PURE WATER PROJECT
LAS VIRGENES-TRIUNFO

Bringing Our Water Full Circle

Program Implementation Plan

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Las Virgenes - Triunfo Joint Powers Authority

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Acronyms

µg/L	microgram(s) per liter
3D	three-dimensional
AACE	AACE International
AB	Assembly Bill
ACH	aluminum chlorohydrate
alum	aluminum sulfate
AOP	advanced oxidation process
AWPF	advanced water purification facility
AWT	advanced water treatment
Basin Plan	Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties
BDCM	bromodichloromethane (also known as dichlorobromomethane, DCBM)
CCB	chlorine contact basin
CCR	California Code of Regulations
CDBM	chlorodibromomethane (also known as dibromochloromethane, DBCM)
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
Cl_2	chlorine
CMAR	construction management at risk
CMWD	Calleguas Municipal Water District
CSF	critical success factor
CTR	California Toxics Rule
DB	design-build
DBB	design-bid-build
DBCM	dibromochloromethane (also known as chlorodibromomethane, CDBM)
DBP	disinfection by-product
DCBM	dichlorobromomethane (also known as bromodichloromethane, BDCM)
DDW	Division of Drinking Water
DE	diatomaceous earth
DO	dissolved oxygen
DPR	direct potable reuse
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency

FAT	full advanced treatment
FPDB	fixed-price design-build
ft^2	square foot (feet)
GAC	granular activated carbon
GM	General Manager
GRRP	Groundwater Replenishment Reuse Project
GWR	groundwater recovery
HOCl	hypochlorous acid
IAP	Independent Advisory Panel
IPR	indirect potable reuse
JPA	Las Virgenes - Triunfo Joint Powers Authority
KPI	key performance indicator
LARWQCB	Los Angeles Regional Water Quality Control Board
lb/d	pound(s) per day
LF	linear foot (feet)
LRV	log reduction value
LVMWD	Las Virgenes Municipal Water District
MCL	maximum contaminant level
mg/L	milligram(s) per liter
MGD	million gallons per day
mL	milliliter(s)
MND	Mitigated Negative Declaration
MWD	Metropolitan Water District of Southern California
N	nitrogen
ND	Negative Declaration
NDMA	N-nitrosodimethylamine
NEPA	National Environmental Policy Act
ng/L	nanogram(s) per liter
NH_3-N	ammoniacal nitrogen
NL	notification level
NMOR	N-nitrosomorpholine
No.	number
NO_3^-	nitrate
NO_3^-N	nitrate nitrogen
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
O&M	operations and maintenance

ORP	oxidation-reduction potential
PAH	polyaromatic hydrocarbon
PCB	polychlorinated biphenyl
PDB	progressive design-build
PEIR	Programmatic Environmental Impact Report
PFD	process flow diagram
PIP	Program Implementation Plan
PMP	Program Management Plan
PMT	Program Management Team
polyDADMAC	polydiallyldimethylammonium chloride
Portal	Program Delivery Portal
PWP or Program	Pure Water Project
QCRA	quantitative cost risk assessment
RAS	returned activated sludge
RFP	Request for Proposals
RFQ	Request for Qualifications
RMP	Risk Management Plan
RO	reverse osmosis
ROWD	Report of Waste Discharge
RPA	Reasonable Potential Analysis
RPZ	reduced pressure zone
RW	recycled water
RWC	recycled water contribution
RWQCB	Regional Water Quality Control Board
SCADA	supervisory control and data acquisition
SMP	Calleguas Salinity Management Pipeline
SRF	State Revolving Fund
SWA	surface water augmentation
SWOT	strength, weakness, opportunity, threat
SWRCB	State Water Resources Control Board
TACT	Tailored Analytics and Comparative Techniques
THMs	trihalomethanes
TN	total nitrogen
TM	technical memorandum
TMDL	total maximum daily load
TOC	total organic carbon
TP	total phosphorus

Trussell	Trussell Technologies, Inc.
TTHM	total trihalomethane
TWRF	Tapia Water Reclamation Facility
TWSD	Triunfo Water & Sanitation District
USACE	U.S. Army Corps of Engineers
UV	ultraviolet
WBS	work breakdown structure
WDR	waste discharge requirement
WFP	Westlake Filtration Plant
WIFIA	Water Infrastructure Finance and Innovations Act
WTP	water treatment plant
WQS	water quality standards
WWTP	wastewater treatment plant

1. Executive Summary

1.1 Purpose of the Program Implementation Plan

The purpose of the Program Implementation Plan (PIP) is to set the foundation and provide overall guidance to the Program Management Team (PMT) to successfully implement the Las Virgenes - Triunfo Pure Water Project (PWP or Program). Las Virgenes Municipal Water District (LVMWD) is the administering agent of the Las Virgenes - Triunfo Joint Powers Authority (JPA). The PMT comprises LVMWD staff; Triunfo Water & Sanitation District (TWSD) staff; and the Jacobs Team, consisting of staff from Jacobs, Woodard & Curran, and Katz & Associates. The Jacobs Team serves as the Owner's Agent and Program Manager Advisor and will assist the JPA with management and delivery of the Program, working with design consultants and construction contractors contracted directly by LVMWD.

Programmatic delivery is based on a broad and encompassing management approach to achieve benefits through delivery of identified projects by addressing technical, environmental, regulatory, delivery, and financial elements. The PIP is intended to accomplish the following objectives:

- Identify approaches, develop strategies, and define requirements for all aspects of Program delivery.
- Define the Program implementation processes, which include communication, management approaches, project execution, and overall Program strategy.
- Define approaches, strategy, and results for this phase of the Program, including the elements on Figure 1-1.

Figure 1-1. Components of the PIP

The PWP is a unique opportunity to proactively address three major challenges facing the JPA:

1) Comply with more stringent regulatory requirements for discharging to Malibu Creek
2) Balance the seasonal variations of recycled water demand
3) Create a valuable resource to supplement the region's water supplies, enabled by California's 2018 SBDDW-16-02 Surface Water Augmentation (SWA) Regulations.

The fundamental plan, as shown in Figure 1-2, is to build an advanced water purification facility (AWPF) to treat tertiary effluent from the Tapia Water Reclamation Facility (TWRF) for indirect potable reuse (IPR), and convey the purified water to the Las Virgenes Reservoir, where it will be blended with Metropolitan Water District of Southern California (MWD) supply. The water from the Las Virgenes Reservoir will then be treated at the Westlake Filtration Plant (WFP) prior to distribution.

Additionally, pipelines will be constructed to extend the recycled water pipeline from the TWRF to the AWPF, convey purified water from the AWPF to the Las Virgenes Reservoir, and convey reverse osmosis (RO) concentrate to the Calleguas Salinity Management Pipeline (SMP) for ocean discharge. This plan must be achieved by 2030 to meet National Pollutant Discharge Elimination System (NPDES) permit requirements for TWRF.

The TWRF will provide treated tertiary effluent to the new, 7.5 million gallons per day (MGD) AWPF. The 12-MGD TWRF currently produces approximately 7.5 MGD of tertiary effluent in the winter months. However, there is no available effluent flow in the summer months due to the effective nonpotable reuse program. Seasonal variation in flow to the AWPF will complicate operations and create an underused asset for half of the year. Achieving a steady-state operation for the AWPF would improve systemwide operational efficiency and continuously produce the valuable product of purified water. In support of this goal, the PWP is conducting a water augmentation evaluation to identify and evaluate feasible options for augmenting sources of influent water to the TWRF or directly to the AWPF, or both. The results of this evaluation will be considered as the conceptual design for the PWP progresses.

Figure 1-2. Pure Water Project Overview

TWSD will receive its share of the resulting potable water through an exchange via an interconnect with Calleguas Municipal Water District (CMWD). While complex, the Program is exciting and offers an array of opportunities to the JPA that will enhance plant operations, contribute to ecosystem protection, offer community benefits, and promote sustainable solutions.

1.2 Programmatic Approach, Benefits, and Objectives

The Program is a complex set of individual projects that must be delivered in a coordinated fashion to achieve the vision, mission, goals, and intended benefits for the JPA. Important to successful Program management is to translate the JPA's vision for the PWP and its corporate governance into a series of Program governance approaches, which are the foundation for Program delivery approaches, as shown on Figure 1-3.

> *PWP Vision Statement: A sustainable partnership to bring water full-circle through commitment, collaboration, trust, transparency, innovation and environmental stewardship; resulting in a cost-effective and regulatory compliant local water source.*

Figure 1-3. Translating Vision and Governance to Delivery

1.2.1 Primary Program Objectives

Programmatic services will be provided to achieve the following primary objectives:

- Incorporate the JPA's vision and target goal of having a new AWPF operational by 2030
- Deliver the Program within established budgets and schedules
- Deliver the Program to manage risk, changes, and quality, and enhance earlier project delivery cost certainty

The PMT will provide leadership, management, and direction on all aspects of Program delivery to achieve these objectives and to meet required regulatory requirements and financial milestones. The PMT will engage experts and the technical team to assist in delivery, financial, environmental, regulatory, and public outreach support as needed.

1.3 Summary of Each Program Component

1.3.1 Chartering Benefits and Results

Chartering is the first major step in establishing a meaningful collaborative governance structure for Program delivery, focusing on an integrated One Team framework. Chartering involves a series of workshops to build relationships and clearly establish expectations, Program vision and mission, Program goals, critical success factors (CSFs), and roles and basic responsibilities. Chartering is a critical element for Program success. Establishing these items early sets the tone for the entire Program effort; however, chartering is not a one-time effort. It is an engagement of delivery resources throughout the life of the Program.

The chartering process is designed to set the stage for successful resource interaction and maturation for a high-performing team that efficiently produces effective results and can handle decision making, change, and challenges both smoothly and gracefully. Experience has shown that early engagement by the entire resource team in establishing these basic performance expectations sets the effort on the appropriate pathway to team and Program delivery success.

The Chartering Poster in Figure 1-4 shows the results of our workshops together. In addition to the tangible outcome is a new clarity of the shared vision and strengths of the team members to work together to achieve those goals.

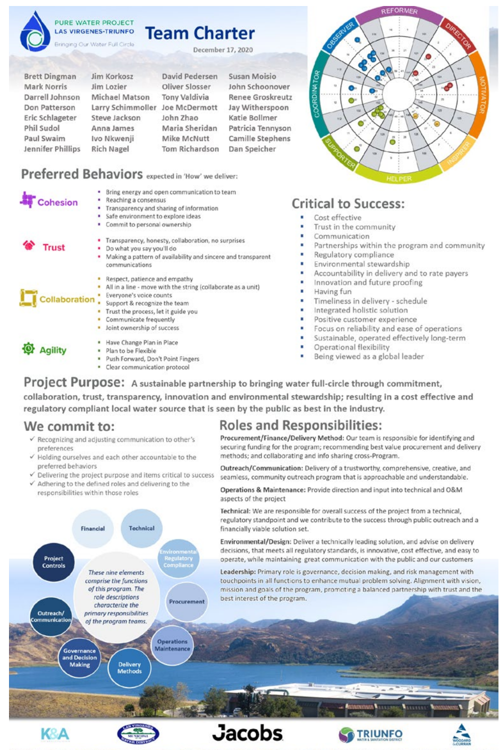

Figure 1-4. Chartering Poster

1.3.2 Program Management Plan Benefits and Results

The Program Management Plan (PMP) provides accountability, consistency, and transparency to the Program team by establishing the Program's policies and procedures, decision-making authority, and performance metrics. The PMP is divided into sections that outline the strategies, responsibilities, processes, key performance indicators (KPIs), and templates to deliver the overall Program and its individual projects.

By setting the foundation for how the JPA, LVMWD, TWSD, Jacobs Team, and future consultants and contractors will interact and communicate on the Program early, transparency is increased and all contributors are aligned to the main objectives of the PWP. Establishing expectations for deliverables, risk and change management, schedule and budget reporting, and document management will result in team clarity and delivery consistency and value. Clearly defining requirements for quality, safety, risk monitoring, and communication provide overall accountability through all phases of the Program.

The resulting PMP will be accessible through the Program Delivery Portal (Portal) to the members of the PMT (Figure 1-5). It is a living document and will be updated to reflect additional information or as changes occur.

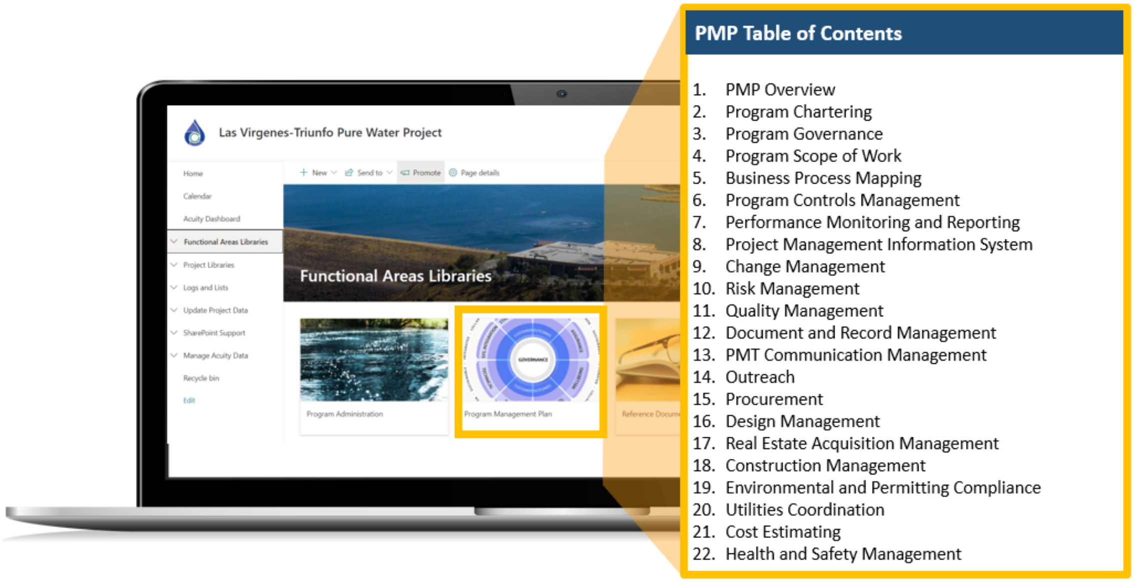

Figure 1-5. Program Management Plan on the Portal

1.3.3 Readiness Assessment Benefits and Results

The Readiness Assessment provided an objective perspective of the status of the PWP by identifying gaps in the baseline project definition and strategy established by previous planning studies, potential roadblocks that could impede progress, and an array of potential priorities for JPA's consideration to set the PWP foundation. The main objectives of the Readiness Assessment included:

- Provide best value for JPA capital investment for current regulatory compliance
- Consider future-proofing facilities for pending regulatory requirements and ongoing Southern California drought impacts
- Understand PWP uncertainties to Program costs, schedule, and risk management
- Develop an integrated strategy for JPA facilities to increase operation and maintenance (O&M) flexibility and system storage, and best manage water resources in the service area

The purpose of the Readiness Assessment was to define the Program uncertainties to help guide the technical, regulatory, environmental, and financial efforts for the next 18 months. The team plans to focus the technical studies to address many of these uncertainties and include the results and recommendations in the AWPF design criteria package and conveyance alignment studies.

The Readiness Assessment evaluated the following elements:

- Tapia Water Reclamation Facility
- Advanced Water Purification Facility
- Las Virgenes Reservoir
- Westlake Filtration Plant
- Concentrate (brine) stabilization
- Conveyance alignments

For each element, a set of recommendations were summarized to provide a roadmap for finalizing treatment concepts and alignments over the next 18 months. The main considerations brought forward during this assessment as recommendations for a modified baseline project include:

- Planning for higher pathogen log reduction credits to support a revised reservoir operating strategy with water augmentation
- Mitigating California Toxics Rule (CTR)-regulated disinfection by-products (DBPs), N-nitrosodimethylamine (NDMA), and brominated trihalomethanes (THMs)
- Purified water chemical stabilization prior to discharge to the reservoir
- Defining architectural theme and building programming
- Determining mitigation and control strategies for brine scaling
- Mitigating algal growth at the reservoir
- Determining the AWPF’s impact on the existing recycled water system and better alignment approaches to mitigate impacts
- Managing excess recycled water and AWPF emergency discharge options

By identifying these requirements early, the team will be able to address the technical issues and recommend treatment and conveyance alignment strategies early in the design process. This approach provides the technical feasibility and cost implication for each potential system requirement to allow the JPA to make the most informed decision. The team will leverage the performance and testing at the Demonstration Facility to refine site-specific design criteria and facility needs, align the regulatory strategy through focused discussions with the regulators, and make conscientious decisions to provide the best value for capital investment.

1.3.4 Project Delivery Approaches Benefits and Results

The purpose of evaluating different project delivery approaches is to provide prompt and effective acquisition of PWP products, materials, engineering services, and construction contracts. The recommended approach will achieve the goals of the Program, in accordance with the spirit and requirements of the LVMWD Code, LVMWD Purchasing Policy, and JPA agreement.

For each project element of the Program, there are different considerations for project delivery. Before choosing an approach, the team reviewed common considerations with the JPA during a special session on March 8, 2021. During the workshop, the team reviewed the main project priorities for the AWPF and conveyance projects, aligning them with the JPA’s comfort zone for key project drivers. These common priorities and drivers include:

- Sharing of control and risk
- Schedule
- Innovation
- Early cost certainty
- Water industry experience with delivery approach
- Contracting ease

After careful consideration of these project delivery drivers, the PMT recommends using a combination of project delivery procurement mechanisms and approaches for the PWP to provide best value for the JPA’s investment.

The PMT recommends proceeding with traditional design-bid-build (DBB) for the conveyance projects because:

- The conveyance design is alignment driven and is not motivated by innovative design or construction methods.
- There will be high agency interaction and permitting, requiring strong working relationships such that LVMWD would like to maintain this oversight with the designer.
- Subsurface conditions will require focused utility research early in the design and will require more time for investigation and coordination.
- The pipelines are commodity driven.

The PMT recommends proceeding with progressive design-build (PDB) for the AWPF because:

- Early cost certainty and control will inform design decisions and help the team understand cost impacts as the design progresses.
- Innovation and collaboration will allow for design-builder creativity and JPA input on design decisions.
- This method results in the best value to capitalize on cost-effective approaches and equipment selections.
- The method allows for better constructability and optimized layout, as the workable area on the two sites is a small footprint.
- PDB provides a single contract with one team for staff to manage, given competing commitments.

1.3.5 Regulatory Strategy

The two most important regulatory agencies for PWP permitting are the Division of Drinking Water (DDW) and the Los Angeles Regional Water Quality Control Board (Los Angeles RWQCB). Both agencies operate under state law and the delegated authority of the U.S. States Environmental Protection Agency (EPA). These agencies will regulate different aspects of the Program based on their statutory responsibilities: DDW is responsible for the regulation of public drinking water systems to provide safe water, and Los Angeles RWQCB is responsible for protecting groundwater and surface water quality in the Los Angeles region.

Surface Water Augmentation (SWA) regulations, which are applicable to the PWP, became effective in 2018. To date, only one SWA project, the City of San Diego's North City Pure Water Project serving Miramar Reservoir, has received a conditional approval letter from DDW and a NPDES permit from the San Diego RWQCB (NPDES Number [No.] CA0109398, Order No. R9-2020-0183) that implements the DDW-imposed discharge requirements.

The PWP will need the following two permits:

1) The Water Supply Permit Amendment issued by DDW, which regulates the withdrawal of water from Las Virgenes Reservoir for potable use
2) A discharge permit issued by Los Angeles RWQCB, which regulates discharges to Las Virgenes Reservoir

To achieve this end goal, the main focus of the regulatory strategy is to understand and define the requirements that will govern the detailed PWP designs. The strategy includes the following components:

- Provide effective and efficient level of treatment to meet DDW requirements considering operational complexity
- Apply a multipronged strategy to address CTR-regulated compounds
- Enhance dilution in Las Virgenes Reservoir during the summer
- Leverage AWPF Demonstration Project results

- Reassemble the Independent Advisory Panel (IAP) to obtain additional insights and input. The IAP provides third-party, expert review of technical elements to assist regulatory agencies in evaluating and permitting the PWP.
- Collaborate early and continuously with regulators to develop workable and acceptable permit language

The PMT plans to initiate the permitting process with DDW and RWQCB over the next 18 months with regular meetings to align the technical approach (Figure 1-6). The regulatory compliance goal for the PWP is to provide a "regulatory standard practice" that expedites RWQCB and DDW permitting, and provides PWP operational flexibility with minimum compliance costs.

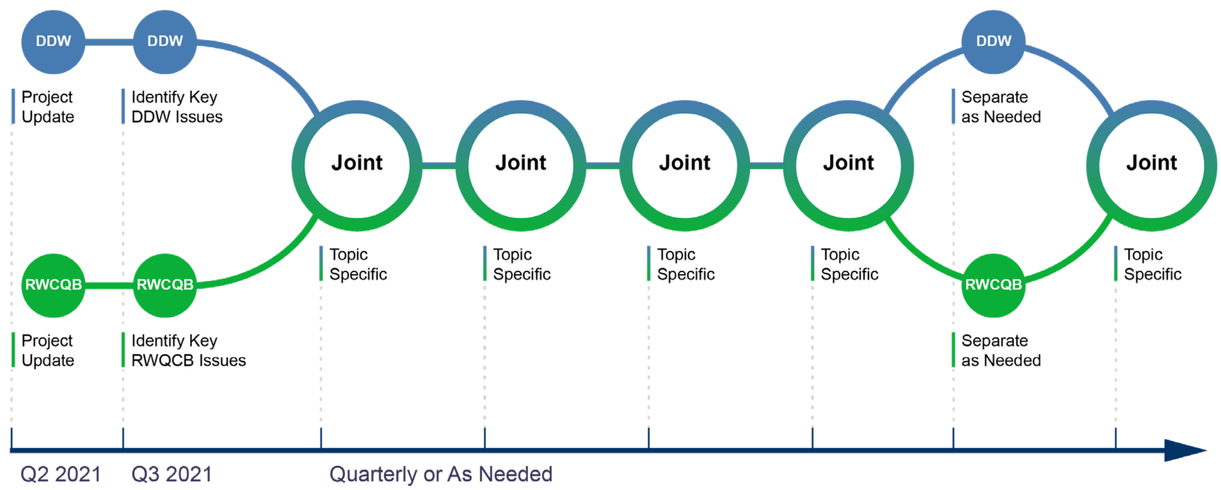

Figure 1-6. Regulatory Meeting Approach

1.3.6 Environmental (CEQA) Strategy

A Programmatic Environmental Impact Report (PEIR) provides early benefits and communication opportunities. A PEIR analyzes the PWP project portfolio and determines broad environmental effects. This approach allows the JPA (Lead Agency) to approve of the entire Program, even as some of the Program's projects are still in concept development and design. This PEIR strategy provides overarching coverage or "an umbrella" for many of the key PWP projects and associated components.

The PEIR approach:

- Allows significant design flexibility – as concepts move to detailed designs, conveyance alignment selections are made, and regional partnership agreements are formed
- Provides regulatory environmental and permitting inputs, compliance requirements, and mitigation needs
- Is used for state and federal low-interest loans and Local Resource Program applications
- Allows internal and external stakeholders and local and regional communities to see PWP's benefits, overall impacts, and mitigation needs
- Provides a Programmatic Delivery Platform without having to complete detailed, individual project CEQA analysis during conceptual designs
- Allows future project-specific environmental review, as required

A certified PEIR demonstrates compliance with CEQA by evaluating and publicly disclosing a program's potential environmental impacts. The PEIR is required to meet a Lead Agency's CEQA obligations and must be completed and certified before construction of individual projects. The PEIR is also required before discretionary permits can be issued by local or state agencies, such as California Department of Fish and Wildlife or the RWQCB. This document is also a critical prerequisite for governmental applications for low-interest loan programs, such as the EPA's Water Infrastructure Finance and Innovations Act (WIFIA) and State Revolving Fund (SRF) programs, and MWD's Local Resources Program.

For development of the Program description and resource needs, the team's current assessment of focus areas include:

- **Conveyance Alignment and Construction Details.** Various conveyance elements require definition for full project coverage in the PEIR, including selection of the preferred alignment, basic alignment plan and profile sheets (for example, pipe centerline), and construction methods.
- **Alternatives Definition.** The PEIR should consider alternatives at multiple levels, including alternatives to the PWP itself and a No Project Alternative. However, this requires an explanation of what would happen in the absence of the PWP—an important opportunity to discuss long-term water supply reliability within the Program area and concerns under the NPDES permit requirements.
- **Cultural Resources.** The Program area has moderate sensitivity for archaeological resources and low sensitivity for historic (built environment) resources.
- **Public Outreach and Communications.** The CEQA process requires various notification processes that, although focused on agency outreach, provide an important outreach opportunity to all stakeholders and the general public. Katz & Associates will coordinate to confirm that all required CEQA legal and regulatory obligations are met, but that the legal and regulatory obligations do not override meaningful engagement.
- **Construction Impacts to Public.** PWP construction activities will be noticeable and will require evaluation in the PEIR. For the AWPF site, nuisance impacts to the adjacent properties will include noise and dust from all onsite construction activities. All PWP conveyance elements will have traffic and noise impacts.
- **Rare Plants and Oak Tree Removal.** The Agoura Road AWPF site and the discharge pipeline alignment near Las Virgenes Reservoir present special challenges regarding protected resources, primarily removal of oak trees (loss of oak woodland habitat) and several species of obscure (and hard to identify) rare plants.
- **Discharges to Malibu Creek.** California Water Code Section 1211 requires a Change Petition when water reuse projects result in changes to the amount of water discharged to an inland waterway. Implementing the PWP will result in a decrease in discharges from the TWRF into Malibu Creek; therefore, the JPA will be required to file a Change Petition with the State Water Resources Control Board (SWRCB) Division of Water Rights.

Figure 1-7 illustrates the required process for CEQA document review and adoption, starting with scoping and ending with PEIR certification and project approval by the JPA Board. Nested within each step are critical meetings with agency reviewers and the general public. The environmental leads will collaborate with PMT and Katz & Associates so that the Program information to be shared publicly is developed to an appropriate level and presented in a way that fosters understanding of the PWP and its expected benefits and potential adverse effects (for example, construction disruptions) that we are addressing in the PEIR.

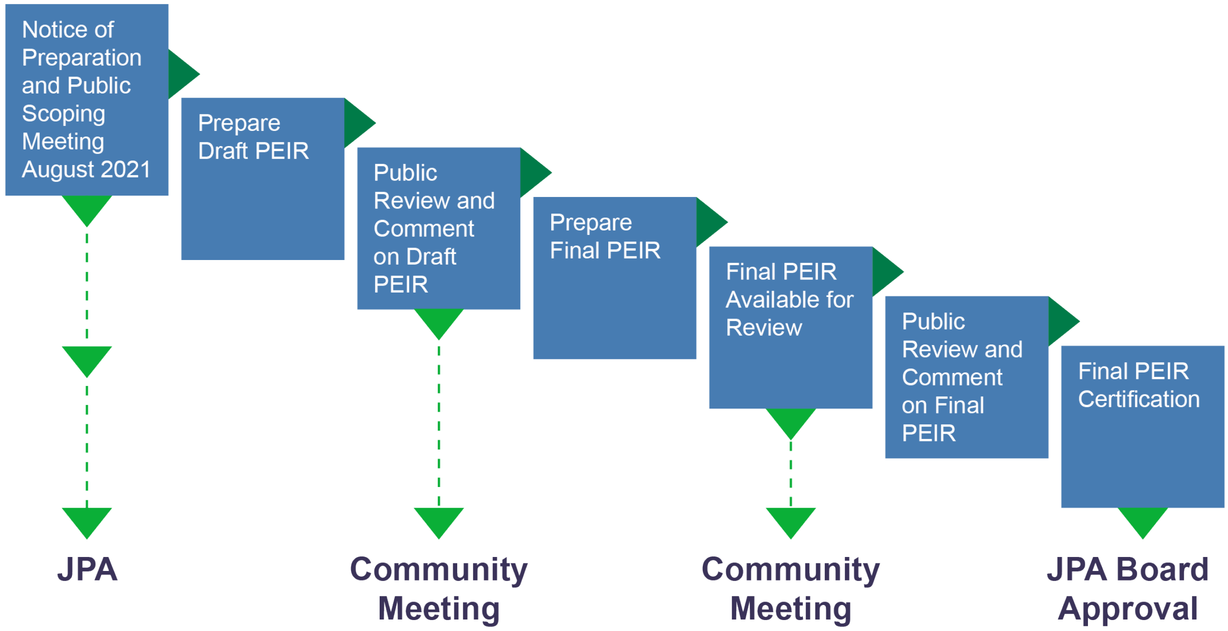

Figure 1-7. PEIR Process and Public Engagement

1.3.7 Public Outreach Strategy

All JPA Board and PWP staff are communication ambassadors. The team will support the general public outreach for the Program, while focusing on supporting the specific needs of the CEQA process.

