LAS VIRGENES - TRIUNFO
JOINT POWERS AUTHORITY
AGENDA
4232 Las Virgenes Road, Calabasas, CA 91302

September 8, 2020, 5:00 PM

Public Participation for Meetings of Las Virgenes - Triunfo Joint Powers Authority in Response to COVID-19

On March 4, 2020, Governor Newsom proclaimed a State of Emergency in California as a result of the threat of COVID-19. On March 17, 2020, Governor Newsom issued Executive Order N-29-20 (superseding the Brown Act-related provisions of Executive Order N-25-20 issued on March 12, 2020), which allows a local legislative body to hold public meetings via teleconferencing and to make public meetings accessible telephonically or otherwise electronically to all members of the public seeking to observe and to address the local legislative body. Pursuant to Executive Order N-29-20, please be advised that members of the Las Virgenes - Triunfo Joint Powers Authority will participate in meetings telephonically.

PUBLIC PARTICIPATION: Pursuant to Executive N-29-20 and given the current health concerns, members of the public can access meetings live on-line, with audio and limited video, at www.LVMWD.com/JPALiveStream. In addition, members of the public can submit comments electronically for consideration by sending them to www.LVMWD.com/JPALiveStream. To ensure distribution to the members of the Las Virgenes - Triunfo Joint Powers Authority prior to consideration of the agenda, please submit comments 24 hours prior to the day of the meeting. Those comments, as well as any comments received after 5:00 P.M., will be distributed to the members of the Board of Directors and will be made part of the official public record of the meeting. Contact Josie Guzman, Executive Assistant/Clerk of the Board at (818) 251-2123 or jguzman@lvmwd.com with any questions.

ACCESSIBILITY: If requested, the agenda and backup materials will be made available in appropriate alternative formats to persons with a disability, as required by Section 202 of the Americans with Disabilities Act of 1990 (42 U.S.C. Sec. 12132), and the federal rules and regulations adopted in implementation thereof. Any person who requires a disability-related modification or accommodation, in order to observe and/or offer public comment may request such reasonable modification, accommodation, aid, or service by contacting the Executive Assistant/Clerk of the Board by telephone at (818) 251-2123 or via email to jguzman@lvmwd.com no later than 8:00 AM on the day of the scheduled meeting.

Members of the public wishing to address the Las Virgenes-Triunfo Joint Powers Authority (JPA) Board of Directors are advised that a statement of Public Comment Protocols is available from the Clerk of the Board. Prior to speaking, each speaker is asked to review these protocols, complete a speakers' card, and hand it to the Clerk of the Board. Speakers will be recognized in the order the cards are received.

The Public Comments agenda item is presented to allow the public to address the Board on matters not on the agenda. The public may also present comments on matters on the agenda; speakers for agendized items will be recognized at the time the item is called up for discussion.

Materials prepared by the JPA in connection with the subject matter on the agenda are available for public inspection at 4232 Las Virgenes Road, Calabasas, CA 91302. Materials prepared by the JPA and distributed to the Board during this meeting are available for public inspection at the meeting or as soon thereafter as possible. Materials presented to the Board by the public will be maintained as part of the records of these proceedings and are available upon request to the Clerk of the Board.

PLEDGE OF ALLEGIANCE

1 CALL TO ORDER AND ROLL CALL

2 APPROVAL OF AGENDA

3 PUBLIC COMMENTS

Members of the public may now address the Board of Directors **ON MATTERS NOT APPEARING ON THE AGENDA**, but within the jurisdiction of the Board. No action shall be taken on any matter not appearing on the agenda unless authorized by Subdivision (b) of Government Code Section 54954.2

4 CONSENT CALENDAR

Matters listed under the Consent Calendar are considered to be routine, non-controversial and normally approved with one motion. If discussion is requested by a member of the Board on any Consent Calendar item, or if a member of the public wishes to comment on an item, that item will be removed from the Consent Calendar for separate action.

A Minutes: Regular Meeting of August 3, 2020 (Pg. 4)
Approve.

5 ILLUSTRATIVE AND/OR VERBAL PRESENTATION AGENDA ITEMS

A Pure Water Project Las Virgenes-Triunfo: Update

B State and Federal Legislative Update (Pg. 12)

C Update on Woolsey Fire Recovery Efforts (Pg. 18)

Receive and file the Woolsey Fire recovery update.

6 ACTION ITEMS

A Owner's Advisor/Program Manager Services for Pure Water Project Las Virgenes-Triunfo: Award (Pg. 20)

Accept the proposal from Jacobs Engineering Group, Inc., and authorize the Administering Agent/General Manager to execute a professional service agreement, in the amount of $6,867,000, including six value-added optional tasks, for Owner's Advisor/Program Manager services for the Pure Water Project Las Virgenes-Triunfo.

B Pure Water Project Las Virgenes-Triunfo: Regional Brine Management Study (Pg. 292)

Receive and file the Regional Brine Management Study.

C State and Federal Legislative and Regulatory Advocacy: Renewal of Professional Services Agreement (Pg. 457)

Authorize the Administering Agent/General Manager to execute a one-year professional services agreement with Best Best & Krieger LLP, in the amount of $155,000, with two one-year renewal options adjusted for inflation, to provide state and federal legislative and regulatory advocacy services.

7 BOARD COMMENTS

8 ADMINISTERING AGENT/GENERAL MANAGER REPORT

9 FUTURE AGENDA ITEMS

10 INFORMATION ITEMS

A Saddle Peak and Cordillera Tank Rehabilitation: Reissuance of Call for Bids (Pg. 475)

11 PUBLIC COMMENTS

Members of the public may now address the Board of Directors **ON MATTERS NOT APPEARING ON THE AGENDA**, but within the jurisdiction of the Board. No action shall be taken on any matter not appearing on the agenda unless authorized by Subdivision (b) of Government Code Section 54954.2

12 CLOSED SESSION

13 ADJOURNMENT

Pursuant to Section 202 of the Americans with Disabilities Act of 1990 (42 U.S.C. Sec. 12132), and applicable federal rules and regulations, requests for a disability-related modification or accommodation, including auxiliary aids or services, in order to attend or participate in a meeting, should be made to the Executive Assistant/Clerk of the Board in advance of the meeting to ensure availability of the requested service or accommodation. Notices, agendas, and public documents related to the Board meetings can be made available in appropriate alternative format upon request.

LAS VIRGENES – TRIUNFO
JOINT POWERS AUTHORITY
MINUTES
REGULAR MEETING

5:00 PM August 3, 2020

PLEDGE OF ALLEGIANCE

The Pledge of Allegiance to the Flag was led by Stephen Bigilen.

1. CALL TO ORDER AND ROLL CALL

The meeting was called to order at **5:00 p.m.** by Chair Lewitt via teleconference in the Board Room at Las Virgenes Municipal Water District headquarters at 4232 Las Virgenes Road, Calabasas, CA 91302. The meeting was conducted via teleconference pursuant to the provisions of the Governor's Executive Order, N-29-20, which suspended certain requirements of the Ralph M. Brown Act to support social distancing guidelines associated with response to the coronavirus (COVID-19) outbreak. Josie Guzman, Clerk of the Board, conducted the roll call.

Present: Directors Caspary, Lewitt, Lo-Hill, Nye, Orkney, Polan (connected to the teleconference at 5:03 p.m.), Renger, Shapiro, Tjulander, and Wall.
Absent: None.

2. APPROVAL OF AGENDA

Director Caspary moved to approve the agenda. Motion seconded by Director Wall. Motion carried by the following roll call vote:

AYES: Caspary, Lewitt, Lo-Hill, Orkney, Renger, Shapiro, Tjulander, Wall
NOES: None
ABSTAIN: None
ABSENT: Polan

3. PUBLIC COMMENTS

None.

4. CONSENT CALENDAR

Director Polan connected to the teleconference at 5:03 p.m.

A Minutes: Regular Meeting of July 6, 2020 and Special Meeting of July 13, 2020: Approve

Director Orkney moved to approve the Consent Calendar. Motion seconded by Director Tjulander. Motion carried unanimously by roll call vote.

5. ILLUSTRATIVE AND/OR VERBAL PRESENTATION AGENDA ITEMS

A Pure Water Project Las Virgenes-Triunfo: Update

Joe McDermott, Director of Engineering and External Affairs, reported that six proposals were received for program management/owner's advisor services for the Pure Water Project Las Virgenes-Triunfo, and staff was in the process of reviewing the proposals and scheduling interviews. He also reported that the ribbon-cutting ceremony for the Pure Water Demonstration Facility, scheduled on September 11th, was moving forward as a hybrid live/virtual event. He stated that staff was planning on conducting a tasting of the treated water with the JPA Board prior to the ribbon-cutting event, while practicing social distancing guidelines.

John Zhao, Director of Facilities and Operations, reported that staff had taken over operation of the Pure Water Demonstration Facility. He noted that laboratory results from the treated water indicated that all parameters were within state and federal drinking water limits with the exception of chlorate, which was a degradation of sodium hypochlorite. He stated that the discrepancy might have been from a bad batch of chemicals supplied by the manufacturer or from the ultraviolet light disinfection process. He also stated that a new batch of sodium hypochlorite was ordered from a different manufacturer.

Director Lo-Hill suggested that the mural artist be included as part of a virtual tour so that she may discuss the various aspects of the mural.

Director Orkney commended staff on the virtual tour arranged for the Association of Water Agencies of Ventura County (AWAVC) WaterWise Breakfast Program. She commented that although there were some audio issues, she realized that staff was working on improvements.

Administering Agent/General Manager David Pedersen stated that staff was generally receiving positive feedback from the virtual tour. He recognized Director of Engineering and External Affairs Joe McDermott, Public Affairs and Communications Manager Mike McNutt, and Public Affairs Associates Steven Baird and Riki Clark on their efforts. Mr. McDermott also recognized Information Systems Manager Ivo Nkwenji.

Mr. Zhao responded to a question regarding whether sodium hypochlorite might jeopardize the integrity of the treated water by stating that the results may have been because only five percent sodium hypochlorite was needed, which was not industry standard. He also stated that the room temperature was high, which caused the sodium hypochlorite to degrade quicker than normal. He noted that this would not be an issue with the full-scale project.

Director Shapiro commended staff on the virtual tours conducted for the JPA Board and for the AWAVC WaterWise Breakfast Program, and stated that each subsequent tour would include a level of improvement. He inquired whether the JPA might have access to better audiovisual equipment and a microphone for future tours. Mr. McDermott responded that staff was looking into upgrading the audiovisual equipment.

Chair Lewitt reminded staff to invite Senator Henry Stern to the ribbon-cutting ceremony.

B State and Federal Legislative Update

John Freshman, representing Best Best & Krieger, LLP (BBK), noted that Ana Schwab was on temporary leave to study for the bar exam, and he wished her well.

Lowry Crook, representing BBK, presented the federal legislative update. He reported that a bill amendment to the National Defense Authorization Act bill to regulate perfluoroalkyl and polyfluoroalkyl substances (PFAS) requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was not allowed on the House Floor for a vote due to a number of other amendments to the bill. He also noted that the bill amendment had not been attached to the Water Resources Development Act bill. He stated that the House of Representatives was working on passing appropriations bills except for Homeland Security, and last week the House passed the Interior-Environment Appropriations Bill and the Energy and Water Appropriations Bill. He noted that the Senate was at a standstill and had not reached agreement on appropriations bills. He also noted that the House Interior-Environment Appropriations Bill contained a provision related to Water Infrastructure Finance and Innovation Act (WIFIA) to reallocate rescinded WIFIA loans to support new Fiscal Year 2021 loans, and no new WIFIA funds were proposed. He provided an update regarding negotiations for COVID-19 relief and noted that Representative John Garamendi introduced H.R. 7073, the Special Districts Provide Essential Service Act, to open up funding to special districts. He noted that Senators John Cornyn and Krysten Sinema issued companion legislation, and the JPA sent a letter of support after Senator Kamala Harris agreed to sign on as a co-sponsor of the bill. He provided an update regarding H.R. 2, Investing in a New Vision for the Environment and Surface Transportation in America Act, which would provide funding for water and transportation. He stated that the House passed this bill; however, there was no movement from the Senate. He responded to a question regarding the possibility of liability protection for governments and industry for reopening due to COVID-19 by stating that provisions were currently under negotiation. He also responded to a question regarding the possibility of states adopting their own PFAS regulations by stating that the EPA initiated the process to consider setting a maximum contaminant limit (MCL) for PFAS at the federal level. He noted the recent House Appropriations bill provided funds directing the EPA to move quicker on setting drinking water regulations.

Syrus Devers, representing BBK, provided an update regarding SB 1385 (Moorlach) related to liability to water districts over fire hydrants, the cost of fire hydrants, and whether this might be a violation of Proposition 218. He also provided an update regarding AB 3030 (Kalra), Resource Conservation: land and ocean conservation goals. He stated that the intent of the bill was to conserve land and water resources by 30 percent as an aspirational goal. He also stated that the bill originally referred to oceans; however, the bill language was amended to save land and water resources with water left undefined. He encouraged the Board to consider sending a letter in opposition unless amended, and request that the term "water" be defined. He also provided an update regarding SB 1099 (Dodd) related to emergency backup generator testing. He noted that this bill, as well as other emergency generator bills, were not moving forward; however, the South Coast Air Quality Management District (SCAQMD) offered a proposal to change the rule to deal with runtimes that go over the limit during a Public Safety Power Shutoff (PSPS) event and deal with testing and maintenance.

Director Caspary noted that the Association of California Water Agencies (ACWA) State Legislative Committee held a special meeting earlier in the day to discuss AB 3030, and adopted an opposed unless amended position. He asked that Mr. Devers prepare an oppose unless amended letter on behalf of the JPA to submit to the Senate Natural Resources and Water Committee by the close of business on August 4th.

Following a brief discussion, it was the unanimous consent of the Board to have Administering Agent/General Manager David Pedersen prepare and send an oppose unless amended letter regarding AB 3030 on behalf of the JPA.

A discussion ensued regarding SCAQMD's proposal and possibly moving forward with testing emergency generators and paying the fines. Chair Lewitt suggested that the Board agendize this discussion for a future meeting.

Mr. Devers provided an update regarding a proposed $100 billion relief package to be paid by tax vouchers. He stated that water recycling, infrastructure improvement, and climate resiliency projects would be included in the package; however, there were no details as to how much would be allocated for these types of projects.

Director Caspary stated that the California State Water Resources Control Board was looking at the affordability of water, and there was a discrepancy on what has been used as an affordability percentage. He noted that 2½ percent of monthly income was the federal standard used for water affordability; however, the State was looking into 1½ percent of monthly income as being the limit on what water should cost an individual. Mr. Devers responded that he had not heard of this particular issue, and stated that he would research and follow-up.

6. ACTION ITEMS

A Tapia Sodium Hypochlorite Tank and Piping Replacement Projects: CEQA Determination and Call for Bids

Find that the work is exempt from the provisions of California Environmental Quality Act and authorize the issuance of a Call for Bids for the Tapia Sodium Hypochlorite Storage Tank and Piping Replacement Project.

John Zhao, Director of Facilities and Operations, provided an overview and brief history of the Tapia sodium hypochlorite storage tanks.

Veronica Hurtado, Assistant Engineer, presented the report.

Director Caspary moved to approve Item 6A. Motion seconded by Director Tjulander.

Ms. Hurtado responded to a question regarding the amount of sodium hypochlorite used per month at the Tapia Water Reclamation Facility by stating that she would follow-up and report back to the Board.

Mr. Zhao responded to a question regarding whether the tanker truck could distribute sodium hypochlorite to two separate tanks without having to disconnect the hose by stating that the existing three tanks were interconnected, and there was no need to disconnect a full-loaded discharge feed pipe from the tank. He also responded to a question regarding whether tank coating materials had improved since 1999 by stating that the coating would be a resin that would bind the fiberglass. He noted that any type of tank material exposed to a harsh environment would deteriorate over time.

Motion carried unanimously by roll call vote.

7. BOARD COMMENTS

Director Lo-Hill reported that she attended the Casitas Municipal Water District's (Casitas) Board meeting via teleconference, and she encouraged the Board to attend other water agencies' board meetings in this manner. She noted that the Casitas Board pointed out their good relationship with Calleguas Municipal Water

District (Calleguas), and stated that she was pleased to see Calleguas' connection with other agencies. She mentioned that she viewed an episode on Netflix entitled "Poop" from the series "Connected: The Hidden Science of Everything," which analyzed 50,000-year-old fossilized excrement. She noted that the effluent could be analyzed to determine what people have consumed. She also reported that she attended the Association of California Water Agencies (ACWA) 2020 Summer Virtual Conference on July 29th and 30th, and stated that she enjoyed the session entitled "Once Upon a Time in Water: What Worked, What Didn't."

Director Polan reported that he also attended the ACWA virtual conference, and stated that he enjoyed the session regarding how electrical utility companies have responded to Public Safety Power Shutoffs (PSPS).

8. ADMINISTERING AGENT/GENERAL MANAGER REPORT

Administering Agent/General Manager David Pedersen reported that compost was being produced at the Rancho Las Virgenes Compost Facility, and staff was waiting on receiving laboratory results prior to having compost available to the public. He also reported that the flow in Malibu Creek measured 6.83 cubic feet per second (CFS) at the gauging station; therefore, fish flow supplement was not needed. He noted that there were high recycled water demands due to recent warm weather; therefore, the recycled water system was supplemented with 1.3 million gallons of potable water on August 2nd. He stated that potable water supplement had since reduced to 600,000 gallons per day.

9. FUTURE AGENDA ITEMS

Director Orkney requested a future agenda item to consider a mascot for the Pure Water Project Las Virgenes-Triunfo.

A brief discussion ensued regarding the procedure for Board Members to request future agenda items. Wayne Lemieux, JPA Legal Counsel, noted that the rule for a motion and a second for requests for future agenda items was for Las Virgenes Municipal Water District as opposed to the JPA.

Director Polan requested a future agenda item for the next Board meeting for a discussion on South Coast Air Quality Management District's proposal regarding backup emergency generator testing.

10. PUBLIC COMMENTS

None.

11. CLOSED SESSION

None.

12. **ADJOURNMENT**

Seeing no further business to come before the Board, the meeting was duly adjourned at **6:18 p.m**.

Jay Lewitt, Chair

ATTEST:

James Wall, Vice Chair

BEST BEST & KRIEGER LLP
ATTORNEYS AT LAW

To:	Las Virgenes-Triunfo JPA
From:	Syrus Devers, Best Best & Krieger
Date:	August 27, 2020
Re:	Monthly Report

Legislative Report

The pandemic continues to interrupt the legislative process a week before the session deadline on the 31st. Two Senators and a staffer tested positive for COVID-19 following the floor session on the 24th. The Senate floor session scheduled for the 26th was canceled although the Assembly did meet. Pro Tem Toni Atkins stated that the Senate would continue to work and finish up all remaining business by the Monday deadline, although she did not say how that would happen by the time this report was prepared.

Legislative leaders, the Governor, and the Controller went to press with the idea of tax vouchers to raise one billion dollars to be used for a laundry list of economic stimulus measures. The idea is that individuals in higher tax brackets would be willing to pay next year's taxes this year for discounts in future tax years. In other words, the state wants to borrow taxes from the future. The proposal is admittedly vague. No specific numbers were given for the value of the vouchers, or how much would be allocated to any of the proposed stimulus measures if the funds were raised. Water recycling and investments in water infrastructure were included on the list, albeit near the bottom. That proposal is now in SB 815, an omnibus budget trailer bill.

The opposition campaign against AB 3030 (Karla) was successful despite a difficult time getting the opposition of water agencies heard. This was the bill that called for the "protection" of 30% of the "waters" of the state without defining either of those terms. The bill was opposed by sport fishing groups and opposition testimony on the alleged impacts to fishing went on for hours. After getting out of policy committee with votes to spare, it was placed on the suspense file in Appropriations where it stayed.

Unfortunately SB 414 (Caballero) was also held in Senate Appropriations. This was the third attempt by ACWA and CMUA to pass legislation facilitating small system consolidation.

AB 1659 (Bloom) was amended on the 25th to allow for revenue bonds to be sold to raise funds for wildfire prevention. The revenue source would be the current fees on large electrical corporations imposed after the 2018 wildfires. The bill would authorize $3 billion, of which a small portion would go to water infrastructure improvements. ($300 million.) Revenue bills are not subject to the same policy committee deadlines as ordinary legislation.

