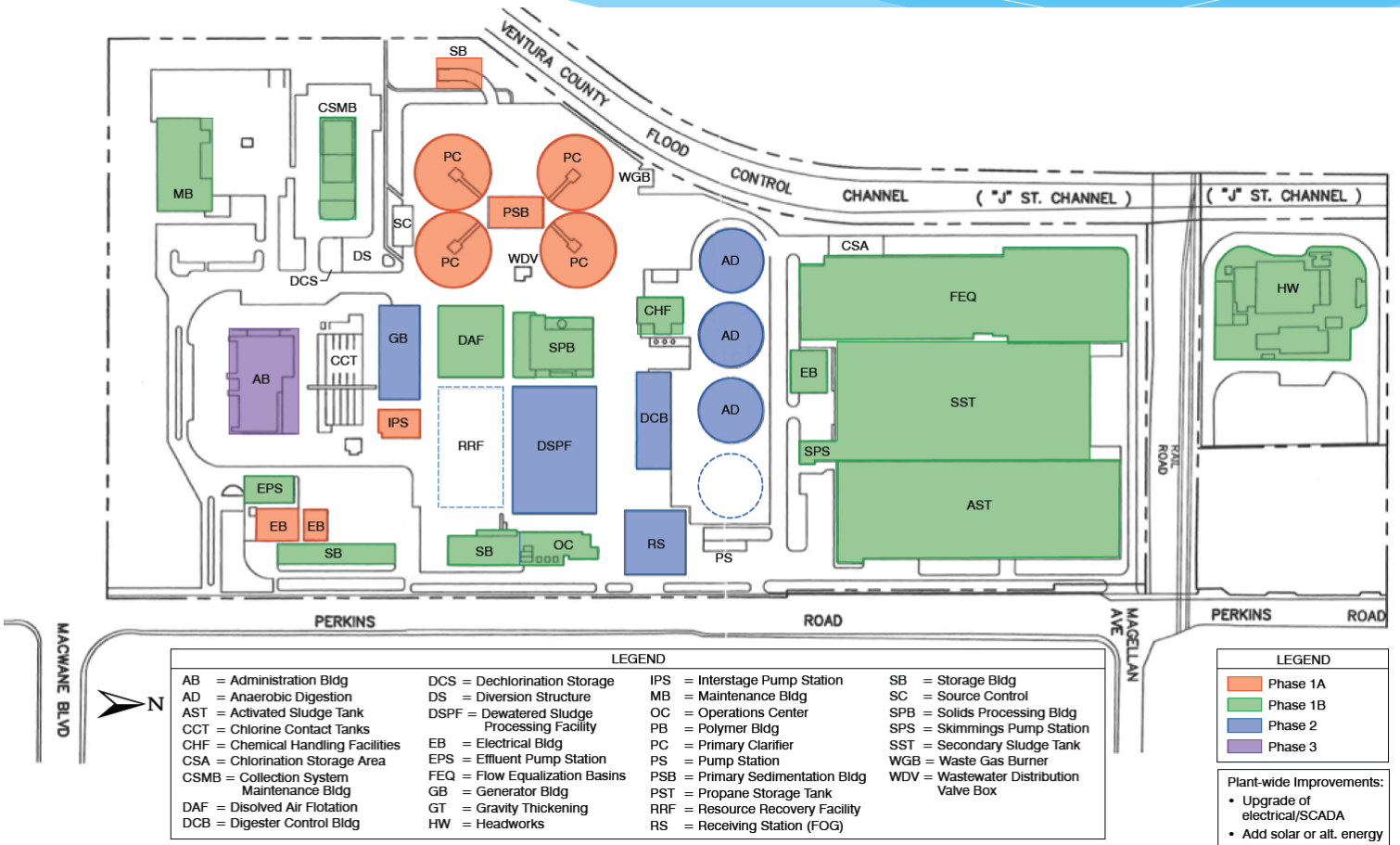
Resource Sustainability

- Blower and cogeneration replacement
- FOG receiving station
- Solar cells
- Membrane bioreactor (MBR)
- UV/AOP
- Seawall

Poor Condition of Existing Infrastructure



Implementation Schedule



LEGEND

AB = Administration Bldg	DCS = Dechlorination Storage	IPS = Interstage Pump Station	SB = Storage Bldg
AD = Anaerobic Digestion	DS = Diversion Structure	MB = Maintenance Bldg	SC = Source Control
AST = Activated Sludge Tank	DSPF = Dewatered Sludge Processing Facility	OC = Operations Center	SPB = Solids Processing Bldg
CCT = Chlorine Contact Tanks	EB = Electrical Bldg	PB = Polymer Bldg	SPS = Skimmings Pump Station
CHF = Chemical Handling Facilities	EPS = Effluent Pump Station	PC = Primary Clarifier	SST = Secondary Sludge Tank
CSA = Chlorination Storage Area	FEQ = Flow Equalization Basins	PS = Pump Station	WGB = Waste Gas Burner
CSMB = Collection System Maintenance Bldg	GB = Generator Bldg	PSB = Primary Sedimentation Bldg	WDV = Wastewater Distribution Valve Box
DAF = Disolved Air Flotation	GT = Gravity Thickening	PST = Propane Storage Tank	
DCB = Digester Control Bldg	HW = Headworks	RRF = Resource Recovery Facility	
		RS = Receiving Station (FOG)	

LEGEND
- Phase 1A
- Phase 1B
- Phase 2
- Phase 3

Plant-wide Improvements:
- Upgrade of electrical/SCADA
- Add solar or alt. energy
- Potential Additonal of Seawall

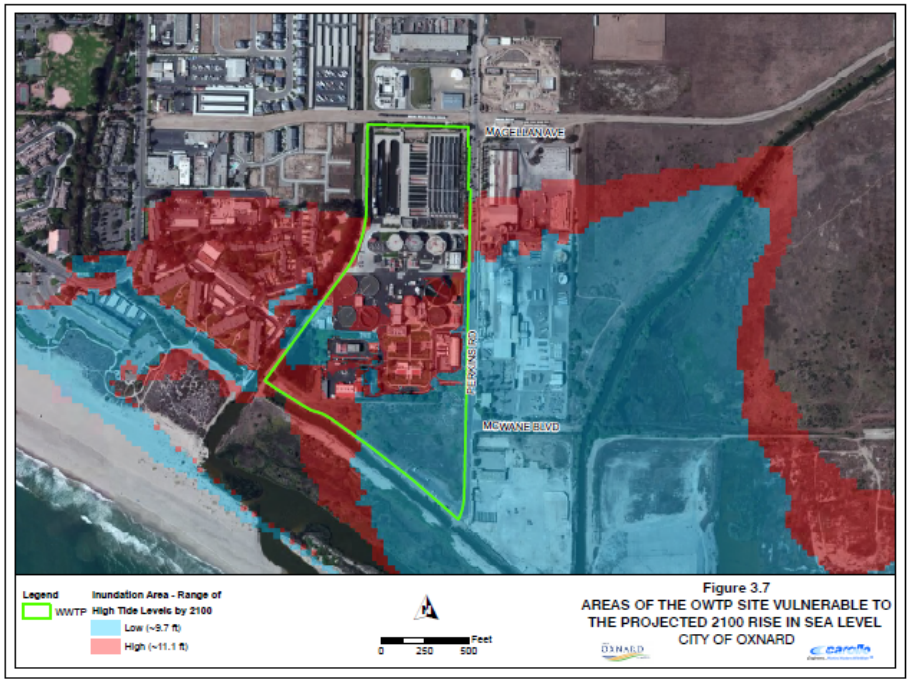
Note: Some facilities require work in multiple phases. The phase indicated here is when the majority of the work is planned.