PWP communication objectives include the following:

- Implement a public outreach program that transparently explains the PWP, the high quality and safety of the water it produces, and its benefits
- Provide consistent and complete information to stakeholders, including multicultural communities, so there are no surprises throughout the multiphased development process
- Foster understanding and acceptance of the science and advanced technology behind recycled water and IPR
- Minimize confusion, opposition, and discomfort with IPR
- Confirm consistency of information among all representatives and spokespersons
- Support the CEQA process with formal public engagement and communication

The main public outreach strategy includes:

- Balancing anticipated challenges with PWP opportunities and strengths
- Leveraging proven solutions, including facts, and matching the correct level of science for the audience
- Leveraging JPA benefits in already knowing the audience, and addressing information and communication needs using established pathways
- Maintaining consistent messaging using PWP branding materials, facts, and supporting scientific information
- Using successful peer applications and proven experiences when facing challenges
- Engaging and informing stakeholders throughout the PWP delivery life cycle and before key milestones, JPA actions, and major environmental documentation approvals

1.3.8 Risk Assessment Approach to Support Program Contingency

Managing risks to support the PWP at the lowest possible cost, with the fewest adverse environmental or human health impacts, and according to the defined schedule are critical aspects of successful Program implementation. Risks, either threats or opportunities, need to be identified; their potential impact on performance, human health, and the environment predicted; and mitigation strategies developed for avoiding, abating, minimizing, and mitigating the risks. This strategy also includes assigning risks and risk mitigations to the proper parties for resolution, tracking, and reporting.

The PMT's approach to risk management starts at the earliest stages of a project by detecting, identifying, and managing risks that have a high probability of negatively impacting safety, quality, budget, and schedule. In the same time frame, risks that impact the entire Program must quickly be identified and follow the same procedure as project-specific risks. Project- and Program-related risks are often different but are interconnected through cost and schedule impacts. In addition, opportunities will be identified, tracked, and managed using a similar approach to risks.

The Program is using an organized, systematic, decision-making process that identifies, assesses, evaluates, and prioritizes risk uncertainties identified as a threat to Program or project objectives. The risk management process has been initiated with development of the baseline cost-loaded schedule, will be updated as each project is initiated, and managed through the life of the Program.

Figure 1-8 shows the five basic steps of the risk management approach.

The Risk Register is the backbone of the risk management process and the mechanism to identify, assess, and document each project and Program risk to track significant threats and opportunity elements. The PMT held four risk management workshops to initiate Risk Register development through identification, qualitative analysis, and quantitative analysis of risks. A Monte Carlo quantitative cost risk analysis estimated a $79 million potential cost impact if identified risks are not mitigated. The results ranged from $9 to 27 million for the planning, detailed design, procurement, construction, and operations phases. Based on the assessment and critical phase values, the PMT has elected to carry $20 million in Program risk contingency.

Figure 1-8. Risk Assessment Overview

1.3.9 Cost and Schedule

The Jacobs Team developed a preliminary schedule and an independent Class 4 cost estimate for the PWP to include construction costs, soft costs, and O&M costs, considering the recommendations from the Readiness Assessment. The Readiness Assessment identified potential system requirements beyond the baseline project, which was established through the Title XVI Study. The need for the other potential system requirements will be confirmed through technical evaluation, leveraging of the Demonstration Facility, and alignment of the regulatory strategy through the work to be completed over the next 16 months of Phase 1. Because the independent cost estimate was significantly higher than the previous estimate provided in the Title XVI Study, a baseline schedule and cost for the confirmed project elements will be provided at the completion of Phase 1 for JPA Board adoption of the Program budget and delivery timeline.

1.4 Phase 1, Programmatic Delivery

With the JPA Board approval of the PIP, the Jacobs Team will continue preparation of the technical studies to support regulatory, environmental, funding, and delivery activities for the identified projects. The team will integrate the results of the Readiness and Risk Assessments in preparing the evaluations and analysis described in this section. These efforts will further define the projects and provide cost clarity, project sequencing and scheduling, and opportunities for collaboration. Major deliverables completed and planned under Phase 1 include:

Completed in the first 6 months:

- ✓ Chartering
- ✓ Program Delivery Portal (Portal), including Document Management System and Performance Dashboards
- ✓ PMP
- ✓ Quality Management Plan and Forms
- ✓ Change Management Plan and Forms
- ✓ Risk Management Plan and Forms
- ✓ Readiness Assessment
- ✓ Regulatory Strategy Plan
- ✓ Environmental Strategy Plan
- ✓ Public Outreach Strategy and Communication Plan
- ✓ Procurement Strategy Plan
- ✓ Cost-loaded Baseline Program Master Schedule
- ✓ PIP

Planned for the next 18 months:

- Tailored Analytics and Comparative Techniques (TACT) Model Updates
- Funding Strategy Action Plan
- Procurement Packages for Design-Build (DB) and PDB Contracts
- Technical Studies, including:
  - Water Augmentation Strategies
  - Discharge 005 Capacity Analysis
  - Alternative Emergency Discharge Options
  - Reservoir Modeling and Recommendation for Air Curtain
  - TWRF Flow Equalization
  - Recycled Water Chlorination Evaluation
  - Integrated Operational Strategies for Westlake Filtration, TWRF, and new AWPF
  - Enhanced Source Control Plan
  - AWPF Site Evaluation
  - AWPF Preliminary Design Report
  - AWPF Alternative Project Delivery Specifications
  - Hydraulic Analysis
  - Preliminary Geotechnical (Desktop) Evaluation
  - Dual Direction, Multipurpose Brine Pipeline Analysis
  - Pipeline Alignment Study Report
- Environmental and Regulatory, including:
  - Notice of Preparation
  - CEQA Findings of Fact and Statement of Overriding Considerations
  - Administrative Draft and Final Program Environmental Impact Report
  - Public Draft and Final PEIR
  - List of Permitting for Program
  - Regulatory Coordination Meetings
  - Draft and Final Concept Report

2. Program Chartering

2.1 Introduction

Chartering is the action associated with a set of workshops designed to clearly establish expectations, the Las Virgenes - Triunfo PWP vision and mission, Program goals, CSFs, and roles and basic responsibilities. Chartering is a critical element for Program success. Building relationships and establishing these items early set the tone for the entire Program effort.

However, chartering is not a one-time effort; rather, it is an engagement of delivery resources throughout the life of the Program. Chartering involves staff from the LVMWD and consultants involved in the day-to-day delivery, along with the involvement of other LVMWD staff and TWSD partners who may have infrequent, yet important, associations with successful Program delivery. Chartering is the first major step in establishing a meaningful collaborative governance structure for successful Program delivery.

The charter itself is a short document capturing the mission, vision, and goals developed and endorsed by the PMT. This document was developed in a team virtual setting using an open, collaborative session strategy so that PMT voices were heard and incorporated into this charter.

This section of the PIP summarizes the purpose and results of the Program chartering efforts; in particular, the results of the initial chartering session in December 2020.

2.2 Chartering Purpose

The chartering process is designed to set the stage for successful resource interaction and maturation for a high-performing team that efficiently produces effective results and can handle decision making, change, and challenges both smoothly and gracefully. Experience has shown that early engagement by the entire resource team in establishing these basic performance expectations sets the effort on the appropriate pathway to team and Program delivery success.

2.3 Chartering Elements

The initial chartering workshops were held virtually in December 2020 because of COVID-19 travel and meeting size restrictions and concerns. Table 2-1 lists the subjects that were part of these chartering sessions. These subjects, and their descriptions, were the topics that produced the integrated team conversation and endorsement of the Program direction.

Table 2-1. Chartering Agenda

Session	Description
Session 1 – Alignment Part 1 (November 30, 2020)	▪ Establish common language and communication preferences. ▪ Understand individual insights. ▪ Recognize the team members may have different preferences, and determine how to effectively and proactively manage these differences.
Session 2 – Alignment Part 2 (December 7, 2020)	▪ Characterize expectations for success. ▪ Agree to behaviors from a personal, programmatic, and organizational standpoint.
Session 3 – Chartering Part 1 (December 16, 2020)	▪ Define the Program. ▪ Characterize Program expectations and elements required for success (CSFs). ▪ Clarify roles and associated responsibilities in Program delivery.
Session 4 – Chartering Part 2 (December 17, 2020)	▪ Clarify team structure, governance, and associated decision authority. ▪ Characterize operating protocols and performance measures. ▪ Generate Commitment Statement.

2.4 Chartering Outcome

The desired outcomes from the chartering process include defining, establishing, and communicating the following elements:

- Preferred behaviors
- Program vision and purpose
- CSFs
- Governance roles and responsibilities
- Performance measures

2.4.1 Preferred Behaviors

Understanding, communicating, and capturing expectations about how we will deliver the Program are a significant part of the chartering session. The participants organized into six groups to list their expectations for this investment from a personal, programmatic, and LVMWD perspective.

Figure 2-1 at the end of this section shows the results of the integrated team conversation that produced the preferred behaviors. All participants in the Program effort were asked to advance or achieve these expectations.

2.4.2 Program Vision and Purpose

A Program vision is an aspiration goal. The Program vision was discussed extensively during the chartering session, with the final wording agreed to by Dave Pederson, LVMWD General Manager (GM) and Mark Norris, TWSD GM. The Program vision is as follows:

> *A sustainable partnership to bringing water full-circle through commitment, collaboration, trust, transparency, innovation, and environmental stewardship; resulting in a cost-effective and regulatory compliant local water source that is seen by the public as best in the industry.*

2.4.3 Critical Success Factors

The entire team sorted through the Program's strengths, weaknesses, opportunities, and threats (SWOTs) to characterize factors that are critical to success. These CSFs, as the name implies, are essential to the success of the Program. All Program activities and decisions must focus upon accomplishing the CSFs (Figure 2-1).

2.4.4 Governance Roles and Responsibilities

Program governance outlines the roles and responsibilities of each group and how they will advance the overall Program purpose and CSFs. The roles and responsibilities were discussed in six breakout rooms by the following groups:

- Program Leadership and Program Controls
- Procurement, Finance, and Delivery Method
- Environmental and Regulatory Compliance
- O&M
- Technical
- Outreach and Communication

Each group identified their roles and responsibilities (Figure 2-1), and realized the interdependency of all groups in working together for a common purpose.

2.4.5 Performance Measures

Performance measures were brainstormed to provide feedback and accountability in achieving the goals of the Program and are summarized in Table 2-2.

Table 2-2. Possible Performance Measures

Category	Possible Measures	Other Metrics	Other Considerations
Schedule	Measuring and tracking deliverables	Staying ahead of schedule	Achieving intermediate milestones
Budget	Developing a realistic, cost-loaded schedule	Having minimal impact on rates	Securing solid funding
Scope	Setting clear final design parameters	Making progress toward achieving permits	-
Public Engagement and Acceptance	Tracking social or video views	Confirming public satisfaction	Confirming employee buy-in and championing the Program
Awards and Accolades	Developing letters of support	Keeping the JPA Board happy, and providing team satisfaction	Having pride in accomplishments and industry leadership
Clear Communication	Developing the Portal and Program Management Plan	Communicating work across disciplines	Holding subsequent chartering for new team members

Notes:

- = not applicable

2.5 Charter Poster

The tangible result of the charter session was a charter poster. This poster captures the results of the sessions in one place. The final element is a commitment statement characterizing the agreement of the participants to work toward delivering all of these elements (Figure 2-1). This poster serves as a reminder of the commitments made at the chartering session.

2.6 Continued Chartering

Chartering is not a one-and-done effort. Checking in with the team, adjusting roles and responsibilities, and clarifying expectations is required as a team and the Program matures. Governance will also evolve as the Program delivery matures. The need for the chartering check-ins will be highly dependent on the needs of the team and the Program. The intent is to:

- Re-establish the direction
- Review performance against the endorsed CSFs
- Look at the governance structure
- Bring the appropriate team members together to maintain the high performance of the team

The PMT is expected to document and share the items captured during each chartering session. Actions and activities must adhere to the performance expectations, satisfy the items that are critical to success, and strive to advance the vision.

Figure 2-1. Charter Poster

3. Program Management Plan Overview

3.1 Purpose

The purpose of the PMP is to provide overall guidance to the PMT to successfully implement the Las Virgenes - Triunfo PWP. The PMP establishes roles and responsibilities, procedures, requirements, templates, and the overall management approach of the Program, tailored to PWP-specific needs.

Programmatic delivery is based on a broad and encompassing management approach to achieve benefits through delivery of identified projects. Projects include those defined by the PWP and those identified during the Readiness Assessment. The PMP is intended to accomplish the following objectives:

- Establish the PMT organization, and define the roles and responsibilities that will manage the Program.
- Identify approaches, develop strategies, and define requirements for all aspects of Program management. Once identified, important aspects will be integrated into execution-level documents required for PWP delivery (such as work plans for individual tasks and Project Execution Plans for the Program's individual projects).
- Define the Program implementation processes, including for communication, management approaches, project execution, and overall Program controls and reporting.
- Generally define Program functions, including:
  - Change management
  - Construction
  - Cost estimating
  - Design
  - Environmental compliance
  - Engineering
  - Health and safety (H&S)
  - Land acquisition
  - Legal
  - Permitting
  - Procurement
  - Purchasing
  - Reporting
  - Resource management
  - Risk management
  - Schedule management
  - Security
  - Technology
- Provide specific sequential steps and tasks to be undertaken so that best practices are used in implementing the Program to meet schedules; avoid scope creep; avoid cost increases; and provide needed service, functionality, and efficiency.
- Generally define approaches and requirements for each phase of the Program's projects, including:
  - Project Definition
  - Schematic Design
  - Design Development
  - Construction Document Development
  - Bid Evaluation
  - Construction and Commissioning
  - Closeout

As the Program matures, the PMP will be updated periodically to reflect additional information or changes that occur.

3.2 Program Management Plan Structure

The PMP is intended to provide the PMT with the overall strategies and approaches used to deliver the Program. The PMP is divided into sections that provide the overall strategy, responsibilities, and processes to deliver the overall Program and its individual projects. The PMP was developed in recognition of the full range of Program stakeholders, including:

- JPA
- LVMWD management and staff
- Partner agencies
- PMT
- Jacobs Team
- Design consultants
- Contractors
- Stakeholders involved in the overall delivery of the Program, such as regulatory and permitting agencies
- Citizens and outside stakeholder interest groups

The PMP was developed as part of the Fast-Start process during the first 6 months of the Program. LVMWD staff provided the LVMWD policy and procedures during virtual workshops. Jacobs introduced the business mapping process, and LVMWD provided clarifications on existing processes. The PMP is accessible to the PMT through the Portal. It is a living document, evolving and being updated through each phase of the Program.

The PMP includes the following sections. A brief description is provided for each section:

- **Section 1, Overview.** Provides the purpose, structure, and outline of the plan.
- **Section 2, Program Chartering**. Provides an overview of this fundamental foundation process for Program delivery and success, and the results of the PWP initial chartering effort.
- **Section 3, Program Governance**. Establishes a framework for management of the Program, including the organizational structure, policies, and procedures used to implement projects, hold meetings, issue resolutions and escalations, and conduct high-level reporting.
- **Section 4, Program Scope of Work**. Provides an overview of the projects that will be delivered by the Program.
- **Section 5, Business Process Mapping**. Identifies process workflows for select Program functions essential to efficient delivery. These maps demonstrate how the PMT approaches are in alignment with LVMWD and JPA existing processes, procedures, policies, specifications, and requirements.
- **Section 6, Program Controls Management**. Outlines tools, policies, and procedures the PMT will use to monitor and track performance, and update project progress to manage and deliver the Program on scope, schedule, and budget.
- **Section 7, Performance Monitoring and Reporting**. Establishes frequency and performance criteria that will be monitored and reported throughout the Program life cycle; and defines reports and Portal dashboards that will be prepared for use by the PMT, LVMWD, and JPA.
- **Section 8, Project Management Information System**. Describes the electronic Portal and its components that will be used to store, manage, distribute, and display Program and project information and documents.
- **Section 9, Change Management**. Documents the process to manage change that may occur to Program and project scope, cost, and schedule. This process includes addressing incident escalation and a Change Management Board for decision making, escalation to the JPA or LVMWD Boards (or both), and approval. The change evaluation process and change log are critical to the success of the overall Program, as changes to individual projects can affect other projects within the Program. This section establishes the change log requirements.

- **Section 10, Risk Management**. Identifies the processes and tools to predict, quantify, identify, track, mitigate, and manage risk for all Program and project elements. This section establishes the Risk Register requirements for the Program and individual projects.
- **Section 11, Quality Management**. Outlines the processes and requirements to verify that the Program quality objectives are achieved; and defines quality management processes for projects, from inception through completion.
- **Section 12, Document and Records Management**. Establishes the processes and systems governing how all documents created throughout the course of the Program will be managed to allow controlled distribution of data, version control, storage, archiving, and sharing of files in a central site.
- **Section 13, Communications Management**. Defines communication protocols internal to the PMT and among the PMT, LVMWD, JPA, and outside agencies as necessary to implement Program projects.
- **Section 14, Outreach.** Establishes the Program's approach to working with the external Program stakeholders; describes the tools that will be used to manage stakeholder communication, outreach challenges, and risks; and establishes the Program brand and core messages.
- **Section 15, Procurement.** Establishes Program-specific requirements and procedures for equipment, materials, and consultant and contractor procurement. Outlines the recommended project delivery approach.
- **Section 16, Design Management**. Provides a description of how the PMT will manage project design consultants and the Program value engineering process.
- **Section 17, Real Estate Acquisition Management**. Outlines the processes and procedures to identify and confirm the necessary property acquisition, easements, and rights-of-way (ROWs) for Program projects; initiate and complete property acquisition, easement, and ROWs; and take possession of acquired property, easements, and ROWs.
- **Section 18, Construction Management**. Provides a description of the Program approach to construction management, including PMT and construction management interfaces with designers, contractors, other utility agencies, permitting and regulatory agencies, and the public.
- **Section 19, Environmental and Permitting Compliance**. Establishes the roles, responsibilities, and procedures for PMT staff to identify the required permits for each Program project, apply for and remit payment for permits, and for timely permit acquisition and compliance. Also defines roles, responsibilities, and procedures for Program environmental and regulatory compliance.
- **Section 20, Utilities Coordination**. Defines the role of the PMT in coordination with LVMWD engineering and O&M staff and outside utility agencies for efficient delivery of individual projects and the Program.
- **Section 21, Cost Estimating**. Establishes cost estimating standards that will be used for each phase of project delivery and for the overall Program.
- **Section 22, Health and Safety Management**. Introduces the framework for the H&S of all PMT members throughout Program delivery, and presents the Program H&S Policy Statement.

Sections will be updated as necessary so they remain current and address changes in Program implementation strategies, processes, and tools.

4. Readiness Assessment

4.1 Introduction and Overview

The Las Virgenes – Triunfo JPA is a partnership between LVMWD and TWSD, established to cooperatively treat wastewater for these two bordering areas that share the Malibu Creek watershed. The JPA has been a pioneer in the development of recycled water as a renewable resource, operating the TWRF since 1965 (LVMWD 2021a). All of the recycled water produced at the TWRF is used for irrigation during summer months; however, surplus recycled water is discharged to Malibu Creek in winter months. The NPDES permit prohibits discharge to Malibu Creek from April 15 to November 15, except under an operational emergency or qualifying storm event.

Regional Board Resolution Number (No.) R16-009 (May 16, 2017) amended the Water Quality Control Plan for the Los Angeles Region (*Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties* [Basin Plan] [Los Angeles RWQCB 2020]) to incorporate more stringent seasonal nitrogen and phosphorus Total Maximum Daily Loads (TMDLs) for discharge to Malibu Creek to address benthic community impairments (Table 4-1).

Table 4-1. Malibu Creek Discharge Limits for Tapia Water Reclamation Facility

Parameter	Period	Average Monthly	Seasonal Average
NO_3^- + NO_3^-N	Current limit	8 mg/L 800 lb/d	--
TN[a]	Summer: April 15 to November 15	--	1 mg/L
TN[b]	Winter: November 16 to April 14	--	4 mg/L
TP[a]	Summer: April 15 to November 15	--	0.1 mg/L
TP[b]	Winter: November 16 to April 14	--	0.2 mg/L

[a] Effective in Year 2022, 5 years from date of Resolution No. R16-009 (May 16, 2017).

[b] Effective in Year 2030, 13.5 years from date of Resolution No. R16-009 (May 16, 2017).

Notes:

-- = not applicable

lb/d = pound(s) per day

mg/L = milligram(s) per liter

N = nitrogen

NO_3^- = nitrate

NO_3^-N = nitrate nitrogen

TN = total nitrogen

TP = total phosphorus

The JPA had to consider a multipronged approach to address these stringent EPA water quality standards for discharge of recycled water into the creek, as compliance was determined to be expensive and impactful to sewage treatment rates for customers. The JPA has expressed its commitment to creek stewardship, but with common sense solutions to water quality issues (Los Angeles RWQCB 2017b).

As part of a robust, 18-month stakeholder participation process that began once the JPA was aware of the upcoming discharge limit changes, the JPA evaluated a number of options to beneficially use surplus recycled water to improve regional water supply reliability and drought resilience, while eliminating discharge into the creek. On August 3, 2016, the JPA Board voted to explore the preferred alternative, IPR, which would create a local, reliable water supply for the region (LVMWD 2021b).

A subsequent feasibility study conducted under a U.S. Bureau of Reclamation grant identified the preferred project alternative as the IPR project, now known as the PWP, over a seasonal storage project, the Encino Reservoir Project (Kennedy Jenks Consultants 2018).

The PWP represents a unique opportunity to proactively address three major challenges facing the JPA:

1) Comply with more stringent regulatory requirements for discharge to Malibu Creek.
2) Balance seasonal variation of recycled water demand.
3) Create a valuable resource to supplement the region's water supplies, enabled by California's reservoir water augmentation regulations.

The fundamental plan is to build an AWPF to treat tertiary effluent from the TWRF for IPR, and convey the purified water to the Las Virgenes Reservoir, where it will be blended with MWD supply. The water from the Las Virgenes Reservoir will then be treated at the WFP prior to distribution. Additionally, pipelines will be constructed to convey source water from the TWRF to the AWPF for treatment, purified water from the AWPF to the Las Virgenes Reservoir for storage, and RO concentrate to the SMP for ultimate discharge to the ocean.

The TWRF will provide treated tertiary effluent to the new, 7.5-MGD AWPF. The 12-MGD TWRF currently produces approximately 7.5 MGD of tertiary effluent in the winter months. However, there is no available effluent flow in the summer months due to the effective nonpotable reuse program, based on 2017 to 2019 flow data. Seasonal variation in flow to the AWPF will complicate operations and create an underused asset for half of the year. Achieving a steady-state operating flow for the AWPF would improve systemwide operational efficiency and continuously produce a valuable product of purified water. In support of this goal, the PWP is conducting a water augmentation evaluation to identify and evaluate feasible options for augmenting sources of influent water to the TWRF, directly to the AWPF, or both. The results of this evaluation will be considered as the conceptual design for the PWP progresses.

4.2 Readiness Assessment Objectives

The purpose of the Readiness Assessment was to assess the status of the PWP by identifying gaps in the baseline project definition and strategy, potential roadblocks that could impede progress, and an array of potential priorities for consideration by the JPA to set the PWP foundation. The Readiness Assessment helped define Program uncertainties to help guide the technical, regulatory, environmental, and financial efforts for the next 18 months.

The main objectives of the Readiness Assessment included:

- Provide best value for JPA capital investment for current regulatory compliance
- Consider future-proofing facilities for pending regulatory requirements and ongoing Southern California drought impacts
- Understand PWP uncertainties regarding Program costs, schedule, and risk management
- Develop an integrated strategy for JPA facilities to increase O&M flexibility and system storage, and best manage water resources in the service area

Jacobs and Woodard & Curran reviewed the baseline project that was established in the previous planning studies (Table 4-2) against regulatory requirements and experience with other accepted full advanced treatment projects to validate the Program's foundation; consider whether a modified baseline is required to future-proof the facilities; and assess impacts to Program costs, schedule, and risk.

Table 4-2. Pure Water Project Planning Studies

Focus	Studies
General	▪ *Pure Water Project Las Virgenes-Triunfo Joint Powers Authority Title XVI Feasibility Study* (Kennedy Jenks 2018) ▪ *Basis of Design Report (BODR) Recycled Water Seasonal Storage* (MWH/Stantec 2016)
AWPF	▪ *AWTP Preliminary Siting Study Report* (Woodard & Curran 2018) ▪ *Recycled Water Seasonal Storage Demonstration Project PDR* (CDM Smith 2017)
Reservoir	▪ *Cover Letter Briefing, Las Virgenes – Triunfo Joint Powers Authority, Modeling Results for the Las Virgenes Reservoir for Pure Water Program* (Trussell 2018) ▪ LVR Modeling (FSI 2017)
Conveyance	▪ *Regional Brine Management Study* (Woodard & Curran 2020)

4.3 Regulatory Requirements

4.3.1 California Indirect Potable Reuse Regulations and Treatment Requirements

In California, requirements for IPR have been established by the SWRCB. California Water Code Section 13561 defines the two types of potable recycled water use. The implementation of projects requires coordination with both the Regional Water Quality Control Board (RWQCB) and the California DDW, as described in Section 6.

The two main approaches to IPR in California are:

1) **Groundwater replenishment**: Includes using an aquifer to provide an environmental buffer between advanced water treatment (AWT) of wastewater and groundwater wells that supply water into a drinking water system. There are two types of groundwater replenishment projects that have significantly different regulatory requirements: (a) Surface application (spreading basins) and (b) subsurface application (direct injection).

2) **Reservoir water augmentation**: Includes using a reservoir to provide an environmental buffer between AWT and a water treatment plant (WTP) that supplies water into a drinking water system. This approach is also known as SWA. The SWRCB adopted SWA regulations in March 2018.

Figure 4-1 shows different approaches to IPR, with stars illustrating the approaches listed.

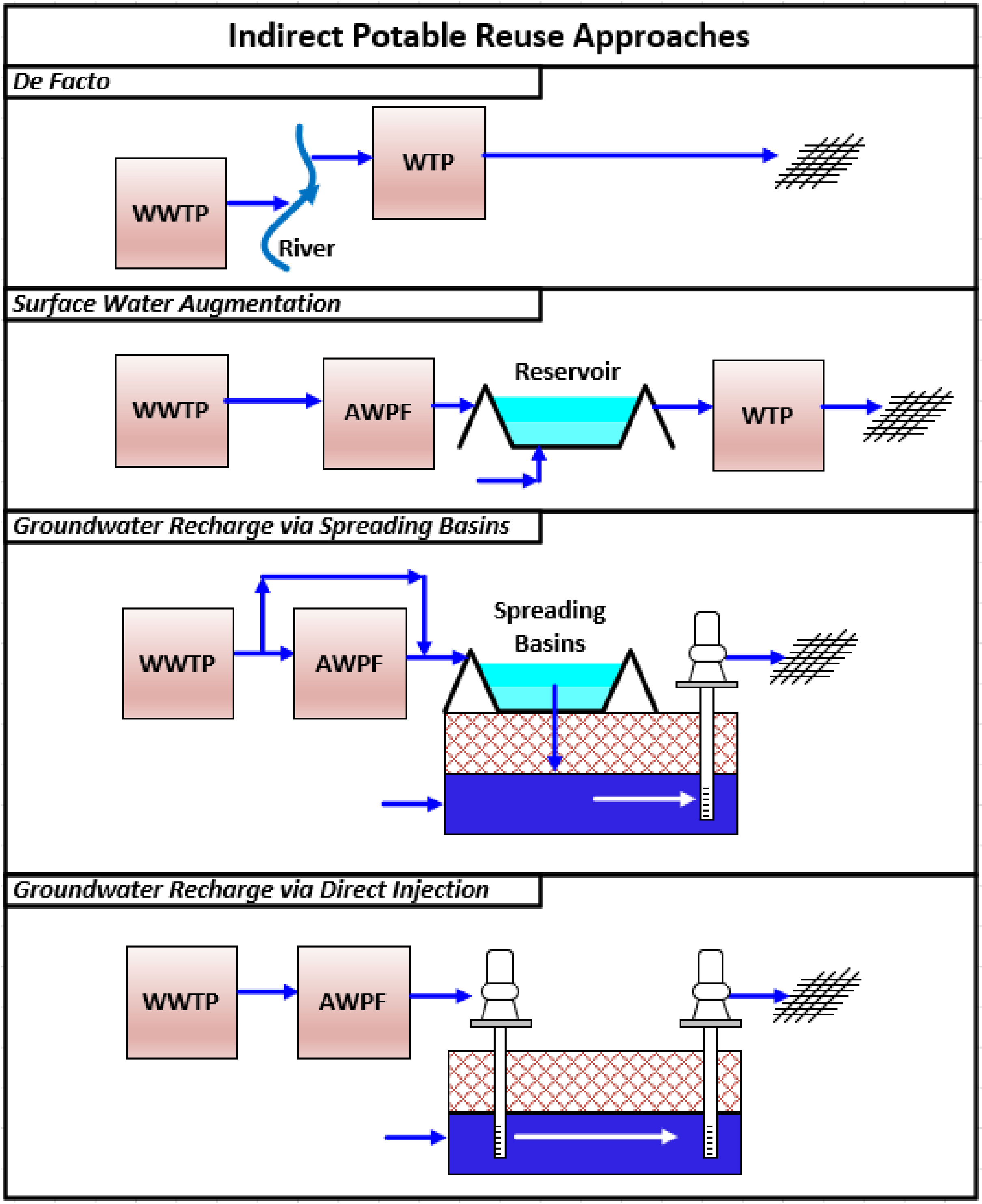

Figure 4-1. Indirect Potable Reuse Approaches

4.3.1.1 Key Indirect Potable Reuse Regulations

Pathogen removal requirements vary for groundwater replenishment and reservoir augmentation projects. Table 4-3 provides a summary of the key requirements for a groundwater replenishment project.