Administrative Report

On July 28th Governor Newsom released his Water Resilience Portfolio following the first draft that was released back in January. (Which was only 8 months ago despite how it may feel.) For the most part it was environmental groups who complained the loudest. Topping their grievances was the Governor's reaffirmation of support for the Delta Conveyance:

> "Plan, permit, and build new diversion and conveyance facilities (such as a tunnel) in the Sacramento-San Joaquin Delta to safeguard State Water Project and, potentially, Central Valley Project deliveries drawn from the Sacramento and San Joaquin river systems."

The report goes on to mention support for Sites reservoir and Salton Sea restoration. Water interests offer muted praise while the Director of the Sierra Club stated, "This version doesn't contain the significant changes we asked for; we can't figure out who's running the ship over there when it comes to water."[1] The report can be read here: https://waterresilience.ca.gov/

[1] Courthouse News Service, *Newsome Lays Out Big Dreams for California's Water Future*. (July 28, 2020)

BEST BEST & KRIEGER LLP
ATTORNEYS AT LAW

To: Las Virgenes-Triunfo JPA Staff and Board of Directors
From: John Freshman, Ana Schwab, and Lowry Crook
Date: August 27, 2020
RE: Federal Report

Congressional Update

Congress is currently out of session and bicameral progress on appropriations and COVID-19 relief have stalled. The Senate will return from recess on Sept. 8; House committees will also return Sept. 8, and the House floor will reconvene on Sept. 14. The Senate is scheduled to be in session until October 9 and the House until October 2 before they recess until after election day.

Appropriations

Last month, the House passed 10 of 12 appropriations bills for fiscal year 2021. In two "minibus" packages, they passed bills that will fund the departments of Defense, Commerce, Justice, Energy, Treasury Labor, Health and Human Services, Education, Transportation, Housing and Urban Development, State, Agriculture, Interior, and Veterans Affairs from October 1, 2020 to September 30, 2021. The House did note vote on the Legislative or Homeland Security funding bills.

House Democrats included several emergency spending measures in the infrastructure-related bills (Transportation, Energy & Water, Interior & Environment), which would provide billions in supplemental funds in addition to the agreed-upon fiscal year 2021 regular appropriations caps. The House Interior and Environment bill also includes a provision rescinding and re-appropriating funds for WIFIA loans, and providing no additional WIFIA funding. Appropriations Committee staff has assured concerned members that this issue would be "fixed" in conference with the Senate.

The White House has issued veto threats for the fiscal packages. Republicans did not vote in favor of either minibus bill. Although the House passed a majority of its appropriation bills, it is unlikely a fiscal budget for 2021 will be adopted before the September 30 deadline.

In the Senate, there is still a stalemate between Republicans and Democrats over what amendments will be considered in an election year with the Senate majority in play. Senate Democrats want to propose amendments that would add coronavirus spending measures, address policing policy issues, and force votes on other high profile issues. Senate Republicans do not want to vote on amendments of that nature. Until the Senate can agree on those ground rules, they will not move forward with their appropriations bills, which have yet to be taken up by the Senate Appropriations Committee.

It is most likely that Congress will have to pass a continuing resolution in September in order to continue funding the government after the September deadline. Congress is unlikely to pass a full appropriations package until a lame-duck session in December 2020 or a new Congress in January 2021.

Defense Reauthorization and PFAS

In July, the House and Senate passed their own versions of the 2021 National Defense Authorization Act (NDAA). However, the chambers have not begun the NDAA conference to resolve differences. It has not been announced when the chambers will begin the conference. As reported previously, neither the House nor Senate bills include provisions that would designate PFAS as hazardous substances under CERCLA. Instead, they include provisions targeted on Defense Department use of, research on, and remediation of PFAS.

Water Resources Development Act

The House also passed its 2020 Water Resources Development Act (WRDA), which provides the U.S. Army Corps of Engineers authorization to carry out water resources development projects and studies. The bill would provide authorization for construction of 34 projects. In May, the Senate Environment and Public Works Committee unanimously passed its version of WRDA, America's Water Infrastructure Act, and a bill focused on improving drinking water infrastructure, the Drinking Water Infrastructure Act of 2020. The Senate has not yet conducted a full Senate floor vote. Unlike other infrastructure and funding bills, the House and Senate WRDA bills have been bipartisan efforts, so the primary challenge for the legislation will be Congress's limited remaining time in session.

COVID-19 Relief

The next round of relief aid is currently at an impasse. Today, House Speaker Nancy Pelosi and White House Chief of Staff Mark Meadows spoke, and Pelosi offered to lower the total size of the relief bill to $2.2 trillion. (The relief bill that passed the House provided $3.4 trillion; the version proposed by Senate Republicans would provide $1.1. trillion.) This week, Meadows said he does not believe a relief package will be reached until the end of September. He also proposed that a relief package should be combined with a fiscal year 2021 stopgap continuing resolution – a move that Speaker Pelosi has opposed.

On aid to state and local government, the House bill would provide $500 billion to states and $375 billion to local governments, split between counties and cities. Republicans have privately offered $150 billion in additional aid to state and local governments.

The House bill would also provide $1.5 billion for low-income drinking water and wastewater assistance.

Rep. Garamendi and Senators Cornyn (R-TX) and Sinema (D-AZ) have introduced bills that would make special districts eligible to receive up to 5% of any additional Coranavirus Relief funds provided to states. Following your outreach, Senator Harris agreed in late July to sign on as a cosponsor.

Clean Water Act and NEPA Regulations

- **Definition of Waters of the U.S.:** Currently, the Administration's new rule defining the "Waters of the U.S." subject to Clean Water Act jurisdiction is effective in California and 48 other states. It has been stayed in Colorado. Litigation against the regulation is ongoing in California eight other states, including a challenge in California by 18 states and the District of Columbia. The Federal government has appealed the stay in Colorado.

- **Rule on scope and timing of Section 401 Water Quality Certifications:** A new rule narrowing the scope and tightening timelines for states' Section 401 Water Quality Certifications is scheduled to take effect on September 11, 2020. It would limit the scope of reviews and conditions to those related to point source discharges to Waters of the U.S., and would put Federal permitting agencies such as the Army Corps of Engineers in charge of setting deadlines for the regional water boards. California and 19 other states have challenged the rule in the Northern District of California. Environmental groups have filed three other challenges to date.

- **Army Corps Nationwide Permits:** On August 3rd, the Army Corps of Engineers released a prepublication draft of its proposal to reissue nationwide permits – general permits that expedite permitting for categories of projects that generally result in relatively limited discharges of dredge or fill into Waters of the U.S. The proposed package includes a new nationwide permit for water reclamation and reuse projects, and a new nationwide permit for water utility pipelines. The proposal has not yet been published in the Federal Register; a 60-day comment period will follow its official publication.

- **Final Updated NEPA Regulations:** On September 14, the Council on Environmental Quality's updated NEPA regulations are scheduled to take effect. These regulations are intended to narrow the number of projects subject to NEPA reviews, the types of environmental impacts that must be considered, and the types of project alternatives that must be considered; set presumptive time and page limits; and narrow the legal remedies for NEPA violations.

September 8, 2020 JPA Board Meeting

TO: JPA Board of Directors

FROM: Finance & Administration

Subject : Update on Woolsey Fire Recovery Efforts

SUMMARY:

On November 12, 2018, the LVMWD Board declared a state of emergency due to the devastating Woolsey Fire that began on November 8, 2018. The Las Virgenes-Triunfo Joint Powers Authority experienced significant damages at the Rancho Las Virgenes Composting Facility. Since the fire, staff has been working to recover from the damages, restore the facilities to their pre-disaster condition and secure reimbursement for the associated costs. At the meeting, staff will provide an update on Woolsey Fire recovery efforts.

RECOMMENDATION(S):

Receive and file the Woolsey Fire recovery update.

FISCAL IMPACT:

No

ITEM BUDGETED:

No

DISCUSSION:

Since November 2018, staff has been diligently working on the recovery efforts related to the Woolsey Fire. At the meeting, staff will provide an update on the current status of the capital projects related to the recovery effort and progress to obtain reimbursement for the eligible costs. The JPA has submitted reimbursement requests totaling $1,635,204 for damages at the Rancho Las Virgenes Composting Facility. As of August 24, 2020, the JPA has recovered $890,067 in damage reimbursements, constituting approximately 54% of the submitted amounts. Staff continues to pursue additional reimbursement through its insurance policy and a claim against Southern California Edison for any unrecovered amounts.

GOALS:

Ensure Effective Utilization of the Public's Assets and Money

Prepared by: Donald Patterson, Director of Finance and Administration

September 8, 2020 JPA Board Meeting

TO: JPA Board of Directors

FROM: Engineering and External Affairs

Subject : Owner's Advisor/Program Manager Services for Pure Water Project Las Virgenes-Triunfo: Award

---

SUMMARY:

On May 8, 2020, staff released a request for proposals (RFP) for Owner's Advisor/Program Manager services for the Pure Water Project Las Virgenes-Triunfo. The selection of an Owner's Advisor/Program Manager to support the effort is an important next step to begin implementation of the Pure Water Program. Utilization of an Owner's Advisor/Program Manager is consistent with the approach taken by other public agencies pursuing potable reuse projects of similar scope and complexity. Among the critical elements of the proposed scope are completion of the preliminary design and environmental documentation in support of the Pure Water Program. The scope of work under the contract would include program management, preparation of preliminary design and/or alternative delivery bridging documents, preparation of all environmental studies and documentation for compliance with the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA), preparation of studies and documents necessary to secure all required regulatory permits, and support of efforts to secure grant funding or low-interest loans.

On June 25, 2020, six proposals were received consisting of varying scopes, fees and proposed value-added options: (1) AECOM; (2) Brown and Caldwell; (3) Carollo Engineers, Inc.; (4) Jacobs Engineering Group, Inc.; (5) Kennedy/Jenks Consultants, Inc.; and (6) Stantec, Inc. The range of proposal responses was encouraged by the open-ended nature of the RFP to allow for creativity and innovation by well-known leaders and engineers in the potable reuse community who were responsive to the RFP. When including the proposed value-added options, the proposed fees ranged from $4,201,755 to $7,117,000.

To help facilitate the review of the proposals and selection of the recommended Owner's Advisor/Program Manager, a proposal review team and selection committee was formed, consisting of both LVMWD and TWSD representatives. The committee was responsible for reviewing the proposals and ranking, shortlisting and interviewing the firms. Three of the six proposals were shortlisted by the committee, and the firms were invited for interviews held on August 25, 2020. Based on the proposed scope of work, project understanding and approach, experience of the team and fee proposal, staff recommends accepting the proposal from Jacobs Engineering Group, Inc., in the amount of $6,867,000, which includes six value-added optional tasks.

RECOMMENDATION(S):

Accept the proposal from Jacobs Engineering Group, Inc., and authorize the Administering Agent/General Manager to execute a professional service agreement, in the amount of $6,867,000, including six value-added optional tasks, for Owner's Advisor/Program Manager services for the Pure Water Project Las Virgenes-Triunfo.

FISCAL IMPACT:

Yes

ITEM BUDGETED:

Yes

FINANCIAL IMPACT:

Sufficient funds are available in the adopted Fiscal Year 2020-21 JPA Budget for this work. No additional appropriation is required. A budget of $7,000,000 is provided for the Pure Water Project Las Virgenes-Triunfo under CIP Job No. 10597, which is allocated 70.6% to LVMWD and 29.4% to Triunfo Water & Sanitation District (TWSD).

DISCUSSION:

The services of an Owner's Advisor/Program Manager are multi-faceted and intended to support collaboration, innovation and teamwork for successful implementation of a program of this size and nature. The Pure Water Project Las Virgenes-Triunfo is better defined as a program than a project. While the cornerstone of the program will be the construction of an advanced water treatment facility, the program also consists of a number of other projects that must be studied, developed and designed to support the overall success. Following is a summary of some of the major elements of the overall program:

1. Advanced Water Treatment Facility (AWTF)
2. Major Supporting Pipelines
    - Recycled water supply to the AWTF (Influent Pipeline)
    - Purified product water to Las Virgenes Reservoir (Product Water Pipeline)
    - RO concentrate pipeline (Brine Disposal Pipeline)
    - Off-spec water pipeline to sewer (Off-Spec Water Pipeline)
    - Augmented source pipelines (Augmented Source Feed Water Pipelines)
3. Tapia Water Reclamation Facility Improvements (Primary Effluent Flow Equalization Tank)

Additionally, there are many studies and numerous sub-tasks necessary to support the program, which include but are not limited to the following:

1. Assisting and supporting JPA staff with grant/loan applications, cost-loaded program scheduling and financial support;
2. Completing tracer/mixing studies for regulatory compliance;
3. Preparing an AWTP steady-state evaluation to achieve year-round operation utilizing alternate source waters for augmented flows (i.e. stormwater capture/diversion, septic-to-sewer conversions, impaired groundwater and conveyance of additional supplies from other agencies);

4. Development of operational strategies for Las Virgenes Reservoir;
5. Preparing hydraulic studies for pipelines;
6. Development of project delivery method(s);
7. Evaluating the capacity of Discharge Point No. 005 (Los Angeles River) and investigating alternative emergency discharge options;
8. Developing brine disposal, maintenance and optimization strategies; and
9. Preparing regional solutions to manage salinity.

All six proposals received were from well-known, highly qualified firms that were responsive to the request for proposals. To narrow the field, a proposal review and selection committee, consisting of TWSD and LVMWD representatives, selected three of the six consultants to be shortlisted for interviews. The shortlisted firms were Carollo Engineers, Kennedy/Jenks Consultants and Jacobs Engineering Group, Inc.

Although all three shortlisted firms were well qualified and very capable of performing the requested work, the review and selection committee recommends selection of the proposal by Jacobs Engineering, Inc., for the following reasons:

- The high quality of the proposal, strong interview and extensive experience of the team managing large programs, including potable reuse efforts;
- A strong understanding of the JPA's needs and objectives to "bring water full circle";
- An effective approach to support the JPA through strategic decision-making and innovation throughout the entire program;
- A strong understanding of the need and importance to engage with both JPA staff and Board Members frequently and consistently;
- An innovative approach to developing a digital watershed model to support the augmentation of water supply to the AWTF and achieve steady-state operations, while addressing salinity management challenges; and
- A creative strategy to address potential maintenance issues that could be associated with a build-up of solids in the proposed Brine Disposal Pipeline.

In addition, the Jacobs team brings a new set of eyes to the JPA's Pure Water Program. As a new consultant to work on the program, their engineers and experienced team will be able to expand upon the studies, reports and project proposals that have been developed to-date by the JPA. The Jacobs team will be able to build upon the work of others, and their selection is consistent with the JPA's approach to utilize the expertise of a variety of firms and recognized leaders in the water reuse community.

Based on the proposed scope of work, project understanding and approach, team experience and fee proposal, staff recommends accepting the proposal from Jacobs Engineering Group, Inc., in the amount of $6,867,000, which includes six optional value-added tasks totaling $405,000.

Following is a summary of the six value-added options tasks that are recommended:

- (VA1) Steady State Water Augmentation Study and Salinity Management Strategies using Digital Watershed;
- (VA4) Reservoir Modeling and Recommendation for Air Curtain and Meeting Greater than a 4-Month 100:1 Dilution;
- (VA5) Integrated Operational Strategies for Westlake Filter Plant, Tapia, and new AWTP;

- (VA8) Enhanced Source Control Plan;
- (VA9) Dual Direction, Multi-Purpose Brine Pipeline Analysis; and
- (VA10) Investigation of Alternative Emergency Discharge Options.

The total fee for the recommended value-added options is $405,000. The remaining value-added optional tasks included in the proposal are not recommended at this time but may be considered at a future date when the program is more clearly defined. Staff will return to the JPA Board for future approval of value-added options, if necessary.

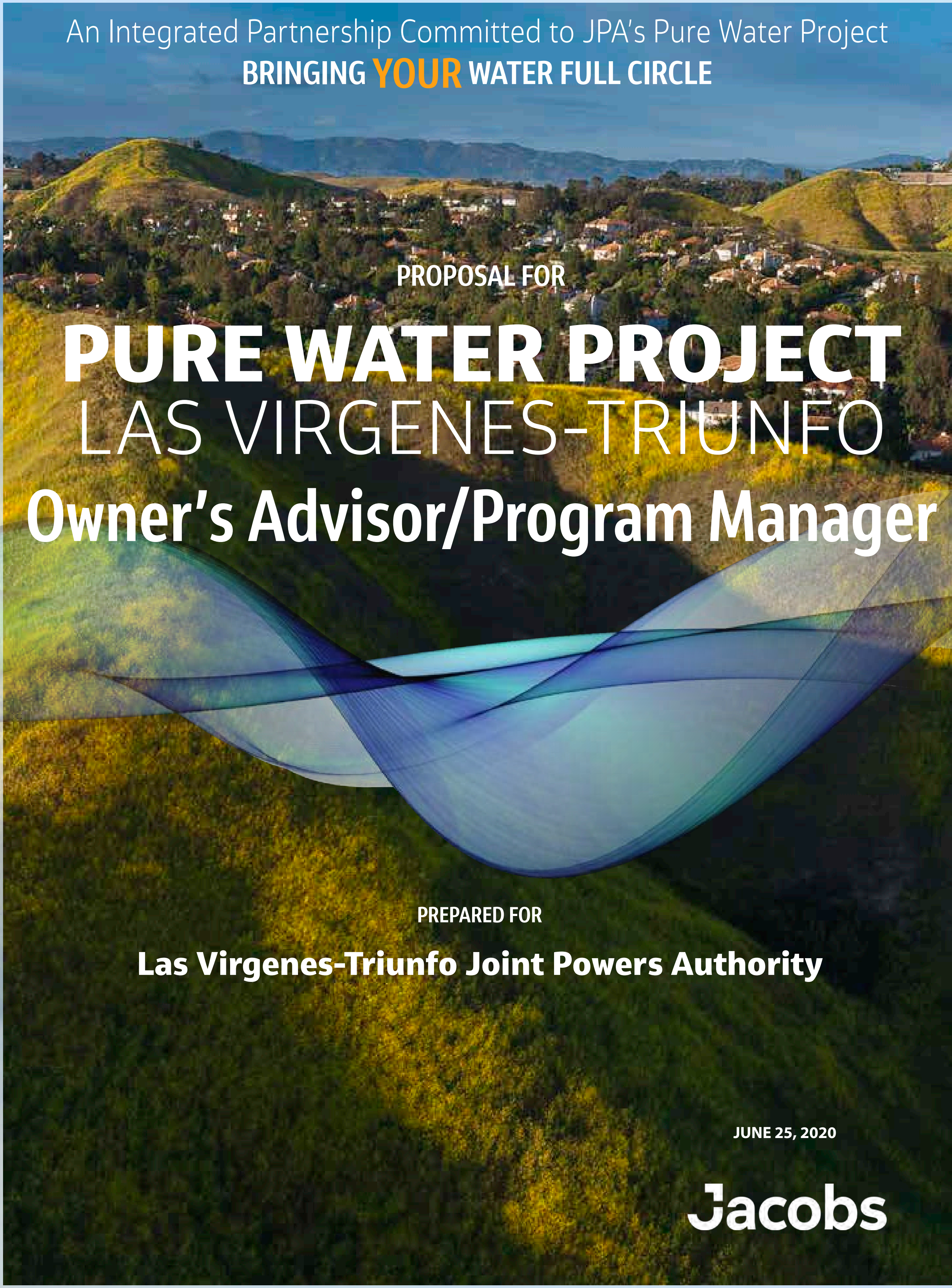
GOALS:

Lead in Sanitation and Recycled Water Services Focusing on Maximum Reuse

Prepared by: Eric Schlageter, P.E., Principal Engineer

ATTACHMENTS:

Technical Proposal by Jacobs Engineering Group, Inc.
Fee Proposal by Jacobs Engineering Group, Inc.



An Integrated Partnership Committed to JPA's Pure Water Project

BRINGING YOUR WATER FULL CIRCLE

PROPOSAL FOR

PURE WATER PROJECT
LAS VIRGENES-TRIUNFO
Owner's Advisor/Program Manager

PREPARED FOR

Las Virgenes-Triunfo Joint Powers Authority

JUNE 25, 2020

Jacobs

TABLE OF CONTENTS

SECTION 3 – Firm Descriptions and History

SECTION 4 – Related Project Experience

SECTION 5 – Staffing and Organization

APPENDIX

Compliance Reference		
IV. Minimum Consultant Qualifications	▪ Registered State of California Professional Engineers ▪ Standard Consulting Agreement ▪ Professional Liability Insurance ▪ Proven experience providing OA experience on at least one project (in past 10-years) for the design-build of a water or wastewater treatment facility AND suitable experience directly performing or managing project similar to the Pure Water Program	▪ Appendix A ▪ Appendix E ▪ Appendix D ▪ Section 4
V. Proposal Requirements		
1. Firm information	▪ Legal name of firm with address, phone and name of at least one principal	▪ Cover letter
2. Project Understanding and Approach		▪ Section 2
3. Recommended Scope of Work		▪ Section 2 ▪ Appendix B
4. List of Assumptions or Recommended Services		▪ Section 2 ▪ Appendix B
5. Subconsultants	▪ Scope, names, qualifications, and principals of any subconsultants	▪ Section 3
6. References	▪ 3-5 references	▪ Section 4
7. Staff	▪ Names, project role and resumes of individual(s) proposed to perform the services including proof of professional registration	▪ Section 5 ▪ Appendix A
8. Quality Control Process	▪ Description of firm's internal quality control process	▪ Appendix C
9. Certificate of Professional Liability Insurance		▪ Appendix D
10. Cost Proposal	▪ Cost to perform services, a schedule of rates, and any anticipated rate changes	▪ Cost Proposal Document

Jacobs

Challenging today.
Reinventing tomorrow.