2 Options For Wastewater Improvements:

Since most of the WWTP needs replacement or major repair…

* Traditional Plant Upgrades

* New "Green Field" Site



New "Green Field" Plant

* There is a potentially large impact from climate change and sea level rise at the WWTP
* Instead of investing in new facilities at the existing location, move the plant to higher ground
* Only invest in Immediate Needs Projects at existing plant
* Phased move of existing plant to a nearby site
  * New plant would be conventional activated sludge

Stormwater System

Stormwater: Improvement Overview

Regulatory

- Infiltration basin to meet TMDL allocation for indicator bacteria

Repair/Rehabilitate (Condition)

- Select stormwater pipeline/culvert replacement due to age and condition

Growth

- 13 projects to reduce surcharging and flooding

Performance

Resource Sustainability

- Dry weather stormwater diversion
- Incentive program to encourage using stormwater as an offset to potable use

Stormwater: Improvement Overview

Main Stormwater Drivers

Regulatory

- Infiltration basin to meet TMDL allocation for indicator bacteria

Repair/Rehabilitate (Condition)

- Select stormwater pipeline/culvert replacement due to age and condition

Growth

- 13 projects to reduce surcharging and flooding

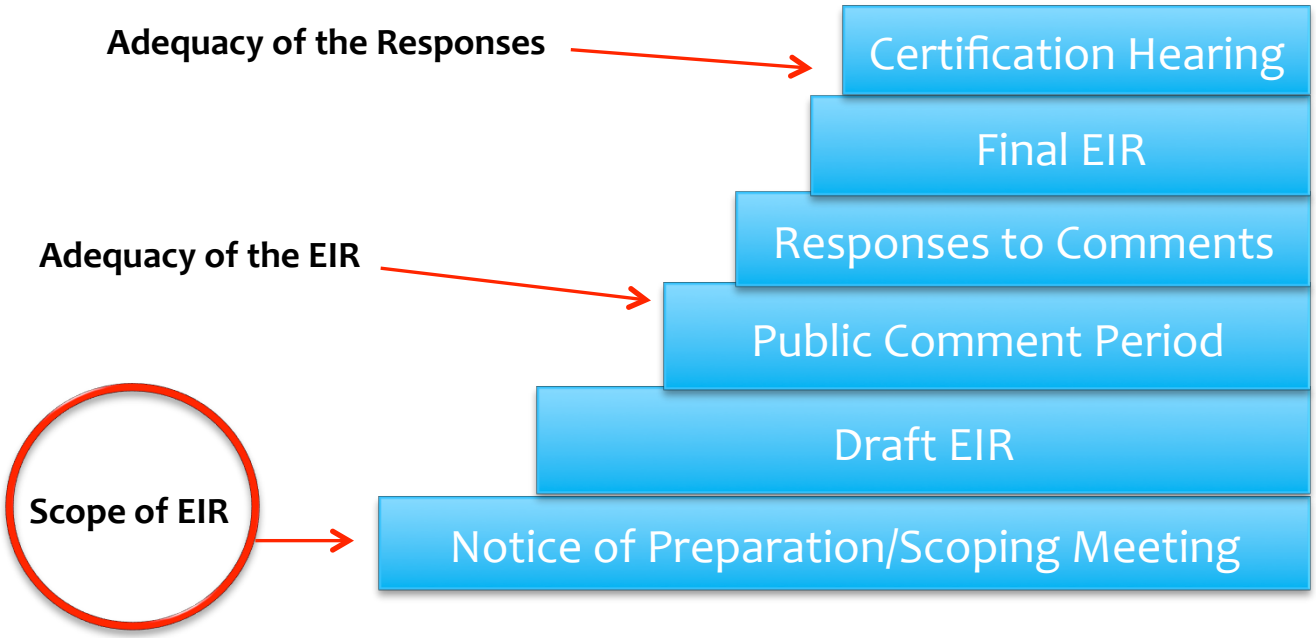
Performance

Resource Sustainability

- Dry weather stormwater diversion
- Incentive program to encourage using stormwater as an offset to potable use

Preliminary Scope of the EIR

Steps in the EIR Process and Opportunities for Input



Key Elements of an EIR

* Executive Summary
* Project Description
* Environmental Impact Analysis
  * Existing Environmental Setting
  * Thresholds of Significance
  * Project Impacts
  * Cumulative Impacts
  * Mitigation Measures
  * Level of Significance after Mitigation
* Alternatives

Environmental Resources to be Evaluated

- ☒ Aesthetics
- ☒ Agriculture Resources
- ☒ Air Quality
- ☒ Biological Resources
- ☒ Cultural Resources
- ☒ Geology / Soils
- ☒ Hazards/Hazardous Materials
- ☒ Hydrology / Water Quality
- ☒ Land Use / Planning
- ☒ Mineral Resources
- ☒ Noise
- ☒ Public Services
- ☒ Population and Housing
- ☒ Recreation
- ☒ Socioeconomics
- ☒ Transportation/Traffic
- ☒ Utilities and Service Systems
- ☒ Mandatory Findings of Significance

Alternatives to be Evaluated

* Proposed Project
* No Project Alternative
* Possible Alternatives
  * Alternative Locations and Configurations
  * Seeking input from the Public for additional Alternatives

Draft EIR Schedule*

Scoping Comments Due	**September 2, 2016**
Public Draft EIR Available	February 2017*
Public Hearing/Meeting	March 2017*
45-day Public Review Ends	April 2017*
Evaluation/Response to Comments	May 2017*
Final EIR	August 2017*
Decision on Project	September 2017*

* Schedule is subject to change

Written Comments

* Written response needs to be received by **September 2, 2016.** Please send your written comments to

Steve Brown
SMB Environmental, Inc.
P.O. Box 381
Roseville, CA 95661

For more information, please call:
Steve Brown at 916-517-2189

Open to Public Comments

* Please keep your comments focused on the EIR document and/or the Proposed Project
  * Proposed Project Description
  * Environmental Analysis
  * Suggested Alternatives
* We are here to Listen to your Comments, Issues and/or Concerns