Table 4-3. Summary of Minimum Treatment Requirements for Groundwater Replenishment Indirect Potable Reuse

<table>
<tr><th>Pathogen</th><th colspan="2">Criteria at Compliance Point</th></tr>
<tr><th>Replenishment Type</th><th>Spreading Basins</th><th>Direct Injection</th></tr>
<tr><td>Virus LRV</td><td colspan="2">12 log before extraction for potable reuse</td></tr>
<tr><td>Giardia LRV</td><td colspan="2">10 log before extraction for potable reuse</td></tr>
<tr><td>Cryptosporidium LRV</td><td colspan="2">10 log before extraction for potable reuse</td></tr>
<tr><td>Multibarrier Approach (minimum required)</td><td>2 treatment barriers (filtration and disinfection)</td><td>3 treatment barriers (unspecified, utility to propose)</td></tr>
<tr><td>Other Requirements</td><td>Compliance before spreading basin:
▪ < 2 NTU (average in any 24-hour period)
▪ ≥ 5-log virus inactivation
▪ < 2.2 total coliform/100 mL
Compliance before extraction for potable reuse:
▪ 10-log reduction credit for Giardia and Cryptosporidium if municipal treated wastewater is retained underground for at least 6 months
▪ No advanced treatment requirements, unless to achieve LRVs
▪ Meet drinking water MCLs (except nitrogen) and action levels for lead and copper
▪ NDMA < 10 ng/L, and meet other NLs[a]
Other:
▪ Downgradient Monitoring: Monitor one location representing no less than 2 weeks or no more than 6 months of travel through the saturated zone and at least 30 days upgradient from nearest drinking water well
▪ Additional well required between GRRP and nearest downgradient drinking water well
▪ Maximum RWC is 20% without additional criteria, and up to 100% if additional criteria met (e.g., health effects study and TOC monitoring)
▪ TOC Monitoring: TOC performance over 20 weeks meets TOC maximum ≤ 0.5 mg/L / RWC in
– (1) undiluted recycled water
– (2) diluted percolated recycled water with the value amended to negate the effect of dilution, or
– (3) undiluted recycled water adjusted by the surface application factor</td><td>Compliance before extraction for potable reuse:
▪ Advanced Treatment Requirement: AOP required to provide 0.5-log 1,4-dioxane oxidation (unless otherwise directed by DDW)
▪ Meet federal Safe Drinking Water Act drinking water MCLs (except nitrogen) and action levels for lead and copper
▪ NDMA < 10 ng/L, and meet other NLs
Other:
▪ Downgradient monitoring: Monitor one location representing no less than 2 weeks or no more than 6 months of travel through the GRRP and at least 30 days upgradient from nearest drinking water well
▪ Additional well required between GRRP and nearest downgradient drinking water well
▪ Maximum RWC is 100%
▪ TOC monitoring: TOC will not exceed 0.5 mg/L based on a 20-week running average of all TOC results and the average of the last 4 TOC results</td></tr>
</table>

Table 4-3. Summary of Minimum Treatment Requirements for Groundwater Replenishment Indirect Potable Reuse

Pathogen	Criteria at Compliance Point	
Replenishment Type	**Spreading Basins**	**Direct Injection**
Other Requirements	▪ Less than or equal to 10 mg/L TN (applies to recycled water effluent or blended water concentration) ▪ Maximum 1-log virus reduction credit earned for each month retained underground ▪ Minimum allowable underground response time is 2 months ▪ Wastewater management agency must have industrial pretreatment and pollutant source control program ▪ Implement a monitoring program for diluent water, with quality not to exceed primary MCLs or a secondary MCL upper limit; meet nitrogen controls and NLs; and determine volume for credit (e.g., initial RWC < 20%) ▪ Response to Off-Spec Water: Prior to operation, approval of a plan describing steps that will be taken to provide an alternative source of drinking water, or an approved treatment mechanism; a project sponsor will provide all owners of a producing water well, that as a result of the GWR operation: (1) violates a California or federal drinking water standard; (2) has been degraded to a degree that it is no longer safe for drinking; or (3) receives water that fails to meet pathogen reduction levels specified in the recycling criteria	

[a] NLs are health-based advisory levels established by DDW for chemicals in drinking water that lack MCLs. When chemicals are found at concentrations greater than their NLs, certain requirements and recommendations apply.

Notes:

< = less than
≤ = less than or equal to
≥ = greater than or equal to
AOP = advanced oxidation processes
DWR = California Department of Water Resources
GRRP = Groundwater Replenishment Reuse Project
GWR = groundwater recovery
LRV = log reduction value
MCL = maximum contaminant level
mL = milliliter(s)
NDMA = N-nitrosodimethylamine
ng/L = nanogram(s) per liter
NL = notification level
NTU = nephelometric turbidity unit
RWC = recycled water contribution
TOC = total organic carbon

Table 4-4 provides an example of how most IPR AWT trains can achieve these requirements.

Table 4-4. Example Advanced Water Treatment Train for Groundwater Recharge Indirect Potable Reuse

Pathogen	Treatment at Upstream WWTP[a] (log)	MF/UF (log)	RO (log)	UV-AOP (log)	Chlorine Contact Time (log)	Underground Detention Time (log)	Total (log)	Total Required (log)
Virus	0-2.0	0	1.5-2.0	6.0	0-6.0	1.0-6.0[b]	12.5-21.0	12.0
Giardia	0-2.0	3.0-4.0	1.5-2.0	6.0	0-0.5	0	10.5-14.5	10.0
Cryptosporidium	0-2.0	3.0-4.0	1.5-2.0	6.0	0	0	10.5-14.0	10.0

[a] Requires a site-specific study to obtain credits from WWTP, and few projects have done this.

[b] Assumes a 1.0 log per month virus and 5 months underground. Minimum allowable underground response time is 2 months. Note that credit varies on underground detention time calculation method: 1.0 log per month with added tracer, 0.75 log per month with intrinsic tracer, and 0.5 log per month via numeric modeling (refer to Title 22 CCR, Division 4).

Notes:

CCR = California Code of Regulations
MF = microfiltration
UF = ultrafiltration
UV = ultraviolet
WWTP = wastewater treatment plant

Table 4-5 provides a summary of the main pathogen treatment requirements for a reservoir augmentation project. Note that the reservoir augmentation approach requires 12/10/10 log reduction for viruses, *Giardia,* and *Cryptosporidium*, but assumes 4/3/2 log reduction through the WTP, resulting in a minimum requirement of 8/7/8 log reduction at the AWPF. Full advanced treatment is also required, with RO and UV-AOP.

Table 4-5. Summary of Minimum Pathogen Treatment Requirements for Reservoir Augmentation

Parameter	Dilution Factor, Detention Time, and Log Removal Values					
Dilution Factor	**≤1% recycled water by volume (1:100 dilution)**			**≤10% recycled water by volume (1:10 dilution)**		
Detention Time (days)[a]	60-119	120-179	≥180	60-119	120-179	≥180
Virus	9 log	8 log	8 log	10 log	9 log	9 log
Giardia	8 log	7 log	7 log	9 log	8 log	8 log
Cryptosporidium	9 log	8 log	8 log	10 log	9 log	9 log
Multibarrier Approach (No. of required treatment processes)	2	2	2	3	3	3
Additional SWRCB Approval?	No	Yes	Yes	No	Yes	Yes
Other Requirements	▪ Meet Safe Drinking Water Act drinking water MCLs, action levels for lead and copper, and NLs ▪ CTR limits for treated discharges into inland surface waters, enclosed bays, and estuaries include the following: ▪ NDMA < 0.69 ng/L = minimum detection limit ▪ Bromoform < 4.3 µg/L ▪ CDBM < 0.401 µg/L ▪ DCBM < 0.56 µg/L ▪ 126 pollutants reviewed on a project-specific basis; pollutants may require limits or monitoring, depending on effluent and receiving water quality ▪ Wastewater management agency must have industrial pretreatment and pollutant source control program ▪ 0.5-log (69%) reduction of 1,4-dioxane					

[a] The SWRCB may increase the minimum virus, *Giardia* or *Cryptosporidium* log reduction requirement (or some combination of these) through additional treatment to obtain SWRCB approval of an alternative minimum theoretical retention time.

Notes:

µg/L = microgram(s) per liter

CDBM = chlorodibromomethane

CTR = California Toxics Rule

DCBM = dichlorobromomethane

4.3.1.2 California Toxics Rule

Table 4-5 includes discussion of a few key CTR requirements. For background, on May 18, 2000, the EPA promulgated numeric water quality criteria for priority toxic pollutants and other provisions for water quality standards to be applied to waters in the state of California. The EPA promulgated this rule—called the CTR—based on the determination that the numeric criteria are necessary in California to protect human health and the environment.

The CTR fills a gap in California water quality standards that was created in 1994 when a state court overturned the state's water quality control plans containing water quality criteria for priority toxic pollutants. Thus, California had been without statewide numeric water quality criteria for priority toxic pollutants as required by the Clean Water Act, necessitating this action by EPA. These federal criteria are legally applicable in the state of California for inland surface waters, enclosed bays, and estuaries for all purposes and programs under the Clean Water Act. Thus, the CTR requirements apply to the PWP because of the planned discharge to Las Virgenes Reservoir, which is a designated surface water body that is part of the Los Angeles RWQCB's Basin Plan.

The CTR requirements include numerical concentration limits for more than a dozen toxic inorganic constituents and more than 85 toxic organic constituents, but the water quality constituents shown in Table 4-5 are those that: (1) have stringent CTR concentration limits, and (2) are typically found in recycled water. As shown in the table, NDMA, CDBM (also known as DBCM), BDCM (also known as DCBM), and bromoform warrant further analysis to assess compliance with CTR standards. Additional sampling is planned as part of demonstration testing to evaluate these constituents. This sampling will also be used to verify compliance with all other CTR parameters.

4.4 Assessment Elements

The following elements were evaluated in the Readiness Assessment.

- **TWRF –** Employs preliminary, primary, and secondary treatment; and nitrogen removal, filtration, and disinfection to produce CCR Title 22 disinfected tertiary recycled water for nonpotable reuse and to comply with current NPDES requirements for discharge of surplus recycled water to Malibu Creek. Recycled water usage includes unrestricted irrigation of parks, golf courses, and landscaping. TWRF effluent will be the main source water for the new AWPF.
- **AWPF –** Will provide full advanced treatment (FAT) that consists of MF, RO, and UV-AOP to meet reservoir augmentation requirements for IPR.
- **Las Virgenes Reservoir –** Purified water from the AWPF will be conveyed to the Las Virgenes Reservoir, which is currently filled with potable water from the MWD.
- **WFP –** Employs diatomaceous filtration and free chlorine primary disinfection (followed by ammonia addition for residual chloramination) and will continue to treat water from the Las Virgenes Reservoir for distribution to JPA customers.
- **Concentrate Stabilization –** RO concentrate can result in scale formation and deposition in conveyance pipelines, depending on the specific water quality characteristics.
- **Conveyance –** Major conveyance lines include recycled water from the TWRF to the AWPF, purified water from the AWPF to the Las Virgenes Reservoir, concentrate from the AWPF to the SMP, and emergency discharges for excess recycled water or AWPF product water not meeting performance requirements.

From Jacobs' and Woodard & Curran's review of previous work (Table 4-2), alignment with regulatory requirements, and experience with other accepted FAT projects, considerations for a modified baseline project were identified that could:

- Meet regulatory requirements
- Provide a higher level of treatment
- Facilitate regulatory approval
- Improve water quality and ease of compliance
- Improve reliability of treatment
- Reduce operational complexity at the AWPF
- Reduce costs

The potential PWP improvements identified in this review are summarized in the following subsections. These potential modifications were presented at the Readiness Assessment Workshop on March 8, 2021.

4.5 Tapia Water Reclamation Facility

Because the effluent from TWRF will be the main source of feed water for the new AWPF, the performance of the two facilities will be integrated. Review of the TWRF focused on strategies to offer operational consistency, stabilization, and optimal AWPF performance; and the review identified enhancements that could reduce costs (capital or O&M) or operational complexity at the AWPF.

The TWRF employs preliminary, primary, and secondary treatment; and nitrogen removal, tertiary filtration, and disinfection to produce CCR Title 22 disinfected tertiary recycled water for nonpotable reuse and to comply with current NPDES requirements for discharge of surplus recycled water to Malibu Creek. Recycled water usage includes unrestricted irrigation of parks, golf courses, and landscaping.

4.5.1 Baseline Project

The baseline project assumed processing of TWRF effluent in the current condition, with no changes.

4.5.2 Potential Modifications

The potential TWRF modifications identified in the Readiness Assessment are summarized in the following subsections and include enhancements to reduce capital and O&M costs, or operational complexity at the AWPF, including the following:

- TWRF-1: Optimize disinfection
- TWRF-2: Assess and reduce NDMA formation
- TWRF-3: Achieve pathogen removal credits for the disinfection process
- TWRF-4: Enhance phosphorus removal to limit RO scaling
- TWRF-5: Equalize effluent flows for water quality benefits

4.5.2.1 TWRF-1: Optimize Disinfection

NDMA poses a unique challenge, as it is often common in disinfected effluent used for water recycling. AWPFs typically receive source water from WRF secondary effluent prior to disinfection, thus avoiding the production of NDMA from conventional disinfection. Because the PWP will operate a distant AWPF that will predominantly receive disinfected recycled water, TWRF disinfection will need to minimize NDMA formation.

A significant factor in the type of chlorine species that will form with sodium hypochlorite addition depends on the concentration and variability of ammonia in the effluent. Low ammonia concentrations favor the formation of free chlorine, while medium to high ammonia concentrations favor combined chlorine (monochloramine or dichloramine). Ammonia in secondary effluent can be highly variable due to diurnal variations and influent of return streams, which can cause regular cycling of chlorine speciation at the point of chlorine addition. This cyclical formation of different chlorine species will lead to the formation of NDMA when chloramines are present, and bromodichloromethane (BDCM) and DBCM when free chlorine is present.

Initial review of January 2019 TWRF effluent data indicated variability in the finished water chlorine residual concentration, which is indicative of chlorine species cycling caused by ammonia variation. LVMWD noted that effluent ammonia does not vary with the diurnal flow pattern and that optimization of the chloramine generation has been occurring through process control and supervisory control and data acquisition (SCADA) system upgrades to achieve a more stable chlorine residual using oxidation-reduction potential (ORP).

According to LVMWD O&M personnel, TWRF effluent is dechlorinated when recycled water is discharged to Malibu Creek, while no dechlorination is performed when recycled water is distributed for nonpotable reuse only. When the recycled water is no longer discharged to Malibu Creek in the future, extended residence time can increase the formation of disinfection by-products (DBPs).

Given the low limits, NDMA and brominated trihalomethane (THM) management and minimization in TWRF effluent will be important. The use of preformed monochloramine for disinfection is one possible solution, as it limits the formation of these DBPs while providing a stable residual needed for disinfection. Preformed monochloramine is a chemical solution created outside of the process water through the mixture of sodium hypochlorite, liquid ammonium sulfate, and softened water. After formation, preformed monochloramine is immediately added to process water, where it is stable and forms very little dichloramine or free chlorine, which are the chlorine species primarily responsible for the formation of NDMA, BDCM, and DBCM (Chang et al. 2020).

Next steps include:

- Collect continuous or frequent ammonia and chlorine residual data at TWRF effluent and Demonstration Facility influent.
- Coordinate with Demonstration Facility testing, including potential bench-scale testing.

Potential solutions include:

- Add online ammonia analyzers with a modified chlorine dosing process control strategy.
- Implement preformed chloramine generation.

4.5.2.2 TWRF-2: Assess and Reduce NDMA Formation

UV-AOP will be designed to provide a minimum of 0.5-log 1,4-dioxane oxidation, with ultimate sizing targeting removal of NDMA to less than the 10-ng/L NL. Because the CTR limits the amount of NDMA that may be discharged to reservoirs at 0.69 ng/L, the standard is met via producing nondetected concentrations. NDMA is typically removed to less than its 2-ng/L detection limit by RO and UV-AOP, but reformation to detectable levels has been observed after treatment if chloramines are present, through rebound (WRF 2020).

NDMA forms from the reaction of chloramines and amine-based precursors, such as dimethylamine. Dichloramine, which is always present to some degree with monochloramine, is the primary chloramine species that forms NDMA. Dichloramine also forms at higher concentrations when chloramines are formed in the bulk water by adding hypochlorous acid (HOCl) to react with background ammonia because of pockets of high chlorine to ammonia nitrogen ratios (Cl_2:NH_3-N). Some precursors, such as polydiallyldimethylammonium chloride (polyDADMAC) polymers, are added in TWRF processes. According to LVMWD O&M personnel, polymer is added to dewatering at Rancho Las Virgenes Composting Facility, and the centrate is returned to TWRF.

A monochloramine residual of 3 to 4 mg/L is targeted for AWPF influent for biofouling control, with low free ammonia concentration due to risk of free chlorine oxidizing RO membranes. The use of preformed monochloramine for disinfection will be employed to limit the formation of NDMA while providing a stable residual.

Next steps include:

- Collect NDMA and N-nitrosomorpholine (NMOR) data from TWRF effluent and Demonstration Facility influent samples.
- Understand the treatment elements and potential impacts.
- Compare travel time from TWRF to the Demonstration Facility versus travel time from the TWRF to the AWPF.

Potential solutions include:

- Reduce the use of polyDADMAC-based polymers.
- Implement preformed chloramine generation at TWRF and in the AWPF influent.

4.5.2.3 TWRF-3: Achieve Pathogen Removal Credits for the Disinfection Process

AWPFs typically receive source water from WRF secondary effluent prior to disinfection. However, the TWRF provides chlorination in a contact basin, with this disinfection step providing virus inactivation and some *Giardia* inactivation, along with disinfection to meet bacterial discharge limits. Dechlorination only occurs when recycled water flow is discharged to Malibu Creek. This approach would need site-specific validation to prove effective disinfection for regulatory approval. The lack of chlorine residual at Reservoir 2 would need to be considered.

This approach would add the most value if other means of achieving pathogen log credits are ruled out for other reasons. For example, if free chlorine contact time at the AWPF following UV-AOP forms BDCM and DBCM exceeding CTR limits, then another means of achieving virus credit may be necessary. If this was the case, then performing validation of disinfection performance at the TWRF through a site-specific study would be one way to achieve the needed log virus reduction credit.

Potential solution includes:

- Conduct a site-specific study to demonstrate disinfection credit for virus inactivation, including assessing the chlorine contact basin (CCB) and conveyance pipeline contactor.

4.5.2.4 TWRF-4: Enhance Phosphorus Removal to Limit Reverse Osmosis Scaling

The TWRF is not designed for biological phosphorus removal, though LVWMD observes a 1-mg/L reduction through the returned activated sludge (RAS) conditioning anoxic channel. In one set of available data, the ortho-phosphate concentration in TWRF effluent ranged from 2.3 to 3.4 mg/L as phosphorus, which is a potential scaling source for the membranes. Avista Technologies Inc. has indicated full-scale success with reuse at 85% recovery with a feed of 1 to 2 mg/L as phosphorus.

Controlling scaling will require pH reduction and antiscalant dosing. Additional removal of phosphorus at TWRF will reduce RO scaling potential and the phosphorus loading to Las Virgenes Reservoir. According to LVWMD O&M personnel, the TWRF adds ferric to the sludge force main for odor control, but does not have infrastructure to add ferric to primary treatment.

Use of aluminum sulfate (alum) in WRFs has caused fouling of membranes at other facilities. The scaling potential in the RO can be raised, as lowering the pH for calcium carbonate and calcium phosphate precipitation management to reduce scaling can reduce the alum solubility. Alum is consistently added prior to tertiary filtration at TWRF.

Next steps include:

- Review phosphorus data from TWRF, and coordinate with Demonstration Facility testing regarding scaling control and results.
- Measure aluminum at the Demonstration Facility influent.
- Understand dosing of alum at the tertiary filters and impacts on RO fouling.

Potential solutions include:

- Convert alum to ferric chloride.
- Feed ferric chloride as a coagulant to primary treatment to reduce phosphorus by 1 to 2 mg/L.

4.5.2.5 TWRF-5: Equalize Effluent Flows for Water Quality Benefits

AWPFs benefit from steady flow and water quality concentrations to provide optimal operational efficiency and performance. Steady, consistent water quality to the AWPF is necessary to produce high-quality purified water and simplifies operation and control. Equalization can deliver a steady influent flow rate, thereby reducing flow changes, and dampen variations in water quality, such as levels of ammonia, chlorine, NDMA, and phosphorous, to improve performance and reduce the risk of off-specification feed or product water that may warrant a diversion or shutdown of the process.

Next step includes:

- Assess the equalization volume required to provide steady-state flow and concentration to the AWPF.

Potential solution includes:

- Route all flow through equalization at all times.

4.5.3 Recommendations for Modified Baseline Project

Based on the Readiness Assessment, Jacobs recommends that the baseline project be modified to include the following improvements for the TWRF:

- Assess and optimize TWRF disinfection practices, if necessary, to minimize DBP formation. *This recommendation would be an addition to the baseline project*.
- Assess and reduce NDMA formation at TWRF, if necessary. *This recommendation would be an addition to the baseline project*.
- Consider a full-scale, site-specific study to demonstrate virus removal credit for TWRF disinfection practices. *This recommendation would be an addition to the baseline project*.
- Consider enhancement of phosphorus removal at TWRF. *This recommendation would be an addition to the baseline project*.
- Provide equalization of TWRF effluent flows for water quality benefits. *This recommendation is a next step from the previously identified elements of the baseline project*.

4.6 Advanced Water Purification Facility

The PWP includes an AWPF that will provide FAT for treated water from the TWRF. As defined by California regulations (Section 4.3), FAT consists of MF, RO, and an UV-AOP. The AWPF will also include ancillary facilities, such as influent screening, a break tank before RO, cartridge filters, and chemical storage and feed systems as required for treatment.

4.6.1 Baseline Project

In the baseline project, it was noted that the AWPF would provide FAT for pathogen reduction (virus, *Giardia,* and *Cryptosporidium*), meeting the minimum requirements for SWA using Recycled Water (SBDDW-16-02) based on the Las Virgenes Reservoir operating scenario examined. This approach is also referred to as “reservoir water augmentation,” meaning the planned placement of recycled water into a raw surface water reservoir used as a source of domestic drinking water supply for a public water system; this terminology is used in this document.

Figure 4-2 shows a representative process flow diagram (PFD) for the AWPF baseline project. The baseline project assumed single-pass RO, with three stages and 85% recovery. The PFD does not show all anticipated chemical feed points, treatment for brine stabilization, or purified water storage.

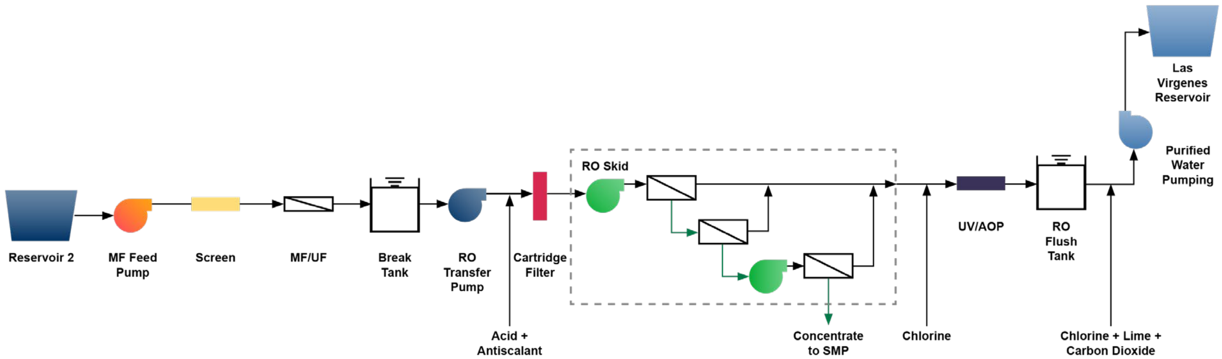

Figure 4-2. Process Flow Diagram for the AWPF Baseline Project
(Source: Adapted from MWH/Stantec 2016)

The baseline project did not appear to include a separate CCB for virus disinfection. Thus, the baseline project consisted of FAT with 8-7-8 log pathogen reduction (virus-*Giardia*-*Cryptosporidium*), meeting minimum SWA requirements based on the Las Virgenes Reservoir operating scenarios that were examined.

The baseline project did not:

- Include three different barriers for virus reduction, as required for certain reservoir operating conditions. A chlorine contactor for virus disinfection after UV-AOP is likely the most cost-effective way to provide three different barriers for virus reduction.
- Address the potential need for additional treatment approaches to meet CTR requirements for discharge to the Las Virgenes Reservoir.
- Include treatment for concentrate stabilization. This element of the project is addressed in Section 4.8.

4.6.2 Potential Project Modifications

The potential AWPF project modifications identified in the Readiness Assessment are summarized in this section and include enhancements to meet regulatory requirements, facilitate regulatory approval, improve water quality and ease of compliance, improve reliability of treatment, provide a higher level of treatment, reduce operational complexity, and reduce capital and O&M costs.

Modifications include the following:

- AWPF-1: Provide additional pathogen log reduction
- AWPF-2: Reduce NDMA and brominated THM formation
- AWPF-3: Manage pipeline purified water quality from the AWPF to Las Virgenes Reservoir discharge
- AWPF-4: Provide UV-AOP with chlorine rather than with hydrogen peroxide

4.6.2.1 AWPF-1: Provide Additional Pathogen Log Reduction

Since the prior work was completed, the reservoir operating strategy may change, as discussed in Section 4.7. In addition, the ongoing work of identifying supplemental water supply options to the AWPF may also result in more inflow to the Las Virgenes Reservoir being available from the AWPF, along with the opportunity for more withdrawal via the WFP. Once decisions on these contributing factors are made, reservoir modeling should be updated, and reservoir dilution and retention time should be re-assessed.

Table 4-6 summarizes the pathogen reduction requirements for SWA.

Table 4-6. AWPF Pathogen Log Reduction Requirements for Surface Water Augmentation

AWPF Log Removal Requirements (Virus-*Giardia*-*Cryptosporidium*)	Dilution	Retention Time (days)	No. of Required Treatment Processes	Additional SWRCB Approval Required
8-7-8	1:100	≥ 180	2	No
8-7-8	1:100	< 180 to 120	2	Yes
9-8-9	1:100	< 120 to 60	3	Yes
9-8-9	1:10	≥ 180	3	No
9-8-9	1:10	< 180 to 120	3	Yes
10-9-10	1:10	< 120 to 60	3	Yes

As shown, the minimum requirements of 8-7-8 log reduction of virus-*Giardia-Cryptosporidium* match the previous baseline project. The pathogen reduction requirements increase to 9-8-9 (virus-*Giardia-Cryptosporidium*) with less dilution (more inflow) or shorten reservoir detention time (or both) if the project moves more toward year-round AWPF operation.

It is recommended that LVWMD plan for and propose to the regulators an approach that provides 10-9-10 log reduction of virus-*Giardia-Cryptosporidium*. Providing 10-9-10 log reduction will provide flexibility for continued operations with less threat of the need to suddenly shutdown, while also improving the prospects for more rapid approval of the planned treatment approach.

FAT with MF, RO, and UV-AOP would provide at least 7.5-10.5-10.5 log reduction of virus-*Giardia-Cryptosporidium* and provide three barriers for the pathogens, *Giardia* and *Cryptosporidium*, but only two barriers for virus inactivation. Again, less dilution or less retention time would require the inclusion of a third treatment barrier as may be required for virus reduction.

Our recommendation is that three treatment process barriers are needed to support a robust strategy for discussion with the regulators. If using three treatment barriers for each pathogen, this results in needing to add a treatment process for virus reduction.

It is realistic to expect a 1.5-log reduction credit for RO for virus-*Giardia-Cryptosporidium* with typical monitoring of RO performance and 3-log *Giardia-Cryptosporidium* credit for MF. Most MF applications have not received log credit for virus reduction. Table 4-7 summarizes the anticipated pathogen log reduction credits.

Table 4-7. Anticipated Log Reduction Credits for Pathogens

Pathogen	MF	RO	UV-AOP	CCB	Total
Virus	0	1.5-2.0	6	6	7.5-14
Giardia	3-4	1.5-2.0	6	0	≥ 10.5
Cryptosporidium	3-4	1.5-2.0	6	0	≥ 10.5

As shown, FAT provides three barriers for *Giardia* and *Cryptosporidium* and readily achieves 10-log reduction for *Giardia* and *Cryptosporidium* as well. However, an additional treatment barrier, such as a CCB, would be required to meet the potential requirements of a third virus treatment barrier and 10-log virus reduction.

Additional virus log reduction credits may be possible for:

- TWRF disinfection or pipeline disinfection (or both) to the AWPF (requiring a site-specific study)
- MF with an approved integrity testing approach
- Cartridge filters (if approved by regulators)
- RO with advanced monitoring (if approved by regulators)
- CCB at the AWPF (as shown in Table 4-7)
- Pipeline contact time from the AWPF to Las Virgenes Reservoir

In terms of site planning for conceptual design, it is recommended that the AWPF include a CCB to provide a third barrier for virus reduction and to meet the goal for 10-log virus reduction credit.