FIRM
Jacobs
1000 Wilshire Blvd
Suite 2100
Los Angeles, CA 90017
213.538.1388

JACOBS PRINCIPAL
Rich Nagel
Rich.Nagel@jacobs.com
(213) 500-2333

June 25, 2020

Eric Schlageter, PE
Las Virgenes-Triunfo Joint Powers Authority
4232 Las Virgenes Road
Calabasas, CA 91302

Subject: Proposal for Owner's Advisor/Program Manager for Las Virgenes-Triunfo Pure Water Project

Dear Eric:

Thank you for the opportunity to propose on this RFP to be your Owner's Advisor/Program Manager for the Pure Water Program. Included herein is our technical proposal. Our table of contents is hyperlinked to help you navigate the document and has a wayfinding table connecting your RFP requirements to where you can find them in our proposal. We have also included an Executive Summary that provides an overview of our proposal.

As required by your RFP, our cost proposal is provided as a separate file. Our firm name is Jacobs Engineering Group Inc. (Jacobs). Our address and phone number is listed in the sidebar.

We are excited to work with the JPA on this visionary program and look forward to the opportunity of helping to move it forward from concept to reality. We have enjoyed our workshops with you and the opportunity to exchange ideas. It is this spirit of collaboration and trust you can count on going forward.

As a principal of Jacobs, I am authorized to commit the firm. I stand behind our commitment and capability to perform the work as described herein. If you have any questions, please feel free to contact me at (213) 500-2333 or via email at Rich.Nagel@jacobs.com.

Sincerely,

Rich Nagel, PE
Vice President and Principal-in-Charge
Jacobs Engineering Group Inc.

Jennifer Phillips, PE
Program Manager
Jacobs Engineering Group Inc

"I am so pleased to have Woodard & Curran, Katz & Associates, and our Strategic Advisors join the Jacobs Team. We hand-picked these partners to complement and further enhance our own capabilities and add even greater value to your Pure Water Program. Together, we are excited to deliver the most successful reservoir water augmentation program ever, to serve you and your communities!"

- RICH NAGEL, PRINCIPAL-IN-CHARGE, JACOBS

SECTION 1 | EXECUTIVE SUMMARY

Jacobs' solution-based, integrated approach to implementation of the Pure Water Program provides the program management and owner's advisory expertise to achieve the JPA's desire for efficiency and collaboration, while supporting a commitment to **innovation**, **enhanced local water**, and **ecosystem protection**.

Superior TEAM
...that draws on **Local Knowledge, Global Experience,** and **Iconic Industry Reputation**

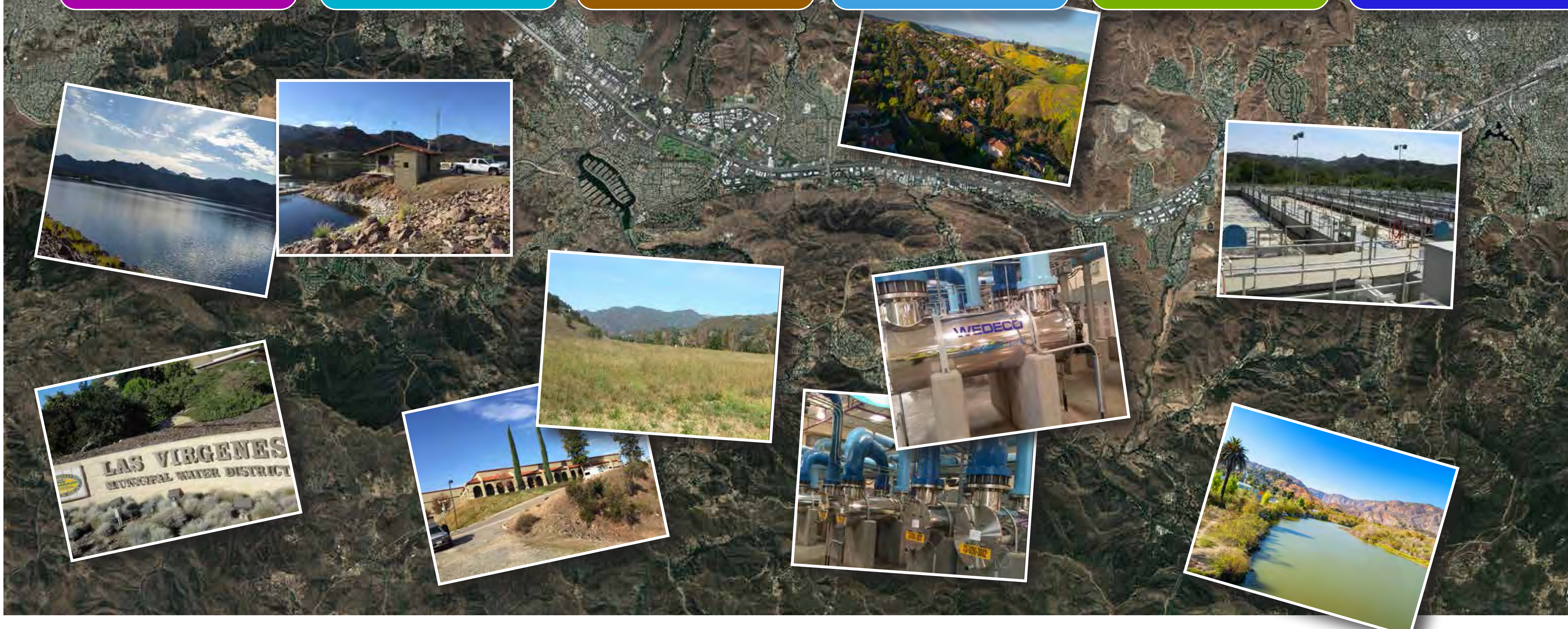
INNOVATIVE Thinking
...that incorporates creative ideas to **Maximize Resiliency, Reduce Costs,** and **Optimize Plant Performance**

INTEGRATED One Team Approach
...that Provides a **Framework to Promote Collaboration and Exceptional Performance**

Delivery EXCELLENCE
...Across the Spectrum, of **Owner's Advisory, Program Management,** and **Alternative Delivery**

INSTITUTIONAL Knowledge
...that **Leverages Accomplishments and Related Project Experience**

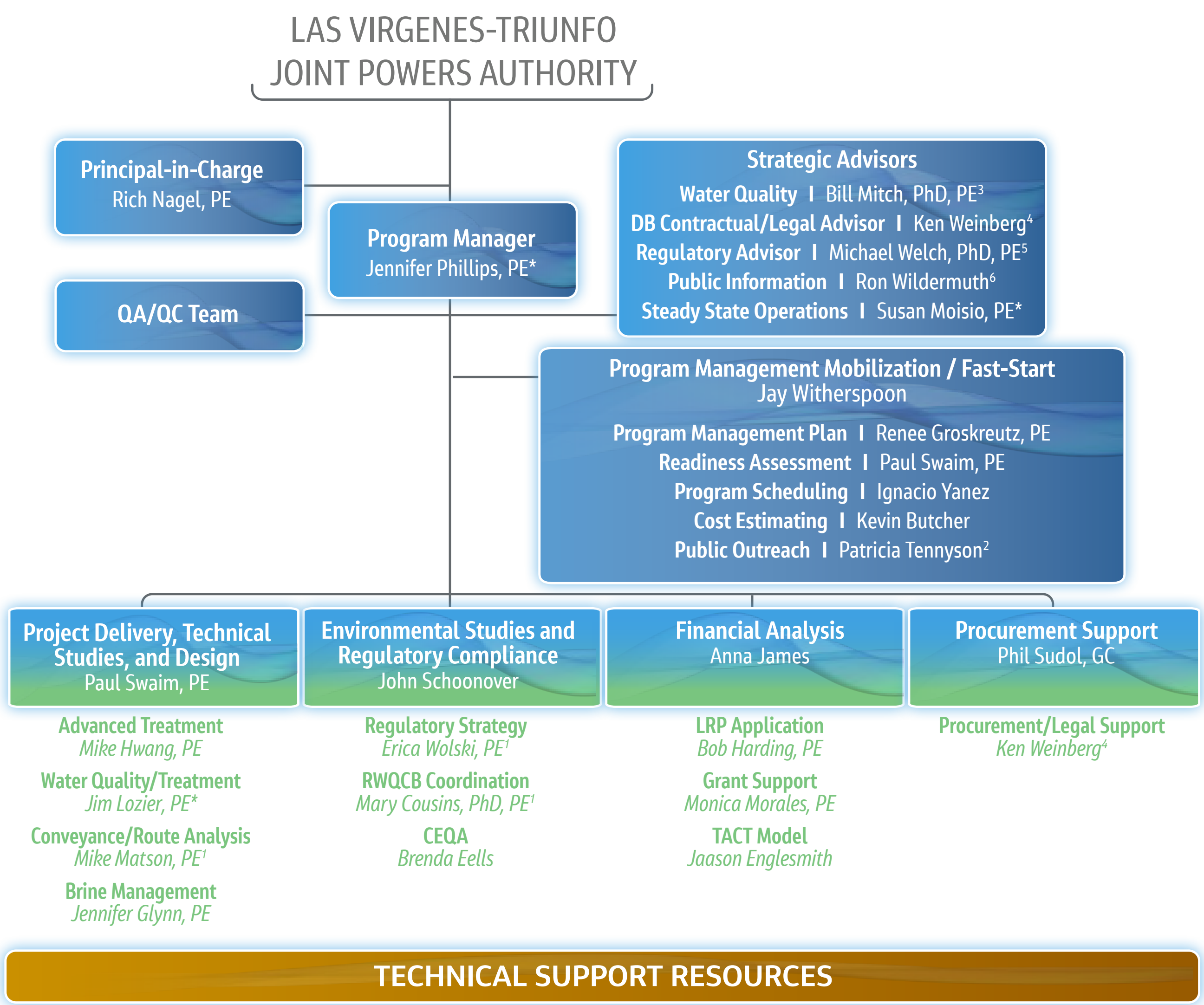
TECHNICAL Leadership
...Built on **Award-Winning Performance** in Advanced Treatment Technologies and Infrastructure



Superior TEAM

...that draws on **Local Knowledge, Global Experience,** and **Iconic Industry Reputation**

- Our staffing strategy features a blend of California-based and globally-experienced professionals with proven, award-winning expertise delivering state-of-the-art advanced treatment and conveyance facilities, under a variety of delivery models.
- This integrated team addresses all elements of the Program, and has a unique combination of owner's advisory and program management prowess, hands-on experience with various delivery models, and a collaborative working style.
- We are a California-based team, supplemented with experts drawn from our global bench, who collectively offer strong credentials in California water and reuse trends, state-of-the-art technology, and related technical expertise.
- Our team's working relationship and proven track record on similar assignments demonstrates their ability to function as a cohesive unit, and contributes to their ability to deliver exceptional performance, inspires innovative ideas, and produces quality outcomes.



* PE in State other than CA (see resumes in Appedix A) 102_v6

SUBCONSULTANTS I [1] Woodard Curran [2] Katz & Associates STRATEGIC ADVISORS I [3] Bill Mitch, PhD [4] Ken Weinberg [5] Mike Welch [6] Ron Wildemuth

INNOVATIVE Thinking

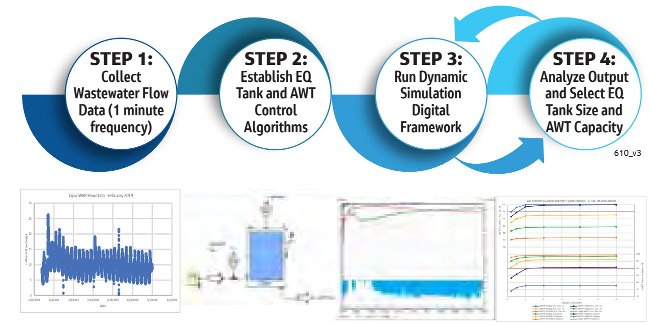
...that incorporates creative ideas to **Maximize Resiliency, Reduce Costs,** and **Optimize Plant Performance**

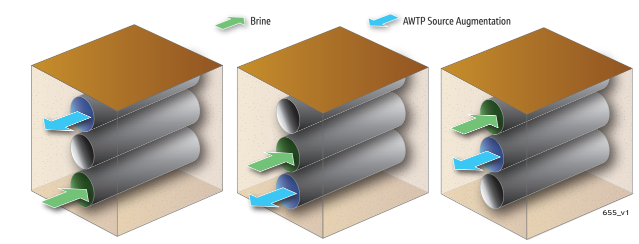
BENEFITS:

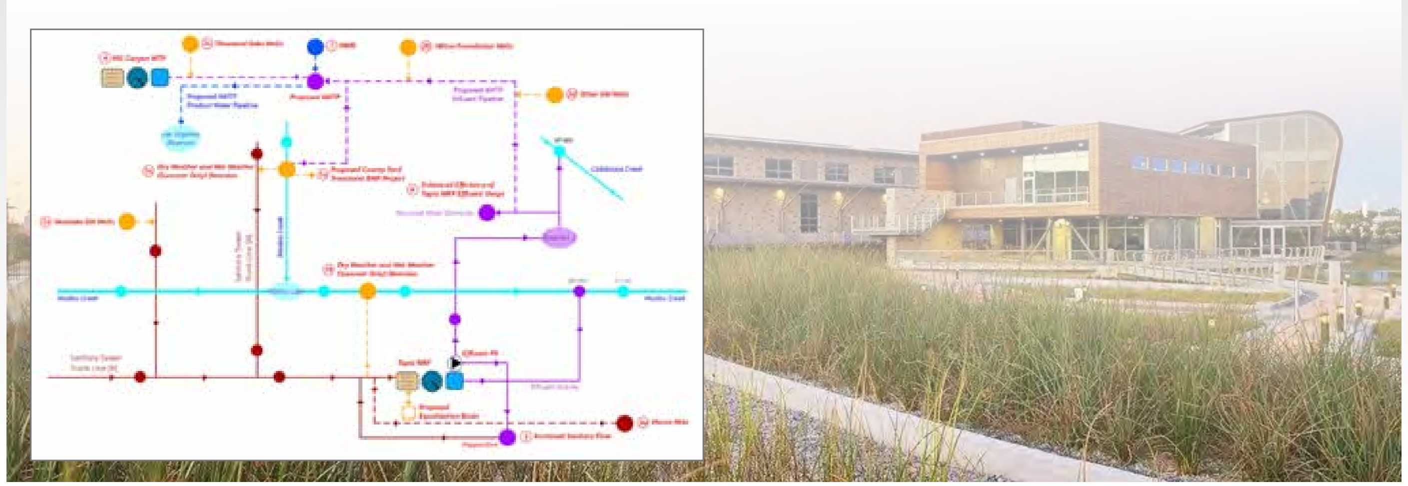
- O Operations
- R Resiliency
- $ Cost Savings
- ✓ Compliance
- Ri Contingency/Risk
- B Community Benefit
- S Section
- P Page

	INNOVATION & WHERE TO FIND IT	BENEFIT
1	Wetlands Brine Pretreatment / S 2 P 30	O R B
2	Hilton Foundation Wells / S 2 P 11	O R
3	Tapia WRF NDMA Control / S 2 P 24	O ✓
4	Achieve 100:1 and >4 Months Travel Time in Las Virgenes Reservoir / S 2 P 18	O R $ ✓
5	Hill Canyon Treatment Plant Effluent to AWTP / S 2 P 32	O R
6	System-wide SCADA in Early Design / S 2 P 10	O
7	Integrate Tapia WRF CIP / S 2 P 11	O R
8	Incorporate JPA Policy Principles Regarding:Agoura Property in Early Stages / S 2 P 39	B
9	Treated Drinking Water Augmentation / S 2 P 25	O R
10	Las Virgenes Digital Watershed-Systems Framework for Water Augmentation / S 2 P 11 & 12	O R $
11	Pigging and Flushing Brine Disposal / S 2 P 31	O R
12	Las Virgenes Reservoir Air Curtain Design / S 2 P 34	O R ✓
13	Onsite Chlorine/Dechlorination Contactor / S 2 P 28	O $ ✓ Ri
14	Las Virgenes Reservoir GAC Adsorbers Replacing SBS Dosing / S 2 P 30	O R $ ✓
15	Strategic Advisors / S 3 P 10 & 11	O R ✓
16	TRASAR System to Enhance RO Log Reduction Credits / S 2 P 25	O R $
17	TACT Model / S 2 P 11 & 13	$ Ri
18	Schedule and Budget Control Tools / S 2 P 14	$ Ri
19	PEIR Earlier Funding Opportunities / S 2 P 36	$ ✓
20	MWD LRP Strategy / S 2 P 13 & 14	$
21	Revenue Risk Strategy for Las Virgenes and Triunfo / S 2 P 9,11,13	$ Ri
22	Risk Register / S 2 P 9	$ Ri
23	O&M Input Throughout / S 2 P 3	O R $ ✓ Ri

- Throughout this proposal we explore a full range of innovations that enhance operations, compliance, resiliency, contingency/risks, cost savings, and community benefits. Sample ideas shown in these illustrations.
- Novel ideas include a unique Digital Watershed Systems Framework as part of the water augmentation strategy, aimed at achieving steady state operations at the AWTP.
- A proactive regulatory strategy offers a conservative, multi-pronged approach that draws on proven experience to achieve compliance, while minimizing operational impacts and costs.
- Our AWTP design criteria incorporate conservative and innovative approaches that combine simulation modeling, forward thinking, and sound engineering science to promote operational optimization; ecosystem protection; DBP/NDMA management; and infrastructure sustainability and resiliency.