No Public Comments Were Received

Appendix C

Biological Resources Special Status Species List

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Oxnard (3411922))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Anniella stebbinsi southern California legless lizard	ARACC01060	None	None	G3	S3	SSC
Astragalus pycnostachyus var. lanosissimus Ventura Marsh milk-vetch	PDFAB0F7B1	Endangered	Endangered	G2T1	S1	1B.1
Athene cunicularia burrowing owl	ABNSB10010	None	None	G4	S3	SSC
Atriplex serenana var. davidsonii Davidson's saltscale	PDCHE041T1	None	None	G5T1	S1	1B.2
Bombus crotchii Crotch bumble bee	IIHYM24480	None	None	G3G4	S1S2	
Catostomus santaanae Santa Ana sucker	AFCJC02190	Threatened	None	G1	S1	
Charadrius alexandrinus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S2S3	SSC
Chloropyron maritimum ssp. maritimum salt marsh bird's-beak	PDSCR0J0C2	Endangered	Endangered	G4?T1	S1	1B.2
Cicindela hirticollis gravida sandy beach tiger beetle	IICOL02101	None	None	G5T2	S2	
Coastal and Valley Freshwater Marsh Coastal and Valley Freshwater Marsh	CTT52410CA	None	None	G3	S2.1	
Coccyzus americanus occidentalis western yellow-billed cuckoo	ABNRB02022	Threatened	Endangered	G5T2T3	S1	
Coelus globosus globose dune beetle	IICOL4A010	None	None	G1G2	S1S2	
Danaus plexippus pop. 1 monarch - California overwintering population	IILEPP2012	None	None	G4T2T3	S2S3	
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Eucyclogobius newberryi tidewater goby	AFCQN04010	Endangered	None	G3	S3	SSC
Lasthenia glabrata ssp. coulteri Coulter's goldfields	PDAST5L0A1	None	None	G4T2	S2	1B.1
Laterallus jamaicensis coturniculus California black rail	ABNME03041	None	Threatened	G3G4T1	S1	FP
Malacothrix similis Mexican malacothrix	PDAST660D0	None	None	G2G3	SH	2A
Passerculus sandwichensis beldingi Belding's savannah sparrow	ABPBX99015	None	Endangered	G5T3	S3	
Phrynosoma blainvillii coast horned lizard	ARACF12100	None	None	G3G4	S3S4	SSC

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Pseudognaphalium leucocephalum white rabbit-tobacco	PDAST440C0	None	None	G4	S2	2B.2
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S2	
Southern Coastal Salt Marsh Southern Coastal Salt Marsh	CTT52120CA	None	None	G2	S2.1	
Southern Riparian Scrub Southern Riparian Scrub	CTT63300CA	None	None	G3	S3.2	
Sternula antillarum browni California least tern	ABNNM08103	Endangered	Endangered	G4T2T3Q	S2	FP
Tryonia imitator mimic tryonia (=California brackishwater snail)	IMGASJ7040	None	None	G2	S2	
Vireo bellii pusillus least Bell's vireo	ABPBW01114	Endangered	Endangered	G5T2	S2	

Record Count: 27

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish And Wildlife Office
2493 Portola Road, Suite B
Ventura, CA 93003-7726
Phone: (805) 644-1766 Fax: (805) 644-3958

In Reply Refer To: February 22, 2018
Consultation Code: 08EVEN00-2018-SLI-0299
Event Code: 08EVEN00-2018-E-00941
Project Name: City of Oxnard - Public Works Integrated Master Plan
Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed list identifies species listed as threatened and endangered, species proposed for listing as threatened or endangered, designated and proposed critical habitat, and species that are candidates for listing that may occur within the boundary of the area you have indicated using the U.S. Fish and Wildlife Service's (Service) Information Planning and Conservation System (IPaC). The species list fulfills the requirements under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the species list should be verified after 90 days. We recommend that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists following the same process you used to receive the enclosed list. Please include the Consultation Tracking Number in the header of this letter with any correspondence about the species list.

Due to staff shortages and excessive workload, we are unable to provide an official list more specific to your area. Numerous other sources of information are available for you to narrow the list to the habitats and conditions of the site in which you are interested. For example, we recommend conducting a biological site assessment or surveys for plants and animals that could help refine the list.

If a Federal agency is involved in the project, that agency has the responsibility to review its proposed activities and determine whether any listed species may be affected. If the project is a major construction project*, the Federal agency has the responsibility to prepare a biological assessment to make a determination of the effects of the action on the listed species or critical habitat. If the Federal agency determines that a listed species or critical habitat is likely to be adversely affected, it should request, in writing through our office, formal consultation pursuant to section 7 of the Act. Informal consultation may be used to exchange information and resolve conflicts with respect to threatened or endangered species or their critical habitat prior to a

written request for formal consultation. During this review process, the Federal agency may engage in planning efforts but may not make any irreversible commitment of resources. Such a commitment could constitute a violation of section 7(d) of the Act.

Federal agencies are required to confer with the Service, pursuant to section 7(a)(4) of the Act, when an agency action is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat (50 CFR 402.10(a)). A request for formal conference must be in writing and should include the same information that would be provided for a request for formal consultation. Conferences can also include discussions between the Service and the Federal agency to identify and resolve potential conflicts between an action and proposed species or proposed critical habitat early in the decision-making process. The Service recommends ways to minimize or avoid adverse effects of the action. These recommendations are advisory because the jeopardy prohibition of section 7(a)(2) of the Act does not apply until the species is listed or the proposed critical habitat is designated. The conference process fulfills the need to inform Federal agencies of possible steps that an agency might take at an early stage to adjust its actions to avoid jeopardizing a proposed species.

When a proposed species or proposed critical habitat may be affected by an action, the lead Federal agency may elect to enter into formal conference with the Service even if the action is not likely to jeopardize or result in the destruction or adverse modification of proposed critical habitat. If the proposed species is listed or the proposed critical habitat is designated after completion of the conference, the Federal agency may ask the Service, in writing, to confirm the conference as a formal consultation. If the Service reviews the proposed action and finds that no significant changes in the action as planned or in the information used during the conference have occurred, the Service will confirm the conference as a formal consultation on the project and no further section 7 consultation will be necessary. Use of the formal conference process in this manner can prevent delays in the event the proposed species is listed or the proposed critical habitat is designated during project development or implementation.

Candidate species are those species presently under review by the Service for consideration for Federal listing. Candidate species should be considered in the planning process because they may become listed or proposed for listing prior to project completion. Preparation of a biological assessment, as described in section 7(c) of the Act, is not required for candidate species. If early evaluation of your project indicates that it is likely to affect a candidate species, you may wish to request technical assistance from this office.

Only listed species receive protection under the Act. However, sensitive species should be considered in the planning process in the event they become listed or proposed for listing prior to project completion. We recommend that you review information in the California Department of Fish and Wildlife's Natural Diversity Data Base. You can contact the California Department of Fish and Wildlife at (916) 324-3812 for information on other sensitive species that may occur in this area.

[*A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.]

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Ventura Fish And Wildlife Office
2493 Portola Road, Suite B
Ventura, CA 93003-7726
(805) 644-1766

Project Summary

Consultation Code: 08EVEN00-2018-SLI-0299

Event Code: 08EVEN00-2018-E-00941

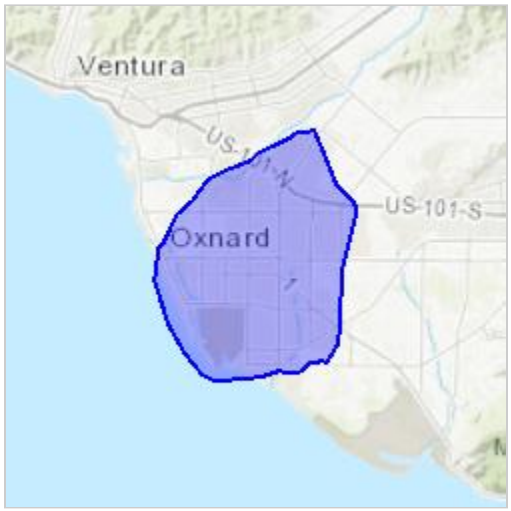
Project Name: City of Ukiah - Public Works Integrated Master Plan

Project Type: WASTEWATER FACILITY

Project Description: Program EIR

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/34.19786864467902N119.19342723788151W



Counties: Ventura, CA

Endangered Species Act Species

There is a total of 17 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Birds