As described in the rest of this section, the incorporation of additional free chlorine contact time in a CCB (or pipeline contact time to Las Virgenes Reservoir) will likely lead to the formation of DBP compounds regulated by the CTR. Consequently, it is recommended that the ongoing Demonstration Facility testing:

- Incorporate potential bench-scale or demonstration-scale testing of CTR-regulated DBP formation during chlorine contact time to simulate a CCB at the AWPF and to simulate pipeline to reservoir discharge.
- Investigate advanced monitoring of RO.

4.6.2.2 AWPF-2: Reduce NDMA and Brominated THM Formation

The Demonstration Facility testing results for the CTR-regulated DBPs, NDMA, BDCM, and DBCM were not yet available for the Readiness Assessment Workshop on March 8, 2021. Since that time, results have been shared, and to date, confirm the need to continue to evaluate formation of these DBPs as well as potential treatment approaches to address these DBPs.

NDMA is photolyzed and destroyed by UV-AOP treatment, with log reduction proportional to the UV dose. UV-AOP can be designed for greater NDMA log destruction if influent concentrations are known, but NDMA can also reform or rebound after UV-AOP treatment. NDMA rebound is dependent on chloramine concentration and speciation, contact time, pH, and the amount of organic precursors present in the water. NDMA formation occurs with chloramination, but NDMA formation is minimized with free chlorine rather than combined chlorine (chloramine).

The UV-AOP process requires the addition of an oxidant, typically hydrogen peroxide or free chlorine, that can be broken apart into hydroxyl radical to initiate advanced oxidation. UV-AOP with free chlorine requires acidic pH. UV-AOP with chlorine could lead to higher NDMA formation because of variable chlorine species present, resulting in potentially a higher UV dose needed to achieve nondetectable NDMA compared to UV-AOP with hydrogen peroxide.

BDCM and DBCM formation control requires the removal of organic precursors and minimal free chlorine contact time. Free chlorine is a much more effective disinfectant for viruses than combined chlorine (chloramine), so if a CCB is included for virus inactivation, there will be free chlorine contact time through UV-AOP (if chlorine is used as the oxidant) and through the CCB. These conditions are expected to lead to the formation of BDCM and DBCM, potentially at levels that do not comply with the CTR requirements.

For modifications to the baseline project, there are several potential solutions available if the CTR requirements *can* be met, including:

- From the ongoing Demonstration Facility testing, demonstrate nondetectable NDMA and low levels of BDCM and DBCM after the AWPF.
- Use UV-AOP with chlorine, and maintain the free chlorine residual through the CCB, followed by dechlorination using a chlorine quenching chemical (for example, sodium bisulfite) at the AWPF or at the reservoir.

For modifications to the baseline project, there are also several potential solutions available if the CTR requirements *cannot* be met, including:

- Use UV-AOP with free chlorine, and maintain the free chlorine residual through the CCB, followed by treatment through granular activated carbon (GAC) media at the AWPF. GAC will provide removal of chlorine and also removal of BDCM and DBCM.
- Use UV-AOP with hydrogen peroxide (and no post-chlorination), potentially maintaining a residual concentration of peroxide residual into the reservoir. This approach does not allow chlorine inactivation of viruses for log pathogen credit, however, so a different means of virus credit would be required.

As described in Section 4.6.2.1, it is recommended that the ongoing Demonstration Facility testing:

- Evaluate NDMA destruction though UV-AOP, and reformation through a simulated CCB after UV-AOP with chlorine as the oxidant.
- Evaluate BDCM and DBCM formation through UV-AOP with chlorine as the oxidant and through a simulated CCB after UV-AOP.
- Incorporate testing simulation to evaluate NDMA rebound and BDCM and DBCM formation through a simulated pipeline to the reservoir with a free chlorine residual present and with a chloramine residual present.
- Evaluate treated water stability and biofilm formation with no residual chlorine or chloramine residual present through the simulated pipeline to the reservoir.

4.6.2.3 AWPF-3: Manage Pipeline Purified Water Quality from the AWPF to Las Virgenes Reservoir Discharge

If the AWPF is ultimately located at the Agoura Hills site under consideration, the pipeline conveying purified water to the reservoir will be several miles long. A typical approach for conveying treated water is to maintain a residual disinfectant concentration to maintain water quality through the pipeline. Typically, a free chlorine or chloramine residual would be added to the purified water for conveyance. For this project, a free chlorine residual would be expected to increase the formation of BDCM and DBCM, while a chloramine residual could potentially increase the formation of NDMA. In addition, either a free chlorine or chloramine residual would require dechlorination before discharge to the reservoir. With no residual disinfectant present, biological activity in the water could lead to biofilm formation and potentially degradation of water quality.

The baseline project did not identify the approach to maintaining water quality for conveyance of the purified water. It is our understanding that there are not regulatory requirements that stipulate the need to maintain a residual disinfectant concentration, so it is a decision to be made by the utility.

As a next step, it is recommended that the ongoing demonstration testing:

- Evaluate treated water stability and biofilm formation with no residual chlorine present through a simulated pipeline from the AWPF to the reservoir.
- Depending on the results of the evaluation, a potential subsequent step could be to evaluate treated water stability and biofilm formation with a hydrogen peroxide residual present (if UV-AOP with hydrogen peroxide as the oxidant is used to limit the formation of CTR-regulated DBPs).

For modifications to the baseline project, the least complex approach would be to demonstrate that purified water can be conveyed to the reservoir without the need for residual disinfection. This approach would avoid the need for dechlorination at the reservoir. If CTR requirements can be readily met, then UV-AOP with chlorine as the oxidant could be used, followed by free chlorine through the CCB and then chemical dechlorination at the AWPF.

If CTR requirements can be readily met for NDMA but not for BDCM and DBCM, then UV-AOP with chlorine as the oxidant could be used, followed by free chlorine through the CCB and then GAC treatment at the AWPF.

On the other hand, if it is necessary to maintain a residual disinfectant through the purified water pipeline to the reservoir for water quality reasons, there are several potential solutions available:

- If CTR requirements can be met, use UV-AOP with chlorine as the oxidant, followed by virus inactivation credit at the CCB; and maintain the free chlorine residual through the purified water pipeline, followed by chemical dechlorination at the reservoir.
- If meeting the CTR requirements is problematic, evaluate the potential use of GAC at the reservoir for dechlorination and removal of BDCM and DBCM.
- If meeting the CTR requirements is problematic, evaluate the use of UV-AOP with hydrogen peroxide (and no post-chlorination) in demonstration testing to assess potentially maintaining the peroxide residual into the reservoir. This approach does not provide free chlorine inactivation of viruses for log pathogen credit, so an alternative approach to virus log reduction would be necessary.

4.6.2.4 AWPF-4: Provide UV-AOP with Chlorine Rather Than with Hydrogen Peroxide

The selection of which oxidant to use, chlorine or hydrogen peroxide, for the UV-AOP is a complex choice that must balance a number of water quality considerations. These considerations have been described in earlier in this section.

For UV-AOP with chlorine, acidic pH is required, with the best oxidation performance at a pH of 5.5 to 6.0. The use of UV-AOP with chlorine has gained favor as part of FAT because upstream RO treatment results in an acidic permeate with low alkalinity for buffering. If acid dosing is required, the acid dose is expected to be reasonably low. If CTR requirements are not an issue, the chlorine present can be beneficial for virus inactivation credit and for maintaining a residual concentration through subsequent conveyance. After UV-AOP, water quality stabilization is typically part of the AWPF treatment approach.

In general, for UV-AOP with hydrogen peroxide, the hydrogen peroxide is partially photolyzed and converted to hydroxyl radical, but 80 to 90% of the hydrogen peroxide dose remains as a residual concentration. The residual hydrogen peroxide requires quenching before a chlorine residual can be formed. Typical approaches for quenching hydrogen peroxide are with chlorine, sodium bisulfite, or GAC contact time. The chemical doses can be significant. For example, the chlorine dose to quench 1 mg/L of hydrogen peroxide is more than 2 mg/L of chlorine. Additional chlorine would be required, in addition to the dose to quench hydrogen peroxide, to establish a chlorine residual concentration for virus inactivation in a CCB or to maintain a residual disinfectant through purified water conveyance.

As noted in the previous section, if meeting the CTR requirements is problematic, and if a residual concentration is needed through the purified water pipeline, and if a means of virus reduction credit other than a CCB is implemented, then LVWMD could consider not quenching the residual hydrogen peroxide and keeping the residual peroxide through the purified water pipeline into the reservoir. This approach would require further study of the fate of the hydrogen peroxide in the reservoir as well as the potential water quality implications in the reservoir water.

As a next step, it is recommended that the ongoing demonstration testing evaluate the issues addressed in the previous section and in this section. Given the complex chemistry issues and the interaction of the decisions for AWPF-2, AWPF-3, and AWPF-4, a number of factors must be considered together to decide on the oxidant to use for UV-AOP.

4.6.2.5 Development of AWPF Design Concepts

For the AWPF, the Readiness Assessment task also included an evaluation of the work completed to date on identifying design concepts. From this evaluation, a number of areas were identified to focus on as the conceptual design is developed, including investigating utility services, including electrical service, in the vicinity of the site location options for the AWPF. In addition, it will be important to understand site commitments and community expectations at each site option.

From the initial facility layouts, the AWPF was shown with a nonoptimized, “warehouse” style layout. In addition, staff facilities were minimized, showing a small administration or O&M building, approximately 1,650 square feet (ft^2) in area. It is not clear if laboratory space, or visitor or tour group amenities were included. The initial facility layouts do not appear to include a maintenance shop for O&M activities. It is also not apparent whether building aesthetics and architectural theme were considered yet. Based on this review, it is recommended that architectural programming be included to develop a conceptual plan for the facilities for staff and for the public (such as tour groups) at the AWPF. As part of the architectural conceptual design, a concept-level architectural theme should also be developed.

4.6.3 Recommendations for Modified Baseline Project:

Based on the Readiness Assessment, Jacobs recommends that the baseline project be modified to include the following improvements for the AWPF:

- Plan for pathogen log reduction credits of 10-9-10 virus-*Giardia*-*Cryptosporidium. This recommendation is a modification to the baseline project*.
- Include a CCB to provide virus log credit in the conceptual design. *This recommendation is an addition to the baseline project.*
- Coordinate ongoing demonstration testing with key AWPF issues, including the formation of CTR-regulated DBPs (NDMA, BDCM, and DBCM) and pipeline water quality. *This recommendation is a next step from the previously identified elements of the baseline project.*
- Assume UV-AOP with the use of chlorine as the oxidant, a CCB for virus reduction credit, and optionally, GAC treatment to meet stringent CTR requirements, if necessary. Use the ongoing demonstration testing results to update or validate these initial assumptions. *This recommendation is a modification to the baseline project.*
- Perform demonstration testing to show that a chlorine residual is not needed in the purified water pipeline to the reservoir, thereby allowing dechlorination at the AWPF. *This recommendation is a modification to the baseline project.*
- Undertake architectural programming to develop a conceptual plan for the facilities for staff and for the public (such as tour groups) at the AWPF, as well as to identify a concept-level architectural theme. *This recommendation is a next step from the previously identified elements of the baseline project.*

4.7 Las Virgenes Reservoir

Following FAT at the AWPF, purified water will be conveyed to Las Virgenes Reservoir, an earthen reservoir, constructed in 1972, that provides a storage volume of approximately 3 billion gallons, with a depth over 100 feet. Currently, Las Virgenes Reservoir is filled with potable water provided to LVMWD by MWD. Seasonally, for several weeks of the year, LVMWD treats water from Las Virgenes Reservoir through the WFP to help meet potable water summer demands for customers.

Following FAT at the AWPF, purified water will be conveyed to Las Virgenes Reservoir, an earthen reservoir, constructed in 1972, that provides a storage volume of approximately 3 billion gallons, with a depth over 100 feet. Currently, Las Virgenes Reservoir is filled with potable water provided to LVMWD by MWD. Seasonally, for several weeks of the year, LVMWD treats water from Las Virgenes Reservoir through the WFP to help meet potable water summer demands for customers.

In the past several years, Las Virgenes Reservoir has experienced seasonal algal activity, and LVWMD has taken steps to try to manage the algal activity with the existing tools available, including aeration with existing aerators and the use of biocidal copper sulfate, as governed by the Los Angeles County Department of Agriculture. The SWRCB adopted the Statewide General NPDES permit for residual aquatic pesticide discharges to waters of the United States from algae and aquatic weed control applications, Water Quality Order 2013-0002-DWQ, which became effective on December 1, 2013.

4.7.1 Baseline Project

Previously, Las Virgenes Reservoir modeling was performed by Flow Science to assess anticipated dilution of AWPF-treated water, or mixing ratio, as well as reservoir detention time. The reservoir modeling was used to inform the assumed requirements for pathogen log reduction at the AWPF. The modeling included the previously identified worst-case scenario incorporating Santa Ana winds and no submerged inlet.

Since the reservoir modeling was performed, however, additional ongoing work is evaluating potential flow augmentation scenarios to allow use of the AWPF during summertime periods when flow from the TWRF is not available. If additional flow augmentation is included in the project, operating scenarios for the Las Virgenes Reservoir will change, and the worst-case scenario will likely differ from the prior modeling work.

To address the algal activity within the Las Virgenes Reservoir, the previous baseline project included a plan to install a second aerator at a new location within the reservoir. The two aerators would be used to help mix the reservoir. As previously identified, the baseline project included:

- Modeling the reservoir operating scenarios to assess dilution ratios and detention times
- Providing better aeration for mixing to destratify the Las Virgenes Reservoir
- Providing submerged and extended diffusers for the AWPF effluent into the Las Virgenes Reservoir

4.7.2 Potential Project Modifications

This section summarizes the potential Las Virgenes Reservoir baseline project modifications identified in the Readiness Assessment, including enhancements to provide better than 100:1 mixing rations and limit algal growth. Potential modifications include the following:

1) LVR-1: Engineer inlet zone design for improved plume dispersion
2) LVR-2: Destratify aeration of the entire reservoir
3) LVR-3: Retain seasonal stratification with hypolimnetic withdrawal
4) LVR-4: Suppress harmful algal blooms

Within the Las Virgenes Reservoir, the prior work (Trussell 2019) recommended the implementation of a multiport diffuser for discharge of AWPF effluent into the Las Virgenes Reservoir, with the diffuser positioned so that it would discharge water as deep as possible. Other prior work (Trussell 2015) recommended adding an aerator further south within the Las Virgenes Reservoir to aerate a second reservoir low point.

In consideration of future-proofing the overall Program, SWRCB NLs are expected for cyanobacteria in California. Specifically, NLs are anticipated for the algal toxins: microcystins, cylindrospermopsin, anatoxin-a, and saxitoxin (SWRCB 2021e). The potential modifications in this section would also address these potential future limits.

4.7.2.1 LVR-1: Engineer Inlet Zone Design for Improved Plume Dispersion

As presented at the Readiness Assessment Workshop on March 8, 2021, a potential baseline project enhancement LVR-1 consisted of providing an engineered inlet zone designed for improved plume dispersion. Based on review of the reservoir models, it was observed that the models predicted the overall volume of the Las Virgenes Reservoir is used inefficiently, with AWPF-treated water not reaching the southwestern and southeastern ends of the reservoir.

It appears that the warmer water discharged from the AWPF will travel along the reservoir surface, and that better plume dispersion can be achieved in the Las Virgenes Reservoir’s southern reach. To accomplish this, it is recommended that the existing model be retrieved and updated for the most representative operating scenarios. Additional virtual tracer studies should be performed using the model. Lastly, aeration should be provided to disperse the AWPF discharge plume laterally and vertically in the Las Virgenes Reservoir's southern reach. Jacobs recommends the use of a ballasted linear diffuser system for discharge of the AWPF effluent.

Additionally, the potential need for a mixing zone should be evaluated based on the testing results from the ongoing demonstration testing activities. Specifically, the ability of the AWPF-treated water to comply with CTR requirements for NDMA and brominated THM concentrations should be assessed. As described in Section 6, Regulatory Strategy, an initial dilution zone within the Las Virgenes Reservoir could be established where the AWPF discharge is diluted by mixing with the Las Virgenes Reservoir water already present, before flow enters the larger reservoir volume. This approach represents one possible means of complying with the CTR requirements.

4.7.2.2 LVR-2: Destratify Aeration of the Entire Reservoir

As stated previously, Trussell Technologies, Inc.'s (Trussell's) previous work assumed the use of a new aerator at a location south of the current locations of the two existing aerators. In Jacobs' experience, a ballasted linear diffuser could also be used to destratify the reservoir. Any approach to reservoir destratification relies on wind energy for vertical mixing. The next steps to evaluate this concept include retrieving the reservoir model, updating it, and using a bubble plume model to determine the amount of air-lift necessary for destratification mixing with aeration.

4.7.2.3 LVR-3: Retain Seasonal Stratification with Hypolimnetic Withdrawal

The third potential baseline project enhancement for Las Virgenes Reservoir would consist of retaining seasonal stratification of the reservoir and implementing approaches to improve reservoir water quality to allow hypolimnetic withdrawal.

Seasonally, deep reservoirs typically stratify thermally, with a warm top layer (epilimnion); a transitional thermocline; and the colder, deeper water forming the hypolimnion. With nutrients present, the deep hypolimnion will become anoxic as summer progresses, resulting in releases of iron, manganese, and phosphorus from sediment into the hypolimnion water.

With this potential baseline project enhancement, the intent would be to keep iron, manganese, and phosphorus bound in the reservoir sediment by keeping hypolimnion dissolved oxygen (DO) greater than 50% saturation with pure oxygen sparging into the reservoir hypolimnion. This approach has been demonstrated successfully at other reservoirs, including Aurora Reservoir in Colorado (Aurora Water et al. 2015).

Recommendations for LVR-3 include providing hypolimnetic oxygenation with an oxygen storage and feed system and a ballasted linear diffuser system installed in the deepest part of the reservoir. This approach would be implemented to reduce algal activity in the reservoir, thus allowing LVWMD to withdraw water from deeper intake depths to feed WFP. Modeling the stability of thermal stratification from hypolimnetic withdrawal is also recommended.

4.7.2.4 LVR-4: Suppress Harmful Algal Blooms

Although the TP concentration in the AWPF product water will be very low, it will likely be sufficient to keep the reservoir eutrophic. In addition, there is typically phosphorus in reservoir sediment that would then be released when DO decreases in the hypolimnion. Thus, there is the potential for continued algal blooms in the Las Virgenes Reservoir.

Potential baseline project enhancement LVR-4 makes use of the hypolimnetic oxygenation concept from LVR-3, along with a low dose of soluble aluminum coagulant (for example, alum or aluminum chlorohydrate [ACH]) to create scavenging geochemistry that will result in the phosphorus in the AWPF discharge being bound with aluminum, thereby preventing the phosphorus from entering the water column for algal uptake.

4.7.3 Recommendations for Modified Baseline Project:

From the Readiness Assessment, Jacobs recommends that the baseline project be modified to include the following improvements for Las Virgenes Reservoir:

1) Provide a submerged multipoint outlet diffuser to create longer detention time within the Las Virgenes Reservoir. *This recommendation is consistent in concept with the baseline project.*
2) Implement a hypolimnetic oxygenation system to improve water quality deep in the reservoir. *This recommendation is a modification of the baseline project.*
3) Provide aluminum coagulant chemical storage and feed system to feed a low dose to AWPF discharge to bind phosphorus. *This recommendation is an addition to the baseline project.*
4) By improving Las Virgenes Reservoir water quality with these recommendations, increase water age via regularly withdrawing from an intake depth deeper in the reservoir's hypolimnion. *This recommendation is an operational modification that, to be possible, requires implementation of the first three recommendations.*

4.7.4 Westlake Filtration Plant

The WFP is a direct filtration plant using diatomaceous earth (DE) filter media. The existing WFP meets the regulatory requirements of the Safe Drinking Water Act and produces potable water during peak demand periods each year. DDW indicated the WFP meets the requirements for the planned SWA project. However, the seasonal algal blooms within Las Virgenes Reservoir increase the potential for the DE filters to clog. Clogging of the filter media results in headloss buildup at the filters, requiring cleaning and constituting an operational bottleneck.

The WFP receives the required disinfection credit due to the use of direct filtration and free chlorine primary disinfection.

The intake to the WFP was constructed with five variable inlet elevations for raw water from the Las Virgenes Reservoir. The lowest elevation intake point includes a debris rack, while the other four have fine screens at the inlets. The two deepest intake points are prone to low DO as well as the presence of hydrogen sulfide, so they are not commonly used. The most commonly used intake point is in the middle at approximately 1,000 feet depth. According to LVMWD, the highest two intake points are not typically used due to presence of algae and taste- and odor-causing compounds that are by-products of algal activity.

LVMWD explained that the existing WFP does not include a clarification process to coagulate and settle solids prior to filtration. The existing WFP also does not include barriers that provide taste and odor control. The WFP is operated seasonally for a period of time that has historically been between May and October, although in recent years, operation has started later in the year once summer begins in June.

At this time, there is no plan to modify or improve the WFP, but LVMWD has concerns with future-proofing of this facility. With the recent expansion from 15 to 18-MGD per LVMWD personnel, a focus was put on the potential for future UV units to assist with pathogen credits, but treatment to address the impacts from algae was not investigated. The recommendations from the previous section on Las Virgenes Reservoir will allow the WFP to withdraw raw water from deeper in the reservoir, allowing the existing WFP to operate more effectively.

4.8 Concentrate Stabilization

The chemistry of the RO concentrate will be super-saturated with sparingly soluble chemicals and will likely scale and rapidly coat pipelines. DDW also requires a physical air gap for discharge of the concentrate, and this air gap will allow carbon dioxide to escape, thereby raising pH and further causing calcium carbonate precipitation in the pipeline. In addition, mixing the RO concentrate with other flows in the SMP could potentially exacerbate scaling downstream as well.

4.8.1 Baseline Project

The previous baseline project incorporated a plan to send the RO concentrate from the AWPF to a new "brine line," approximately 12 miles in length, that would connect downstream at the SMP. The previous baseline project did not include any stabilization or treatment steps for the concentrate prior to conveyance.

4.8.2 Potential Project Modifications

Potential modifications to help in stabilizing the concentrate and reducing scale formation include potentially working with DDW to explore alternatives to the physical air gap. Modifications, such as a reduced pressure zone (RPZ) backflow prevention device or a "duckbill" style check valve are not allowed by DDW in place of a physical air gap, but the reason provided by DDW in discussion was the potential for valve scaling and failure to operate. Thus, a demonstration test may be able to show the continued operation of the valve as a potentially suitable replacement for a physical air gap. As part of the testing, requirements for inspection and maintenance of the device can be established.

In terms of treatment steps, acidification treatment at the AWPF would reduce saturation levels of calcium carbonate and calcium phosphate. Eastern Municipal Water District indicated testing this approach and reportedly provided approximately 24 hours of stabilization. However, if the approach is effective for a limited period of time, it would potentially result in scaling downstream in the SMP, with the need for O&M activities to mitigate scaling.

For acidification, the required chemical doses are expected to be very high (for example, more than 100 mg/L of sulfuric acid). Additional treatment steps could be employed to stabilize concentrate more fully at the AWPF by precipitating calcium carbonate and calcium phosphate through softening treatment. The concentrate flow is expected to be approximately 1-MGD. One approach to softening treatment is the use of an upflow pellet softening reactor. Alternatively, a natural treatment system may also be feasible, although it would require much more land area. Either approach would require demonstration-scale testing to demonstrate performance and develop potential conceptual design criteria.

Other approaches that would help to control scale formation include constructing a two-pipe system for concentrate conveyance. This approach adds cost but provides operational flexibility.

With one pipeline or two, it is recommended that the project include a means to regularly clean the concentrate pipeline to remove scale. A survey of other operating facilities is recommended to gather information on approaches that have been tried and found to be effective for scale removal and concentrate pipeline O&M.

4.8.3 Concentrate Stabilization Recommended Next Steps

From the Readiness Assessment, Jacobs recommends that the following next steps be undertaken as part of the project:

- Perform demonstration testing with concentrate in a representative pipeline to simulate the concentrate conveyance approach. At the demonstration testing facility, evaluate scale formation and simulate stabilization treatment to assess performance improvement.
- Explore alternatives to a physical air gap with DDW, and consider incorporating alternative approaches, such as an RPZ or duckbill-style check valve into planned demonstration testing to show operability over time.
- Perform bench-scale testing of acid addition at the Demonstration Facility to inform the potential chemical doses necessary for concentrate stabilization.
- Perform a survey of other utilities with concentrate pipelines to gather information on approaches that have been tried and found effective for scale removal and concentrate pipeline O&M.

4.8.4 Recommended Modifications to Baseline Project

Based on the Readiness Assessment, Jacobs recommends that the baseline project be modified to include the following improvements for concentrate stabilization:

- For conveyance conceptual design, consider constructing a two-pipe system if the cost is acceptable. *This recommendation is a modification to the baseline project.*
- Use the results from the recommended operations survey to inform pipeline cleaning and scale removal approaches to be incorporated into the design. *This recommendation is a modification to the baseline project.*
- Partner with the CMWD to prepare for and implement pipeline O&M activities. *This recommendation is a next step from the previously identified elements of the baseline project.*
- Use the results from demonstration testing to evaluate the costs and benefits of additional concentrate stabilization treatment at the AWPF. Include the potential requirements for acidification treatment in the conceptual design. *This recommendation is an addition to the baseline project.*

4.9 Conveyance

The potential conveyance baseline project modifications identified in the Readiness Assessment are summarized in this section and include enhancements to improve overall system performance, operational flexibility, constructability, and environmental compliance. Modifications are included for the following conveyance pipelines:

- Source water
- Purified water
- Concentrate
- Excess recycled water discharge and AWPF emergency discharge

There are no recommended modifications to the baseline project's handling of AWPF residuals flowing to the sewer.

4.9.1 Source Water

The baseline project identified extension of the 24-inch-diameter recycled water system backbone by 9,200 linear feet (LF) for conveyance of recycled water to the new Agoura Road AWPF site, or 19,100-LF extension to the Las Virgenes Reservoir AWPF site. A consistent flow to the AWPF will be required for optimal operational efficiency and performance. Conveyance of a significant demand, up to 7.5 MGD, from the end of the recycled water system has the potential to impact delivery pressure to nonpotable customers and the ability to maintain a steady-state flow to the AWPF. An alternate 14,840 LF alignment near the Indian Hills Tank is proposed to run along Agoura Hills Road to provide the following benefits:

- A more direct connection to the AWPF from recycled water equalization
- Less pressure impact to nonpotable customers
- Elimination of a Ventura Freeway crossing

Figure 4-3 shows both alignments. LVMWD noted there have been considerations to provide a loop system in the future.

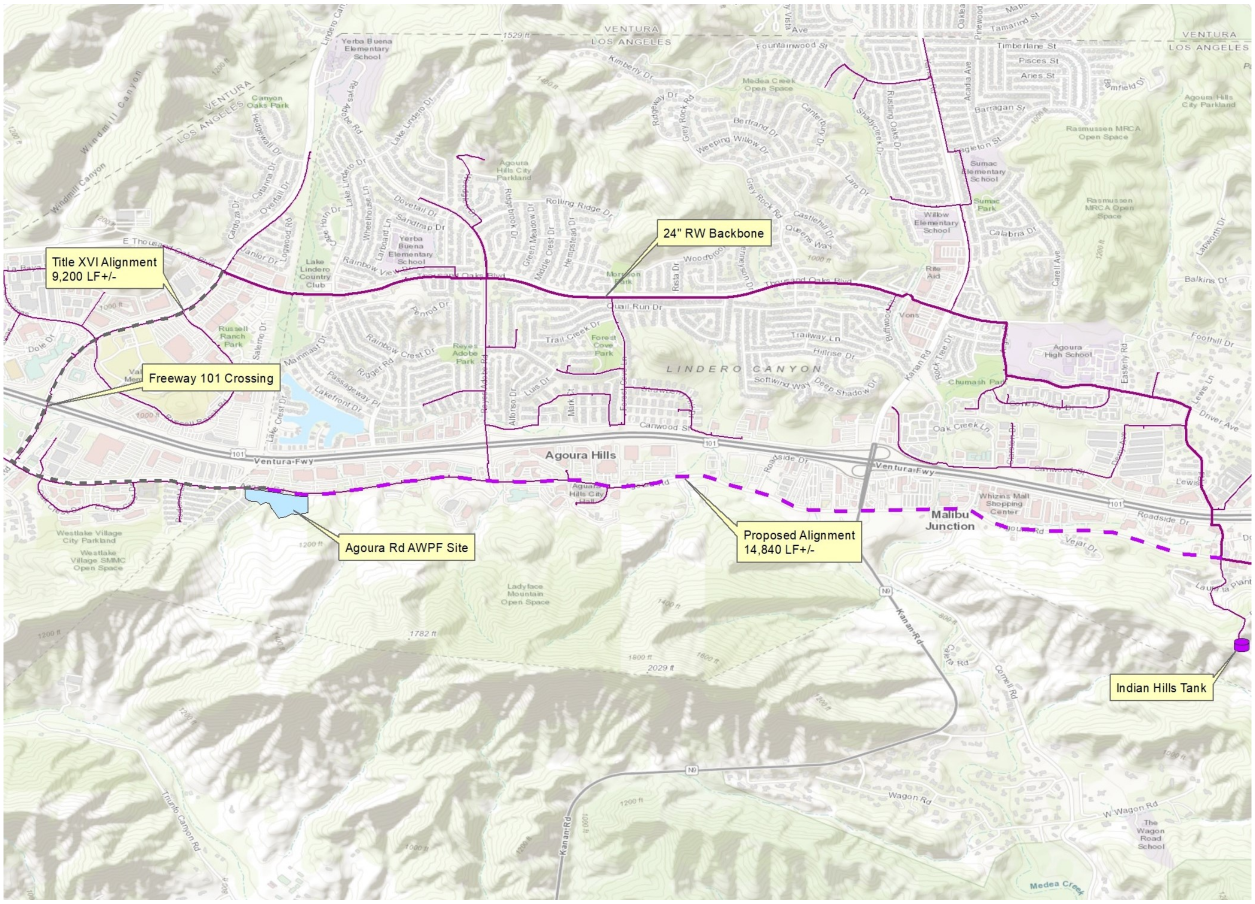

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Figure 4-3. Baseline and Modified Source Water Alignments

4.9.2 Purified Water

The alignment identified in the baseline project for purified water from the AWPF to the Las Virgenes Reservoir was confirmed to be appropriate, with a proposed increase from 15,200 to 16,100 LF of 20-inch-diameter pipe (Figure 4-4). The Readiness Assessment identified the need to assess environmental considerations and constructability in Triunfo Canyon, as these elements were not fully captured in the original cost estimate. There can be regulatory and permitting challenges related to open-cut construction in open space areas, so trenchless construction will be evaluated as an alternative. In addition, an inlet structure will be required for introduction of purified water into Las Virgenes Reservoir.