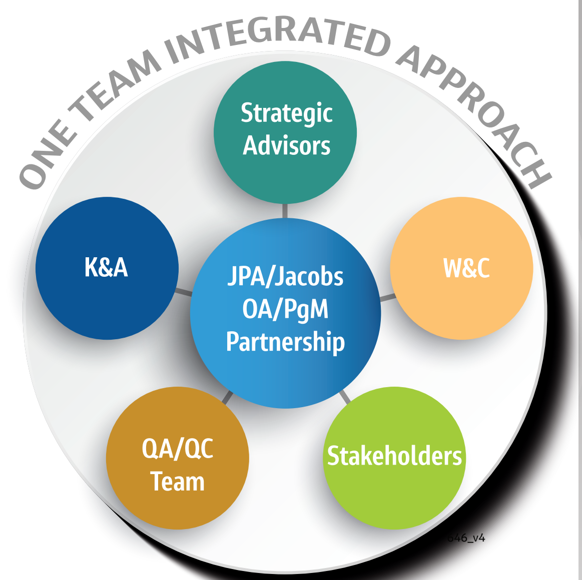






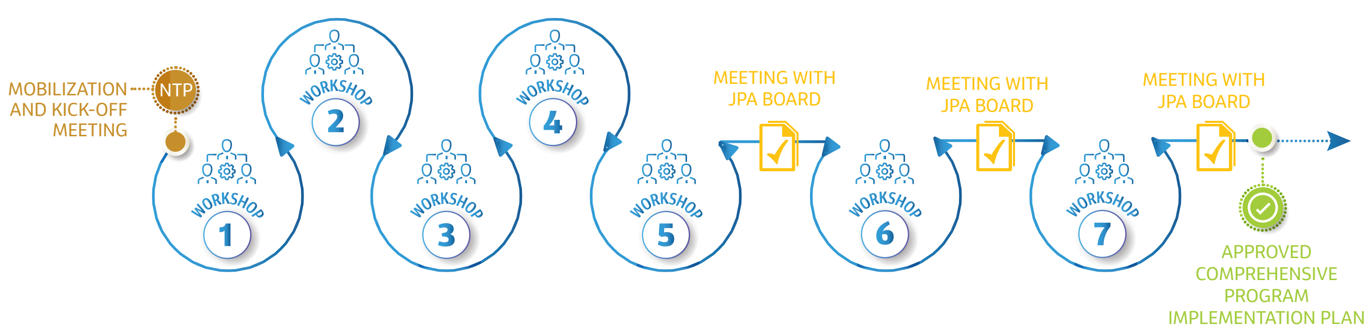
INTEGRATED One Team Approach

...that Provides a **Framework to Promote Collaboration and Exceptional Performance**

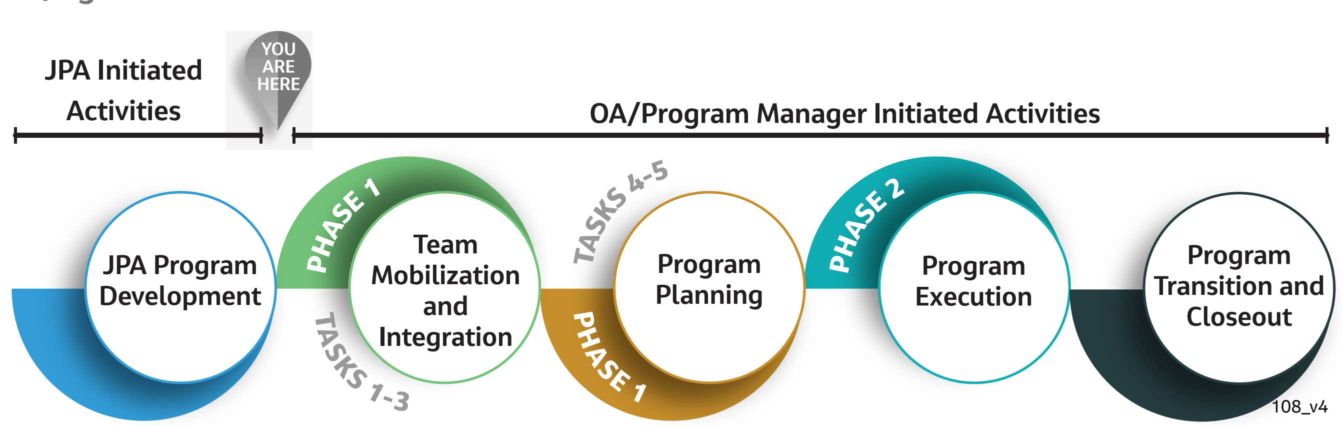


- Our integrated, "One Team" program management framework is structured to efficiently deliver this critical program, and address the multiple technical, environmental, regulatory, delivery and financial components.
- This approach will foster collaboration and informed decision making, provide quality performance, invite innovative thinking, manage risks, and strive for superior delivery.
- A "Fast Start" mobilization strategy occurs in the first six months, and through a workshop venue that establishes program priorities, drivers, and risks, sets the foundation for program implementation for the life of the Program.

Fast Start Workshop Strategy



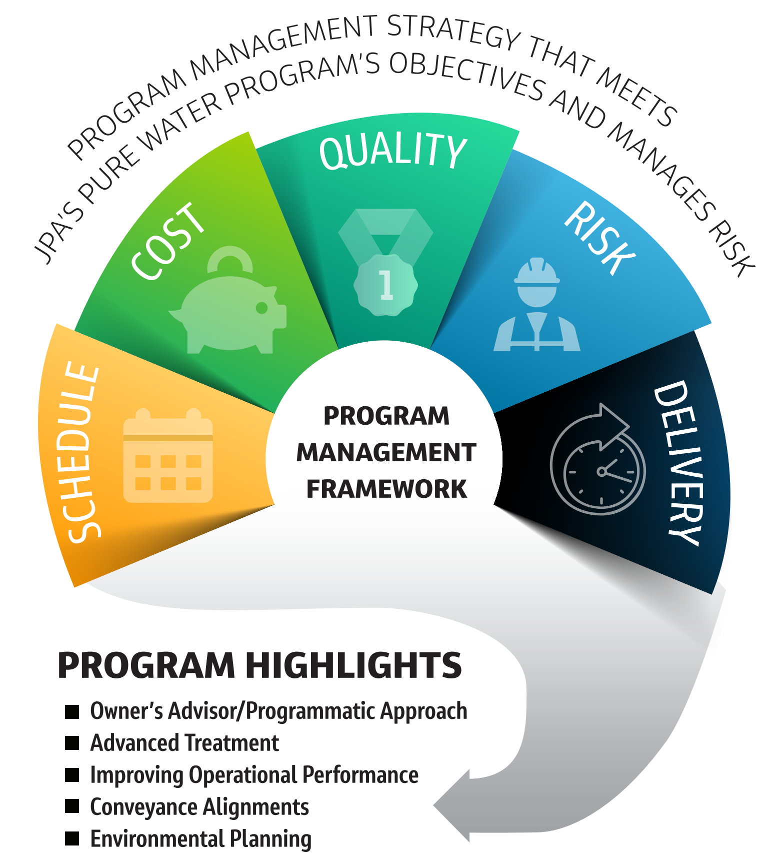
OA/PgM Framework



Delivery EXCELLENCE

...Across the Spectrum, of **Owner's Advisory, Program Management,** and **Alternative Delivery**

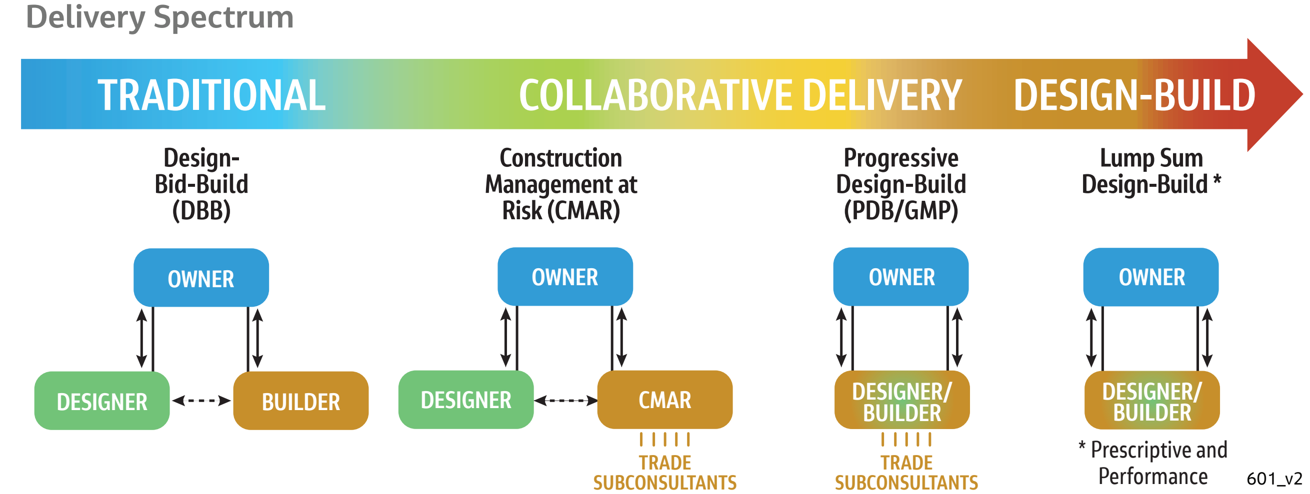
- We draw on our extensive program and alternative delivery experience to align optimal delivery models with project delivery, while addressing statutory and regulatory requirements; key objectives (cost; schedule; technology; innovation; operational impacts); risk tolerance; and funding considerations. By working closely with the JPA staff, our team will create the environment to achieve delivery excellence:
  - Organizing multiple services and functions under one umbrella, to achieve a unified vision and optimized outcomes
  - Promoting efficiency in terms of a reduced implementation schedule, maximized cost savings, managed risks and change; and early cost certainty
  - Fostering a collaborative partnership, transparent decision-making, innovative thinking and an array of sustainable and resilient solutions
  - Provides learning and professional growth opportunities for JPA staff through access to, and direct interaction with, Jacobs' global technology and delivery platform leads



PROGRAM HIGHLIGHTS

- **Owner's Advisor/Programmatic Approach**
- **Advanced Treatment**
- **Improving Operational Performance**
- **Conveyance Alignments**
- **Environmental Planning**
- **Regulatory Compliance**
- **Financial and Funding Optimization**
- **Delivery Procurement Model**

Delivery Spectrum

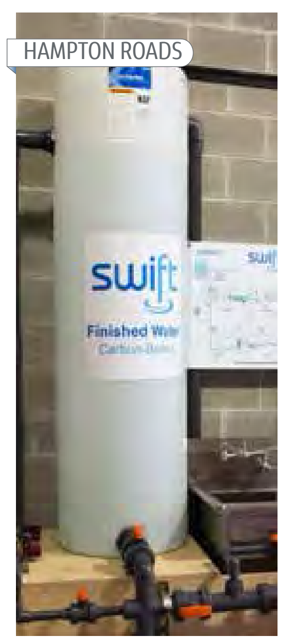


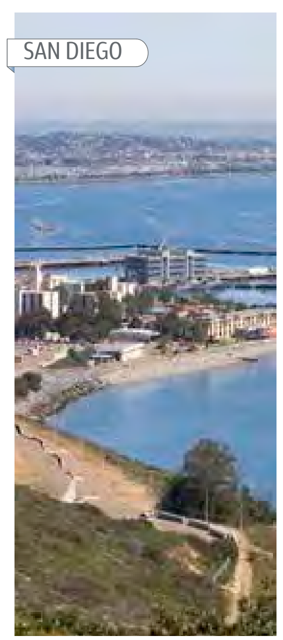
INSTITUTIONAL Knowledge

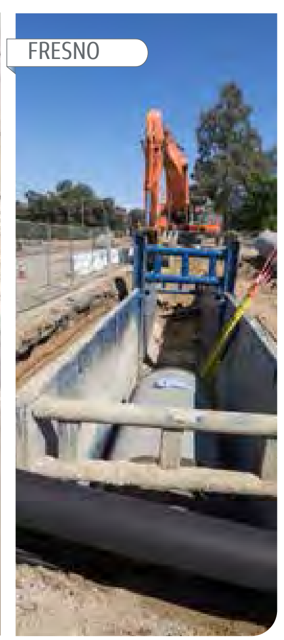
...that Leverages Accomplishments and Related Project Experience

- In formulating our approach, we have drawn on extensive related experience and prior work with the JPA, especially that of Woodard and Curran (W&C), which includes a series of projects that have shaped your current Pure Water Program.
- Our strong background in California reuse includes successful regulatory experience working with the Division of Drinking Water (DDW) and Regional Water Quality Control Board (RWQCB), enabling out team to apply lessons learned and avoiding a learning curve; this experience includes a successful regulatory strategy used on the Pure Water San Diego Program that can be applied to the Pure Water Program.
- Katz & Associates has worked with the JPA for 15 years, developing effective public outreach strategies; their work includes developing the brand name and messaging for the Pure Water Project.

LEVERAGING INSTITUTIONAL KNOWLEDGE GAINED ON PRIOR WORK







TECHNICAL Leadership

...Built on Award-Winning Performance in Advanced Treatment Technologies and Infrastructure

- One of the top ranked firms by Engineering News Record, Jacobs is the go to firm for complex infrastructure programs where budget, schedule, and risk management are essential to success. We have pioneered technology advancements, conveyance schemes, and alternative delivery strategies for many of California's – and the world's – most iconic projects, and have worked within all alternative delivery models, such as Progressive Design-Build, to deliver more than 145 water and wastewater treatment plants. Our AWT portfolio spans over 60 years and ranges in size from demonstration/pilot plants to full-scale operational facilities.
- Our team brings the conveyance and facilities expertise, including alignment analysis, planning, and design. Our long-term presence in California provides an in-depth understanding of CEQA's environmental requirements. For California's largest water resources program, Delta Conveyance (formerly Waterfix), Jacobs led the NEPA, CEQA, and California ESA processes and assisted with permits and mitigation planning.
- W&C has been a leader in conveyance and California water recycling for over 20 years, focusing on the evolving California potable reuse setting including groundwater and reservoir water augmentation.
- Katz & Associates specializes in strategic communications, public involvement, and community relations to advance essential infrastructure projects. The firm comprises nationally recognized public outreach experts who have worked with the JPA on your Pure Water Program.
- We supplement our team with a panel of strategic advisors well known to the JPA, including **Bill Mitch** for Water Quality; **Mike Welch** for Regulatory Strategies; **Ken Weinberg** for Procurement and Legal Guidance; and **Ron Wildermuth** for Public Involvement.

ENR RANKINGS

#1 Top 500 in Design Firms

Consistently Ranked Among the Top Consultants in Relevant Categories

- Water Supply
- Design Builder
- Water Transmission Lines and Aqueducts
- Wastewater Treatment Plants
- Water Treatment Desalination Plants
- Sewer and Waste
- Dams and Reservoirs

Building Design and Construction Giants

- Construction Management and Project Management
- Green Building Engineering Firms

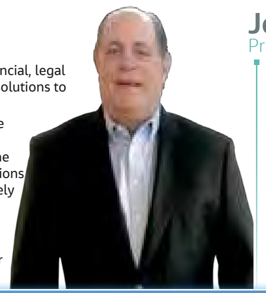
Advanced Treatment Technology Experience

IN SUMMARY

Our team has completed an in-depth analysis of the Program, which, coupled with the team's past work experience, has led to an approach that builds on the foundational elements of the Pure Water Program and captures the JPA's vision. We have the resources, experienced staff, lessons learned from similar assignments, and capacity to deliver, and are ready to partner with the JPA and share our ideas and strategies to realize your success.

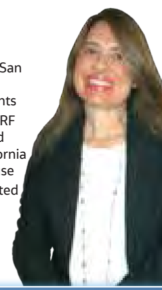
Leadership Team

Rich Nagel, PE
Principal-in-Charge



- 30 years of experience integrating financial, legal and regulatory strategies to create to solutions to southern California water challenges
- As President Elect of the CA WateReuse Association, Rich played an active role in SB 918 Kuehl (2010) which led to the Reservoir Water Augmentation regulations and AB 574 Quirk (2018), and ultimately to additional regulation updates
- Successful leadership of several major facility expansions, including two expansion of the Edward C. Little Water Recycling Facility

Jennifer Phillips, PE*
Program Manager



- Program lead and project manager for San Mateo's $427 million wastewater plant upgrade to meet regulatory requirements
- Led the design of San Luis Obispo's WRRF upgrade to provide capacity for 30 mgd wet weather flows and ~8 mgd of California Title 22 recycled water and potable reuse
- Successful track record leading integrated teams for DB and CMAR projects and leading process and operations startup and commissioning for plants from 4 to 50 mgd

Jay Witherspoon
Fast Start / Mobilization

- Over 38 years of experience across all areas of program and project management including 190 water, wastewater, water reuse, conveyance and sustainability projects
- Program manager for San Mateo's $900 million Clean Water Program to meet regulatory requirements and replace aging infrastructure under the umbrella of the City's sustainability and water reuse goals.
- As a former manager at a large water and wastewater utility in Oakland, California, brings unique insights to build an integrated team that understands the challenges facing utilities

"What Their Clients Have to Say

Delivers Highest Quality of Work — **Creative** Thinking — Displays **Tireless Effort** — Technically **Savvy**

PROVEN LEADERSHIP WILL DELIVER YOUR VISION

Exceptional **Responsiveness** — **Meets** Commitments — Endless **Dedication** — Provides **Innovation and Tireless Knowledge**

Paul Swaim, PE
Project Delivery, Technical Studies, & Design

- Internationally recognized expert in disinfection and advanced oxidation for drinking water, water reuse and wastewater treatment applications
- Successful track record delivering complex drinking and reuse projects with facilities up to 300 mgd for the cities of Oxnard, California; Henderson, Nevada; Park City, Utah; and Aurora, Colorado. Experience with regional agencies includes the Southern Nevada Water Authority, Metropolitan Water Reclamation District of Greater Chicago, and Metropolitan Water District of Southern California

John Schoonover
Environmnetal Studies & Regulatory Compliance

- Expertise in California and federal permitting processes and environmental documentation - CEQA, USACE 401/404, CDFG 1600 LSAA, CESA/ESA, RWQCB 401 Certifications and Section 106 consultations
- Providing permitting and outreach for the City of San Mateo's Clean Water Program which is under a RWQCB order, including CEQA, CEQA-Plus for SRF funding and permit tracking for the entire program

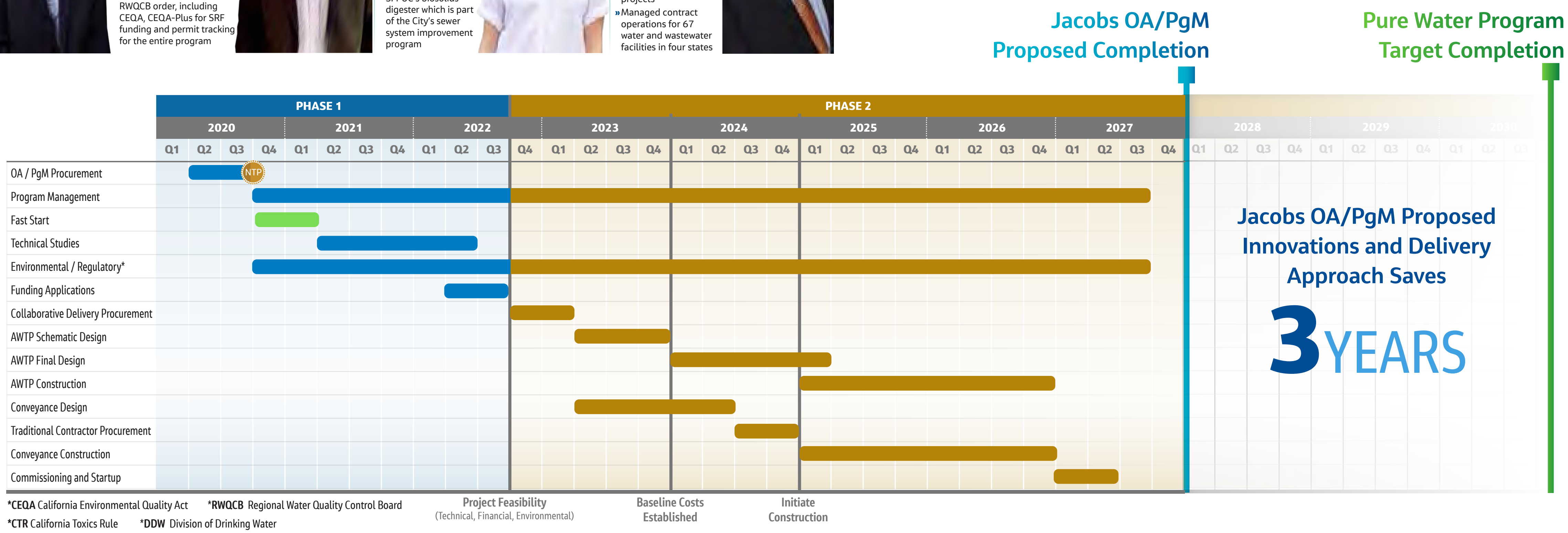
Anna James
Financial Analysis

- Led state and federal funding efforts for the San Mateo Clean Water Program; prepared successful letters of interest and loan applications for WIFIA funding and a financing agreement with the California State Board to obtain SRF assistance.
- Design engineer and facility lead SFPUC's biosolids digester which is part of the City's sewer system improvement program

Phil Sudol, GC
Procurement Support

- A licensed Commercial General Contractor, with 25 years of water/wastewater delivery experience throughout the US including the City of San Jose, California and North Texas Municipal Water District in Texas
- Developed and managed multi-million-dollar lump sum/fixed price projects
- Managed contract operations for 67 water and wastewater facilities in four states

MEETING YOUR EVALUATION CRITERIA	
The Jacobs' OA/PgM team is excited to begin working formally with the JPA on your Pure Water Program, and we pledge our unwavering commitment to your success.	
Comprehensive and understandable Scope of Work	Our proposed OA/PgM team has completed a detailed evaluation of the JPA's scope of work for the Pure Water Program, and has developed a comprehensive understanding of the proposed work. Section 2 provides a summary that demonstrates our understanding of the JPA's Program, vision, and objectives, as well as a description of our proven approach to achieving your desired outcomes, offering a series of innovative ideas, and a solid delivery framework. (See Section 2)
Expertise in performing the Scope of Work	The Jacobs' team has experience in all elements of the Pure Water Program. As shown in Section 3, our assigned team, both leadership and support staff, is comprised of specialists with industry-recognized experience on similar water infrastructure programs, globally and in California. Section 4 captures the vast experience of the team in similar related projects.
Understanding of the Project and delivery requirements	Section 2 highlights many of the delivery requirements of this Program. Exhibits 2-39 and 2-40 present a detailed schedule of activities and outcomes, and a summary scope of work, respectively. Further, Appendix B provides a detailed scope of work, noting both deliverables and assumptions.
Understanding of the policies, procedures, and other requirements of the JPA	Members of our team have worked with the JPA, through both LVMWD and TWSD on several occasions, that provide a formidable understanding of the JPA, including your infrastructure and requirements. Specifics are included in Sections 3 and 4.
Quality of performance on similar past projects, including those on which the proposed team has worked together	Section 4 presents details of past work and achievements of the Jacobs' OA/PgM team on programs of similar scope and magnitude. Section 3 provides an account of projects on which members of the team have worked together.
Ability to meet time schedules and complete the work within established budgets	Jacobs has the capacity to complete this Program, not only on schedule, but as noted in our proposed Schedule (Exhibit 2-39), a plan to shave 3 years off the proposed 2030 schedule, which translates into cost savings.
Firm's history and resource capacity to perform the requested service	As noted in Section 3, our resources are extensive, and provide the deep bench to meet the needs of the Program. The history of the firm is also captured in Section 3, and Section 4 demonstrates assignments for which we have met, or exceeded, schedule and budget objectives.
Experience and qualifications of assigned personnel	Section 5 provides a detailed summary of our proposed staff and resource pool to support your Program. Resumes of proposed staff, as well as support resources, are provided in Appendix A.