NAME	STATUS
California Condor *Gymnogyps californianus* Population: U.S.A. only, except where listed as an experimental population There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8193	Endangered
California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8104	Endangered
Least Bell's Vireo *Vireo bellii pusillus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5945	Endangered
Light-footed Clapper Rail *Rallus longirostris levipes* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6035	Endangered
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Southwestern Willow Flycatcher *Empidonax traillii extimus* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6749	Endangered
Western Snowy Plover *Charadrius alexandrinus nivosus* Population: Pacific Coast population DPS-U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast) There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8035	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Tidewater Goby *Eucyclogobius newberryi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/57	Endangered

Crustaceans

NAME	STATUS
Riverside Fairy Shrimp *Streptocephalus woottoni* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8148	Endangered
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plants

NAME	STATUS
California Orcutt Grass *Orcuttia californica* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4923	Endangered
Gambel's Watercress *Rorippa gambellii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4201	Endangered
Marsh Sandwort *Arenaria paludicola* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2229	Endangered
Salt Marsh Bird's-beak *Cordylanthus maritimus ssp. maritimus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6447	Endangered
Spreading Navarretia *Navarretia fossalis* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1334	Threatened
Ventura Marsh Milk-vetch *Astragalus pycnostachyus var. lanosissimus* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1160	Endangered

Critical habitats

There are 3 critical habitats wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Southwestern Willow Flycatcher *Empidonax traillii extimus* https://ecos.fws.gov/ecp/species/6749#crithab	Final
Ventura Marsh Milk-vetch *Astragalus pycnostachyus var. lanosissimus* https://ecos.fws.gov/ecp/species/1160#crithab	Final
Western Snowy Plover *Charadrius alexandrinus nivosus* https://ecos.fws.gov/ecp/species/8035#crithab	Final

Appendix D

Native American Correspondence

April 1, 2018

California Native American Heritage Commission
1550 Harbor Blvd, Suite 100
West Sacramento, CA 95691

Subject: **Sacred Land Files and Native American Contact List Request for the City of Oxnard's Proposed Public Works Integrated Master Plan, Ventura County**

To whom it may concern:

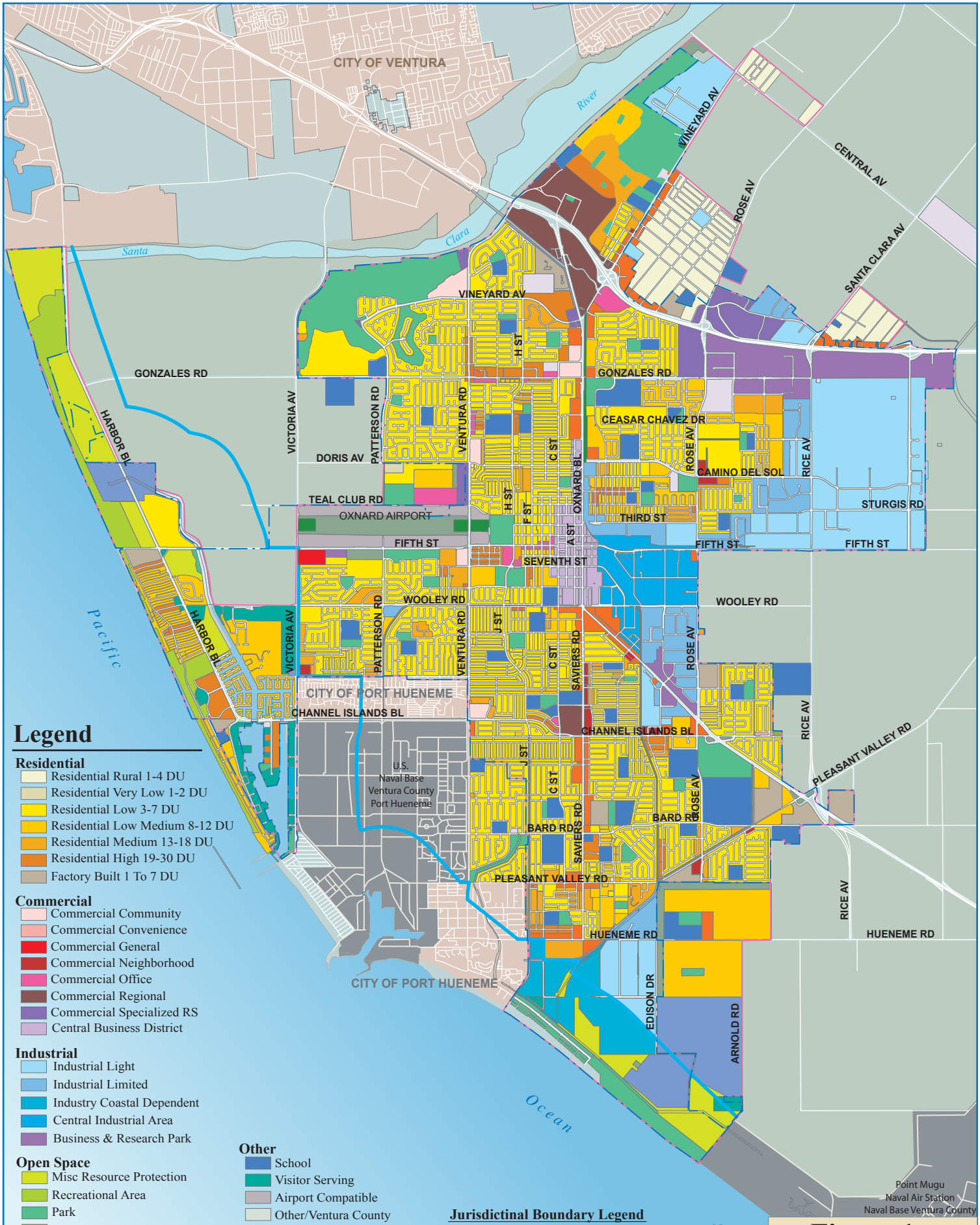
SMB Environmental is assisting the City of Oxnard (City) prepare environmental documentation for its proposed Public Works Integrated Master Plan (PWIMP or Proposed Project). The Proposed Project is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. The Proposed Project is located within the City limits of the City of Oxnard, portions of Ventura County, and on the Oxnard, California USGS 7.5 Minute Topographic Map. Coordinates: 34°11'29"N 119°10'57"W Please also see attached Project Location Map.

For purposes of Section 106 compliance, we would appreciate your checking of the Sacred Lands Files to see if there are any culturally sensitive areas within the immediate project vicinity. We would also like to receive a list of Native American organizations that may have knowledge or interest in the Proposed Project area and we will attempt to contact them to solicit their written input/concerns about the Proposed Project.

Thank you for your cooperation and assistance. I look forward to your earliest possible reply. If any questions, please feel free to contact me at 916-517-2189 or at steve@smbenvironmental.com.