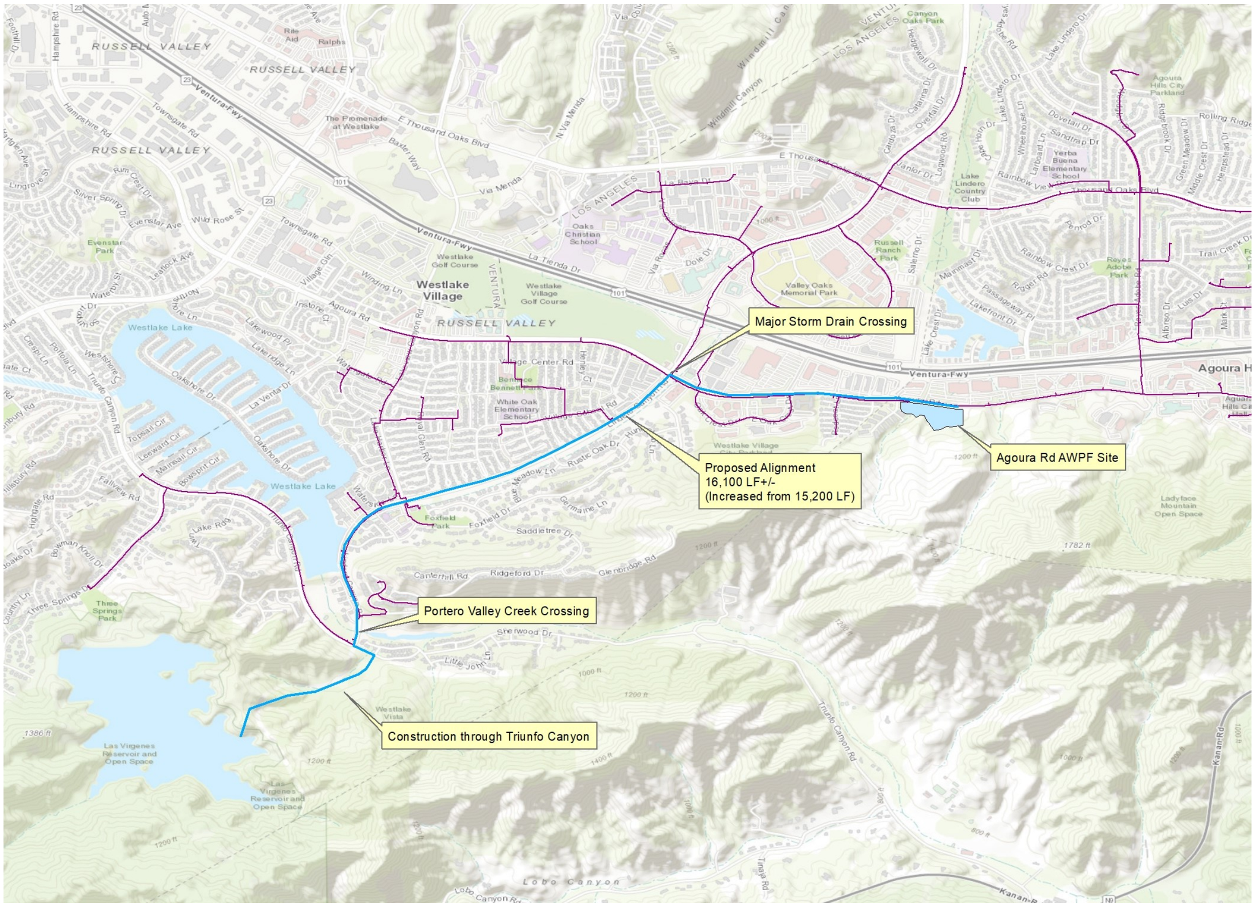

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Figure 4-4. Purified Water Alignment

Based on the Readiness Assessment, Woodard & Curran recommends that the baseline project be modified to include the following improvements for purified water conveyance:

- Evaluate environmental and permitting considerations and alternate construction approaches for work in Triunfo Canyon. *This recommendation is a modification to the baseline project.*

4.9.3 Concentrate

The baseline project identified routing an estimated 62,800 LF of 12-inch-diameter pipeline from the AWPF to the SMP to convey RO concentrate for ultimate discharge to the ocean. Due to the construction challenges along the Norwegian Grade, an alternate 72,000-LF alignment that runs along Thousand Oaks Road in the vicinity of the Hill Canyon Treatment Plant was proposed in the Regional Brine Study (Woodard & Curran 2020). The *Hill Canyon Treatment Plant Master Plan* (Gannet Fleming 2021) further refined this alignment to accommodate the City of Thousand Oaks’ long-term plans. This latest alignment will be considered (Figure 4-5).

The baseline project did not consider brine conveyance resiliency with respect to potential scaling and solids resiliency. As outlined in Section 4.8, the site-specific water quality characteristics and potential for concentrate scaling will be evaluated using the Demonstration Facility, and successful methods for scaling mitigation and management will be considered from existing operating RO facilities. A second pipeline has been proposed to provide operational resiliency, and it also gives another option for excess or diverted water discharges. Because the potential sources for water augmentation include the

Thousand Oaks Wells and the Hill Canyon Treatment Plant effluent, a third pipeline could be installed in the trench to supply source water to the new AWPF.

An air gap is typically required at the discharge of the concentrate to prevent cross-contamination. A pump station will need to be added if alternative options to provide the same function, as outlined in Section 4.8, do not eliminate the need for an air gap.

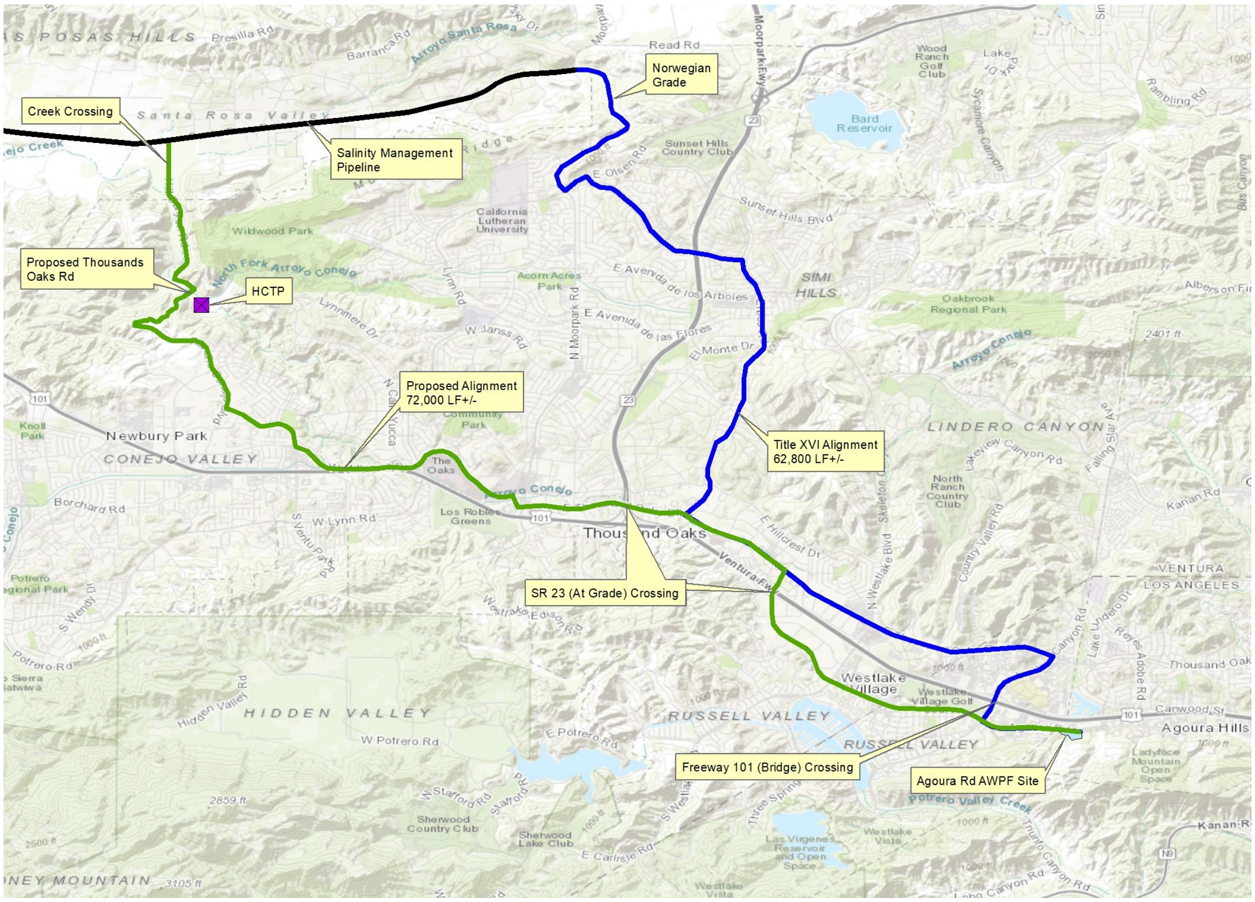

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Figure 4-5. Baseline and Modified Concentrate Alignments

Based on the Readiness Assessment, Woodard & Curran recommends that the baseline project be modified to include the following improvements for concentrate conveyance:

- For conveyance conceptual design, consider constructing a two-pipe system if the cost is acceptable. *This recommendation is a modification to the baseline project*.
- Provide a pump station for concentrate conveyance if an air gap is confirmed to be required. *This recommendation is an addition to the baseline project*.

4.9.4 Excess Recycled Water Discharge and AWPF Emergency Discharge

The baseline project assumed the discharge of excess recycled water to Discharge Point 005 for flows exceeding AWPF capacity, with no improvements to the conveyance system. Evaluation of this system has revealed that improvements to the recycled water and storm drain systems will be required to provide capacity for excess flow discharge during a wet weather event starting at a 10-year storm, or if the AWPF is offline. No supplemental discharge options were identified in the baseline project.

The baseline project does not identify dedicated infrastructure for AWPF emergency discharges. To provide LVMWD operations staff with flexibility in responding to emergency situations and flows higher than AWPF capacity, a holistic strategy to flow management will consider AWPF redundancy, discharge options, and available equalization storage for potential scenarios. Preliminary options identified for emergency discharge include short-duration discharge to the sewer system, and use of the second concentrate line or potentially the storm drain system (Figure 4-6). The intent is to capture and beneficially use all water, so these options are reserved for emergency situations.

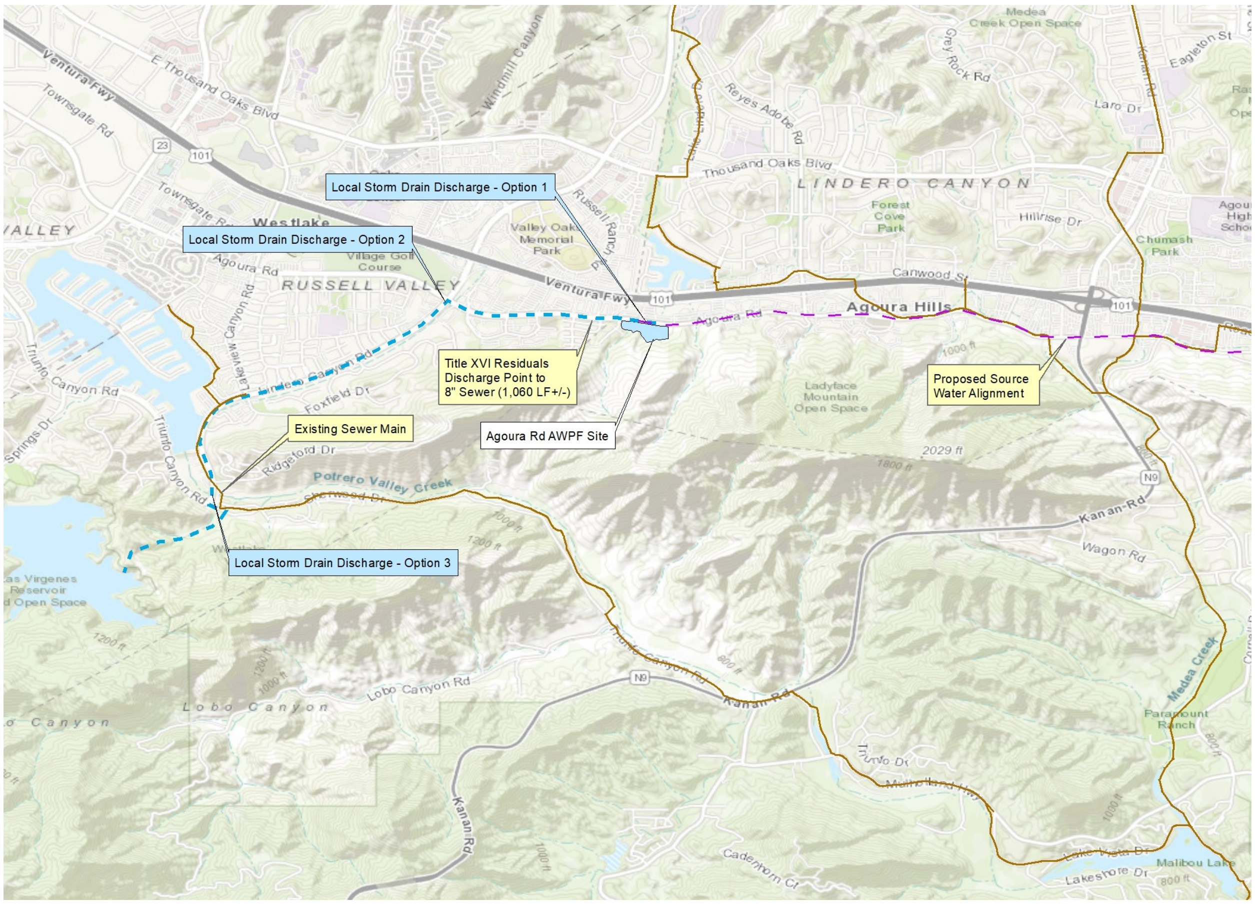

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Figure 4-6. Modified AWPF Emergency Discharge Alignments

4.9.5 Next Steps

The following next steps will be completed during the conceptual planning (10% design) and alignment evaluation of the major conveyance pipelines:

- Perform recycled water system modeling.
- Perform equalization modeling.
- Assess environmental and permitting considerations and alternative construction methods.
- Refine mitigation measures for scaling and solids deposition in concentrate line.
- Confirm improvements for recycled water and storm drain system to provide needed emergency discharge capacity.

4.9.6 Recommended Modifications to Baseline Project

Based on the Readiness Assessment, Woodard & Curran recommends that the baseline project be modified to include the following improvements to the conveyance systems:

- For source water conveyance, provide an alternate alignment originating near the tank storage and along Agoura Hills Road for improved flow and pressure control to the AWPF and customer uses. *This recommendation is a modification to the baseline project.*
- For purified water conveyance, the baseline project alignment is appropriate. Evaluate environmental and permitting considerations and alternate construction approaches for work in Triunfo Canyon. *This recommendation is a modification to the baseline project.*
- For concentrate conveyance, revise the alignment based on the findings from the *Regional Brine Study* (Woodard & Curran 2020) and *Hill Canyon Treatment Plant Master Plan* (Gannett Fleming 2021). *This recommendation is a modification to the baseline project.*
- For the residuals conveyance, the baseline project alignment is appropriate.
- Consider improvements to the recycled water and storm drain systems to maximize the capacity of Discharge Point 005. *This recommendation is a modification to the baseline project*.
- Consider dedicated infrastructure for AWPF emergency discharges in responding to excess or diverted water production or emergency situations. *This recommendation is an addition to the baseline project*.

4.10 Summary Recommendations

Based on the Readiness Assessment, Jacobs recommends that the baseline project be modified to include the following improvements for the TWRF:

- Assess and optimize TWRF disinfection practices, if necessary, to minimize DBP formation. *This recommendation would be an addition to the baseline project.*
- Assess and reduce NDMA formation at TWRF, if necessary. *This recommendation would be an addition to the baseline project*.
- Consider a full-scale, site-specific study to demonstrate virus removal credit for TWRF disinfection practices. *This recommendation would be an addition to the baseline project.*
- Consider enhancement of phosphorus removal at TWRF. *This recommendation would be an addition to the baseline project*.
- Provide equalization of TWRF effluent flows for water quality benefits. *This recommendation is a next step from the previously identified elements of the baseline project*.

Based on the Readiness Assessment, Jacobs recommends that the baseline project be modified to include the following improvements for the AWPF:

- Plan for pathogen log reduction credits of 10-9-10 virus-*Giardia-Cryptosporidium. This recommendation is a modification to the baseline project*.
- Include a CCB to provide virus log credit in the conceptual design. *This recommendation is an addition to the baseline project.*
- Coordinate ongoing demonstration testing with key AWPF issues, including the formation of CTR-regulated DBPs (NDMA, BDCM, and DBCM) and pipeline water quality. *This recommendation is a next step from the previously identified elements of the baseline project.*
- Assume UV-AOP with the use of chlorine as the oxidant; a CCB for virus reduction credit; and optionally, GAC treatment to meet stringent CTR requirements, if necessary. Use the ongoing demonstration testing results to update or validate these initial assumptions. *This recommendation is a modification to the baseline project.*

- Perform demonstration testing to show that a chlorine residual is not needed in the purified water pipeline to the reservoir, thereby allowing dechlorination at the AWPF. *This recommendation is a modification to the baseline project.*
- Undertake architectural programming to develop a conceptual plan for the facilities for staff and for the public (such as tour groups) at the AWPF, as well as to identify a concept-level architectural theme. *This recommendation is a next step from the previously identified elements of the baseline project.*

Based on the Readiness Assessment, Jacobs recommends that the baseline project be modified to include the following improvements for Las Virgenes Reservoir:

- Provide a submerged multipoint outlet diffuser to create longer detention time within the Las Virgenes Reservoir. *This recommendation is consistent in concept with the baseline project.*
- Implement a hypolimnetic oxygenation system to improve water quality deep in the reservoir. *This recommendation is a modification to the baseline project.*
- Provide a chemical storage and feed system to provide a low dose of aluminum coagulant to AWPF discharge to bind phosphorus. *This recommendation is an addition to the baseline project.*
- By improving Las Virgenes Reservoir water quality with these recommendations, increase water age via regularly withdrawing from an intake depth deeper in the reservoir's hypolimnion. *This recommendation is an operational modification that, to be possible, requires implementation of the first three recommendations.*

Based on the Readiness Assessment, Jacobs recommends that the baseline project be modified to include the following improvements for concentrate stabilization:

- For conveyance conceptual design, consider constructing a two-pipe system if the cost is acceptable. *This recommendation is a modification to the baseline project.*
- Use the results from the recommended operations survey to inform pipeline cleaning and scale removal approaches to be incorporated into the design. *This recommendation is a modification to the baseline project.*
- Partner with CMWD, owner and operator of the downstream SMP, to prepare for and implement pipeline O&M activities. *This recommendation is a next step from the previously identified elements of the baseline project.*
- Use the results from demonstration testing to evaluate the costs and benefits of additional concentrate stabilization treatment at the AWPF. Include the potential requirements for acidification treatment in the conceptual design. *This recommendation is an addition to the baseline project.*

Based on the Readiness Assessment, Woodard & Curran recommends that the baseline project be modified to include the following improvements for conveyance:

- For source water conveyance, provide an alternate alignment originating near the tank storage and along Agoura Hills Road for improved flow and pressure control to the AWPF and customer uses. *This recommendation is a modification to the baseline project.*
- For purified water conveyance, the baseline project alignment is appropriate.
- For concentrate conveyance, revise the alignment based on the findings from the Regional Brine Study (Woodard & Curran 2020) and *Hill Canyon Treatment Plant Master Plan* (Gannett Fleming 2021). *This recommendation is a modification to the baseline project.*
- Explore a holistic strategy that may require additional infrastructure to provide flexibility to manage excess recycled water discharge and AWPF emergency discharge flows, given there is no capacity in Discharge Point 005 under wet weather events starting at a 10-year storm. *This recommendation is an addition to the baseline project.*

5. Project Delivery Approach

5.1 Purpose

The purpose of evaluating different project delivery approaches is to provide prompt and effective acquisition of Las Virgenes - Triunfo PWP products, materials, engineering services, and construction contracts. The recommended approach will achieve the goals of the Program, in accordance with the spirit and requirements of the California Code - Public Contract Code, LVMWD Code, LVMWD Purchasing Policy, and JPA agreement.

5.2 Overview

Typically, the JPA uses a traditional DBB project delivery contracting model to select, award, and execute design and construction projects. This approach first completes the final contract documents and then issues requests for bids to select and award a construction contract to a qualified contractor. LVMWD may prequalify bidders for specialized skills costing in excess of $5 million, specifying a rating system based on Public Contract Code Section 20101. The benefits of this approach include a delivery staff experienced in managing and executing DBB contracts, JPA full design control and direct construction oversight, and the fact that this model has been successfully used for many years.

The PMT considered a recent and innovative project delivery contracting approach called the Collaborative Project Delivery Model for the PWP, given the Program's size and complexity. This approach engages the contractor earlier in the design development and delivery process to facilitate early cost certainty, constructability input, innovation, and collaboration through an integrated team model. These benefits are quickly making this delivery model a preferred project delivery approach used by California public agencies and special districts for their large capital project portfolio deliveries.

The JPA can use this Collaborative Project Delivery Model to award contracts for PWP portfolio delivery because costs are estimated to be more than $1,000,000, and the portfolio falls within the allowable Public Contract Code Sections 22160 et seq. for this delivery approach. The JPA's Legal Counsel confirmed the JPA's ability to use the Collaborative Project Delivery Model.

5.3 Project Delivery Drivers and Considerations

For each project element of the Program, there are different considerations for project delivery. Before choosing an approach, the team reviewed common considerations with the JPA during a special session on March 8, 2021. During the workshop, the team reviewed the main project priorities for the AWPF and conveyance projects, aligning them with JPA's comfort zone for top project drivers.

The project drivers are defined from discussions about each of the following project priorities:

- **Schedule:** How can the procurement process be varied if schedule is critical?
- **Selection Criteria:** What criteria are important to success? What's the best indicator of future performance?
- **Design Effort:** How much predesign is required to fulfill the JPA's vision of the PWP (versus designing for performance specifications only)?
- **Price:** Beyond price, what else should proposals be evaluated for? Does low price always win?
- **Scope**: What elements of the Program could use collaborative delivery versus traditional delivery?
- **Design Approval:** How much design oversight is required?
- **Risk Sharing:** How are risks best shared?
- **Quality**: How are innovation and quality built into the design process and verified?

Table 5-1 provides a summary of delivery model spectrum considerations.

Table 5-1. Delivery Model Spectrum and Drivers

Considerations	Traditional Delivery	→	Collaborative Delivery
Contracting	Multiple contracts and separate deliverables.	Multiple contracts; coordinated deliverables	Single contract; single-point responsibility
Experience with Delivery Model	Proven and familiar, but known challenges to success.	DB “lite” – familiar yet introduces collaboration	Proven, but not as familiar; promotes collaboration
Risk and Control	JPA maintains most control and keeps most of the risk. JPA “owns” delivery issues. *JPA gets prescribed project.*	JPA “owns” delivery issues but mitigates challenges early	Design-builder takes responsibility for delivery, and *JPA gets defined performance*
Cost Certainty	Fixed design fees and low-bid contracting results in potential lower first price, with change orders later.	Shifts the cost certainty earlier in the process	Early cost clarity and guaranteed maximum price, in combination with performance guarantee results in earlier price certainty and no change orders, makes this approach a higher overall value
Typical Impact to Schedule	Distinct milestones to confirm expected results in the design. Design completed before bidding. Bidding completed before construction.	Collaboration can shorten schedule	Faster, integrated schedule; contractor involved during design process to incorporate constructability considerations
Innovation	Proven approaches and solutions, and standard technology.	Opening to innovative ideas	More opportunity for value engineering, delivery period reductions, innovation, varying approaches, out-of-the box thinking

Notes:

DB = design-build

5.4 Project Delivery Approaches Considered

Figure 5-1 shows the spectrum of available project delivery procurement mechanisms, strategies, and approaches.

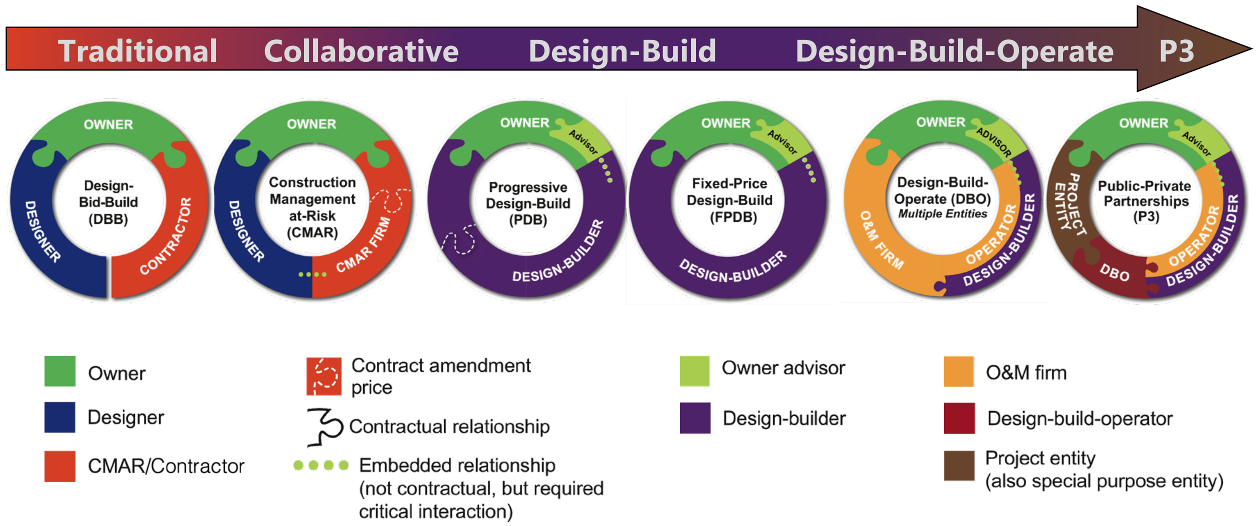


Figure 5-1. Spectrum of Potential Program Project Delivery Mechanisms

Under the collaborative delivery model, staff considered multiple project delivery approaches to apply to the PWP, including construction management at risk (CMAR), PDB, and fixed-price design-build (FPDB). These approaches work well for various PWP delivery elements, including:

- Proactively managing and using innovations during project design and construction development and implementation
- Quickly finding and securing a highly qualified constructor early in the upcoming highly competitive, high-volume construction environment expected in Southern California over the next 5 to 10 years
- Facilitating collaboration among all parties to optimize solutions, provide early cost certainty, and address market and regulatory conditions and requirements as the PWP matures

Several collaborative mechanisms shown on Figure 5-1 are not currently viable for this Program due to Code restrictions, asset ownership issues, or JPA risk and control procurement and contractual comfort levels.

5.5 Recommendation for Pure Water Project Delivery Approach

Procurement method selection is designed to match the project priorities and drivers, as well as JPA"s preferences and risk profile, as follows:

- **Reasons to Use Traditional Delivery.** This is a familiar approach that LVMWD has significant experience in administrating; the scope of work is straightforward; construction uses cost-driven, commodity-based materials; and there is a longer schedule available for defining project elements.
- **Reasons to Use Collaborative Delivery.** Early contractor engagement during design allows for owner input on design selections and decisions; enhanced constructability during design reduces change orders, and employs best value proposition as a combination of price and qualifications; and collaborative delivery provides schedule certainty, early cost certainty, and increased opportunity for value engineering.

The recommended project delivery approach is to use a combination of project delivery procurement mechanisms and approaches to provide the best value for JPA's investment.

The PMT recommends proceeding with traditional DBB for the conveyance projects because:

- The conveyance design is based on the alignment and is not motivated by innovative design or construction methods.
- There will be high agency interaction and permitting, requiring strong working relationships such that JPA would like to maintain this oversight with the designer.
- Subsurface conditions will require focused utility research early in the design and will require more time for investigation and coordination.
- The pipeline procurements are commodity driven.