*CEQA California Environmental Quality Act *RWQCB Regional Water Quality Control Board
*CTR California Toxics Rule *DDW Division of Drinking Water

At-a-glance...

SECTION 2: Project Understanding and Approach

- **Alignment with Program Vision and Objectives:** Our in-depth analysis of the JPA's work completed to date, coupled with the team's prior work on elements of the Program, led to an approach that builds on the foundational elements of the Pure Water Program and captures the JPA's vision.
- **"One Team" Integrated Approach:** A collaborative OA/PgM structure fosters informed decisionmaking, provides quality performance, invites innovative thinking, manages risks, and strives for superior delivery.
- **"Fast Start" Strategy:** A critical step that uses a workshop venue to establish program priorities, drivers, and risks, which sets the foundation for program implementation; it is comprised of these five key tasks Mobilization; Readiness Assessment; Program Implementation Plan; Financial Planning; and Schedule Management and Cost Estimating.
- **A Water Augmentation Strategy to Get to Steady State Operations of the AWTP:** Our Digital Watershed-Systems Framework is an innovative and unique simulation model that will evaluate the opportunities and constraints for a range of alternatives. The results will be an optimized alternative for water augmentation that considers whether an alternative is technically feasible, and the impacts of that alternative.
- **Project Delivery Methodology and Procurement:** We draw on our extensive alternative delivery experience to align optimal delivery models with program delivery, while addressing statutory and regulatory requirements; key objectives (cost; schedule; technology; innovation; operational impacts); risk tolerance; and funding considerations.
- **A Proactive, Proven Regulatory Strategy:** A conservative, multi-pronged approach that draws on experience, including the recent Pure Water San Diego process, and features tactics that comply with DDW, RWQCB, and California Toxics Rule (CTR); minimizes operational issues and costs; leverages the JPA's Pure Water Demonstration Facility, and promotes early and continuous collaboration with regulators.
- **AWTP Design that Incorporates Conservative and Innovative Approaches:** Using simulation modeling, forward thinking, out-of-the-box ideas, and sound engineering science, our design promotes operational efficiency and optimization; regulatory compliance; ecosystem protection; DBP/NDMA management; and infrastructure sustainability and resiliency.
- **A Multi-Beneficial Natural System:** This value-added feature stabilizes Reverse Osmosis (RO) concentrate to control brine pipeline scaling, while offering an educational, public asset.
- **Pipeline Alignment Study:** A staged alignment analysis is closely integrated with the AWTP design tasks, and is structured to attract outside funding sources; enhance operational resiliency and redundancy; adhere to budget parameters; balance community needs and operational requirements; and optimize brine management.
- **Environmental Planning and CEQA "Plus" Strategy:** A proactive approach that allows the Program to qualify early for increased funding opportunities, addresses Water Code Section 1211, and provides compliance with federal and state requirements, while minimizing supplemental CEQA work.

SECTION 2

PROJECT UNDERSTANDING AND APPROACH

Jacobs' solution-based, integrated approach to implementation of the Pure Water Program provides the program management and owner's advisory expertise to achieve the JPA's desire for efficiency and collaboration, while supporting a commitment to innovation, enhanced local water, and ecosystem protection.

Jacobs is excited to have the opportunity to serve as the Las Virgenes-Triunfo Joint Powers Authority (JPA)'s Owner's Advisor/Program Manager (OA/PgM) for your Pure Water Program (Program), and offers the resources, staff, lessons learned from similar assignments, and an unwavering commitment to the JPA's success. This section describes Jacobs' integrated, "One Team" program management approach to deliver this critical program, which provides an effective framework to efficiently implement its myriad of technical, environmental, regulatory, delivery and financial components. There are a multitude of benefits that the JPA will realize from applying this programmatic model to the Pure Water Program:

- Organizes multiple services and functions under one umbrella, to achieve a unified vision and optimized outcomes
- Promotes efficient delivery that results in a reduced implementation schedule and cost savings
- Fosters collaborative partnerships to inform transparent decision-making and encourage staff development
- Inspires innovative and cost saving ideas to meet JPA's long-term vision
- Offers an array of sustainable and resilient solutions that future-proof JPA's planned and existing assets
- Proactively manages risks and change, and offers early cost certainty on projects
- Provides learning and professional growth opportunities for JPA staff through access to, and direct interaction with, Jacobs' global technology and delivery platform leads

WHAT YOU'LL FIND IN THIS SECTION:

- ✓ Project Understanding
- ✓ Scope Enhancements/Innovative Ideas
- ✓ Approach and Scope of Work
- ✓ Schedule and Deliverables
- ✓ Assumptions

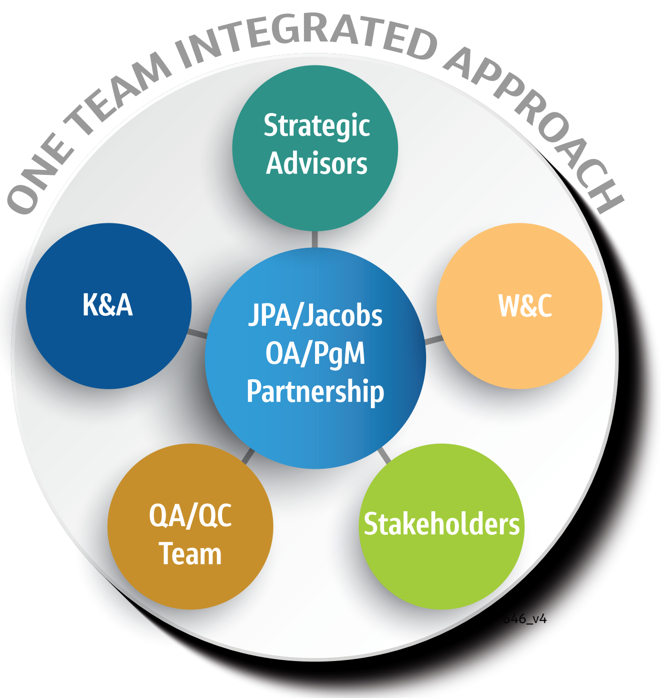
EXHIBIT 2-1. JPA'S VISION FOR PURE WATER PROGRAM

The Pure Water Program represents a long-term vision held by the JPA that reflects a commitment to innovation, augmenting and enhancing local water supplies, and protecting the ecosystem.

2.1 ONE TEAM APPROACH PROMOTES TEAM INTEGRATION

Our team will provide a streamlined, OA/PgM core leadership team, who will be the principal points of contact for the JPA. Jennifer Phillips, as the Program Manager will provide project direction, timely communications between the JPA staff and the team, and continuity as inter-related tasks advance from concept through to completion. Our team leaders will engage subject matter experts and additional support only as needed for all support functions, including technical, delivery, financial, public outreach, procurement, environmental, and regulatory compliance. A cadre of design engineers will support design functions. The assigned staff, described more fully in Section 5, will be drawn from Jacobs and our partner firms, who will function as one integrated team, with clearly defined roles and responsibilities, and open lines of communication between and among firms and JPA staff, as illustrated in **EXHIBIT 2-2**. In summary, we will promote informed decisionmaking, provide quality performance, invite innovative thinking, and strive for superior delivery.

EXHIBIT 2-2. TEAM INTEGRATION



2.2 PROJECT UNDERSTANDING BACKGROUND AND DRIVERS

The Pure Water Program is a unique opportunity to proactively address three major challenges facing the JPA – complying with more stringent regulatory requirements for discharging to Malibu Creek, balancing seasonal variation of recycled water demand, and creating a valuable resource to supplement the region's water supplies, enabled by California's cutting-edge reservoir water augmentation program.

The fundamental plan is to build an advanced water treatment plant (AWTP) to treat tertiary effluent from the Tapia Water Reclamation Facility (WRF) for indirect potable reuse, and convey the product water to the Las Virgenes Reservoir, where it will be blended with Metropolitan Water District (MWD) supply. This plan must be achieved by 2030. The water from the Las Virgenes Reservoir would then be treated at the Westlake Filtration Plant prior to distribution. Additionally, pipelines will be constructed to convey source water from the Tapia WRF to the AWTP; product water from the AWTP to the Las Virgenes Reservoir; and reverse osmosis (RO) concentrate (brine) to a disposal site. Triunfo Water & Sanitation District (TWSD) will receive its "share" of "Pure Water" through an exchange via an interconnect with Calleguas MWD. 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.

2.3 PROGRAM APPROACH AND SCOPE OF WORK

While the program will be completed in two phases, this scope addresses those activities that comprise Phase 1. Our OA/PgM approach is structured to promote a dynamic and collaborative environment to enable the JPA to achieve the program's objectives, while minimizing risks, adhering to schedule, controlling budget, and complying with regulatory mandates. Since meeting the schedule is an important goal, an alternative delivery model is incorporated into the procurement strategy, to guide the JPA in reviewing, evaluating, and selecting the delivery method(s) that suits the JPA's criteria and risk profile.

This approach will facilitate the identification of a broader set of opportunities, will recognize and overcome challenges, and will address the numerous project elements and tasks that characterize the program. These tasks are described in the remainder of this section, and summarized in **EXHIBIT 2-3** and **EXHIBIT 2-4**. Throughout this proposal, we also highlight innovative ideas and cost saving opportunities, which are summarized in **EXHIBIT 2-5** on page 2-5.

2.3.1 TASK 1– PROGRAM MANAGEMENT FRAMEWORK EMBRACES ALL PHASES OF THE PURE WATER PROGRAM

The tasks described in the RFP follow a framework that is fundamental to program management delivery, listed below, and illustrated in **EXHIBIT 2-6** on page 2-6.

- **Program Development** – A step already initiated by the JPA
- **Team Mobilization and Integration** – Phase 1, Tasks 1, 2, and 3
- **Program Planning** – Phase 1, Tasks 4 and 5
- **Program Execution** – Phase 2
- **Program Transition and Closeout** – Completion of the Program

The activities of Task 1 embrace the processes and tools needed to effectively manage the delivery of Phases 1 and 2 of this multi-year program, incorporating flexibility to accommodate the inevitable changes that will occur as the program evolves. We envision working in a virtual-based Program Management Office (VPMO) setting, featuring an integrated network infrastructure that remotely connects the entire team, including the JPA's staff, Jacobs' OA/PgM staff, and our teaming partners.

To supplement our VPMO, a small working space at the JPA's offices, if available, would accommodate core leadership staff and experts, when they are needed onsite. This remote working strategy has proven to be effective, and has been further tested during the recent COVID-19 shutdown, which led to Jacobs'

EXHIBIT 2-3. PROGRAM SCOPE ELEMENTS

PROGRAM HIGHLIGHTS

- Owner's Advisor/Programmatic Approach
- Advanced Treatment
- Improving Operational Performance
- Conveyance Alignments
- Environmental Planning
- Regulatory Compliance
- Financial and Funding Optimization
- Delivery Procurement Model

PROGRAM HIGHLIGHTS

Owner's Advisor/Programmatic Approach (OA/PgM). Owners Agent/Programmatic Approach (OA/PgM). Our OA/PgM strategy is a collaborative model that provides proven processes, procedures, resources, and tools to address the myriad of activities needed to achieve the JPA's vision, assure regulatory compliance, and meet a 2030-completion. The Jacobs' OA/PgM team will work as "One Team" in an integrated manner, maximizing delivery efficiency, managing risks, and fostering innovative and cost saving ideas, while adhering to schedule milestones and program budget. Given the interrelated project components, our workshop-based decision making strategy will be executed in collaboration with the JPA's staff to maximize input into critical tasks and activities. Fundamental to the OA/PgM model is considering project interdependencies, prioritizing project and task implementation, optimizing systemwide operations, complying with regulatory mandates, and providing financial guidance to maximize affordability. Section 2.3 presents the details of this approach.

Advanced Treatment. The processes planned for the AWTP will comprise membrane filtration (MF), reverse osmosis (RO) and ultraviolet (light)-advanced oxidation (UV-AOP). The team's approach provides innovative, but proven ideas that achieve performance goals, while complying with DDW, RWQCB and CTR rules for reservoir water augmentation, and addressing key public health requirements for removal of pathogenic microorganisms and synthetic organic compounds. We are aware that the RWQCB will likely implement limits for specific trace organics present in the purified water prior to its discharge to Las Virgenes Reservoir based on the requirements of the California Toxics Rule (CTR), including NDMA, bromodichloromethane, and dibromochloromethane. The Jacobs team explores and presents in Task 4 how to address these challenges, optimize plant performance, maintain operating permits at Tapia WRF, and achieve regulatory approvals for the new AWTP. Task 4D presents the details of this approach.

Improving Operational Performance. Adding a new AWTP to JPA's system requires integrated strategies that focus on interim and long-term operational performance, such as operating practices and procedures, SCADA/ IT, process management, and resources, with the objective of achieving a fully integrated system. The OA/PgM team will work closely with the JPA's operations staff early in designs to incorporate into the design operational considerations, preferences, emerging technologies, and lessons learned. A priority is to ensure Tapia WRF operations are not negatively affected, and performance is maintained. Specific factors that will be addressed are achieving steady state operations and tie-in coordination; minimizing NDMA; establishing flow equalization to improve operations at Tapia and AWTP; addressing brine disposal and resiliency; exploring impacts of Wet vs Dry Weather flows; impacts of incorporating a natural habitat system; Las Virgenes Reservoir and Westlake Diatomaceous Earth Water Filtration Plant; and controlling algal blooms. Operational considerations are discussed throughout this section, including Tasks 2B and 4A-4D.

Conveyance Alignments. There are three principal conveyance lines that comprise the Project – the line carrying the Tapia effluent to the new AWTP; the pipeline carrying the product water to the reservoir, and the pipeline carrying the brine discharge, and each require different design considerations. There are several criteria used to select the best alignment, but ultimately, environmental impacts and construction and operational costs are key determinants of the preferred alignment. The brine line poses a major challenge, as the brine's high mineral concentration will scale lengthy conveyance pipe¬lines; our brine management strategy focuses on traditional techniques such as pipe material, operational modifications, and maintenance protocols, as well as more innovative ideas such as brine acidification, stabilization, and preconditioning through creation of a natural habitat. Tasks 4D3 and 4E present these options in further detail.

Environmental Planning. Our CEQA strategy will deliver a Programmatic Environmental Impact Report (PEIR) early in the program delivery implementation process to identify and disclose for public input the impacts related to each component of the Pure Water Program. This early CEQA process will provide early input opportunities for stakeholders to better define a project that will ultimately be successful for the JPA, the rate payers and the surrounding community. The CEQA Programmatic document completion will signal to the funding agencies (SRF, WIFIA, and LRP) that the Pure Water Program is viable and ready for serious funding consideration. Task 5 describes the details of the environmental planning process.

Regulatory Compliance. Our primary regulatory agencies focus is aimed at the DDW and RWQCB. The Pure Water Program CEQA document will address these and any additional regulatory agencies and coordination needed to meet Pure Water vision. Our conservative, but proven strategy is modeled after the team's success in assisting San Diego in securing the reservoir augmentation permit for their Pure Water Program, and proposes sufficient "conservatism" in design criteria, while maintaining operational flexibility and minimizing capital and operating costs. Incorporating features to address the California Toxics Rule (CTR)-regulated compounds is a key criterion for RWQCB compliance. Task 4A describes the details of these ideas.

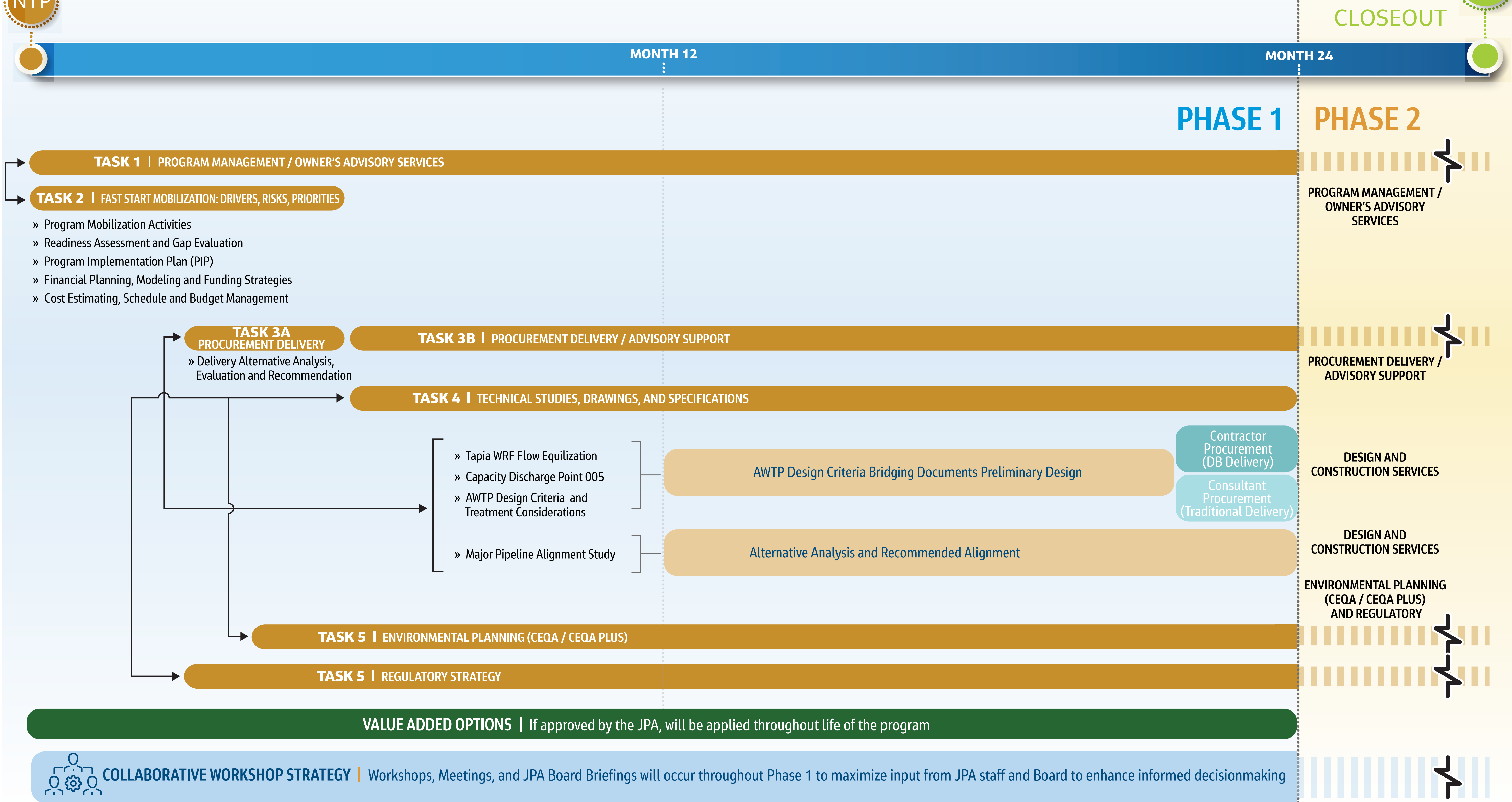
Financial and Funding Optimization. As OA/PgM, Jacobs will assist the JPA in addressing key funding parameters: aligning program implementation expenditures with available and projected cash flows; attaining low interest loans; and qualifying for grant programs, including the MWD's Local Resources Program (LRP). Our financial strategy is closely synced up to the CEQA process, developing it to "final draft levels" to apply for low interest loan and grant applications (WIFIA, SRF, LRP), and other available grant programs. We will build upon the JPA's Master Schedule and Baseline Costs to develop an Affordability Cash Flow Curve using a proven TACT (Tailored Analytics and Comparative Techniques) Model, which produces an affordability curve to address JPA allocation and financial sharing, and funding planning; TACT will also allow for post-COVID planning for project delivery and supply chain challenges, such as potential delays, resourcing issues, rising costs, and slower construction turnaround times. Task 2D presents the details of this task.