Sincerely,

Steve Brown
Principal



Legend

Residential
- Residential Rural 1-4 DU
- Residential Very Low 1-2 DU
- Residential Low 3-7 DU
- Residential Low Medium 8-12 DU
- Residential Medium 13-18 DU
- Residential High 19-30 DU
- Factory Built 1 To 7 DU

Commercial
- Commercial Community
- Commercial Convenience
- Commercial General
- Commercial Neighborhood
- Commercial Office
- Commercial Regional
- Commercial Specialized RS
- Central Business District

Industrial
- Industrial Light
- Industrial Limited
- Industry Coastal Dependent
- Central Industrial Area
- Business & Research Park

Open Space
- Misc Resource Protection
- Recreational Area
- Park
- Misc Ag/Planning Reserve
- Misc Open Space
- Open Space Buffer
- Misc Agriculture

Other
- School
- Visitor Serving
- Airport Compatible
- Other/Ventura County
- Military Base
- Public Utility/Energy Facility
- Public/Semi Public
- Easement

Jurisdictinal Boundary Legend
- Oxnard City Limits
- Oxnard Sphere of Influence
- Coastal Zone Boundary

N W E S

Figure 1
PWIMP Planning Area

Source: City of Oxnard GIS
Created By: City of Oxnard Planning & Environmental Services, 11-2005

0 1 2 3 4 Miles

NATIVE AMERICAN HERITAGE COMMISSION
Environmental and Cultural Department
1550 Harbor Blvd., ROOM 100
West SACRAMENTO, CA 95691
(916) 373-3710
Fax (916) 373-5471

April 10, 2018

Steve Brown
SMB Environmental

Email to: steve@smbenvironmental.com

RE: Oxnard Proposed Public Works Integrated Master Plan, Ventura County

Dear Mr. Brown,

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were negative. However, the absence of specific site information in the SLF does not preclude the presence of cultural resources in any project area. Other sources for cultural resources should also be contacted for information regarding known and/or recorded sites.

Enclosed is a list of Native Americans tribes who may have knowledge of cultural resources in the project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any of these tribes, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at 916-573-1033 or frank.lienert@nahc.ca.gov.

Sincerely,

Frank Lienert
Associate Governmental Program Analyst

Native American Heritage Commission
Native American Contacts
4/10/2018

Santa Ynez Band of Chumash Indians
Kenneth Kahn. Chairperson
P.O. Box 517 Chumash
Santa Ynez , CA 93460
kkahn@santaynezchumash.org
(805) 688-7997

(805) 686-9578 Fax

Barbareno/Ventureno Band of Mission Indians
Julie Lynn Tumamait-Stenslie. Chair
365 North Poli Ave Chumash
Oiai , CA 93023
itumamait@hotmail.com
(805) 646-6214

Barbareno/Ventureno Band of Mission Indians
Patrick Tumamait
992 El Camino Corto Chumash
Oiai , CA 93023
(805) 216-1253 Cell

Coastal Band of the Chumash Nation
Mia Lopez
, Chumash
No Contact Information
(805) 324-0135

Barbareno/Ventureno Band of Mission Indians
Eleanor Arrellanes
P.O. Box 5687 Chumash
Ventura , CA 93005
(805) 701-3246

Barbareno/Ventureno Band of Mission Indians
Raudel Joe Banuelos. Jr.
331 Mira Flores Court Chumash
Camarillo , CA 93012
(805) 427-0015

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was pr oduced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native American Tribes with regard to cultural resources assessments for the proposed Oxnard Proposed Public Works Integrated Master Plan, Ventura County

Development Services
Planning Division
214 South C Street
Oxnard, California 93030
(805) 385-7858
Fax (805) 385-7417

CITY OF OXNARD CALIFORNIA

April 30, 2018

Santa Ynez Band of Chumash Indians
Kenneth Kahn, Chairperson
P.O. Box 517
Santa Ynez, CA 93460

Subject: **Request for Government-to-Government Consultation under Assembly Bill 52 (AB-52) for the City of Oxnard's Proposed Public Works Integrated Master Plan**

Dear Kenneth Kahn:

The City of Oxnard (City) is requesting a formal government-to-government consultation with your organization to discuss the City's Proposed Public Works Integrated Master Pan (Proposed Project) and the potential that the Proposed Project could have on Tribal Cultural Resources.

The Proposed Project is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. The Proposed Project is located within the City limits of the City of Oxnard, portions of Ventura County, and on the Oxnard, California USGS 7.5 Minute Topographic Map. Coordinates: 34°11′29″N 119°10′57″W . Please also see attached Project Location Map.

Thank you for your cooperation and assistance. I look forward to your earliest possible reply. If we do not receive a request from you (or your organization) within 30 days, we will assume that you do not want to have a formal consultation and agree with our assessment that the Proposed Project would not have any impacts to Tribal Cultural Resources that you are aware of. If you have any questions, please feel free to contact me at (805) 385-8207 or at isidro.figueroa@oxnard.org.

Sincerely,

Isidro Figueroa
Principal Planner

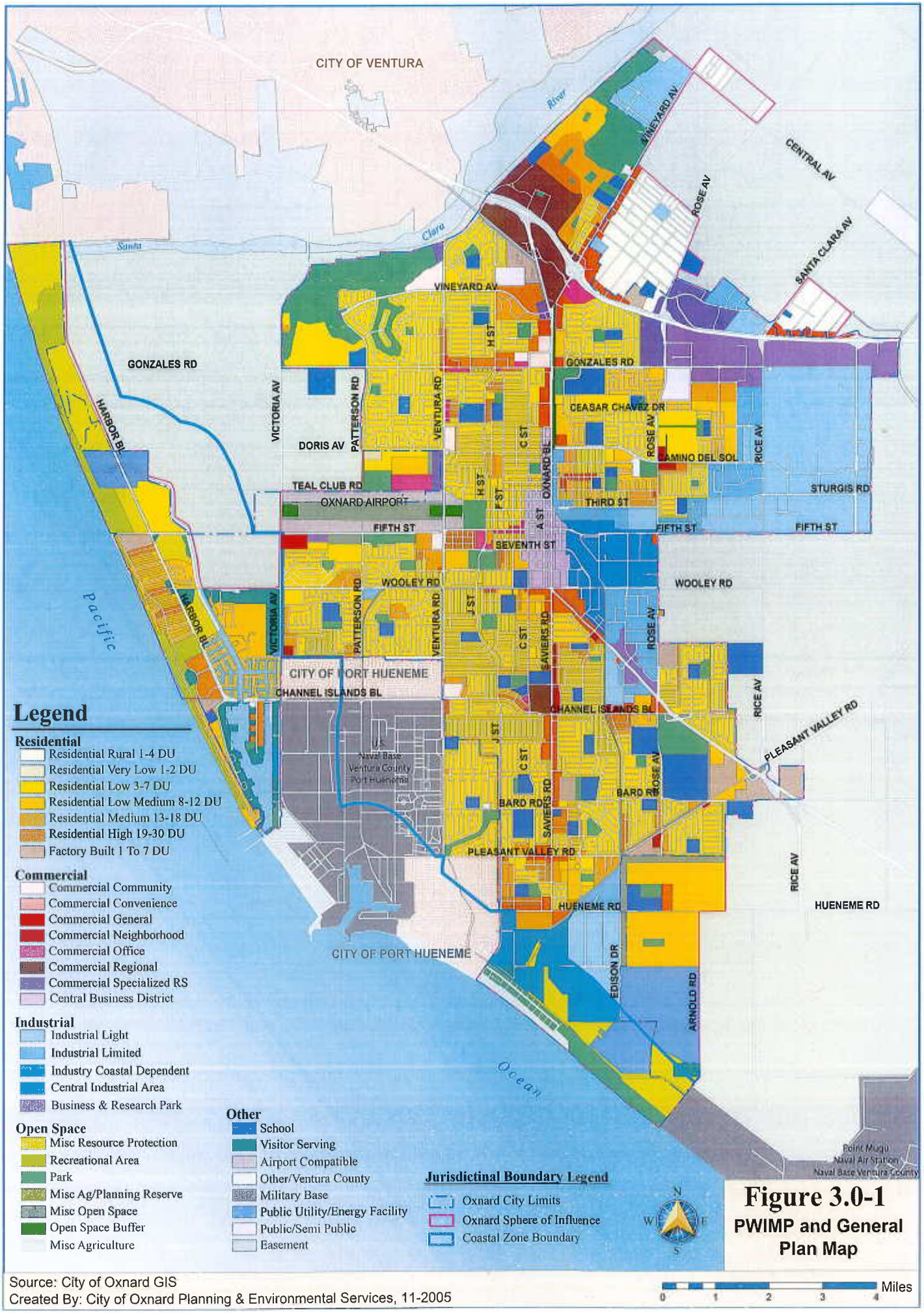


Figure 3.0-1
PWIMP and General Plan Map

Source: City of Oxnard GIS
Created By: City of Oxnard Planning & Environmental Services, 11-2005