The PMT recommends proceeding with PDB for the AWPF to provide:

- Early cost certainty and control to inform design decisions and understand cost impacts as the design progresses
- Innovation and collaboration to allow for design-builder creativity and JPA input on design decisions
- Best value to capitalize on cost-effective approaches and equipment selections
- Constructability and an optimized layout, as both workable areas on the two sites have a small footprint
- Single contract with one team for staff to manage

5.6 Professional Services Procurement Process – Traditional and Collaborative Project Delivery Procurements

5.6.1 Traditional Project Delivery Procurement Approach

LVMWD will engage pre-approved consultants for some assignments and will also allow consultants not in the pre-approved pool to bid on some projects. A prequalification process may be used at LVMWD's discretion and is outlined in the LVMWD Code, Section 2-6.404.

Figure 5-2 summarizes the typical procurement strategy for a traditional professional services contract.

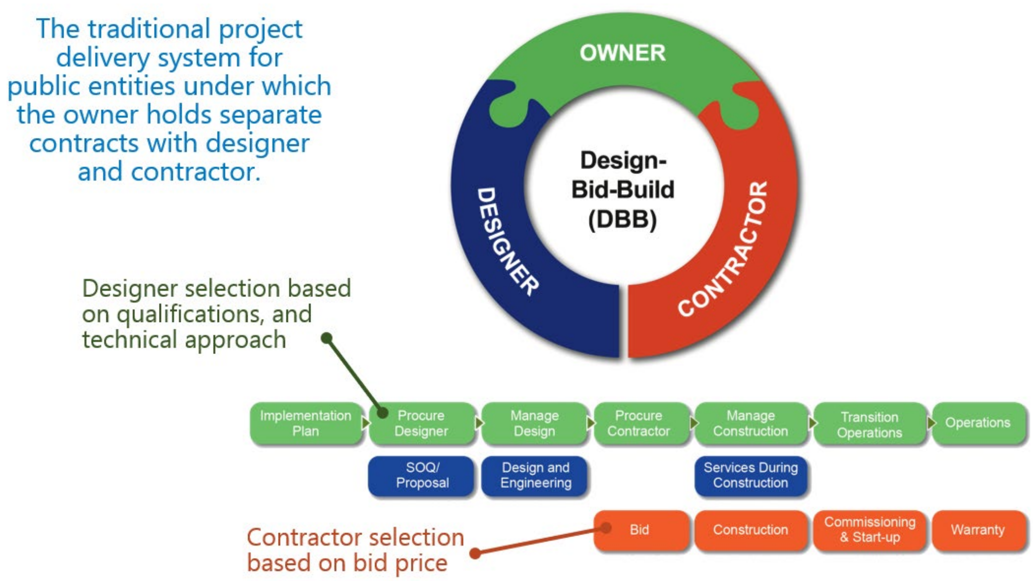


Figure 5-2. Overview of Traditional Procurement Mechanism and Strategy

5.6.2 Collaborative Project Delivery Procurement Approach

Figure 5-3 provides the PDB procurement approach, mechanism, and strategy being considered by the JPA and Program.

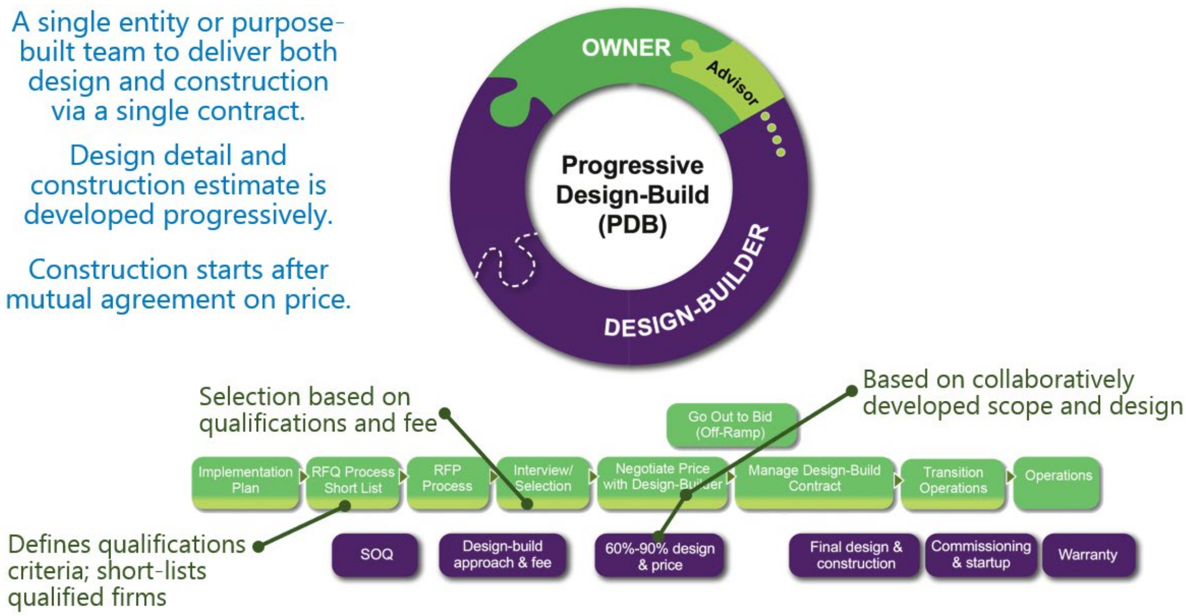


Figure 5-3. Progressive Design-Build Project Delivery Procurement Mechanism and Strategy

6. Regulatory Strategy

6.1 Overview

The PWP is an opportunity to proactively address three major challenges facing the JPA:

1) Comply with more stringent regulatory requirements for discharging to Malibu Creek.
2) Balance seasonal variation of recycled water demand.
3) Create a valuable resource to supplement the region’s water supplies, enabled by California’s reservoir water augmentation regulations.

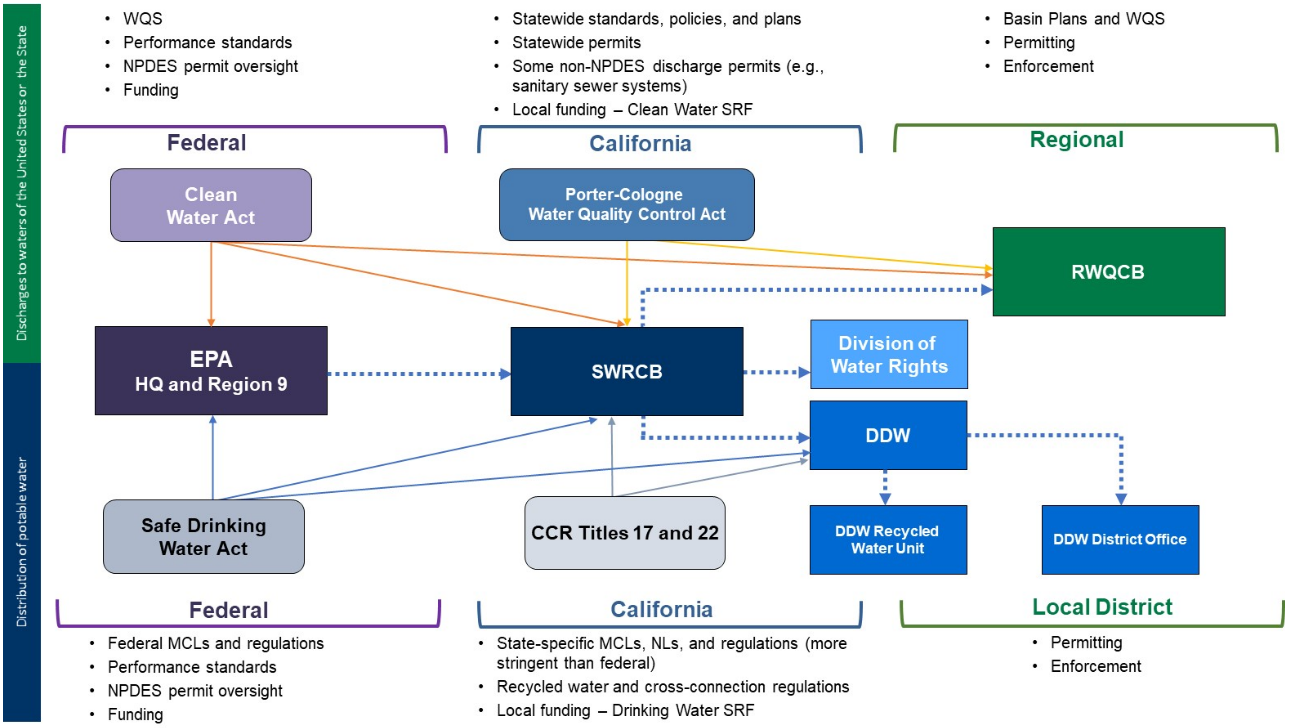
By 2030, the plan is to have an operational AWPF to treat tertiary effluent from the TWRF for IPR, and convey the purified water to the Las Virgenes Reservoir for blending with MWD supply for subsequent treatment at the WFP prior to distribution.

The PWP is the first of its kind in the Los Angeles area. Regulatory approvals for the Program from the SWRCB DDW and the Los Angeles RWQCB are required before operations of related facilities commence and purified water from the AWPF is conveyed to Las Virgenes Reservoir. The objective of this regulatory strategy is to craft a standard practice project that supports expedient DDW and Los Angeles RWQCB permitting while providing operational flexibility for the best value. This regulatory strategy provides an overview of the regulatory authorities, permitting process, and the regulatory approaches identified to meet Program objectives.

6.2 Regulatory Authorities

The two most important regulatory agencies for PWP permitting are DDW and the Los Angeles RWQCB. Both agencies operate under state law and delegated authority from the EPA. These agencies will regulate different aspects of the Program based on their statutory responsibilities: DDW is responsible for the regulation of public drinking water systems to provide safe water, and Los Angeles RWQCB is responsible for protecting groundwater and surface water quality in the Los Angeles region. A memorandum of agreement governs the basic authorities and responsibilities of each agency in the permitting and regulation of recycled water projects in California. Figure 6-1 illustrates EPA’s delegation of authority to state and local agencies and lists their respective responsibilities.

Information for another important regulatory division within the SWRCB, the Division of Water Rights, is also included in this section, but more detailed information is covered in the Section 7, Environmental Strategy.



HQ = headquarters
MCL = maximum contaminant levels
NL = notification level
SRF = State Revolving Fund

Figure 6-1. EPA Delegation of Authority to State Agencies

6.2.1 State Water Resources Control Board Division of Drinking Water

DDW is a division of the SWRCB, and the EPA has delegated Safe Drinking Water Act primacy for regulation of public drinking water systems to DDW. It is also responsible for establishing uniform criteria for recycled water treatment and use, as well as for protecting potable water systems from cross--connections. These criteria take the form of regulations found in the California Code of Regulations (CCR), Titles 17 and 22.[1] Historically, these regulations focused on nonpotable reuse projects (for example, “purple pipe” irrigation), but for the past several years, DDW has also been developing regulations for IPR and DPR, respectively.

The development of potable reuse regulations was required by the California legislature in response to prolonged drought conditions and are the culmination of years of research, analysis, and comment. The first statewide standardized IPR regulations were finalized in 2014 for groundwater recharge. Prior to 2014, groundwater IPR projects were approved and regulated by DDW on a case-by-case basis.

SWA regulations, which are applicable to the PWP, became effective in 2018. To date, only one SWA project, the City of San Diego’s North City Pure Water Project serving Miramar Reservoir, has received a conditional approval letter from DDW and a NPDES permit from the San Diego RWQCB (NPDES Number [No.] CA0109398, Order No. R9-2020-0183) that implements the DDW-imposed discharge requirements. Section 6.2.2 provides more details about discharge permits.

[1] Title 17, Public Health, Division 1 State Department of Health Services, and Title 22, Social Security, Division 4 Environmental Health

In addition to recycled water, CCR Title 22 governs the treatment requirements and MCLs for drinking water in California, including at the WFP. Within DDW, the Recycled Water Unit staff reviews recycled water projects and issues conditional approval letters for inclusion in Los Angeles RWQCB permits. District staff does the following tasks:

- Reviews traditional drinking water projects
- Conducts inspections, and ensures ongoing compliance of drinking water systems
- Issues operating permits to drinking water utilities to treat and serve potable water
- Issues enforcement actions to public water systems that violate regulations or permit conditions

The LVMWD's potable water system is regulated by DDW's Angeles District from their Glendale office (SWRCB 2021a).

Finally, the SWRCB is also responsible for the testing and certification of water treatment and water distribution operators in California and relies on DDW's input for treatment and distribution system classification (SWRCB 2021b).

6.2.2 Los Angeles Regional Water Quality Control Board

SWRCB coordinates with California's nine Regional Water Boards to preserve, protect, enhance, and restore surface and groundwater quality. The regional boundaries are based on watersheds, and water quality requirements are based on the unique characteristics of these watersheds (SWRCB 2019a). Figure 6-2 is a map of the California Regional Water Boards' watershed boundaries.

Each Regional Water Board determines standards, issues waste discharge requirements (WDRs), determines compliance with the set requirements, and takes appropriate enforcement actions (SWRCB 2019a). The Los Angeles RWQCB, also referred to as Region 4, is one of these nine Regional Water Boards, and its area comprises the coastal watersheds of Los Angeles and Ventura Counties and small portions of Kern and Santa Barbara Counties.

The Regional Water Boards maintain Water Quality Control Plans or Basin Plans, which are region-specific water quality regulations that recognize regional receiving water beneficial uses, water quality characteristics, and water quality issues. Specifically, the Los Angeles region maintains the *Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties* (Basin Plan) (SWRCB 2020a). The Basin Plan is designed to preserve and enhance water quality and protect receiving water (both surface and groundwater) beneficial uses and contains the Los Angeles region's water quality regulations and programs to implement these regulations. The Basin Plan contains both numeric and narrative water quality objectives. Numeric surface water quality objectives established within the Basin Plan have been approved by EPA and serve as federal water quality standards (WQS) that are enforceable under the federal Clean Water Act.

The Regional Water Boards are empowered to regulate discharges defined by law as "wastewater," which, in part, includes treated municipal wastewater, industrial wastewater, and stormwater. The Regional Water Boards implement the Basin Plan by issuing and enforcing WDRs for discharges to state waters (which include groundwater) or NPDES permits for discharges to waters that meet criteria for designation as waters of the United States. The federal NPDES program "…addresses water pollution by regulating point sources that discharge pollutants to waters of the United States" (EPA 2021).

Basin Plan

Water Quality Control Plans or Basin Plans are maintained by the individual Regional Water Boards and are reviewed and updated as necessary every 3 years through a process referred to as Triennial Review. Amendments must be adopted by the Regional Water Board and be approved by the State Water Board, the State Office of Administrative Law, and, in some instances, the EPA (SWRCB 2020a).

Note: Water quality regulations and programs for the Pacific Ocean in California are contained in the *California Ocean Plan* (SWRCB 2019b).

NPDES permits are issued by the Los Angeles RWQCB through EPA-delegated authority. The Regional Water Boards also issue WDRs to protect waters of the State, including groundwater or surface impoundments not classified as waters of the United States (SWRCB 2020a).

In addition to water quality objectives established by the State of California, *Numeric Criteria for Priority Toxic Pollutants for the State of California*, also referred to as CTR (Section 40 *Code of Federal Regulations* [CFR] Part 131) were promulgated by the EPA in May 2000 to protect human health and the environment and establish numeric WQS for 126 organic and inorganic priority toxic pollutants for inland surface waters, enclosed bays, and estuaries under the Clean Water Act. These WQS are used in developing discharge permit limits (EPA 2020). Los Angeles RWQCB implements and enforces the EPA-imposed CTR standards, which are also referenced in the Basin Plan. This means that discharges to federal surface waters must comply with the appropriate criteria and water quality objectives defined in the CTR, the Basin Plan, and other state and federal regulations. Los Angeles RWQCB may also implement CTR standards for discharges to state-regulated surface waters.

LVMWD currently has an NPDES permit for the TWRF (NPDES No. CA0056014, Order No. R4-2017-0024), which was most recently reissued on June 1, 2017 (Los Angeles RWQCB 2017a). This NPDES permit regulates discharges of treated wastewater from the TWRF to Malibu Creek, Las Virgenes Creek (a tributary to Malibu Creek), and Arroyo Calabasas Creek (a tributary to Los Angeles River).

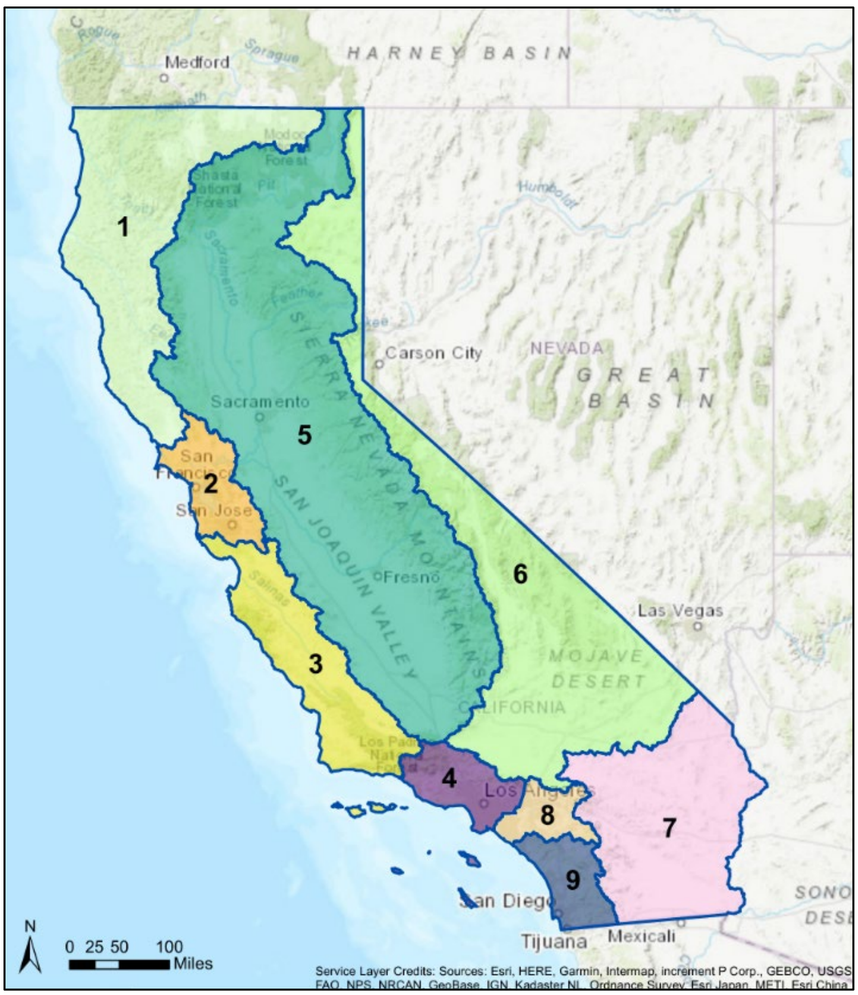


Figure 6-2. Nine Regional Water Boards

6.2.3 State Water Resources Control Board Division of Water Rights

The Division of Water Rights is a division of the SWRCB and reviews wastewater change petitions filed by wastewater treatment plant owners for recycled water projects that have the potential to change the point of use, place of use, or purpose of use of treated wastewater. Specifically, Division of Water Rights oversees compliance with Water Code Section 1211 (SWRCB 2021c).

More information about Division of Water Rights can be found in Section 7, Environmental Strategy.

6.3 Regulatory Process Approval

For a SWA project, regulatory authorities have different permitting requirements. Figure 6-3 illustrates the regulatory approval processes for DDW, Los Angeles RWQCB, and Division of Water Rights. This section describes these processes. The two endpoints of this regulatory process are:

1) The Water Supply Permit Amendment issued by DDW, which regulates the withdrawal of water from Las Virgenes Reservoir for potable use
2) A discharge permit issued by Los Angeles RWQCB, which regulates discharges to Las Virgenes Reservoir

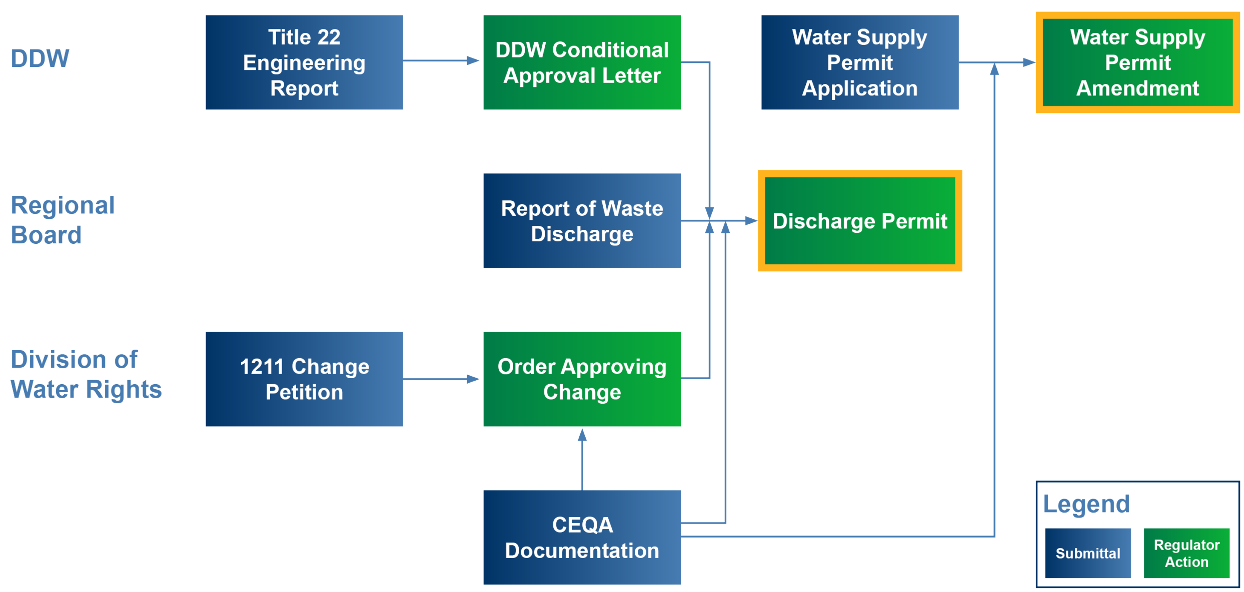


Figure 6-3. Regulatory Process for Surface Water Augmentation Projects

6.3.1 State Water Resources Control Board Division of Drinking Water Regulatory Process

California's Surface Water Augmentation Regulations, found in CCR Title 22, govern the DDW standards for this type of potable reuse. These standards require full advanced wastewater treatment, which consists of treatment of an oxidized wastewater using a RO and an oxidation treatment process, such as ultraviolet (UV) disinfection or advanced oxidation processes (AOP); discharge of the purified water into a drinking water reservoir (that is, into surface water) with specified dilution and retention time; and subsequent treatment at a surface WTP. The combined processes must meet a required level of dilution, retention time, and pathogen and chemical control.

As shown on Figure 6-3, DDW has two primary regulatory actions in a SWA project. First is the review of the Title 22 Engineering Report, which must be prepared in accordance with DDW's 2001 *Guidelines for the Preparation of an Engineering Report for the Production, Distribution and Use of Recycled Water*.

This report documents how the proposed treatment, storage, distribution, and uses of recycled water will meet the Title 22 recycled water regulation requirements.

Following DDW's review of the Title 22 Engineering Report, and once all comments from DDW are addressed, JPA and DDW will schedule public hearings to review the findings of the Title 22 Engineering Report and DDW's review. Following, the public hearings, the Title 22 Engineering Report will be updated, if needed, to address public comments.

After the updated report is reviewed and approved by DDW, DDW will provide a conditional approval letter for the PWP, which notifies the Los Angeles RWQCB of the conditional approval of the Program and lists DDW's conditions that should be included in the discharge permit. The DDW Recycled Water Unit completes this review and commenting process.

The second regulatory action is issuance of an amended water supply permit to allow a new source of supply—the purified water in Las Virgenes Reservoir—to be treated at the WFP and then served to the distribution system. The permit application materials submitted to DDW include an engineering report describing the characteristics and treatment of the new source of supply; results of water quality monitoring; and a revised Operations, Maintenance, and Monitoring Plan for the WTP. This regulatory review confirms that the drinking water continues to satisfy relevant regulations, including meeting MCLs and providing sufficient filtration and disinfection to remove and inactivate pathogens. For the WFP, the permit amendment is prepared and issued by DDW's Angeles District.

6.3.2 Los Angeles Regional Water Quality Control Board Regulatory Process

As noted, a discharge permit (WDR or NPDES) is required for discharging pollutants to surface waters. WDRs and NPDES permits are issued by Los Angeles RWQCB. Consultation with Los Angeles RWQCB will be required to determine the type of permit required for the discharge to Las Virgenes Reservoir. If WDRs are issued, they remain in effect until rescinded by Los Angeles RWQCB. In contrast, NPDES permits are reissued approximately every 5 years or administratively extended no later than 5 years following their effective dates. As part of a discharge permit, the discharges must comply with applicable criteria and water quality objectives defined in the CTR, the Basin Plan, and other state and federal regulations.

A Report of Waste Discharge (ROWD) is required to apply for, reissue, amend, or administratively extend a discharge permit. For an existing discharge permit, any changes to the treatment process that may affect water quality, volume of treated wastewater discharged, and discharge point locations should be included in the ROWD for these anticipated changes to be added to the discharge permit.

As shown on Figure 6-3, the primary document that prompts regulatory consideration of a discharge permit is the preparation of an ROWD. For discharge to Las Virgenes Reservoir, the ROWD will describe changes to the TWRF, the addition of the AWPF, and discharge of purified water to Las Virgenes Reservoir.

6.3.3 State Water Resources Control Board Division of Water Rights Regulatory Process

The PWP proposes an increased amount of treated wastewater flows to be diverted from discharges to watercourses to recycled water uses. To ensure the removal of water from a watercourse does not result in adverse impacts to habitat, this change may require Division of Water Rights approval of a Section 1211 Wastewater Change Petition. Division of Water Rights is in the process of developing a checklist for determining whether a Water Code Section 1211 approval is required, or confirmation of a previous approval, for every recycled water project or program. A screening checklist will be required for the PWP and will need to be submitted to Division of Water Rights for review and determination (SWRCB 2021d).

More information about Division of Water Rights' approval process can be found in Section 7, Environmental Strategy.

6.4 Regulatory Strategies

Early engagement with regulatory agencies will be critical to identify and understand their priorities and needs, as regulatory requirements will dictate the level of advanced treatment and Las Virgenes Reservoir operational strategy. The main regulatory strategies identified for the PWP include the following:

- Enhance dilution in the Las Virgenes Reservoir.
- Provide an appropriate level of treatment to conservatively meet DDW requirements without causing extra operational degree of difficulty or cost.
- Apply a multipronged strategy to address CTR and Basin Plan regulated compounds.
- Maximize use of the JPA's Pure Water Demonstration Facility to achieve regulatory goals.
- Engage the IAP to support regulatory strategies.
- Collaborate early and continuously with regulators to craft workable permit language.

These strategies are explained in the following subsections.

6.4.1 Enhance Dilution in Las Virgenes Reservoir

DDW regulates Las Virgenes Reservoir as a drinking water source and will require modeling of the reservoir operations to assess the blending of water from MWD and purified water, as well as the dilution that a 24-hour discharge of purified water receives in Las Virgenes Reservoir before withdrawal for subsequent treatment at the WFP. Modeling will also evaluate water detention time in the reservoir. Dilution ratio and detention time will guide the pathogen removal required of the AWPF.

A three-dimensional (3D) numerical hydrodynamic reservoir model was used to evaluate (FSI 2017) a range of operating scenarios at Las Virgenes Reservoir. Routine, Boundary, and Emergency scenarios were developed to define the intended use of the reservoir with purified water inputs, and to assess boundary conditions and operating strategies against SWA regulations.

Since this evaluation, other operating strategies have been considered by LVMWD and the Jacobs Team; hence, the hydrodynamic reservoir model will need to be updated. Ideally, maintaining 1:100 dilution will allow the JPA to limit advanced treatment to FAT and avoid the need for additional pathogen log removal treatment, such as a substantive, expensive, and operationally complex ozone or biologically active filtration pretreatment component.

To verify that the dilution requirements are met, the JPA will need to initiate a tracer study using an added tracer within the first 6 months of operation. The results of the tracer study will be used to validate the hydrodynamic modeling requirements mentioned. A tracer study protocol will need to be submitted to DDW for approval prior to conducting the tracer study.

6.4.2 Level of Treatment

The recommended level of advanced treatment presented is based on conservatively meeting DDW requirements, without causing extra operational degree of difficulty or cost. Studies to date (Kennedy Jenks 2016) have indicated that JPA's proposed AWPF treatment train would include microfiltration/ ultrafiltration, 2-stage or 3-stage RO, UV/AOP, product stabilization, and free chlorine disinfection, if needed, prior to conveyance to Las Virgenes Reservoir. In addition to enhancing dilution as discussed in Section 4.1, early engagement of DDW and Los Angeles RWQCB will be fundamental to understand regulatory requirements, which dictate the appropriate level of treatment.

6.4.3 Apply a Multipronged Strategy for California Toxics Rule and Basin Plan Requirements

As discussed in Section 2.2, discharges of purified water to Los Angeles RWQCB Basin Plan-designated surface water bodies, such as Las Virgenes Reservoir, must address two categories of water quality objectives, in addition to the DDW SWA regulations requirements: (1) those specified in the SWRCB policies or federal regulations, such as CTR standards; and (2) those designated in the Basin Plan, which also references the CTR.