Delivery Procurement Model. Selection of the procurement strategy and optimal construction delivery model for implementing the program's projects, especially the conveyance lines and the AWTP, is a critical element of the program, as it drives program execution, including the level of design to be provided by the OA/PgM team. The vastly different design requirements, facility complexities, construction methods, and risks associated with the AWTP and conveyance lines may warrant different approaches for these projects. As OA/PgM, Jacobs will work closely with the JPA staff to evaluate delivery options, which will consider the needs and objectives of the JPA, and specific project requirements, especially regulatory and environmental compliance, which will lead to a recommended delivery approach. Once the construction delivery approach is selected, the team will provide continual guidance in assisting the JPA in reviewing legal, contract terms and conditions, and procurement selection and award processes. Task 3 discusses this topic in detail.

643 v7

EXHIBIT 2-4. A ROADMAP TO BRINGING YOUR WATER FULL CIRCLE

The Pure Water Program features a number of inter-related activities, comprised of specific tasks noted in the RFP, as well as additional studies that will be decided upon during the Task 2 Readiness Assessment. This illustration provides a roadmap showing which activities run in parallel, and which are sequential. None of the tasks are independent of the other, and the programmatic approach, featuring a milestone schedule, will be the means in which our team will manage their implementation, while keeping an eye on achieving program objectives (Details on our proposed schedule are included in **EXHIBIT 2-39** on page 2-41).



This symbol denotes that most tasks are interrelated, and outputs from one task will impact and inform other ongoing or subsequent tasks.

EXHIBIT 2-5. INNOVATIONS AND BENEFITS FOR PURE WATER PROJECT LAS VIRGENES-TRIUNFO

The Jacobs' team will explore a full range of innovations to achieve benefits for the JPA to enhance operations, compliance, resiliency, contingency/risk, cost savings, and community benefits.

BENEFITS:

- O Operations
- ✓ Compliance
- R Resiliency
- Ri Contingency/Risk
- $ Cost Savings
- B Community Benefit
- S Section
- P Page

	INNOVATION & WHERE TO FIND IT	BENEFIT
1	Wetlands Brine Pretreatment / S 2 P 30	O R B
2	Hilton Foundation Wells / S 2 P 11	O R
3	Tapia WRF NDMA Control / S 2 P 24	O ✓
4	Achieve 1:100 and >4 Months Travel Time in Las Virgenes Reservoir / S 2 P 18	O R $ ✓
5	Hill Canyon Treatment Plant Effluent to AWTP / S 2 P 32	O R
6	System-wide SCADA in Early Design / S 2 P 10	O
7	Integrate Tapia WRF CIP / S 2 P 11	O R
8	Incorporate JPA Policy Principles Regarding:Agoura Property in Early Stages / S 2 P 39	B
9	Treated Drinking Water Augmentation / S 2 P 25	O R
10	Las Virgenes Digital Watershed-Systems Framework for Water Augmentation / S 2 P 11 & 12	O R $
11	Pigging and Flushing Brine Disposal / S 2 P 31	O R
12	Las Virgenes Reservoir Air Curtain Design / S 2 P 34	O R ✓
13	Onsite Chlorine/Dechlorination Contactor / S 2 P 28	O $ ✓ Ri
14	Las Virgenes Reservoir GAC Adsorbers Replacing SBS Dosing / S 2 P 30	O R $ ✓
15	Strategic Advisors / S 3 P 10 & 11	O R ✓
16	TRASAR System to Enhance RO Log Reduction Credits / S 2 P 25	O R $
17	TACT Model / S 2 P 11 & 13	$ Ri
18	Schedule and Budget Control Tools / S 2 P 14	$ Ri
19	PEIR Earlier Funding Opportunities / S 2 P 36	$ ✓
20	MWD LRP Strategy / S 2 P 13 & 14	$
21	Revenue Risk Strategy for Las Virgenes and Triunfo / S 2 P 9,11,13	$ Ri
22	Risk Register / S 2 P 9	$ Ri
23	O&M Input Throughout / S 2 P 3	O R $ ✓ Ri
24	Salinity Management Strategy / S 2 P 11 & 12	O R B
25	Early Submittal of Regulatory Concept Plan / S 2 P 21	✓ B
26	Develop Demo Plant Testing Plan to Confirm NDMA/CTR Compliance / S 2 P 20	O R ✓
27	Las Virgenes Reservoir Mixing Zones to Meet CTR / S 2 P 18 & 19	O R ✓ Ri
28	Multi-Pipe Multi-Directional Brine Disposal/Water Augmentation / S 2 P 34 & 35	O R Ri
29	Las Virgenes Digital Watershed for Tapia EQ / S 2 P 11 & 12	O R
30	Common Trench Hill Canyon for Water Augmentation / S 2 P 34	O R Ri
31	Conversation Triunfo Canyon Construction Bench to Community Trail / S 2 P 36	B
32	Use of Triunfo Creek for Product Pipeline / S 2 P 35	$
33	Consider UV/HOCl to Reduce Chemical Usage / S 2 P 28	O $
34	Thousand Oaks Dewatering Wells / S 2 P 11	O R
35	Optimize Reservoir No. 2 to Reduce 005 Discharge / S 2 P 23	O R ✓ Ri

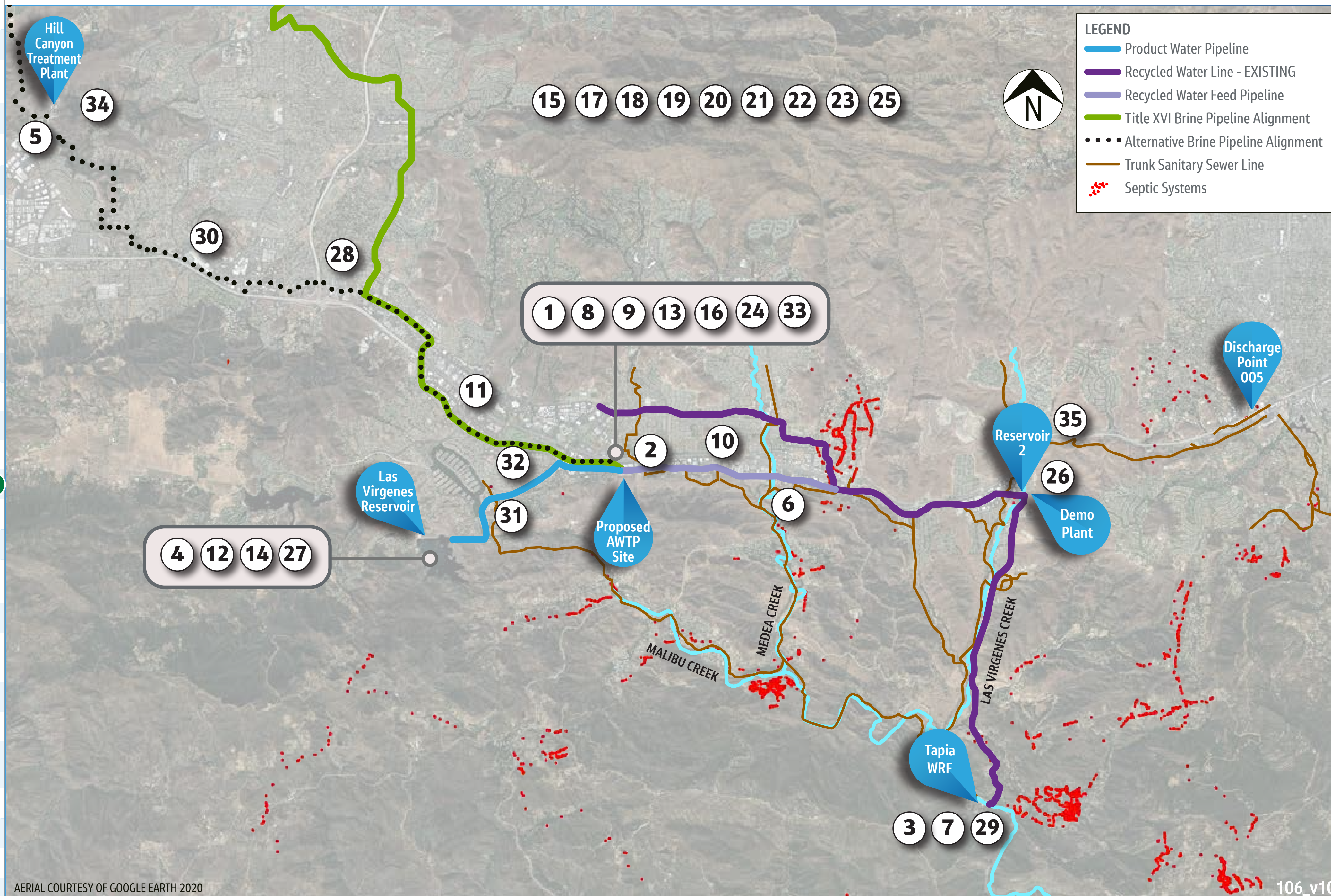
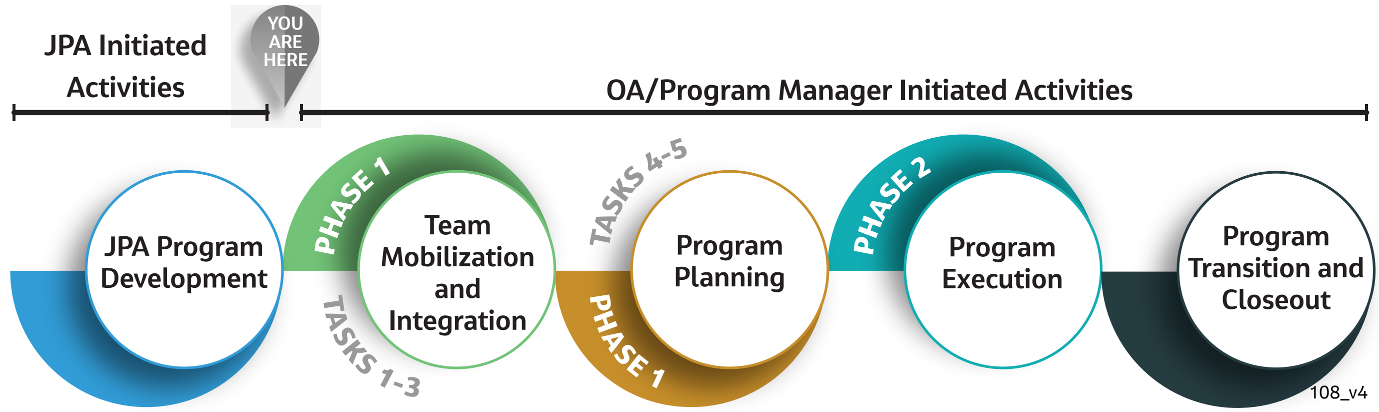


EXHIBIT 2-6. FOUR-PHASED PROCESS



JPA Program Development

- Select OA/PgM approach
- Identify critical success factors
- Select critical schedule elements
- Establish budget for delivery
- Determine internal leadership/resources
- Select OA/PgM

Team Mobilization and Integration

- Virtual PMO office
- Team chartering and governance
- Program management plan
- Rapid Readiness Assessment
- Prioritize projects and studies
- Master schedule and budget
- Implementation Plan
- Project delivery/procurement methodology and recommendation
- Public outreach plan
- Funding plan
- Environmental planning
- Regulatory/permitting plan
- Advise on Legal Counsel

Program Planning

- Studies and Packages
  - *Tapia WRF Flow Equalization*
  - *Discharge Capacity to LA River*
  - *Pipeline Routing Study*
  - *Water Augmentation*
  - *AWTP Design Bridging Document*
  - *Innovative Considerations*
- Environmental Planning/CEQA
- Program controls
- Quality management
- Risk management
- Document control

Program Execution

- Consultants and contractor selection
- Design and construction management
- Program controls
- Quality management
- Risk management
- Document control
- Project commissioning
- Contractual Controls and Compliance Monitoring

Program Transition and Closeout

- Transition data management to JPA (including applicable programmatic tools and models)
- OA/PgM demobilization

HIGHLIGHTS OF PROGRAM MANAGEMENT DELIVERY

- Aligns spending to JPA funding, cash flow, and revenue generation.
- Prioritizes delivery and logistics.
- Provides early cost certainty.
- Offers real time performance tracking.
- Recognizes and leverages project interactions and interdependencies.
- Proactively envisions and plans for long-term requirements.
- Provides Program Master Schedule and Baseline Cost.
- Projects future O&M costs, debt services (existing and Program-related) and financial impacts.
- Provides communications protocols among multiple internal and external stakeholders.

making a significant investment in our digital network and infrastructure to enhance communications within Jacobs global offices, and between our clients. Through this communication network, staff and team members are not working alone, but actually have easy access to all offerings of the firm.

The benefits to the JPA are lowered operational and delivery costs and enhanced team collaboration. Moreover, delivery quality is not compromised, and programmatic tasks can be easily accomplished remotely, such as progress reporting, economic summits, and delivery milestone meetings. The VPMO strategy allows for as needed staff augmentation, and low-cost access and reach-back to Jacobs' global bench of technical, environmental, financial, and delivery experts, no matter where they reside. When needed, our OA/PgM staff will attend, participate, document and assist the JPA staff at program meetings, workshops, and periodic Board of Directors meetings. Our team will assist in creating meeting agendas, and preparing and distributing meeting minutes.

2.3.2 TASK 2 FAST START: ESTABLISHING PROGRAM PRIORITIES, DRIVERS AND RISKS

Task 2 focuses on a Fast Start mobilization effort that will occur in the first six months of the program. This is a critical step that sets the foundation for the implementation of the entire program. There are five major, inter-related tasks that comprise Task 2 as outlined in the RFP, which drive the program forward, and include:

- **Task 2A –** Program Mobilization Activities
- **Task 2B –** Readiness Assessment, Gap Evaluation, and Water Augmentation Study
- **Task 2C –** Creating a Comprehensive Program Implementation Plan (PIP)
- **Task 2D –** Financial Planning, Modeling and Funding Strategies
- **Task 2E –** Cost Estimating, Schedule and Budget Management

Task 2A Program Mobilization Activities

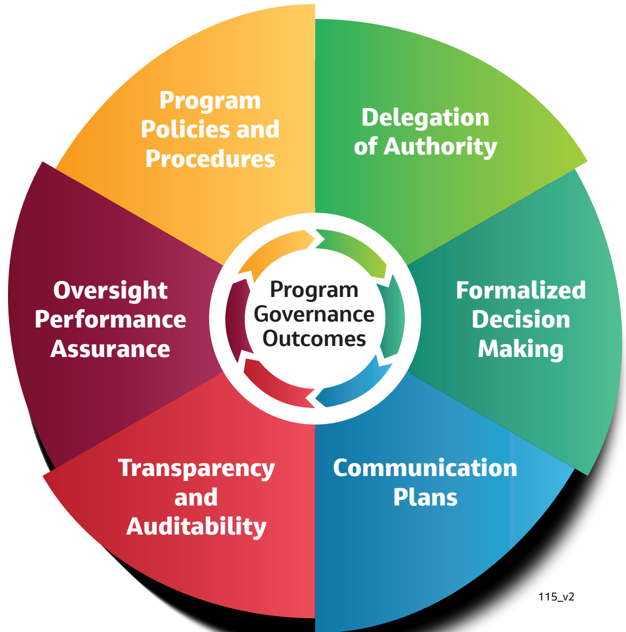
The Fast Start mobilization approach quickly sets up key programmatic tools, processes, and governance, allowing the OA/PgM to mobilize resources, charter and establish performance expectations, and define scope, and delivery needs. This Fast Start team will be managed by Jay Witherspoon, Jacobs Senior Program Manager Director, who reports directly to our Program Manager, Jennifer Phillips. It is made up of senior Jacobs programmatic delivery experts, as well as other team members, such as the Program Controls and Project Delivery Managers

HIGHLIGHTS OF PROGRAM MOBILIZATION ACTIVITIES

- Confirm program drivers, vision, mission and goals.
- Finalize OA/PgM organizational structure; and align core leadership team.
- Define and clarify program governance.
- Confirm decision making process and workshop schedule.
- Identify a risk management strategy.
- Develop a permitting plan that outlines regulatory strategies, such as compliance with DDW and RWQCB.
- Expand on our proposed environmental planning strategy, including CEQA compliance.
- Develop a financial plan, assess funding scenarios and maximize outside funding sources.
- Identify early project delivery wins, and critical delivery, permitting, and financial milestones.
- Determine protocols for addressing: stakeholders, partners, and regulatory agencies.

EXHIBIT 2-7. PROGRAM GOVERNANCE OUTCOMES

Program Governance is part of chartering, where team member roles and responsibilities and a decisionmaking structure are established.



They will leverage lessons learned from recent programs managed around the world - and in California - and apply applicable aspects to the Program.

The mobilization team will establish program tools and performance tracking portal, and will develop the Program Management Plan (PMP)– a comprehensive document that becomes the OA/PgM team's Playbook used to manage the program effectively. A Sample PMP table of contents from the San Mateo Clean Water Program is provided in Appendix F, offering an example of a real, working PMP document. Other key activities that will occur during Program Mobilization include a workshop strategy; risk management strategy; public outreach; and document management. .

Workshop Approach: Our Fast Start strategy features seven workshops, an approach that promotes a collaborative partnership among the team, facilitates decision making, provides operational input, and builds strong communications. While we would intend to hold a series of workshops throughout the life of the program, several are critical for occurring during the first six months. **EXHIBIT 2-8**, on the following page, summarizes those workshops we propose to hold during Months 1 – 6.

Risk Management and Mitigation Planning and Change Management Strategies: Risk management is essential to setting a program's success, providing appropriate cost estimates and contingencies for both project and program-related risks. One of our first activities will be to establish a risk register that will be maintained by the OA/PgM's Program Controls and Project Delivery Teams; risk "owners" are assigned to major program and project risks, and will monitor

EXHIBIT 2-8. FAST START WORKSHOP STRATEGY - THE FIRST 6 MONTHS

During the Fast Start / Mobilization period, a series of seven workshops, as well as meetings and JPA Board briefings will be held, as shown below. Workshops will also be used throughout the life of the program, to engage the JPA staff, and JPA Board, as necessary, in decision making. Workshops promote collaborative partnerships, build trust among the team members, and enhance communications – all of which lead to a well-run program and desired outcomes.

MOBILIZATION AND KICK-OFF MEETING

OBJECTIVE:

» Mobilize Fast Start OA/PgM Leadership on site

» Hold one-on-one meetings for mapping exercise to understand standard policy, procedures, governance, objectives

PARTICIPANTS:

» At least General Managers, environmental, engineering, procurement, finance, operations, IT, and outreach departments)

OUTCOME:

» Creation of the Draft Program Management Plan, which includes the Performance Tracking Portal and TACT model and will be incorporated into the Program Implementation Plan (PIP)

WORKSHOP 1. Introductory Workshop with JPA Staff

» Set up expectations, successes, goals statement – internal and external alignment

» Building bridges and team relationship and collaborative environment

OUTCOME:

» Create a charter and sign it at end of meeting and begin preparing PIP.