Development Services
Planning Division
214 South C Street
Oxnard, California 93030
(805) 385-7858
Fax (805) 385-7417

CITY OF OXNARD CALIFORNIA

April 30, 2018

Barbareno Ventureno Band of Mission Indians
Raudel Joe Banuelos, Jr.
331 Mira Flores Court
Camarillo, CA 93005

Subject: **Request for Government-to-Government Consultation under Assembly Bill 52 (AB-52) for the City of Oxnard's Proposed Public Works Integrated Master Plan**

Dear Raudel Joe Banuelos, Jr.:

The City of Oxnard (City) is requesting a formal government-to-government consultation with your organization to discuss the City's Proposed Public Works Integrated Master Pan (Proposed Project) and the potential that the Proposed Project could have on Tribal Cultural Resources.

The Proposed Project is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. The Proposed Project is located within the City limits of the City of Oxnard, portions of Ventura County, and on the Oxnard, California USGS 7.5 Minute Topographic Map. Coordinates: 34°11′29″N 119°10′57″W . Please also see attached Project Location Map.

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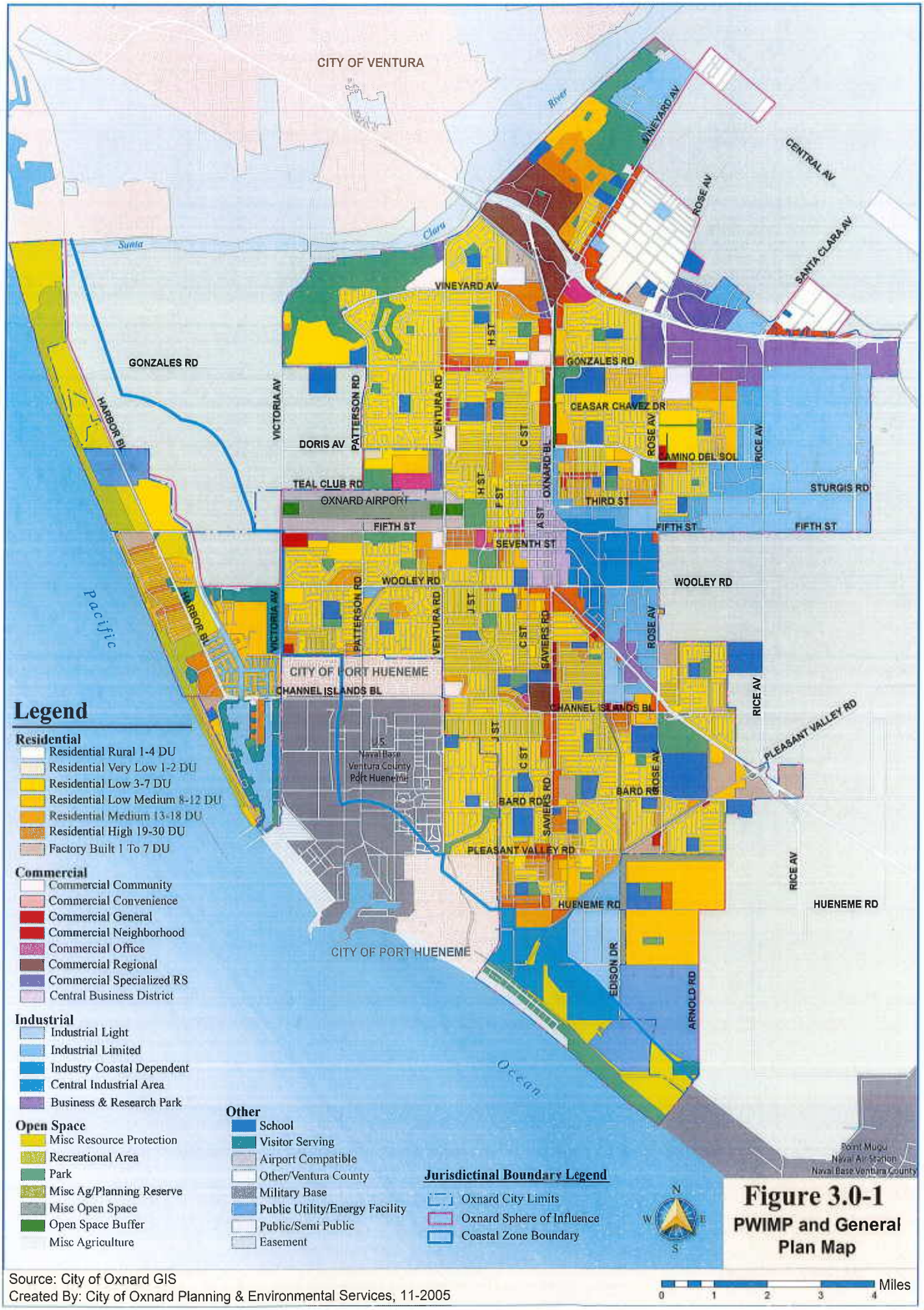
Sincerely,

Isidro Figueroa
Principal Planner


CITY OF VENTURA
River
Santa Clara
VINEYARD AV
CENTRAL AV
ROSE AV
SANTA CLARA AV
GONZALES RD
HARBOR BL
VICTORIA AV
PATTERSON RD
VENTURA RD
H ST
C ST
OXNARD BL
DORIS AV
TEAL CLUB RD
OXNARD AIRPORT
F ST
A ST
FIFTH ST
SEVENTH ST
CEASAR CHAVEZ DR
CAMINO DEL SOL
RICE AV
STURGIS RD
THIRD ST
WOOLEY RD
J ST
SAVIERS RD
CITY OF PORT HUENEME
CHANNEL ISLANDS BL
Naval Base Ventura County Port Hueneme
BARD RD
PLEASANT VALLEY RD
HUENEME RD
EDISON DR
ARNOLD RD
Pacific
Ocean
Point Mugu Naval Air Station Naval Base Ventura County
Legend
Residential
Residential Rural 1-4 DU
Residential Very Low 1-2 DU
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Industry Coastal Dependent
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Business & Research Park
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Recreational Area
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Coastal Zone Boundary
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Figure 3.0-1
PWIMP and General Plan Map
Source: City of Oxnard GIS
Created By: City of Oxnard Planning & Environmental Services, 11-2005
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Development Services
Planning Division
214 South C Street
Oxnard, California 93030
(805) 385-7858
Fax (805) 385-7417

CITY OF OXNARD CALIFORNIA

April 30, 2018

Barbareno Ventureno Band of Mission Indians
Patrick Tumamait-Stenslie
992 El Camino Corto
Ojai, CA 93023

Subject: **Request for Government-to-Government Consultation under Assembly Bill 52 (AB-52) for the City of Oxnard's Proposed Public Works Integrated Master Plan**

Dear Patrick Tumamait-Stenslie:

The City of Oxnard (City) is requesting a formal government-to-government consultation with your organization to discuss the City's Proposed Public Works Integrated Master Pan (Proposed Project) and the potential that the Proposed Project could have on Tribal Cultural Resources.