6.4.3.1 California Toxics Rule

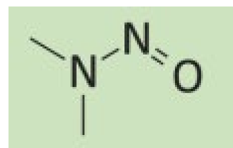
CTR standards apply to federal surface waters and are more stringent than DDW drinking water standards. Additionally, in some cases, these standards are more stringent than current analytical detection limits, including CTR standards for chlorinated pesticides, such as (SWRCB 2016):

- DDT
- Aldrin
- Dieldrin
- Heptachlor
- Polychlorinated biphenyls (PCBs)
- Polyaromatic hydrocarbons (PAHs)
- N-nitrosodimethylamine (NDMA)
- BDCM
- DBCM

CTR parameters of particular interest that will need further analysis and study to demonstrate compliance with CTR criteria are NDMA and the DBP group of total trihalomethanes (TTHMs), which include chloroform, BDCM, DBCM, and bromoform.

As shown in Table 6-1, the lowest CTR criteria for NDMA and TTHMs are much more stringent that the corresponding drinking water standards. The lowest CTR criteria are from the Human Health for Consumption of Water and Organisms category.

NDMA



NDMA is a semivolatile organic compound that forms in natural and industrial processes. It is often present at elevated concentrations in wastewater from certain industries and produced during the chloramination process of wastewater effluent and ozonation of surface water contaminated with pesticides or industrial chemicals. NDMA is completely miscible in water and may break down in water as a result of exposure to sunlight or other natural biological processes (EPA 2017).

Table 6-1. Comparison Drinking Water Standards and California Toxics Rule Criteria

Compound	Units	Drinking Water Standard	Lowest CTR Criterion (Human Health for Consumption of Water and Organisms)
NDMA	ng/L	10	0.69
Chloroform	µg/L	80 as sum of TTHMs	--
BDCM (also referred to as dichlorobromomethane)	µg/L		0.56
DBCM (also referred to as chlorodibromomethane)	µg/L		0.401
Bromoform	µg/L		4.3

Notes:
-- = not applicable
µg/L = microgram(s) per liter
ng/L = nanogram(s) per liter

CTR criteria for many pollutants are more stringent than drinking water standards because the CTR criteria consider effects on both human health and aquatic organisms, whereas the drinking water standards only consider human health effects. Some aquatic organisms may be more sensitive to pollutants due to their enhanced exposure via water, sediment, and food (Rand 2020). In particular, NDMA poses a unique challenge in that it can be created by certain treatment processes used in water recycling, including chloramine disinfection and advanced treatment technologies, such as ozonation (EPA 2017, Sgroi 2018). For the PWP, where a distant AWPF will be sourced with disinfected recycled water, this potential source of NDMA will need to be addressed.

In the absence of the Los Angeles RWQCB establishing a designated mixing zone, the CTR standards would apply directly to the end-of-pipe discharge to the reservoir. If the Los Angeles RWQCB were to establish a designated mixing zone, the CTR standards would apply outside the boundary of the mixing zone. In this event, reservoir discharge standards would be based on the degree of dilution that occurs within the mixing zone.

The use of a mixing zone in Las Virgenes Reservoir could significantly affect the nature of the effluent concentration limits imposed on the PWP. For constituents that do not persist in the environment, the designation of a mixing zone (that is, the zone where the purified water is diluted into the receiving water) could allow Los Angeles RWQCB to consider dilution effects in establishing effluent concentration standards, performance goals, or mass emission standards. This mixing zone approach potentially results in establishing effluent limits less stringent than the CTR receiving water limits.

6.4.3.2 Biostimulatory Substances (Nutrients)

Other WQS that should be considered for future studies are nitrogen and phosphorus and their effects in the Las Virgenes Reservoir, as periodic biostimulatory effects have been associated with high concentrations of these two constituents (SWRCB 2020a). The Basin Plan contains no numerical standards for nitrogen and phosphorus and, instead, establishes the following narrative biostimulatory objective: “Water shall not contain biostimulatory substances in concentrations that promote algae growth to the extent that such growth causes nuisance or adversely affects beneficial uses.”

Las Virgenes Reservoir currently experiences nuisance algal activity (LVMWD 2020), although it is anticipated that the introduction of purified water coupled with reservoir operational changes will help reduce this activity. Analysis will be required to demonstrate that no adverse biostimulatory effects are caused by the introduction of purified water under various reservoir operating scenarios. Reservoir operating strategies under consideration are included in the Section 4, Readiness Assessment.

6.4.4 Maximize Use of the JPA’s Pure Water Demonstration Facility

In accordance with SWRCB implementation policies, Los Angeles RWQCB uses Reasonable Potential Analysis (RPA) to determine which parameters are to be regulated through the imposition of enforceable effluent limits (SWRCB 2020a). Through the RPA process, parameters deemed to not have a reasonable potential to be present are typically regulated through nonenforceable performance goals. Enforceable water quality concentration limits (subject to minimum mandatory financial penalties) are imposed to regulate constituents determined to have a reasonable potential to be present in the discharge.

The RPA, in part, considers a number of statistical parameters, such as the following:

- Number of data points for each constituent
- Detection limits for the sample results
- Number of nondetected sample results
- Number of sample results with concentrations exceeding applicable standards

Proper development and implementation of a demonstration testing program is important to influencing the RPA process.

Testing plans can be developed for the JPA’s Pure Water Demonstration Facility to address specific issues, such as NDMA compliance with the CTR requirement. Data obtained through these testing plans could justify the implementation of performance goals instead of effluent limits in the discharge permit. Lastly, the JPA’s Pure Water Demonstration Facility can help build public confidence and approval.

6.4.5 Engage the Independent Advisory Panel

At a minimum, DDW requires that an IAP be engaged to evaluate the hydrodynamic modeling of the reservoir for SWA projects. However, an IAP can also provide other benefits to the PWP.

An IAP was organized by the JPA in 2018 to evaluate the technical, scientific, and regulatory aspects of the Program (NWRI 2018). The IAP provides third-party, expert review of Program elements to assist regulatory agencies in evaluating and permitting the PWP. The regulatory strategy will continue to leverage the IAP to:

- Build public and regulator confidence
- Answer regulator questions, and endorse design team approaches
- Provide input to help clarify how unclear regulations should be addressed
- Review demonstration test plan and results, reservoir modeling and operation strategy, and tracer study protocol

When appropriate, a subcommittee of the IAP may be convened to review specialized topics, such as specifics of the reservoir modeling.

6.4.6 Collaborate Early and Continuously with Regulators

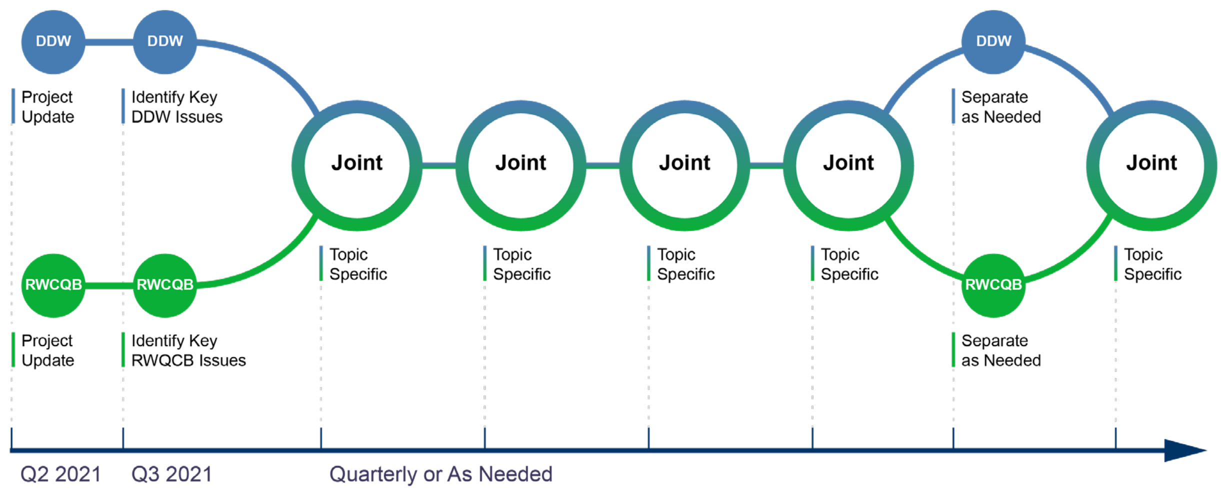
Early and continuous collaboration with regulators will build confidence in the PWP and help set the right permitting stage for future phases of the Program. DDW and the Los Angeles RWQCB will be engaged with appropriate data and support, and will be provided with tailored permit application documents to support regulatory approaches consistent with the JPA's desired regulatory outcome. This strategy should also shorten the permitting process schedule.

One lesson learned from previous experience is that, while DDW has clear guidelines through the SWA regulations, Los Angeles RWQCB has substantial discretion in how to regulate this type of discharge relative to complying with Basin Plan objectives and CTR standards and achieving environmental water quality goals. More specifically, the message to the Los Angeles RWQCB should emphasize:

- The PWP will protect beneficial uses of Las Virgenes Reservoir.
- The PWP will have a robust approach for NDMA and DBPs, and the JPA's Pure Water Demonstration Facility study will be leveraged to assist the Los Angeles RWQCB in developing workable effluent limits.

As part of early engagement, it is recommended that the ROWD for the reissuance of TWRF's NPDES permit include information that will support the implementation of favorable permit language to accommodate Program needs. This TWRF ROWD is due in February 2022 and will help inform Los Angeles RWQCB staff of the Program and relevant issues, supporting future phases of the PWP and a strong working relationship with a new generation of permit writers at the Los Angeles RWQCB.

As part of this early and continuous engagement strategy, a series of meeting will be held with DDW and Los Angeles RWQCB staff. Figure 6-4 shows the tentative schedule of meetings to engage with DDW and the Los Angeles RWQCB for Phase 1 of the PWP.



Note: Figure shows meetings with DDW and Los Angeles RWQCB

Figure 6-4. Tentative Schedule of Regulatory Phase 1 Meetings

7. Environmental (CEQA) Strategy

7.1 Overview

The California Environmental Quality Act (CEQA) was enacted into California law in 1970. The purpose of CEQA is to foster public input into the decision-making process when a public agency undertakes a project that requires a discretionary decision. CEQA is implemented through a defined methodology, during which a decision-making agency – the CEQA Lead Agency – prepares and discloses information to the public, stakeholders, and other regulatory agencies regarding the environmental impacts and potential consequences that may occur as a result of approving a project. The JPA is the CEQA Lead Agency for the PWP.

CEQA provides options for the type of environmental document to be prepared. For the PWP, a programmatic analysis—a Program Environmental Impact Report or PEIR—is recommended. This type of CEQA document may be prepared for a series of actions that can be characterized as one large project (CEQA Guidelines Section 15168). The PEIR is an “umbrella” CEQA document that allows for a more exhaustive consideration of high-level effects that would be practical under a case-by-case review of individual project components at a time when the Lead Agency has more flexibility to address environmental effects.

A certified PEIR demonstrates compliance with CEQA by evaluating and publicly disclosing a program’s potential environmental impacts. The PEIR is required to meet a Lead Agency’s CEQA obligations and must be completed and certified before construction of individual projects. The PEIR is also required before discretionary permits can be issued by local or state agencies, such as California Department of Fish and Wildlife or the RWQCB. This document is also a critical prerequisite for governmental applications for low-interest loan programs, such as the EPA’s WIFIA and SRF programs, and MWD’s Local Resources Program.

This section documents the PWP CEQA strategy and recommendations that the PWP Team and JPA will use to complete the PEIR process. Also, this TM provides the PWP Team strategy to address future CEQA compliance and approvals that will arise as the PWP matures, develops, and is implemented.

7.2 Future CEQA Review Process

By focusing on high-level impacts, a PEIR allows the Lead Agency considerable flexibility regarding project-level detail. This is especially helpful because the PWP is still in a concept definition and early design phase, with only some elements that are defined enough to warrant a project-level evaluation.

This programmatic approach allows the JPA (Lead Agency) to approve of the entire PWP even as some of the PWP’s projects are still in concept development and design. This PEIR strategy solves potential design and implementation challenges by providing overarching coverage, or “an umbrella,” for many of the important PWP projects and associated components, while allowing for detailed review as new PWP projects are developed and move toward approval.

The recommended strategy for providing detailed review of individual projects to achieve future CEQA compliance is summarized as follows:

- **PEIR Checklist**. CEQA Guidelines Section 16168(c) allows for PEIRs to be used for later activities without preparing a new CEQA document of any kind. PWP could benefit from this allowance by using a PEIR Checklist as the preferred approach for individual project review throughout the life of the Program. The JPA will need to determine that each project is within the scope of the PEIR and that none of the tests for subsequent CEQA review (Section 15162) are met. The CEQA Guidelines recommend using a checklist to document the evaluation of later activity (determination that environmental effects are within the scope of the PEIR).

- **CEQA Addendums**. A CEQA Addendum can be prepared for a previously certified PEIR when changes or additions are needed, but the changes do not trigger conditions requiring preparation of a subsequent environmental document, as described in CEQA Guidelines Section 15162. No public notice is required for a CEQA Addendum, and it does not need to be circulated for public review.
- **Negative Declarations (NDs) or Mitigated Negative Declarations (MNDs).** A PEIR can be used to support the determination made in an Initial Study to prepare either an ND or an Environmental Impact Report (EIR) for a later project under a program. Pursuant to subdivision (c) of CEQA Guidelines Section 15168, an MND prepared for a later project would focus on new effects that had not previously been considered in the PEIR, and which can be reduced to a less than significant level by mitigation measures or revisions incorporated into the project. In addition to these measures or revisions, the project must incorporate all applicable mitigation measures and alternatives identified in the PEIR (CEQA Guidelines Section 15168(c)).
- **Supplemental EIR**. If some of the tests for subsequent environmental review are met, then a Supplemental EIR can be prepared. A Supplemental EIR would focus on the areas that have changed and the new impacts associated with the change. Typical EIR processes are required with a Supplemental EIR, including scoping, public review, and documenting responses to comments. A Supplemental EIR may be necessary if critical elements of the PWP cannot be developed in sufficient detail to meet the PEIR schedule.

7.3 CEQA-Plus and NEPA

The PEIR approach and future project review described is focused on the JPA’s obligations to analyze the environmental impacts of the PWP as the CEQA Lead Agency. This approach also considers the actions required by other agencies (for example, state regulators) and the potential use by the MWD Local Resource Program. However, consideration is also needed to ensure that the environmental review satisfies the *additional* needs of other funding agencies that are over and above what is required by CEQA. This section addresses the additional environmental requirements needed for two important funding processes: the SRF and the WIFIA.

7.3.1 CEQA-Plus

CEQA-Plus is a specific type of CEQA process that was approved by the SWRCB to develop a National Environmental Policy Act (NEPA)-like state environmental review for projects funded through the SRF, which is ultimately financed through the EPA. Because the EPA is a federal agency, a NEPA approval must be obtained to allow funding authorization.

CEQA-Plus uses a CEQA document (PEIR or EIR) as well as documentation for specified federal consultation obligations, known as “cross-cutters.” CEQA-Plus uses all PEIR elements for CEQA, but also includes the “Plus” components, including Section 106 of the National Historic Preservation Act and Section 7 of the federal Endangered Species Act.

In addition, a CEQA-Plus analysis augments the CEQA analysis to include the following additional federal cross-cutter requirements:

- Federal Clean Air Act
- Executive Order 11990 Protection of Wetlands
- Coastal Zone Management Act
- Farmland Protection Policy Act
- Executive Order 11988 Floodplain Management
- Wild and Scenic Rivers Act
- Migratory Bird Treaty Act

7.3.2 NEPA

The NEPA, which was signed into law on January 1, 1970, establishes a national environmental policy and goals for the protection, maintenance, and enhancement of the environment, and provides a process for federal agencies to implement these goals.

NEPA requires that all federal agencies use all practicable means to create and maintain conditions under which humans and nature can exist in harmony. NEPA further requires that federal agencies incorporate environmental considerations into their planning and decision making using an interdisciplinary approach.

NEPA's implementing regulations are administered by the Council on Environmental Quality (CEQ) (40 CFR 1500 et seq.). Section 1502.14 of the CEQ Regulations for Implementing NEPA requires that Environmental Impact Statements (EISs) rigorously explore and objectively evaluate all reasonable alternatives to the project, including the No Action Alternative and reasonable alternatives not within the jurisdiction of the Lead Agency.

For the PWP, the most likely triggers for NEPA would be submission of an application and funding approval through the WIFIA and potentially the issuance of a Section 404 permit from the U.S. Army Corps of Engineers (USACE). It is anticipated that NEPA compliance for WIFIA funding may be covered through the Programmatic Environmental Assessment that the EPA previously certified in 2018. For the USACE, NEPA compliance for permit issuance under a Nationwide Permit is already completed for each permit prior to issuance. If an individual permit becomes necessary for the PWP, a NEPA review and document would need to be prepared.

7.4 PEIR Process and Implementation

This section describes the proposed implementation plan for the PWP PEIR, including milestone process steps and expected timeline, document preparation strategies, and focus topics to be developed in the PEIR.

7.4.1 PEIR Milestones and Timeline

Figure 7-1 illustrates the required process for CEQA document review and adoption, starting with scoping and ending with PEIR certification and project approval by the JPA Board. Nested within each step are critical touch points with agency reviewers and the general public. The Jacobs Environmental Team will collaborate with JPA staff, the PMT, and Katz & Associates so that the project information to be shared publicly is developed to an appropriate level and presented in a way that fosters understanding of the PWP and its expected benefits and potential adverse effects (for example, construction disruptions) that we are addressing in the PEIR.

From an external perspective, the public will be introduced to the CEQA process by a Notice of Preparation. At this time, we envision releasing the Notice of Preparation in August 2021, which initiates the official *scoping* process. Typically, scoping lasts approximately 30 calendar days with an optional public meeting or workshop that introduces the attendees to the project and requests their input.

The second milestone is the release of the Draft EIR (sometimes called the Public Draft) for review. The typical review period is 45 calendar days, which can be longer (or extended) if needed. During that time, an optional public meeting or workshop is often held to support effective outreach and project understanding.

Shortly after the close of the public review period, any necessary updates to the document will be prepared, and a Final EIR will be released, including written responses to comments. Usually, the Final EIR is released 2 to 3 weeks in advance of the scheduled JPA Board Meeting, where the Final EIR will be considered for adoption—effectively, the formal end of the PEIR process.

Figure 7-1 provides an overview of the PEIR review process.

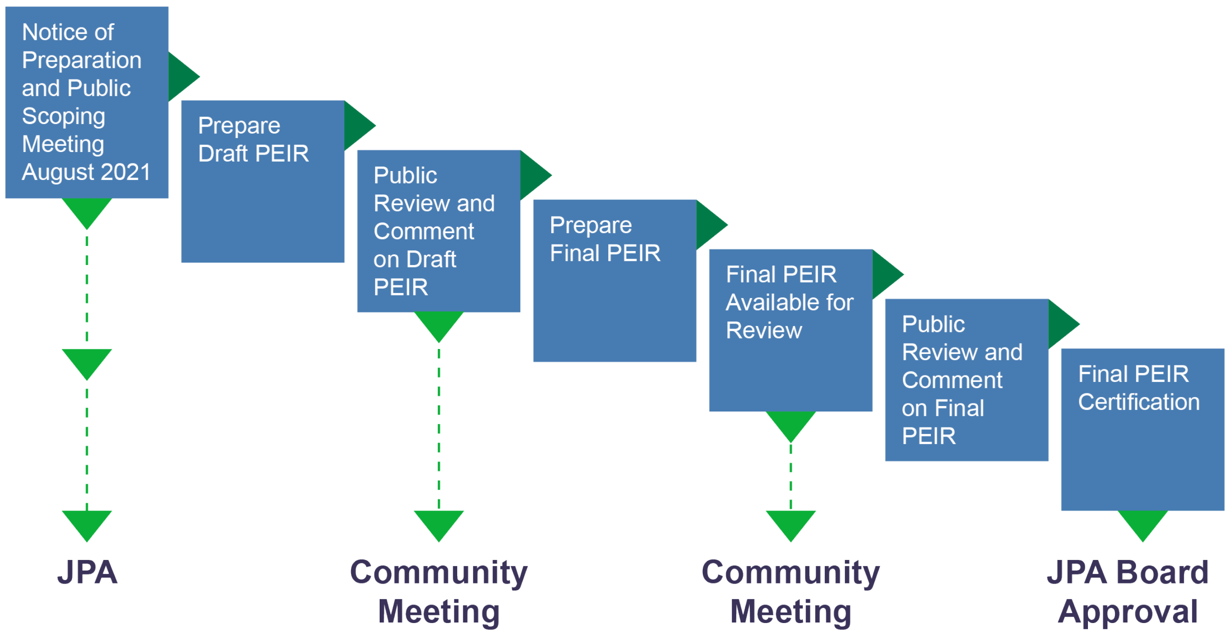


Figure 7-1. PEIR Review Process

7.4.2 PEIR Preparation Approach

The internal, staff-level work to conduct the environmental evaluation and prepare the PEIR itself is an intensive process involving an interdisciplinary team of resource specialists and environmental planners. The goal of this process is to present information about environmental impacts in a clear, concise manner that is understandable to the general public while being technically rigorous.

To best fulfill our obligations, we recommend the following document preparation approaches.

- **Initial Study**. Jacobs will prepare a CEQA Initial Study checklist per Appendix G of the State CEQA Guidelines. The Initial Study will be a milestone for developing the *project description* by focusing on our ability to define core project features and meet basic CEQA data needs for a PEIR and (if possible) for project-level approval. In addition, the Initial Study will confirm what resources do not need to be evaluated in the PEIR—for example, there are no expected farmland impacts—and what resources should be the focus of the analysis. For CEQA resources to be evaluated in detail, the Initial Study will determine available data sources and identify data collection needs appropriate for a PEIR and (if possible) for project-level approval.
- **Project Description**. The PEIR should include a project description that is comprehensive and broadly written to provide flexibility in future design work. At the same time, the PEIR should, where possible, describe individual project features at a sufficient level of detail to streamline future project-level review. The team will be challenged to find the right balance. To support this effort, Jacobs will develop a list of data needs to provide full, project-level CEQA coverage. If the data needs can be met with confidence, project-level coverage can be provided. If there is uncertainty or a need to preserve flexibility for future design decision making, the impact analysis will remain at a programmatic level.
- **PEIR Outline**. Based on the results of the Initial Study review and the expected level of detail, Jacobs will prepare a detailed, annotated outline of the PEIR to guide document preparation. The outline will provide the framework for our interdisciplinary team's individual contributors to provide technical content in a consistent manner across all sections. The outline provides a timely preview to JPA staff

regarding how important project elements are to be addressed—for example, the treatment of alternative AWPF sites.

- **Information Collection**. A wealth of information has already been collected about the PWP and its individual components, including prior studies of the Agora Road AWPF site and the Malibu Creek discharge pipeline. Our interdisciplinary team will conduct additional information collection activities appropriate for each resource to be evaluated. At that time, we expect to begin closely working with local agencies—primarily the City of Agoura Hills and the City of Westlake Village—to better understand local issues and concerns. This is expected to include collecting traffic counts, determining designated haul routes, researching local noise standards and practices, and collecting similar data points that will be useful during public review.
- **Editorial Standards**. The Jacobs Environmental Team will collaborate with the larger PMT on editorial standards, including using feature names and acronyms that are consistent across the PWP. This step should not be underestimated—our professional editing and document production team will meet high standards for print and electronic products, associated presentation materials, and other project information shared with the general public.

7.4.3 PEIR Focus Elements

For both the *project description* and *resources* needs, our current assessment of focus areas and proposed strategies are as follows.

- **Conveyance Alignment and Construction Details.** Various conveyance elements require definition for full project coverage in the PEIR, including selection of the preferred alignment, basic alignment plan and profile sheets (for example, pipe centerline), and construction methods. The preferred alignment and construction methods appear to be well-developed between the TWRF and the Agoura Road AWPF site. Similarly, basic alignment information appears to be established for AWPF effluent, although details need to be confirmed near Las Virgenes Reservoir. Brine line alignments and connection points, however, appear to require additional study and may not be fully covered in the PEIR. In terms of construction details, good CEQA coverage can be provided with standard cut-and-cover illustrations and noting where trenchless methods will be used. For the PWP, focused effort should be made in identifying construction methods in hard-rock portions of the alignment near Las Virgenes Reservoir.
- **Alternatives Definition.** The PEIR should consider alternatives at multiple levels, including alternatives to the PWP itself. Based on the long history of the Program, we expect that sufficient information is available to demonstrate a reasonable process to select the PWP over other high-level alternatives. At a more detailed level, the AWPF site may be the most substantial alternatives decision. For the PEIR, we propose fully evaluating the Agoura Road AWPF site as the “proposed project” and relegating the Reservoir AWPF site to a more streamlined evaluation in the alternatives section. Other potential alternatives to consider include brine line alignments, water supply sources and discharge locations, and different construction methods. As the PWP is further developed, the team will consider what can be presented as a *design option* versus what is better addressed as a full Program alternative.

  The discussion of alternatives also must include a No Project Alternative. Under this critical alternative, no PWP features would be constructed. However, this requires an explanation of what would happen in the absence of the PWP—an important opportunity to discuss long-term water supply reliability within the Program area and threats under a “business as usual” scenario.
- **Cultural Resources.** The Program area has moderate sensitivity for archaeological resources and low sensitivity for historic (built environment) resources. These resources will be evaluated using standard methods, with the potential for field surveys determined for each Program feature – more rigor allows for greater completion of the studies such that no further analysis will be needed and most federal processes will be covered. However, field surveys where alignments and construction methods have not been confirmed may not be helpful, as they almost certainly would need to be duplicated later. In addition to standard cultural resources work, the recently adopted Assembly Bill (AB) 52, *Gatto. Native Americans: California Environmental Quality Act*, procedures require

notification to local Native American Tribes. We understand that the LVMWD maintains a list of tribal contacts pursuant to AB 52.

- **Public Outreach and Communications.** The CEQA process requires various notification processes that, although focused on agency outreach, provide an important outreach opportunity to all stakeholders and the general public. The JPA, together with support from Jacobs and Katz & Associates, will coordinate to confirm that all required CEQA legal and regulatory obligations are met *but* that the legal and regulatory obligations do not override meaningful engagement.
- **Construction Impacts to Public.** PWP construction activities will be noticeable and will require evaluation in the PEIR. For the AWPF site, nuisance impacts to the adjacent apartments will include noise and dust from all onsite construction activities. All PWP conveyance elements will have traffic and noise impacts, but these impacts are expected to be most pronounced along Lindero Canyon Road. For the PEIR, our approach is to describe the intensity and duration of construction impacts to the extent possible and focus on the processes and procedures to be used during construction. For example, mitigation should be prepared that describes for the public our proposed preconstruction notifications, use of construction hotlines, and monitoring and reporting procedures.
- **Rare Plants and Oak Tree Removal.** The Agoura Road AWPF site and the discharge pipeline alignment near Las Virgenes Reservoir present special challenges regarding protected resources, primarily removal of oak trees (loss of oak woodland habitat) and several species of obscure (and hard to identify) rare plants. Considering these resources will be important when developing our AWPF site plan (including grading plans) and construction methods near Las Virgenes Reservoir. The AWPF site is expected to include several remainder areas that are not mass graded; therefore, they provide an opportunity for restoration and at least partial mitigation for the loss of trees and rare plants. Information is available that greatly helps us understand the biological opportunities and constraints at the site—for example, the prior CEQA document prepared for the Park at Ladyface Mountain senior apartments—but focused work (for example, botanical survey) is required.
- **Discharges to Malibu Creek.** California Water Code Section 1211 requires a Change Petition when water reuse projects result in changes to the amount of water discharged to an inland waterway. Implementing the PWP will result in a decrease in discharges from the TWRF into Malibu Creek; therefore, the JPA will be required to file a Change Petition with the SWRCB Division of Water Rights. Fortunately, this is not a new issue—the LVMWD and the TWSD been active stewards of the Malibu Creek watershed for decades. At this time, our understanding is that the PWP will not seek to alter the existing Consent Decree in any way. Creek discharges will continue to be limited during the dry season, and supplemental flows will continue to be provided to meet steelhead flow requirements. This is the foundation of our approach; however, the changes in TWRF treatment processes and discharges to the new recycled water system provide an opportunity to consider optimizing how to best meet the Consent Decree requirements while minimizing supplemental water purchases.

8. Public Outreach Implementation Plan

8.1 Introduction and Background

The JPA is a partnership between LVMWD and TWSD, established to cooperatively treat wastewater for these two bordering areas that share the Malibu Creek watershed. The JPA has been a pioneer in the development of recycled water as a renewable resource, operating the TWRF since 1965 (LVMWD 2021a). All of the recycled water produced at the facility is used for irrigation during summer months; however, surplus recycled water is discharged to Malibu Creek in winter months.

The JPA also has a goal of improving the health of the Malibu Creek Watershed. This has required a multipronged approach to address stringent EPA WQS when recycled water must be discharged into the creek. However, compliance with standards has proven to be expensive and impactful to sewage treatment rates for customers, without fully protecting the creek or the species that live there. The JPA has expressed its commitment to creek stewardship, but with common sense solutions to water quality issues (Los Angeles RWQCB 2017b).