» PIP INCLUDES:

Public Outreach Plan, Change Management, Program and Project Risk Management (Risk Register), PMP, Permitting, Readiness Assessment and Gap Evaluation, Financial Planning, Modeling and Funding Strategies, Cost Estimating, Schedule and Budget Management, Procurement Management and Controls, KPIs, TACT/Affordability Curves, Project Delivery Folders and Performance Tracking Portal

WORKSHOP 2. Meet with JPA Staff and Functional Leads

» Input on development of performance tracking portal, preferences, progress indicators, and selected IT delivery platform, program risk register, KPIs, Master Schedule and Baseline Cost

OUTCOME:

» Lead to development of Internal website for all of the projects, tasks and processes that feed into the PMP

WORKSHOP 3. Meet with JPA Delivery and Financial Staff and Financial Functional Leads

» Introduce TACT and Affordability Cash Flow Curve model

OUTCOME:

» Incorporate input to TACT model

WORKSHOP 4. Facilitated Workshop with JPA Staff

» Review/Discuss Rapid Program Readiness Assessment and Gap Evaluation (RFP Items a. - i)

» Review alternative and optional studies

» Agree to which studies to advance and how to proceed

» Present approach to initiate four technical studies (name them)

» Present Environmental Planning Strategy

OUTCOME:

» Agree to studies and approach for incorporation into draft PIP

WORKSHOP 5. Workshop with JPA Staff

» Present Project delivery methods/options

OUTCOME:

» Agree to approach for JPA Board consideration

MEETING WITH JPA BOARD

» Present project delivery options and introduce delivery methods

OUTCOME:

» JPA adoption on available delivery methods

WORKSHOP 6 Workshop with JPA Staff

» Present draft PIP

OUTCOME:

» Agree to draft PIP to present to JPA Board

MEETING WITH JPA BOARD

» Present draft PIP

OUTCOME:

» Board adoption of PIP

WORKSHOP 7. Workshop with JPA Delivery Staff and Functional Leads

» Introduce draft Projects Validation

OUTCOME:

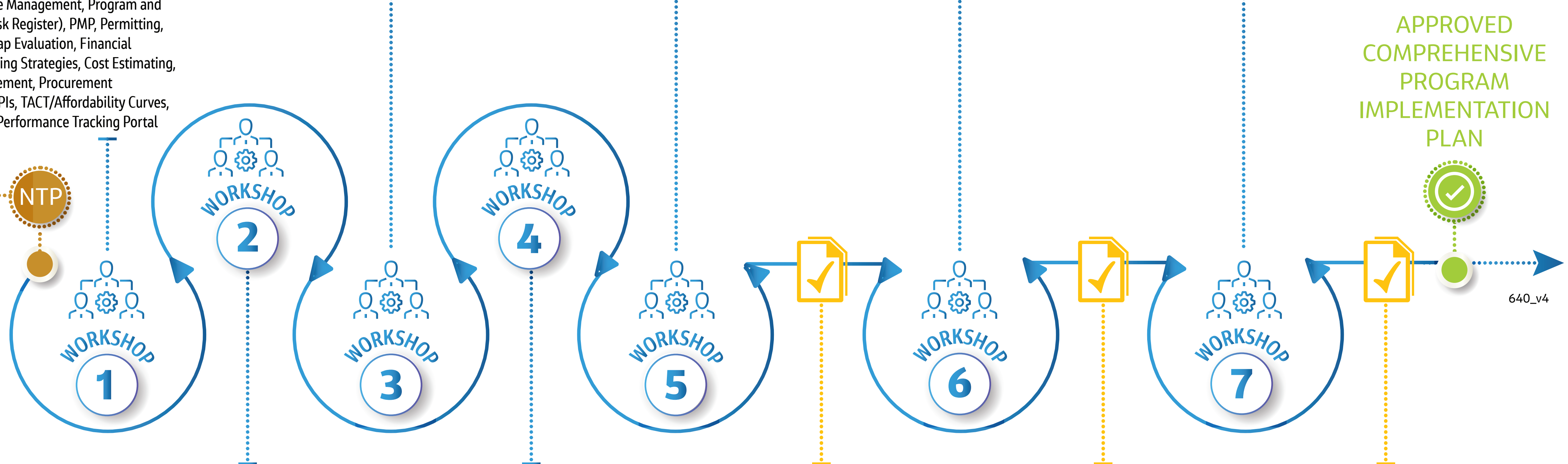
» Finalize Program's master schedule, baseline cost, set performance tracking needs and progress reporting requirements

MEETING WITH JPA BOARD

» Present final projects, master program schedule, baseline cost and proposed delivery methods

OUTCOME:

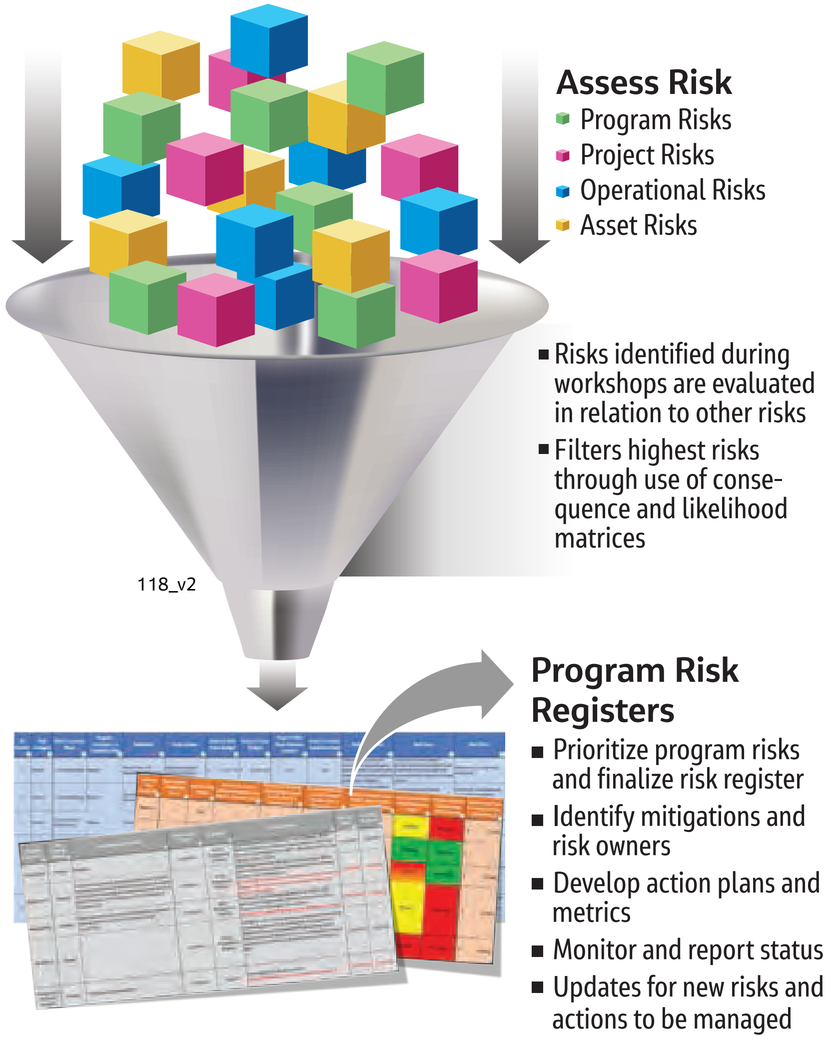
» Board adoption



risk response and mitigation strategies until the risk is mitigated to an acceptable level or passes unrationalized. Our risk analysis approach will provide a confidence window for identified risks, mitigation strategies, duration and probability of risk, mitigation cost estimates, and/or schedule delays. We will refine this initial risk register exercise through a series of workshops and staff meetings, that will feed into the Program's Master Schedule and Baseline Cost. We will also discuss the advantages of including an additional "program risk mitigation" contingency beyond the typical construction risk contingency in the Baseline Cost, as well as a protocol for handling earmarked risk contingency funds once the risk potential has passed without being rationalized.

This contingency strategy differs from the typical project risk contingency because it accounts for potential programmatic risks cost impacts, such as loss of funding, having to use high interest loans, and systemwide impacts from a project change, delay or elimination. **EXHIBIT 2-9** provides an approach to developing a combined program and project risk register using Jacobs Risk Management Approach and Tool.

EXHIBIT 2-9. APPROACH TO RISK MANAGEMENT



Effective change management is another element of risk management, and an important aspect of ensuring that work is executed within scope and budget. It first starts with recognizing that a long-term program will see changes occur. The process identifies changes and out of scope items that impact cost and schedule, assesses contract compliance, prioritizes implementation, measures impact on design budget, construction cost, and if approved by the JPA, are built into the plan. **EXHIBIT 2-10** describes an effective change management process for managing change that can be applied to the Pure Water Program.

Public Outreach and Stakeholder Coordination Maintains Program Consensus: This task is a critical function during the planning, design, and construction procurement tasks, and will be coordinated through our subconsultant, Katz and Associates, who will work with our Strategic Advisor **Ron Wildermuth**, and the JPA's public outreach staff and consultant and build upon the foundation the JPA has already established. Public outreach coordination is key to making affected public and stakeholders aware of the timing, scope and duration of the project, construction-related restrictions, and long-term impacts.

Our approach involves scheduling a series of workshops held throughout the planning, design and construction procurement phases to set up mutual understanding of the key issues and considerations and to work into the design and construction packaging specific requirements to minimize impacts to the community. We have learned from years of designing, building and repairing critical infrastructure projects within our communities that early communication and coordination can virtually eliminate project disruptions and delays from impacted stakeholders.

Effective Document Management Promotes Efficient Delivery: Defining the type and content of reports necessary from the program control system is a collaborative, iterative task we will commence during team mobilization. Later, we can refine these reports as necessary to keep pace with changing program needs. We recommend a SharePoint-based contract management and document control process to manage all contract-

EXHIBIT 2-10. CHANGE MANAGEMENT STRATEGY

CHANGE MANAGEMENT STRATEGY PROTECTS BUDGET

Jacobs' change management strategy has been effective in maintaining program schedules and budget, and focuses on off-setting any cost or time lost associated with an approved change, by reducing time or costs on another line item in the overall project.

Initiated on the **Fort Lauderdale WaterWorks Infrastructure Program**, the program team used this approach to manage scope creep, and was instrumental in delivering the 9-year, $690 Million program 1 year early with a -1-percent change order rate.

and project-related documentation. This tool facilitates sharing of all documents in progress and provides a well-organized repository for all project records. The following reporting levels should be considered:

- Monthly progress reports, summarizing planned versus actual progress
- Quarterly reports, summarizing actual performance versus baseline goals and objectives
- Semi-annually, we recommend producing graphics-intensive reports to communicate program successes to stakeholders

Task 2B Rapid Program Readiness Assessment

As the JPA prepares for the implementation of this major program, there is an opportunity to assess the value of other studies or projects that can be implemented under the umbrella of the OA/PgM assignment. The Readiness Assessment will serve two functions – it provides a forum to obtain an objective perspective of the status of the program, including potential road-blocks that could impede progress, gaps in the program plan and structure; and resources needed to complete objectives. A second benefit is to identify and evaluate an array of potential priorities for the JPA to consider implementing.

Topics to be studied during the Readiness Assessment, including additional ideas to consider studying as part the readiness assessment, are listed below, as per the RFP, items B(a) through B(i), and are expanded upon throughout this proposal.

- **Conduct Tracer Mixer Studies:** This topic is addressed in Task 4, and will address impacts of reservoir augmentation; DDW; and reservoir modeling.
- **AWTP Steady State Evaluation:** A water augmentation study would evaluate options to achieve this goal; the water augmentation study is discussed in detail below, and is illustrated in **EXHIBIT 2-11** on page 2-12.
- **Operational Strategies:** Working closely with the JPA's operations staff is critical to integrate into design operational considerations, and accommodate and enhance, O&M practices. This discussion will address the need to achieve a fully integrated system that "talks to each other." Optional strategies include the tie-in between the new AWTP and Tapia WRF, to ensure operations of the existing plant are not affected, and permit compliance is never compromised. The operations evaluation of the Tapia WRF, and the future AWTP, would explore the use of SCADA to enhance disinfection practices, offer operational consistency and stabilization, and improve plant performance. Providing subsequent staff training in SCADA instrumentation monitoring would be studied, as appropriate.
- Other potential topics include:
  - *Tie into Tapia WRF Disinfection and Control to minimize NDMA*
  - *Flow Equalization to improve operations at both Tapia WRF and AWTP, including systemwide SCADA applications*
  - *Impacts of brine disposal options on operational requirements*
  - *Resiliency goals and strategies*
  - *Operational staffing and training – now and in the future*
  - *Impacts of Wet vs Dry Weather flow on operations*
  - *Impacts of required flows to optimize the potential natural habitat*
  - *Impacts on Las Virgenes Reservoir and Westlake Diatomaceous Earth Water Filtration Plant*
  - *Controlling and minimizing algal blooms on water quality and treatment plant options (discussed as part of reservoir augmentation)*

- **Hydraulic Studies and Surge Analysis:** This will be addressed in conveyance design development, and addresses the multiple pipelines comprising this program.
- **Utility Investigations:** This is a routine activity that will draw on the team's prior work with LVMWD, and will be addressed during permitting and design development.
- **Corrosion:** Details are addressed in Task 4, and is principally dependent on the composition and quality of the flows through the pipe.
- **Reservoir Management:** This critical topic is discussed in Task 4, and includes coordination with NDMA management strategies. Obtaining credit for dilution or THMs in reservoir is a topic, as well as impacts of the California Toxic Rule and dilution factors.
- **Source Control Study:** Task 4 discussion includes our strategy for source control, including recommendations for addressing PFAS, if it is found to be an issue for the JPA.
- **Improvements at Tapia WRF:** Task 4 discusses the importance of the Tapia WRF producing a quality effluent so that the new AWTP performance is optimized. We would explore cost/benefit (including life cycle costs) of of CIP options. This evaluation would explore out of the box concepts, such as the feasibility of incorporating MBR treatment at Tapia, addressing affordability, long-term treatment strategy, and its ability to managing NDMA.

Water Augmentation Study Addresses Steady State Goal: It is understood that up to approximately 8 mgd of Tapia WRF effluent is available for treatment at the AWTP during the winter months – November to April. However, in summer months, May to October, the availability of tertiary effluent rapidly dissipates to approximately 2 mgd or less due to increased use for summertime non-potable irrigation demands, which would result in uneven flows to the AWTP during this period. This instability complicates operations, and creates a partially stranded asset half of the year. Achieving a Steady State Operations of the facilities would improve systemwide operational efficiency. A Water Augmentation Study is proposed to identify and evaluate feasible options for augmenting sources of influent water to the Tapia WRF and/or directly to the AWTP. Possible augmentation sources are described in **EXHIBIT 2-11** on the following page:

Task 2C Creating a Program Implementation Plan

The RFP calls for a Program Implementation Plan (PIP), which will provide the OA/PgM team with the policies, processes, design criteria, and standards necessary to effectively and consistently implement the program. It will describe roles and responsibilities of the OA/PgM, design consultants, contractors, and other stakeholders, and will define program delivery strategies. The Program Implementation Plan (PIP) provides a comprehensive programmatic delivery platform for project delivery clarity and collaboration from design through construction to commissioning for the final suite of projects and studies selected to comprise the Program. This Plan maps out the Program through to the completion of Phase 2 and Closeout, including programmatic activities, tasks and services.

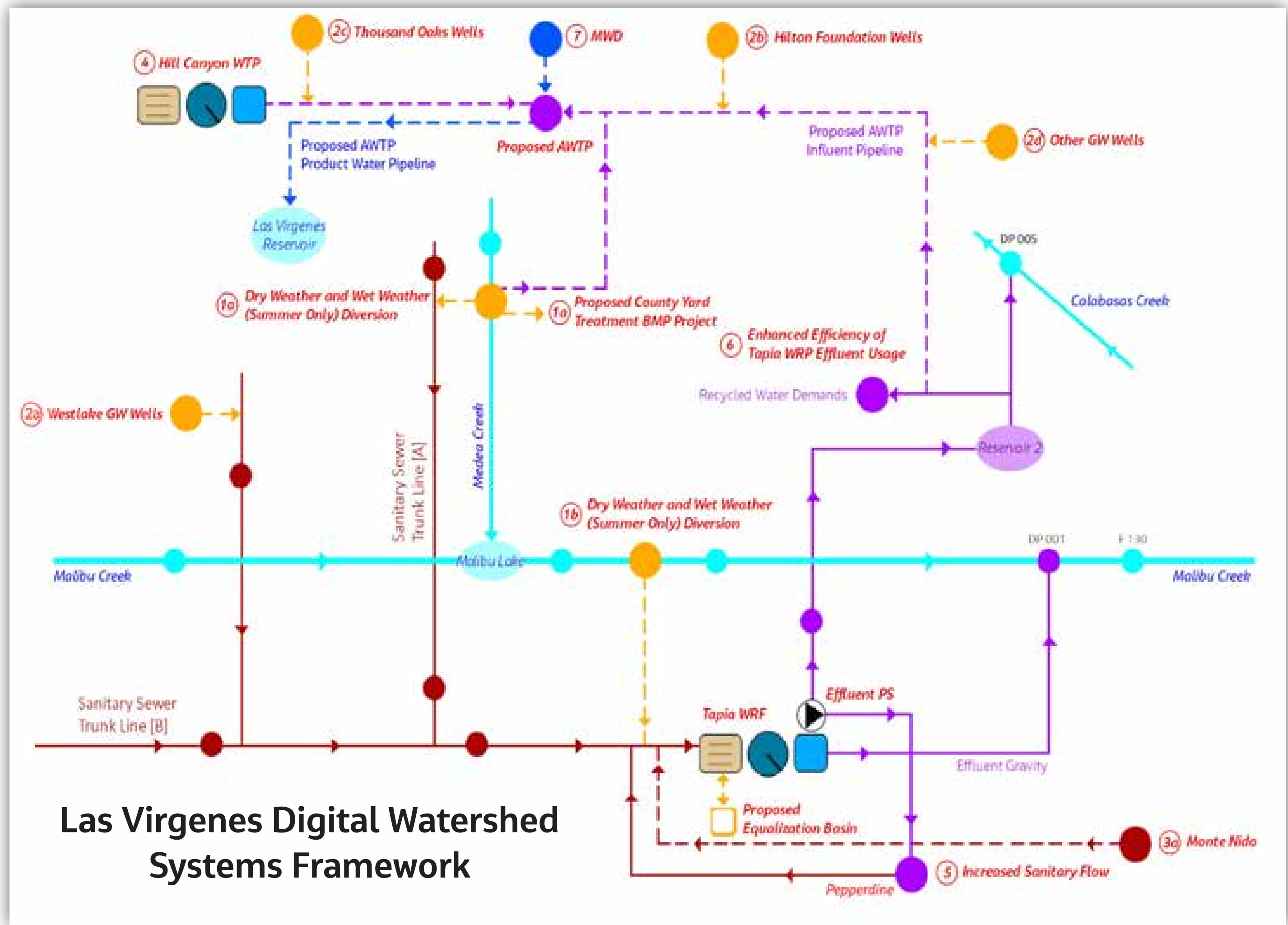
The PIP will be continuously updated, as the program evolves, and will incorporate routing, technical, constructability, environmental feasibility, and potential innovations. For each project, schedule status will be compared to the Master Program and Affordability Curve Schedules (to prevent scheduling and cost delay conflicts and scope creep). The latter will look at key upcoming design, constructability review, and engineering estimates, milestones, and any interactions with other projects and/or any required long-term permitting requirements. This information is fed into the overall OA/PgM project delivery platform delivery and supply chain logistics, project delivery prioritization, cash flow tracking needs, and OA/PgM resources to manage and deliver on time and budget best value to the JPA.

Task 2D Financial Planning, Modeling and Funding Strategies

Our finance planning approach supports and complements the JPA's Financial Team's planning efforts, and addresses project delivery, cash flow needs (just-in-time-funding during design and construction activities) and efficient and effective project sequencing that augments the value for this investment. The Program needs to be both technically and financially prioritized for delivery to match short- and long-term planning cycles, and the Program's affordability curve cash flow and spend needs. The affordability curve captures the program's Master Schedule and Baseline Cost, while factoring in revenue with costs, including current and future assets; O&M needs; escalation; debt service and payback periods; and risk mitigation and change management cost considerations over the full delivery and operational life cycle and targeted loan payback period. This programmatic approach provides a roadmap forward with cost, debt service, and revenue certainties to provide a successful Program delivery. Elements of the funding strategy include our Cash Flow Planning Model; Incorporating MWD's Local Resource Program (LRP); and Maximizing Funding from WIFIA, SRF, and Grant Applications, which are described below.

Cash Flow Planning Model Aligns Program Needs With Affordability: Cash flow planning projections and an affordability curve is created through our TACT Model (Tailored Analytics and Comparative Techniques), shown in

EXHIBIT 2-11. WATER AUGMENTATION STUDY
Possible augmentation sources and study approach.