The Proposed Project is comprised of improvements to the City's Water Supply System, Recycled Water System, Wastewater System, and Stormwater System through build-out of the City's 2030 General Plan. The Proposed Project is located within the City limits of the City of Oxnard, portions of Ventura County, and on the Oxnard, California USGS 7.5 Minute Topographic Map. Coordinates: 34°11'29"N 119°10'57"W . Please also see attached Project Location Map.

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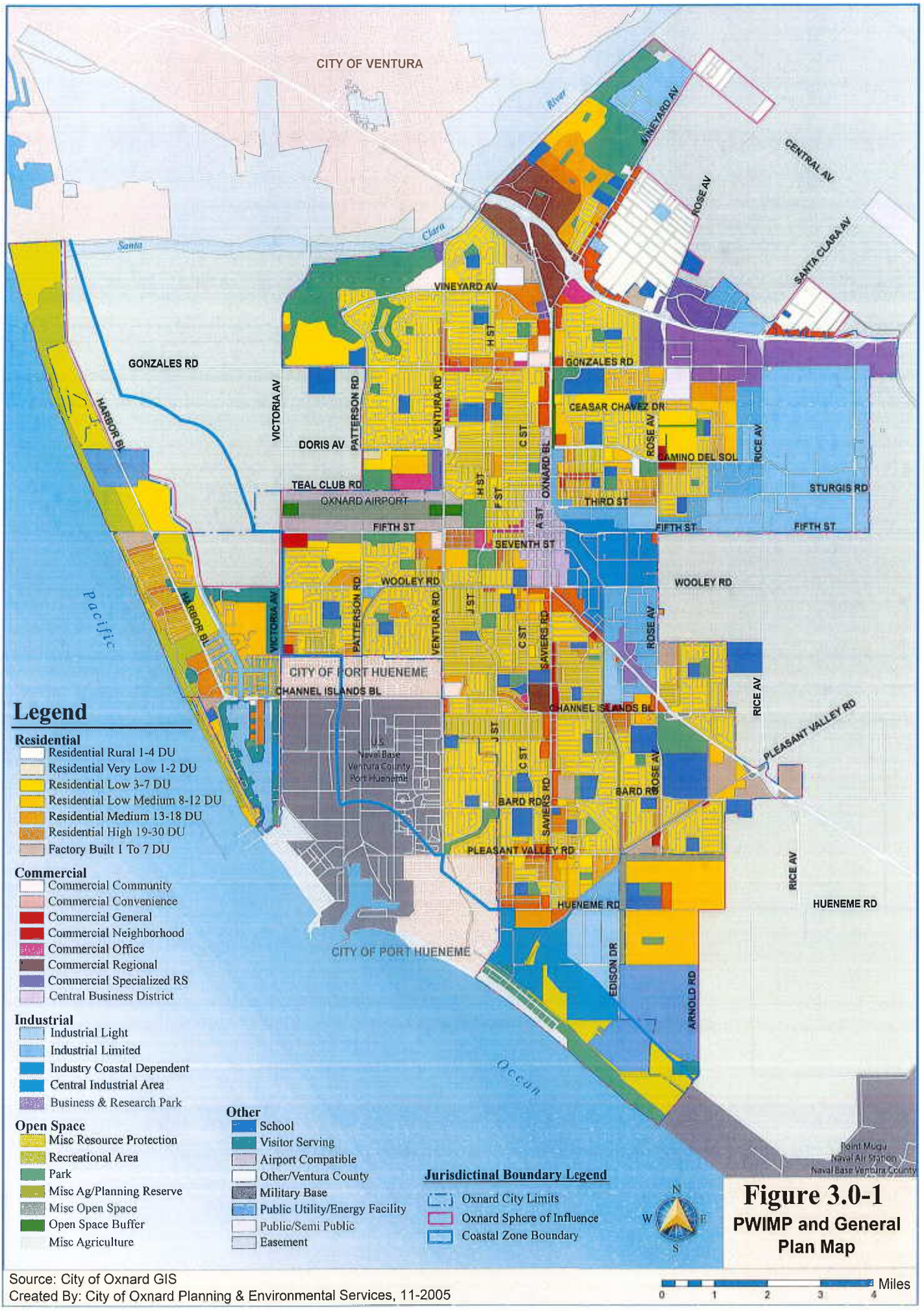
Sincerely,

Isidro Figueroa
Principal Planner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VENTURA RD
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RICE AV
CAMINO DEL SOL
STURGIS RD
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OXNARD AIRPORT
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THIRD ST
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Pacific
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J ST
SAVIERS RD
CITY OF PORT HUENEME
CHANNEL ISLANDS BL
U.S. Naval Base Ventura County Port Hueneme
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PLEASANT VALLEY RD
HUENEME RD
EDISON DR
ARNOLD RD
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Development Services
Planning Division
214 South C Street
Oxnard, California 93030
(805) 385-7858
Fax (805) 385-7417

CITY OF OXNARD CALIFORNIA

April 30, 2018

Barbareno Ventureno Band of Mission Indians
Julie Lynn Tumamait-Stenslie, Chair
365 North Poli Avenue
Ojai, CA 93023

Subject: **Request for Government-to-Government Consultation under Assembly Bill 52 (AB-52) for the City of Oxnard's Proposed Public Works Integrated Master Plan**

Dear Julie Lynn Tumamait-Stenslie:

The City of Oxnard (City) is requesting a formal government-to-government consultation with your organization to discuss the City's Proposed Public Works Integrated Master Pan (Proposed Project) and the potential that the Proposed Project could have on Tribal Cultural Resources.