As part of a robust, 18-month stakeholder participation process, the JPA evaluated a number of options to beneficially use recycled water so that it will not need to be discharged into the creek. On August 1, 2016, the JPA Board approved the preferred alternative, the IPR project, which would create a local, reliable water supply for the region (LVMWD 2021b). This new local source of water will reduce dependency on imported water but will also effectively eliminate surplus recycled water discharged to the ocean through Malibu Creek.

The original Public Outreach Plan for the Las Virgenes - Triunfo PWP was developed in by Katz & Associates in 2016 for LVMWD; it focused, largely, on sharing information about the PWP with the local community and gaining support for its implementation. Since then, significant activities have been undertaken by JPA staff to build understanding, momentum, and interest in the PWP. As we move into the next phase, our objectives for communicating about PWP remain largely the same, but updates to the approaches and strategies must be made to adapt to new circumstance and available information, including creating outreach related to CEQA and construction, broadening the reach to support regional partnerships, and engaging stakeholders for the purpose of public acceptance and support for the Program.

Updated in 2021, the revised Public Outreach Plan relies both on the work successfully completed in the past, and on the renewed drive to support and celebrate public acceptance of this Program. To achieve this vision of public acceptance, we must achieve widespread awareness and understanding of PWP's purpose, need, and benefit, and encourage support for its successful implementation.

8.2 Public Outreach Plan Purpose

The purpose of the Public Outreach Plan is to provide a guide for the JPA to convey timely, accurate, and clear Program information to local leaders, stakeholders, and residents. This plan includes strategies and approaches that will maximize public awareness and understanding of the Program and is a living, working document that will be reviewed and revised as the Program and associated analyses proceed. As we approach the CEQA and preconstruction phase, the outreach plan is geared toward conducting communications that will address the specific needs of this phase.

8.3 Public Outreach Plan Goal

The goal of this plan is to raise awareness and obtain support among JPA stakeholders about the importance and benefits of the PWP and increase comfort with and support for its implementation. Stakeholders include governmental and regulatory agencies, elected officials, environmental organizations, the community and ratepayers, and schools.

8.4 Public Outreach Plan Objectives

When initiating or renewing a public outreach effort, it is important to clarify its objectives at the outset so that progress can be measured later on. **The objectives** of undertaking the public outreach effort are to:

- Implement a public outreach program that transparently explains the Program, the high quality and safety of the water it produces, and its benefits.
- Provide consistent and complete information to stakeholders, including multicultural communities, so there are no surprises throughout the multiphased development process.
- Foster understanding and acceptance of the science and advanced technology behind recycled water and IPR.
- Minimize confusion, opposition, and discomfort with IPR.
- Provide consistent information to representatives and spokespersons.

8.5 Public Outreach Plan Strategies and Implementation Plan

To meet these objectives, a set of **strategies** developed from best practices, past JPA experience, and stakeholder expectations have been developed to guide the public outreach team. Strategies serve as a plan of action or implementation plan for outreach team members and will be implemented using a variety of approaches. This section describes these strategies and actions.

PWP Messaging: PWP messaging helps focus communication efforts using understandable terms and accessible language to:

- Explain technology in a transparent way
- Address H&S concerns
- Demonstrate pertinent aspects of IPR
- Provide a range of simple to complex information, depending on the specific audience

Data Collection and Research: A way to measure the opinion of stakeholders, data collection as formal as public opinion surveys or as informal as sentiment gathered from stakeholder interactions or conversations can help track and measure the efficacy of our Program messages and uncover communication needs not previously met. Continued data collection allows for dynamic programming and helps meet stakeholder needs.

Stakeholder Engagement and Participation: Consistent, sustained, and multifaceted communication tools will be used to educate, inform, and engage with the community, regional partners, regulatory agencies, governmental officials, and environmental organizations, and to create a two-way dialogue with stakeholders. We will employ a variety of tools, in multiple formats, to clearly communicate Program history, purpose, and other relevant information to an array of audiences. We will also rely on partnerships with civic, environmental, academic, regional, and other groups to raise awareness with diverse audiences about potable reuse and empower others to carry PWP messages and, potentially, develop support statements.

PWP Informational Materials and Branding: With a previously established brand, we can continue to establish the PWP as a recognizable Program throughout all JPA and individual agency communication vehicles. Using engaging graphics and visuals to communicate messages and complex information about potable reuse, we will develop consistency, recognition, familiarity, and comfort. With both general and tailored information (translated and disseminated appropriately), we will be able to provide consistent and regular updates to important stakeholders across the service area and beyond.

Media Relations and Social Media: These methods will be a significant portion of the outreach and education provided about the Program. Strengthening and building upon relationships with media creates direct lines of communication and may prevent misinformation. We will perform up-to-date media outreach activities in a variety of formats and will use LVMWD social media channels to share information broadly and widely. In the event of misinformation, this will also be our most impactful method for responding accurately and rapidly. These actions are critical as the CEQA PEIR is developed and finally certified by the JPA.

Construction Relations: When the Program moves into the construction phase, including preconstruction, integrated team management, clear internal and external communication, and impact assessment will help the team transition seamlessly into the new phase. While this phase requires direct stakeholder outreach and communication, it will also require sustained communication activities as previously mentioned. This involves interacting with stakeholders that will be impacted by the conveyance system alignments and facility needs.

Tracking and Measurement: Evaluation and course-correction are important to a dynamic, effective, and nimble outreach effort. We must constantly measure efficacy and impact, identify accomplishments, listen to feedback, and adjust as needed to reflect the evolution of the Program and its projects. Proactively tracking performance, addressing concerns and misinformation early, and focusing the outreach team will support successful communications in meeting audience messaging and informational needs in a timely, proactive fashion.

We are confident that this implementation plan will lead to a robust, defensible, coordinated outreach program for the PWP and will result in the achievement of the stated goals and objectives. We also know that a plan is only as good as its implementation. To accurately and effectively implement the plan, a roles and responsibilities matrix will be jointly created, describing Program activities and providing a way to track that the team is working together to move PWP forward.

9. Risk Management

9.1 Introduction and Purpose

Managing risks to support the Las Virgenes - Triunfo PWP at the lowest possible cost, with the fewest adverse environmental or human health impacts, and according to the defined schedule is a critical aspect of successful Program implementation. Risks and opportunities need to be identified; their potential impact on performance, human health, and the environment predicted; and mitigation strategies developed for avoiding, abating, minimizing, and mitigating the risks. This strategy also includes assigning risks and risk mitigations to the proper parties for resolution, tracking, and reporting.

A Risk Management Plan (RMP) was initiated and will be implemented throughout the Program and be maintained as a Risk Register on the Portal. The purpose of risk management is to document and provide standardized processes, Program consistency, and uniform approaches in treating risk and opportunities at the Program and project levels. Risk management will be focused on (1) threat avoidances and reductions to reduce impacts and consequences; and (2) opportunity enhancements through effective risk identification and mitigation practices. To achieve overall success, this approach must be in continuous alignment with the goals of the Program, including safety and environmental safeguarding.

The PMT's approach to risk management starts now, at the earliest stages of the Program, by detecting, identifying, and managing risks that have a high probability of negatively impacting safety, quality, budget, and schedule.

9.2 Benefits of Risk Management

The Program will use an organized, systematic, decision-making process that identifies, assesses, evaluates, and prioritizes risk uncertainties identified as a threat to Program or project objectives. The risk management process is initiated when developing the baseline cost-loaded schedule; updated as each project is initiated; and managed through the life of the Program.

At a project's onset, the **impact** of project risk is at its lowest. Through time, the ability to adjust without substantially impacting scope, schedule, quality, or budget decreases. Simultaneously, the magnitude of adverse impacts to these components increases. Because these adverse impacts can increase over time, ongoing monitoring and response to eliminate or mitigate risk-related events is the best weapon against unplanned for scope and budget increases, time extensions, and the erosion of quality.

9.3 Risk Definition

Risk is an uncertain event that, if it occurs, will have a positive or negative effect on one or more of the Program's objectives. A **threat** is a risk that may result in a negative impact; while an **opportunity** is a risk that may result in a positive outcome after the mitigation process. The two major components of assessing risk and opportunities are:

1) The probability of occurrence
2) The impact or effect on project or Program objective

In Program risk management, it is important to focus on the critical risks that have the potential to affect the success of the overall Program. These could consist of the following:

- High-level individual project risks
- Risks that impact multiple projects
- Risks that impact the Program directly but not specific projects

9.4 Guiding Principles of Risk Management

Effective risk and opportunities management is guided by a set of principles that represent current best practices. Irrespective of the size or complexity of a project, the RMP should reflect these principles:

- **Global Perspective:** View each phase of a project as a means to overall project success. View each project and its success in relationship to other projects and the Program overall.
- **Forward-looking View, Materials and Labor Market Perspectives, and Trends:** Look ahead to anticipate risks and their potential impacts. More importantly, anticipate potential risks in time to successfully address them.
- **Open Communications:** Encourage a free flow of formal and informal information to make each individual a part of effective risk management.
- **Integrated Management, and O&M Inputs and Perspectives:** Integrate risk management within the overall Program management and operations process.
- **Continuous Process:** Identify and manage risks routinely through all phases of the project life cycle. Set risk milestones and active risk time periods that are tracked on the project or Program schedule.
- **Shared Project Vision:** Maintain a shared vision of the expected outcome of the project based on common purpose, shared ownership in results, and collective communication.
- **Teamwork:** Pool talents, skills, and knowledge to work cooperatively to identify and manage project risk.

9.5 Risk Management Approach

The risk management framework aids in early detection of uncertainties in costs; delays; and business, safety, environmental, and technical elements. The framework also provides a proactive approach to managing projects by forecasting future uncertainties before they occur. To be successful, the RMP will require collaborative participation from everyone on the Program to use a consistent approach that begins with project planning; to thoroughly develop project concept, scope, and level of effort; and to identify important uncertainties and risks associated with each project.

The approach to risk management will follow these five basic steps:

1) Identify risks
2) Analyze risks: Score, rank, and prioritize
3) Implement risk response plans
4) Monitor and control
5) Close out risks by reporting, communicating, and reallocating unused contingency appropriately

Figure 9-1 illustrates the five steps and incorporates a continuous improvement process and risk management training component, which are vital elements of successful risk management.

Figure 9-1. Risk Management Process Overview

9.6 Risk Management Workshops

The PMT held a series of risk management workshops to identify and analyze the potential risks and opportunities for the PWP and determine appropriate contingencies to include to manage those risks. Table 9-1 provides a summary of those sessions and the objectives of each meeting.

Table 9-1. Risk Management Workshops

Date	Session Purpose	Session Results
March 15, 2021	Identify risks with LVMWD staff	▪ Defined risk in terms of Program- and project-specific risks and the risk management process ▪ Conducted an initial brainstorm session about potential risks and opportunities
March 16, 2021	Analyze risks with LVMWD staff	▪ Grouped risks, and identified duplicates ▪ Developed definition and potential cause and effect for each uncertainty, and classified each risk as a threat or opportunity
April 5, 2021	Quantify risks: Rank and prioritize risks with LVMWD staff	▪ With initial definition, ranked risk probability
April 16, 2021	Perform a QCRA results with the Jacobs Team	▪ Conducted an initial review of the Monte Carlo simulation using uncertainty and risk events to predict likely cost and schedule outcomes
May 8, 2021	Review the Risk Register with the Jacobs Team	▪ Reviewed the information captured on a Risk Register and decided how to monitor, manage, update them through the life of the Program
May 13, 2021	Update the PWP cost estimate considering risk assessment with the LVMWD management team	▪ Discussed the results of the QCRA and how it is quantifies the uncertainty at the Program level, including the amount of contingency needed to implement the PWP

Notes:

QCRA = quantitative cost risk assessment

9.7 Risk Register Tool

The Risk Register is the backbone of the risk management process and the template to be used to identify, assess, and document each project and Program risk. It is critical to maintaining a historical risk database, and is used for both reporting and forecasting. Each project's risk will be documented and maintained in a Risk Register, which has cells for risk identification, analysis, response, and monitoring.

The Risk Register tracks significant risk and opportunity elements. An initial risk analysis is performed to build a project's Risk Register. As a project progresses, the potential impact, probability, and response needs will change; and the Risk Register will be updated. As well, new potential risk and opportunity elements will be identified and managed using the following process:

1) Continuously review project work and conditions, and identify new potential risk and opportunity elements.
2) Report new potential risks and opportunities to the PMT first, and then document them in a Risk Register.
3) Identify and evaluate the probability of occurrence, potential impact, timing, and the appropriate signals and indicators to track and monitor.
4) Establish preliminary responses, and monitor the status of each risk.
5) Encourage team members to report all potential risks and opportunities they encounter regardless of how improbable. It is better to identify and discuss all possible risks than to ignore one that may be important.

10. Cost and Schedule

10.1 Introduction

The Jacobs Team developed a preliminary schedule and an independent Class 4 cost estimate for the PWP to include construction costs, soft costs, and O&M costs, considering the recommendations from the Readiness Assessment. The Readiness Assessment identified potential system requirements beyond the baseline project, which was established through the Title XVI Study. The need for the other potential system requirements will be confirmed through technical evaluation, leveraging of the Demonstration Facility, and alignment of the regulatory strategy through the work to be completed over the next 16 months of Phase 1. Because the independent cost estimate was significantly higher than the previous estimate provided in the Title XVI Study, a schedule and baseline cost for the confirmed project elements will be provided at the completion of Phase 1 for JPA Board adoption of the Program budget and delivery timeline.

10.2 Pure Water Project Independent Cost Estimate

10.2.1 Cost Estimating Objectives

Accurate and consistent cost estimating is essential for effective management of the PWP. A comprehensive and current Program cost estimate provides the JPA and PMT with an ongoing understanding of total Program costs and enables effective management of Program budget and risk.

10.2.2 Cost Estimate Classification Accuracy

The types of estimates that will be prepared for each project over its life cycle are defined by AACE International (AACE) Standard 18R-97, *Cost Estimate Classification System – As applied in Engineering, Procurement, and Construction for the Process Industries*, (2020a). These are summarized in Table 10-1 and further clarified as follows:

- **Class 5:** These estimates are prepared based on very limited information. Class 5 estimates generally use stochastic estimating methods, such as cost and capacity curves and factors; scale of operations factors; and other parametric and modeling techniques. The typical expected accuracy range for this class estimate is –20 to –50% on the low side and +30 to +100% on the high side.
- **Class 4:** These estimates are generally prepared based on limited information. Class 4 estimates generally use stochastic estimating methods, such as equipment factors, gross unit costs and ratios, and other parametric and modeling techniques. The typical expected accuracy range for this class estimate is –15 to –30% on the low side and +20 to +50% on the high side.
- **Class 3:** These estimates are generally prepared to form the basis for budget authorization, appropriation, and funding. As such, they typically form the initial control estimate baseline to compare to all actual costs and resources. Class 3 estimates generally involve more deterministic estimating methods than stochastic methods. They usually involve predominant use of unit cost line items, although these may be at an assembly level of detail rather than individual components. Factoring and other stochastic methods may be used to estimate less-significant areas of a project. The typical expected accuracy range for this class estimate is –10 to –20% on the low side and +10 to +30% on the high side.
- **Class 2:** Class 2 estimates are generally prepared to form a detailed contractor control baseline to compare to all actual project work in terms of cost and progress control. For contractors, this class of estimate is often used as the bid estimate to establish contract value. Class 2 estimates involve a high degree of deterministic estimating methods and are prepared in great detail. For those areas of a project still undefined, an assumed level of detail takeoff may be developed to use as line items in the estimate instead of relying on factoring methods. The typical expected accuracy ranges for this class estimate are –5 to –15% on the low side and +5 to +20% on the high side.

- **Class 1:** These estimates are generally prepared for discrete parts or sections of a total project rather than generating this level of detail for an entire project. The parts of a project estimated at this level of detail will typically be used by subcontractors for bids or by owners to check estimates. The updated estimate is often referred to as the current control estimate and becomes the new baseline for cost and schedule control of a project. Class 1 estimates generally involve the highest degree of deterministic estimating methods, and require a great amount of effort. Class 1 estimates are prepared in great detail; thus, they are usually performed on only the most important or critical areas of a project. All items in the estimate are usually unit cost line items based on actual design quantities. The typical expected accuracy ranges for this class estimate are –3 to –10% on the low side and +3 to +15% on the high side.

Table 10-1. AACE Estimate Classes

Estimate Class	Project Definition Range (%)		End Usage	Methodology	AACE *Recommended Practices 17R* and *18R* Expected Accuracy Range (%)	
	Start	End			Low	High
Class 5	0	2	Concept screening	Capacity factor, parametric model, judgment, or analogy	-50	100
Class 4	1	15	Study or feasibility	Equipment factored or parametric model	-30	50
Class 3	10	40	Budget, authorization, or control	Semi-detailed unit cost with assembly-level line items	-20	30
Class 2	30	70	Control or bid and tender	Detailed unit costs with forced detailed takeoff	-15	20
Class 1	50	100	Check estimate or bid and tender	Detailed unit costs with detailed takeoff	-10	15

Source: AACE 2020a, b

10.2.3 Potential System Requirements

The Readiness Assessment identified potential system requirements beyond the baseline project that will be confirmed through technical evaluation, leveraging of the Demonstration Facility, and alignment of the regulatory strategy through the work to be completed in Phase 1, including:

1) AWPF potential system requirements, such as:
   - Level of pathogen reduction
   - Level of process redundancy
   - Requirements to attain CTR compliance, specifically with N-nitrosodimethylamine (NDMA) and brominated trihalomethanes (THMs)
   - Purified water chemical stabilization
   - Building programming and architectural requirements
2) Conveyance potential system requirements, including:
   - Specific alignments for the four conveyance systems
   - Recycled water system balancing with anticipated flow to the AWPF
   - Emergency discharge locations and improvements required
   - Brine scaling mitigation and control requirements

3) Reservoir potential system requirements, including:

  - Liquid oxygen and alumina requirements for algal bloom control
  - System dynamics with continuous operation

10.3 Pure Water Project Preliminary Program Schedule

10.3.1 Program Scheduling Objectives

The Program master schedule and baseline cost are the roadmap for delivery of the Program. They translate the Program and projects scope into timely, sequenced, and logical interactions to allow managing the overall Program, including change impacts to project delivery progress and performance for the full portfolio of projects. The Program master schedule and baseline cost are held in the Oracle Primavera P6 tool.

10.3.2 Program Schedule Development and Refinement

Program Controls will maintain and integrate the individual project schedules and cost data across all work elements on the Program Portal (Portal). Integration of data using the Program work breakdown structure (WBS) is the method used to confirm that task detail, logic, duration, and resources fully represent all related project work scopes. This integration also allows for clear identification of inter-project interfaces and links through logical dependencies.

The schedule will be updated throughout the Program timeline as more detailed information is made available. For example, as contracts are awarded within a project, that schedule updates the overall Program schedule and costs as compared to the baseline cost (Figure 10-1). At the planning phase, contingencies are maintained as defined by a risk assessment; as the Program moves from the planning phase to the delivery phase, these costs will become more defined and mitigated, and the baseline will be updated.

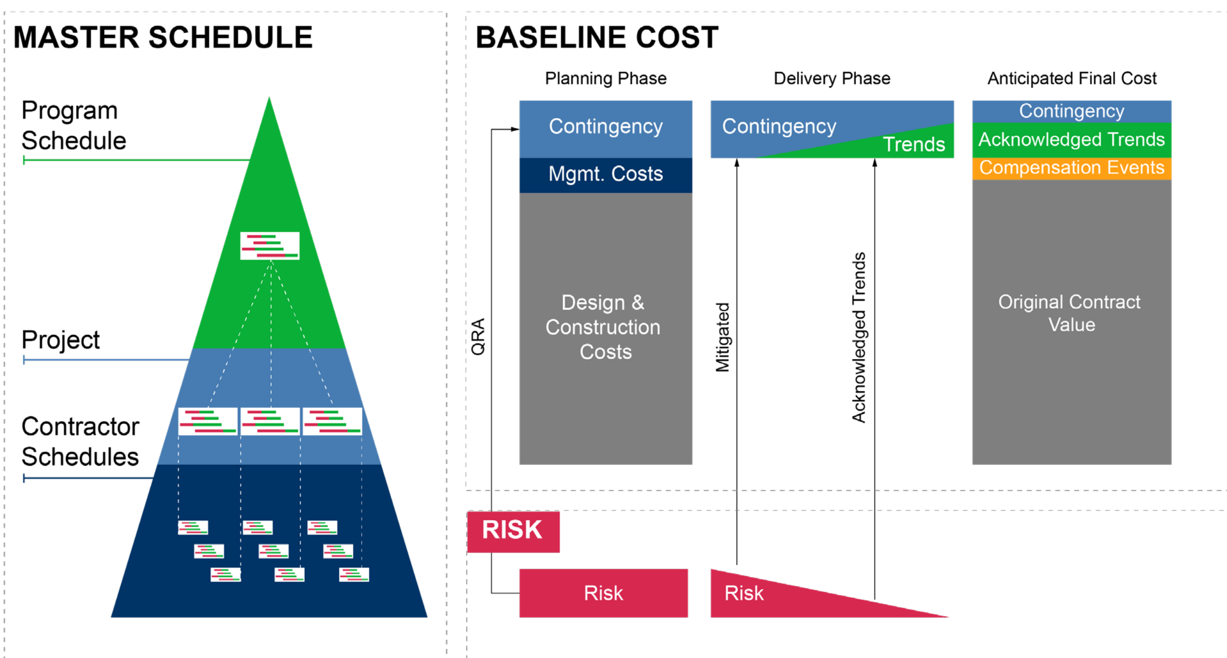


Figure 10-1. Program Master Schedule and Baseline Cost

10.3.3 Preliminary Pure Water Project Schedule

The compliance date for operation of the new AWPF is November 16, 2030. This is the date when the new NPDES permit limits for the TWRF take effect for discharge of final effluent to Malibu Creek (Los Angeles RWQCB 2017a).

11. References

AACE International (AACE). 2020a. *18R-97, Cost Estimate Classification System – As applied in Engineering, Procurement, and Construction for the Process Industries*. August 7. https://web.aacei.org/resources/publications/recommended-practices.

AACE International (AACE). 2020b. *17R-97, Cost Estimate Classification System*. August 7. https://web.aacei.org/resources/publications/recommended-practices.

California State Water Resources Control Board (SWRCB). 2016. *Evaluation of the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse. Expert Panel Final Report.* August. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/rw_dpr_criteria/app_a_ep_rpt.pdf.

California State Water Resources Control Board (SWRCB). 2019a. *About the California Water Boards*. February. https://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/boardoverview.pdf.

California State Water Resources Control Board (SWRCB). 2019b. "California Ocean Plan." *Water Quality Control Plan, Ocean Waters of California*. Established 1972. Revised 2019. February 4. https://www.waterboards.ca.gov/water_issues/programs/ocean/docs/oceanplan2019.pdf.

California State Water Resources Control Board (SWRCB). 2020a. "Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties." *LARWQCB Basin Plan*. November 10. https://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/.

California State Water Resources Control Board (SWRCB). 2021a. *Division of Drinking Water District Offices*. April. https://www.waterboards.ca.gov/drinking_water/programs/documents/ddwem/DDWdistrictofficesmap.pdf.

California State Water Resources Control Board (SWRCB). 2021b. *Drinking Water Treatment & Distribution System Operators*. May 24. https://www.waterboards.ca.gov/drinking_water/certlic/occupations/DWopcert.html.

California State Water Resources Control Board (SWRCB). 2021c. *Wastewater Change Petition*. May 21. https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/wastewaterchange/.

California State Water Resources Control Board (SWRCB). 2021d. *Wastewater Change Petition Checklist*. May 14. https://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/docs/2021/1211_checklist_v2_accessible_3.pdf.

California State Water Resources Control Board (SWRCB). 2021e. *Drinking Water Notification Levels*. March 25. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/NotificationLevels.html

CDM Smith. 2017. *Recycled Water Seasonal Storage Demonstration Project Preliminary Design Report.* June 17.

CH2M HILL, Inc. (CH2M). 2015. *Improving Water Quality in Aurora Reservoir, the First Step in Two Water Treatment Plants*. Presentation to the American Water Works Association 2015 WQTC. November 18.

Chang, J, R Golda, P Schauer, M Noesen, and L Schimmoller. 2020. Meeting Stringent Ammonia and Disinfection Byproducts Limits Using Preformed Monochloramine Disinfection. *Proceedings of WEFTEC 2020.*

Division of Drinking Water (DDW). 2001. *Guidelines for the Preparation of an Engineering Report for the Production, Distribution and Use of Recycled Water.* March. Replaces September 1997 version. State of California-Health and Human Services Agency. Department of Health Services. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/recharge/ERGUIDE2001.pdf.

Flow Science Incorporated (FSI). 2017. *Las Virgenes Reservoir Purified Water Augmentation Analysis – Hydrodynamic Modeling*. January.

Gannet Fleming. 2021. *Hill Canyon Treatment Plant Master Plan*. Final. MI 2542. Prepared for City of Thousand Oaks. January 5. https://www.toaks.org/home/showpublisheddocument?id=33783.

Kennedy Jenks. 2016. *MWH Recycled Water Seasonal Storage Basis of Design Report and 2018 Title XVI Feasibility Study*.

Kennedy Jenks. 2018. *Pure Water Project Las Virgenes-Triunfo Joint Powers Authority Title XVI Feasibility Study*. September 6.

Las Virgenes Municipal Water District (LVMWD). 2020. “Item 10A: Management of Water Quality at the Las Virgenes Reservoir.” *Regular Board Meeting Agenda on October 6, 2021*. https://www.lvmwd.com/home/showdocument?id=12785.

Las Virgenes Municipal Water District (LVMWD). 2021a. "Joint Powers Authority." *About Us*. Accessed May 2021. https://www.lvmwd.com/about-us/joint-powers-authority

Las Virgenes Municipal Water District (LVMWD). 2021b. “JPA Meeting Agendas & Minutes.” *About Us*. https://www.lvmwd.com/about-us/joint-powers-authority/jpa-meeting-agendas-minutes/-toggle-allpast/-npage-4

Los Angeles Region Water Quality Control Board (Los Angeles RWQCB). 2017a. *NPDES Permit No. CA 0056014; Waste Discharge Requirements for the Las Virgenes Municipal Water District; Tapia Water Reclamation Facility.* June 1.

Los Angeles Region Water Quality Control Board (Los Angeles RWQCB). 2017b. *Regional Board Resolution No. R16-009, Amendment to the Water Quality Control Plan – Los Angeles Region to Incorporate an Implementation Plan for the U.S. EPA-Established Malibu Creek Nutrients TMDL and the U.S. EPA-Established Malibu Creek and Lagoon Sedimentation and Nutrients TMDL to Address Benthic Community Impairments*. May 16.

Los Angeles Region Water Quality Control Board (Los Angeles RWQCB). 2020. *Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties*. May 18. https://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/basin_plan_documentation.html.

MWH/Stantec. 2016. *Basis of Design Report (BODR) Recycled Water Seasonal Storage*. September.

National Water Research Institute (NWRI). 2018. *NWRI Independent Advisory Panel for Las Virgenes-Triunfo Pure Water Project: Findings and Recommendations from the Panel Meeting held May 4, 2018 Final Memorandum*. June. https://www.lvmwd.com/home/showdocument?id=11186.

Rand G.M., Editor. 2020. *Fundamentals Of Aquatic Toxicology: Effects, Environmental Fate And Risk Assessment*. 2nd Ed. United States: CRC Press.

Sgroi M, FGA Vagliasindi, SA Snyder, and P Roccaro. 2018. P. “N-Nitrosodimethylamine (NDMA) and its precursors in water and wastewater: A review on formation and removal.” *Chemosphere*. January.191:685-703. doi: 10.1016/j.chemosphere.2017.10.089. Epub 2017 Oct 15. PMID: 29078192.

Trussell Technologies, Inc. (Trussell). 2015. *Las Virgenes Reservoir Model Results Briefing*. January.

Trussell Technologies, Inc. (Trussell). 2018. *Cover Letter Briefing, Las Virgenes – Triunfo Joint Powers Authority, Modeling Results for the Las Virgenes Reservoir for Pure Water Program*.

Trussell Technologies, Inc. (Trussell). 2019. *Las Virgenes Reservoir Modeling Results*. January.

U.S. Environmental Protection Agency (EPA). 2017. *Technical Fact Sheet – N-Nitroso-dimethylamine (NDMA).* November. https://www.epa.gov/sites/production/files/2017-10/documents/ndma_fact_sheet_update_9-15-17_508.pdf.

U.S. Environmental Protection Agency (EPA). 2020. *Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California (California Toxics Rule).* August 31. https://www.epa.gov/wqs-tech/water-quality-standards-establishment-numeric-criteria-priority-toxic-pollutants-state.

U.S. Environmental Protection Agency (EPA). 2021. *National Pollutant Discharge Elimination System (NPDES).* May 10. https://www.epa.gov/npdes.

Woodard & Curran. 2018. *AWTP Preliminary Siting Study Report*. February 12.

Woodard & Curran. 2020. *Regional Brine Management Study*.

The Water Research Foundation (WRF). 2020. *Evaluating Post Treatment Challenges for Potable Reuse Applications. Project #4780*. Principal Investigator David Hokanson; Contractor Trussell Technologies Inc. https://www.waterrf.org/research/projects/evaluating-post-treatment-challenges-potable-reuse-applications.