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Sincerely,

Isidro Figueroa
Principal Planner

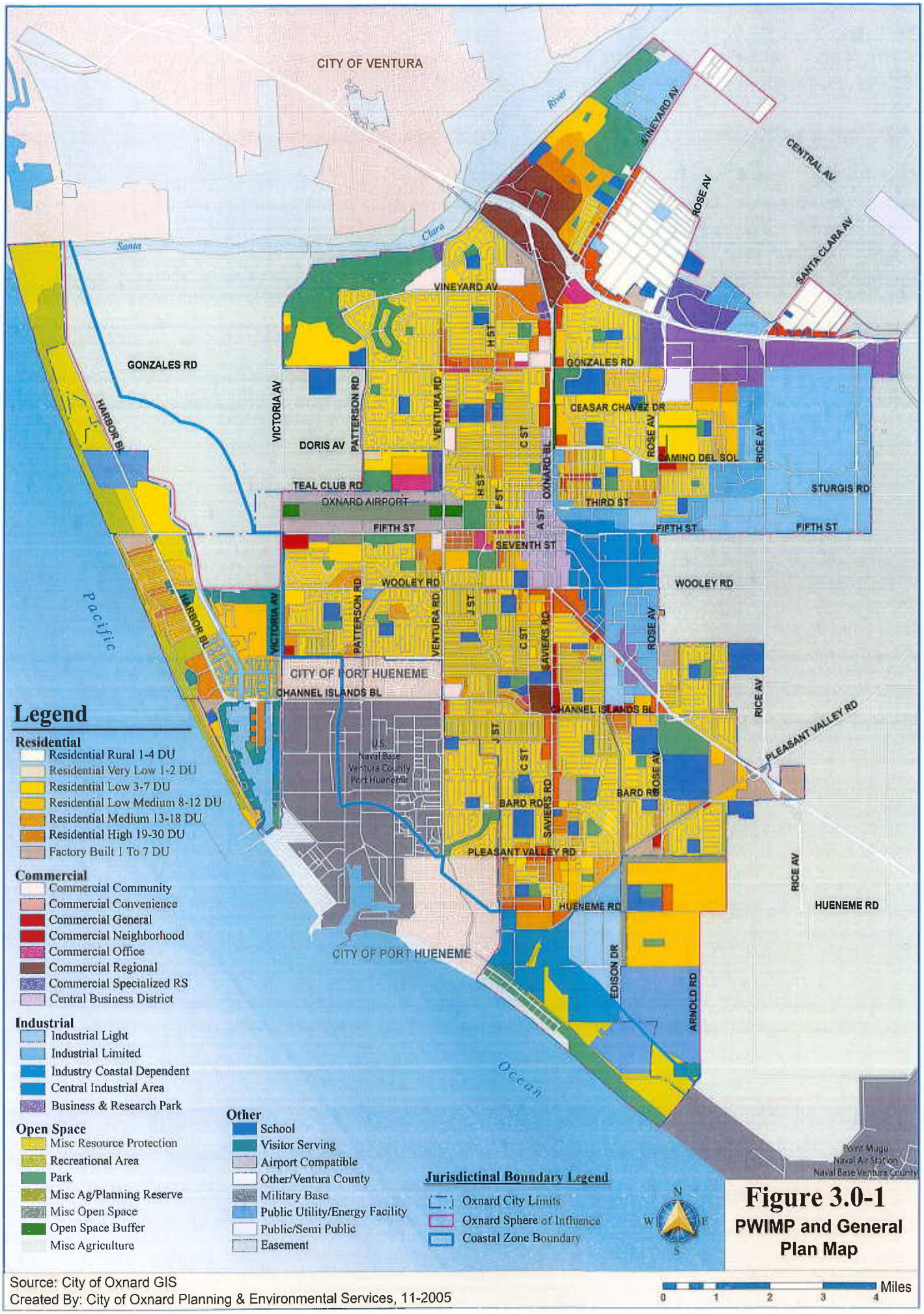

Figure 3.0-1
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Created By: City of Oxnard Planning & Environmental Services, 11-2005

Development Services
Planning Division
214 South C Street
Oxnard, California 93030
(805) 385-7858
Fax (805) 385-7417

CITY OF OXNARD CALIFORNIA

April 30, 2018

Barbareno Ventureno Band of Mission Indians
Eleanor Arrellanes
P.O. Box 5687
Ventura, CA 93005

Subject: **Request for Government-to-Government Consultation under Assembly Bill 52 (AB-52) for the City of Oxnard's Proposed Public Works Integrated Master Plan**

Dear Eleanor Arrellanes:

The City of Oxnard (City) is requesting a formal government-to-government consultation with your organization to discuss the City's Proposed Public Works Integrated Master Pan (Proposed Project) and the potential that the Proposed Project could have on Tribal Cultural Resources.

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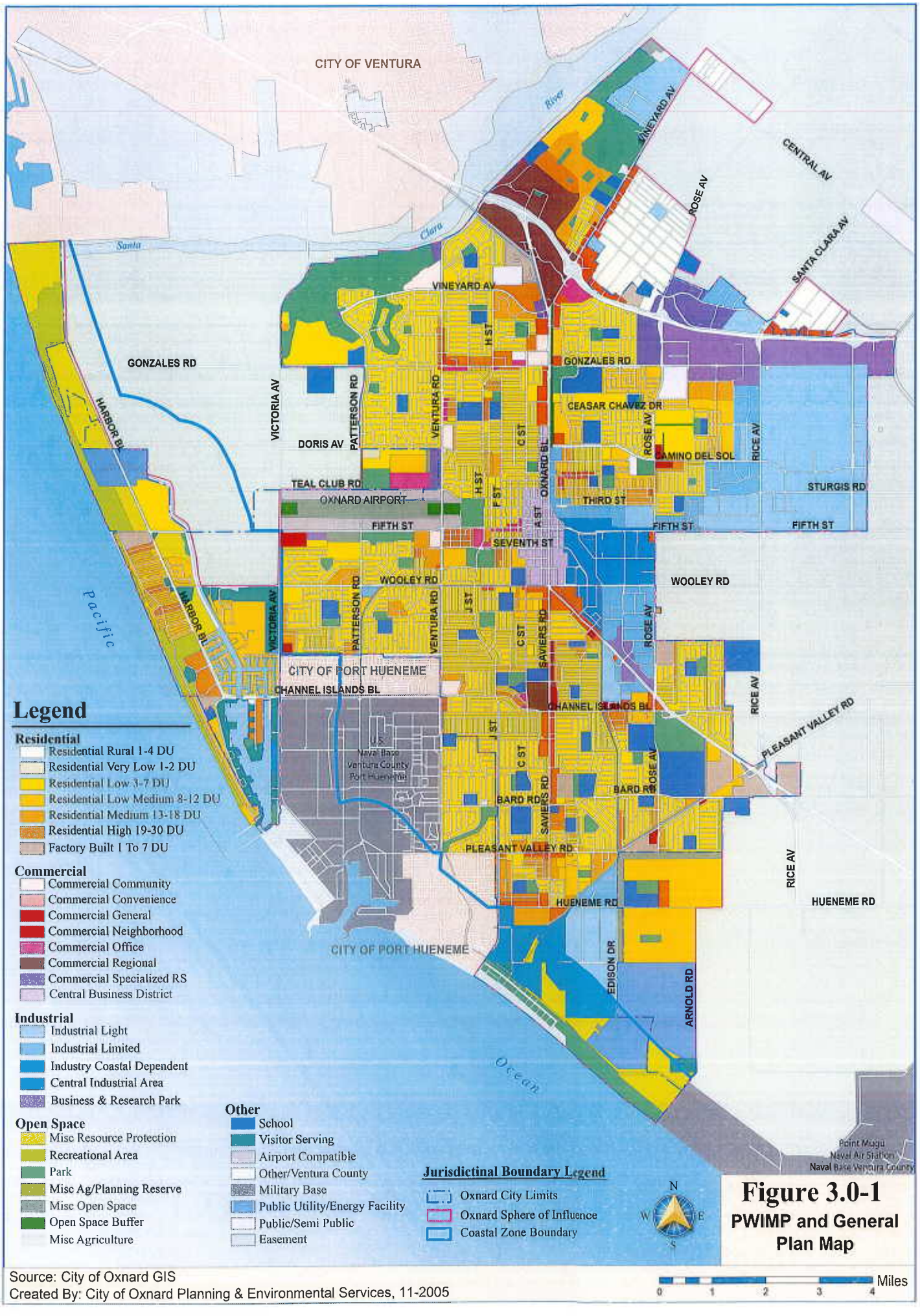
Sincerely,

Isidro Figueroa
Principal Planner



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