SOURCE		TYPE	SYSTEM INPUTS
1a	Medea Creek/County Yard	Dry Weather and Wet Weather (Summer)	SS AW
1b	Tapia WRF	Dry weather and Wet Weather (Summer)	T
2a	West Lake Wells (existing)	Impaired Groundwater	SS R
2b	Hilton Foundation (existing)	Impaired Groundwater	AW
2c	Thousand Oaks Wells	Impaired Groundwater	AW R
2d	New Wells	Impaired Groundwater	SS AW T R
3a	Monte Nido	Septic Conversion to Sanitary Sewer	SS
3b	Other Communities	Septic Conversion to Sanitary Sewer	SS
4	Hill Canyon Treatment Plant (HCTP)	Hill Canyon Treatment Plant Effluent	AW R
5	Increased Sanitary Flow from Pepperdine	Raw Sewage	SS
6	Existing Recycled Uses	BMPs for Recycled Water	R
7	MWD	MWD Treated Water	AW R

Our team will, under the direction of Strategic Advisor Susan Moisio, develop a Digital Watershed Systems Framework that will be used for this evaluation. The Digital Watershed-Systems Framework will be built upon elements from available models (e.g., Los Angeles County WMMS2 watershed model) and data to represent key components of the wastewater collection system, Tapia WRF, the recycled water system, and the receiving waters, with respect to both the quantity of flow and relevant water quality constituents. The digital watershed will be calibrated to actual data from the watershed to ensure accuracy. Once complete, the digital watershed will then be applied to evaluate the opportunities and constraints for a range of water augmentation alternatives.

The opportunities include sources such as dry weather flow and wet weather flow (in the summer months only) diversions, septic-to-sewer conversions, utilization of impaired groundwater, and conveyance of additional supplies either to the sanitary system, the recycled water system, or the AWTP, all with the goal of achieving steady state flow to the AWTP.

The constraints include the limitations for discharge to Malibu Creek during certain times of the year, the capacity of Tapia WRF and the sanitary sewer system, and the impacts to Malibu Creek and to Southern Steelhead and the Tidewater Goby.

This analysis will include tracking of key water quality constituents, such as total dissolved solids (TDS), chlorides, and sulfate, from the source water through the existing and proposed systems to evaluate the water quality benefit of diverting runoff to the AWTP. This strategy will also carefully consider the salinity management goals and strategies for Las Virgenes, the watershed, and their customer agencies.

The results of the Digital Watershed will be an optimized alternative for water augmentation that considers the technical feasibility, cost-effectiveness, and the social and environmental impacts.

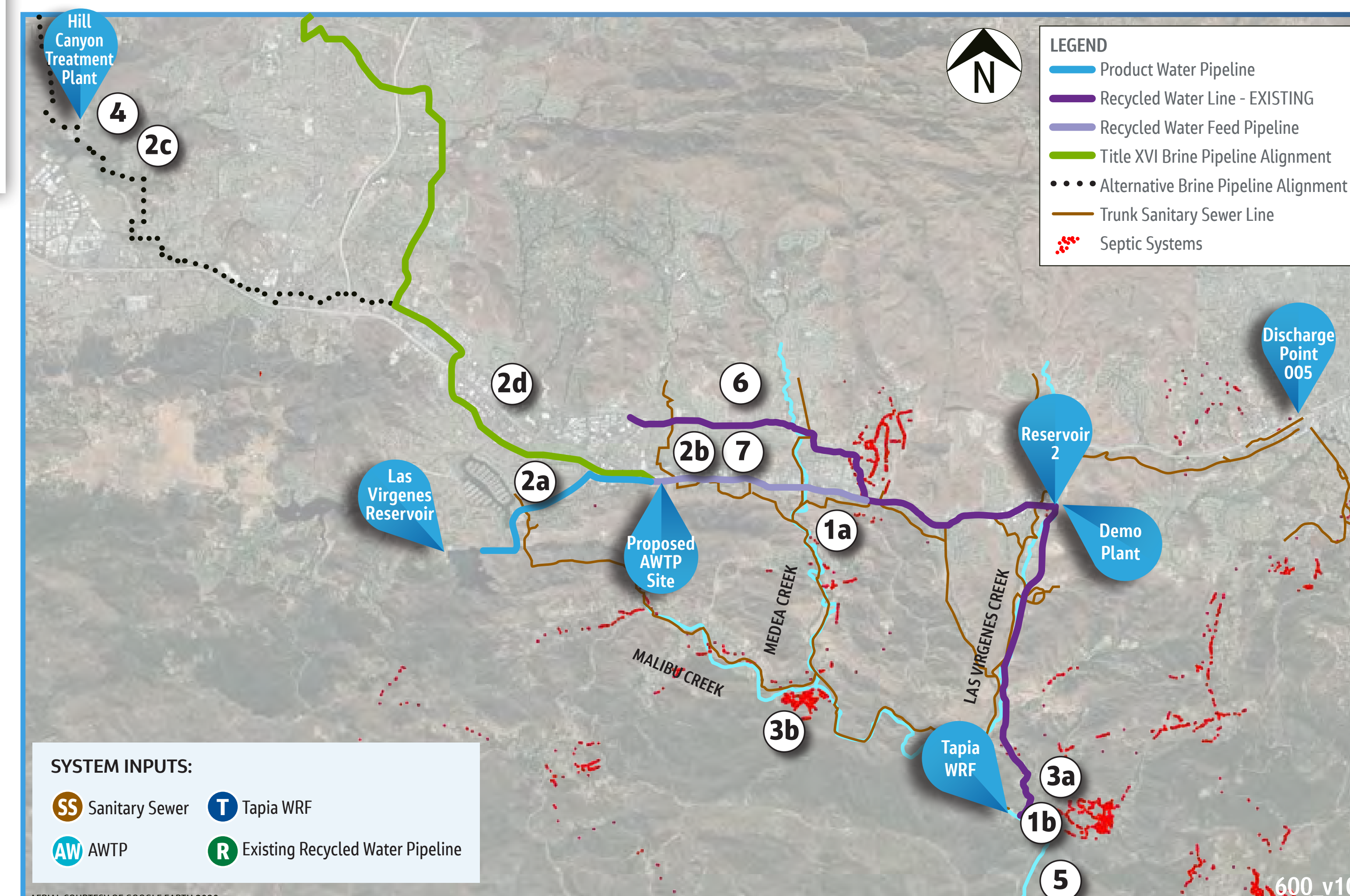


EXHIBIT 2-12. TACT MODEL

TACT Model supports a thorough understanding of cash flow and expenditure limits through an affordability curve strategy for financial decision making.

TACT MODEL SUPPORTS A THOROUGH UNDERSTANDING OF CASH FLOW AND EXPENDITURE LIMITS

- Ensures optimal schedule and sequence of projects within a portfolio
- Choice of funds: Cash, Loans, Bonds, Grants to minimize total cost of capital
- Start date of projects based on affordability to minimize total program duration
- Ensure that coverage and liquidity targets are met within approved annual rate increases

639_v1

EXHIBIT 2-12. The TACT Model will be used to evaluate the cost-benefits of different technology and projects sequencing options; demonstrate the feasibility of a compressed or extended program delivery timeline (7 vs.10-year delivery period); calculate revenue shortfalls and impacts; manage risk and change management, and provide the justification for the decision to pursue SRF, WIFIA, or LRP loan funding, as well as other grant or bond opportunities. We recommend quarterly TACT driven Economic Summits to review affordability curve performance and delivery progress; to discuss low interest loan or grant programs, and to proactively review and prepare for either a Program or Project Risk Mitigation milestone, unpredicted change or significant construction variation request and annual rate setting requirements (driven by Prop 218), for program revenue and cash flow needs.

Incorporating MWD's Local Resource Program: Jacobs is very familiar with the process to receive funding under MWD's Local Resources Program (LRP). The LRP was created to provide financial incentives to water recycling, groundwater recovery, and seawater desalination projects. Project applications will be accepted until the target yield of 170,000 acre-feet per year is fully subscribed. The JPA's Pure Water Program projects are eligible for funding, provided they include construction of new facilities. Expansion of an existing project may be eligible on a case by case basis.

Maximizing Funding from Low Interest Loans and Grants: Our funding plan optimizes the projects for competitive funding opportunities, such as SRF or WIFIA Our grant strategy features close coordination with the JPA leadership and staff, and includes:

TACT MODEL SAVES $150-$200 MILLION FOR SAN MATEO CLEAN WATER PROGRAM

The City of San Mateo Clean Water Program Team used the TACT Model, market assessment, and Jacobs Economic Advisors to successfully receive low interest loans from both SRF ($137 million loan) and WIFIA ($277 million loan), totaling over $400 million in very low interest loans.

The financial portfolio driven by the TACT Model saved the City over $160 Million in just SRF and WIFIA payback escalation costs, as shown in the table below, and an additional $30 million in bond escalation savings. The TACT Model was also used to show short- and long-term cost and service rates impacts for viable technology innovations, saving an additional $150 - $250 million capital costs over the City's Master Plan.

117_v1

SAN MATEO FUNDING SCENARIO	TOTAL SAVINGS[1]	PERCENT SAVINGS[2]
SRF Funding (one loan)	$64,100,000[3]	3.5%
WIFIA Funding (two loans)	$100,700,000[4]	5.5%
WIFIA + SRF Funding	$164,800,000	8.9%

[1]The savings calculated are compared to interest costs associated with funding the entire CWP with traditional bond funding, at an assumed interest rate of 4.5%.
[2]Percent savings were modeled compared to interest costs associated with funding the entire CWP with traditional bond funding, at an assumed interest rate of 4.5%.
[3]SRF calculations were made with an assumed interest rate of 2.2%. The actual rate will be determined when the financial agreement is finalized in mid-2020.
[4]WIFIA calculations were made with an assumed interest rate of 3.1%. The actual rate will be determined when each loan is closed but is likely to be near 3.1%.

- Identify project eligibility for funding based on project type, schedules, and funding program goals
- Create work plans to produce high-quality deliverables on schedule for loan application cycles
- Evaluate whether creating a joint financing authority with the JPA to provide a single source of responsibility for the loan programs is worthwhile, and maximizes benefits to the JPA
- Coordinate with funding programs to align application materials with their goals, and highlight relevant aspects of the projects, including overall regional, environmental, rate payers, and residences. A Resilience Triple-Bottom-Line approach is used to assess net benefits for environmental, social and economic impacts of the Program

Task 2E: Master Program Schedule, Budget Management and Cost Estimating

Establishment of effective cost and schedule controls is essential to program success, and will form the foundation for undertaking the work through all phases of the program. A web-based information system provides rigorous cost, schedule, quality, and risk management reporting tools to maximize project control. The value of these tools lies in its ability to integrate information from various elements of the program and easily gauge program performance. The system also serves as an interface to industry standard control tools so the OA/PgM and the JPA can upgrade the tools as needed. Since the control tools system relies on commercial or non-proprietary software and hardware, it can be developed and housed on either the JPA's or Jacobs' network. If the latter, at Program Transition and Closeout, Jacobs will transfer the Portal to the JPA network system.

We will populate the controls system using a programmatic work breakdown structure developed in the PMP, that will enable users to view information at a high level (such as the entire program's performance) or at a more detailed level, viewing the performance of a specific project or task. The Portal is a highly secure site, that provides the program team access to information about the current cost and schedule performance of their project.

While Cost Performance Index and Schedule Performance Index are relatively standard performance indicators, the JPA may choose to define other key performance indicators—for example, using earned value for progress performance and indicators regarding safety performance—and the Portal can be customized to display this information as well. **EXHIBIT 2-13** shows the tools, models and guidance that will be provided and used by the OA/PgM to measure, prioritize, and proactively track project delivery throughout the PWP Program.

Scheduling and Cost Management. Jacobs' success managing large programs clearly demonstrates that the single most effective approach to managing project cost is to keep the project on schedule and to manage change. In collaboration with the JPA, Jacobs will build and maintain a master program schedule that will serve as our roadmap to driving the on-time and on-budget completion of the program. We will develop and utilize integrated cost control processes that complement the JPA Standard Operating Procedures (SOPs) to guide the integration of budgeting information and expenditure data with schedule and other project activities, which will enable us to measure program performance and manage the work. The OA/PgM will develop a cost tracking system linked to actual expenditures. A critical component of this approach is the recurring analysis of potential costs, variances, and the quantification of financial risks. By integrating these elements into the master program schedule, we will produce highly accurate and reliable cost models. This approach will allow annual cash flow models for each fiscal year and aid the JPA's capital planning process.

Cost Estimating: Jacobs will prepare independent cost estimates of the projects at specified intervals. Additionally, project budgets will be reviewed to ensure adequate budgeting for all Program and project delivery elements. Cost estimates will be prepared using typical soft costs from similar programs, and Jacobs' Cost Parametric Estimating System (CPES) will be used to validate construction costs.

CPES is a process design and cost estimating tool developed by Jacobs specifically for water and wastewater treatment projects, and is based on data from actual projects. CPES users can quickly construct and compare the process designs and estimated costs of a variety of treatment plant alternatives. The CPES model allows teams to develop project specific capital and annual costs for facilities, It provides several benefits:

Jacobs LRP activities will be led by **Bob Harding**, who was formerly with Metropolitan Water District of Southern California and one of the leaders of the LRP. Bob will work with our technologists to look into increasing Pure Water Program's reusable water production to get more LRP funding, using a LRP Technology and Regional Strategy Roadmap process that captures technology innovations, creative alignments and conveyance strategies, and project delivery excellence to plan, design, and confirm increased water reuse production with PWP program implementation.

- Increases accuracy of conceptual cost estimating by calculating quantity take-offs and applying a unit cost versus the conventional cost-curve approach.
- Allows accurate cost estimates to be developed before any drawings are produced.
- Substantially reduces the amount of time required to develop cost estimates.
- Output from a capital cost model can be seamlessly integrated into the O&M cost model to accurately estimate annual costs.
- Quickly provides cost information that can be used to compare multiple process alternatives in a multi-attribute decision model.
- Allows the user to specify basic design criteria for the particular unit process, which CPES uses to perform interim process calculations and estimate the cost for a given unit process.

The estimate will become a "living document" throughout the entire program. This cost model will be developed using the Jacobs cost database for materials, labor and equipment. This model will be updated on a regular basis as information is made available. The cost model will then be used to verify all cost information prepared by the design-builder and/or contractor. This model will give the JPA early cost certainty and confidence for the program, as well as the individual projects. This information will feed into the cost-loaded master schedule.

2.3.3 TASK 3: PROJECT DELIVERY METHODOLOGY AND PROCUREMENT SUPPORT

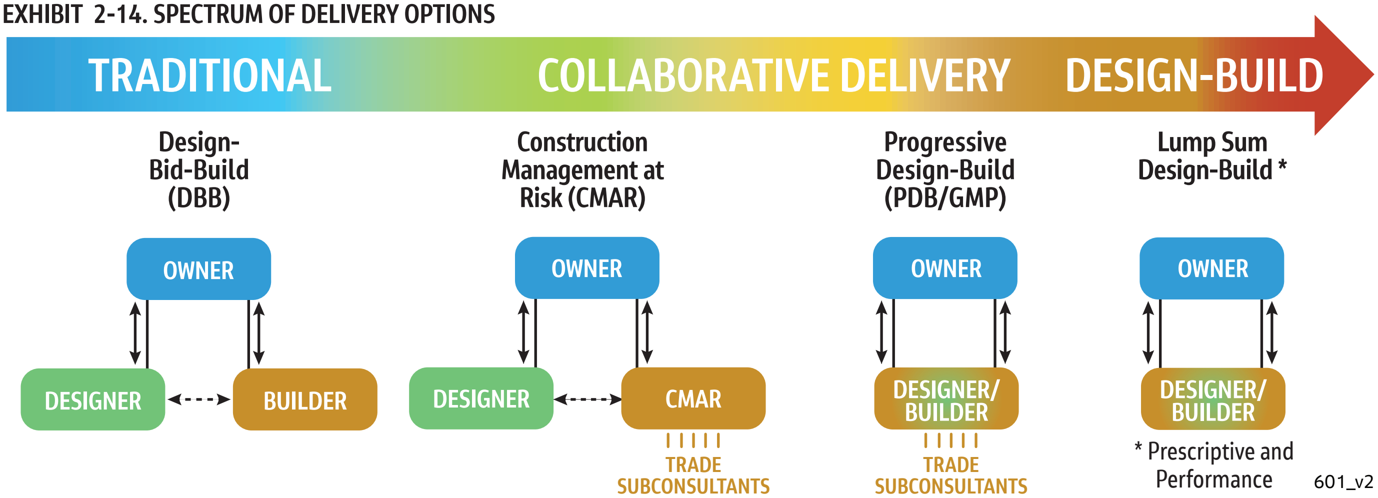
Once the Rapid Program Readiness Assessment is complete and the projects required to deliver the Pure Water Program are validated, the design and construction delivery models will be assessed and selected for each project based on the drivers, priorities, challenges and risks. Jacobs will guide the JPA through the process of developing a project delivery strategy that meets the needs and objectives of the Program, including advising on selecting outside legal counsel and assisting with contractual agreements. We will draw upon our experience as a design professional, constructor, design-builder and Owner's Advisor, as well as coordinate with our Strategic Advisor, **Ken Weinberg** on contractual agreements.

Evaluating Procurement Options

There is a spectrum of project delivery options, as shown in **EXHIBIT 2-14**, that could benefit the Pure Water Program. Jacobs will develop a Procurement Strategy that would be developed through a series of workshops with the JPA staff and Board to

EXHIBIT 2-13. PgM PORTAL

EXHIBIT 2-14. SPECTRUM OF DELIVERY OPTIONS



HIGHLIGHTS OF PROCUREMENT

- Market-based project delivery selection.
- Early cost certainty through rigorous cost estimating (CPES) application.
- Objective evaluation through in-depth knowledge of all available project delivery options.
- Strong background as both Owner's Advisor and design-builder, providing hands on expertise to guide best practices.

educate and evaluate the merits of a spectrum of delivery alternatives, and eventually lead to a recommended delivery model for the AWTP and the conveyance system. There are benefits and challenges for each of these delivery options, as shown in the table of comparison below.

While the key design projects are related to the AWTP and conveyance lines, other projects could be identified and prioritized during the Rapid Program Readiness Assessment (Task 2B). It is possible that different delivery models could be adopted for the various program elements. It might be more advantageous to deliver pipelines through a traditional Design-Bid-Build model, while a Progressive Design-Build model might be suitable for the AWTP due to the innovation and collaboration potential. One of the most critical factors is the JPA's comfort level between being performance and prescriptive based. There are inherent benefits and challenges for both approaches, and we will work with you to develop the appropriate balance to meet your needs. Throughout the procurement evaluation and selection process, Jacobs will work with the JPA's legal counsel in development of packages that protect the interest of the JPA, meet the goals of the projects, and encourage strong and qualified bidders. Once the delivery model is selected for each project, there are different steps for implementation.

COMPARISON OF FOUR DELIVERY OPTIONS

DESIGN-BID-BUILD	CMAR	PROGRESSIVE D-B	FIXED PRICE D-B
Well established, defined, proven process	Similar to traditional delivery, with accelerated schedule	Faster delivery with concurrent design/construction	Earlier schedule certainty
Hard bid selection	Quals based selection with a fee component	Quals based selection with a fee component	Quals based shortlist, then selection based on total project price (best value)
JPA involvement in the design process	JPA involvement in the design process	JPA involvement in the design process	Performance and/or prescriptive-based criteria
Cost certainty at bidding	Earlier cost certainty	Earlier cost certainty	Earlier cost certainty
Traditional cast of participants	Familiar cast of participants	Generally, a larger pool of bidders since proposal prep costs are lower	Ideal for innovation and a turn-key solution
Unless specified, limited input into subs/equipment selection	Greater ability to provide input into subs/equipment selection based on best value	Greater ability to provide input into subs/equipment selection based on best value	Unless specified, limited input into subs/equipment selection

Delivery Model Criteria for Achieving Best Value to the JPA
The evaluation will align the best delivery model to each individual program component by addressing a variety of criteria, including:

- Statutory and Regulatory Requirements
- Key Project Drivers and Objectives (Cost; Schedule; Innovation; Operational impacts)
- Risk Tolerance
- Permitting and Technical Requirements
- Funding Considerations

Procurement Criteria Considerations

The construction market is ever changing on a monthly, if not weekly basis. Our evaluation will include a Market Sounding with potential bidders and industry leaders to get a firm understanding of the current market place. These will be vendor fairs with the engineering and construction market sectors. The goal is to obtain information for use in the development of procurement documents that will afford offerors the ability to provide the maximum value in each package.

Implementing a Traditional Design-Bid-Build or CMAR Delivery Option: For the projects selected for a design-bid-build or CMAR delivery, Jacobs will work with the JPA to develop a plan for procurement, including how to proceed with design services. The design and preparation of final bid documents could be completed by Jacobs, or the JPA may elect to use the bridging documents developed by Jacobs for use by one or more designers to complete the design and preparation of final bid documents. Jacobs will assist the JPA in procurement services, evaluation and selection of design consultants, and design management.

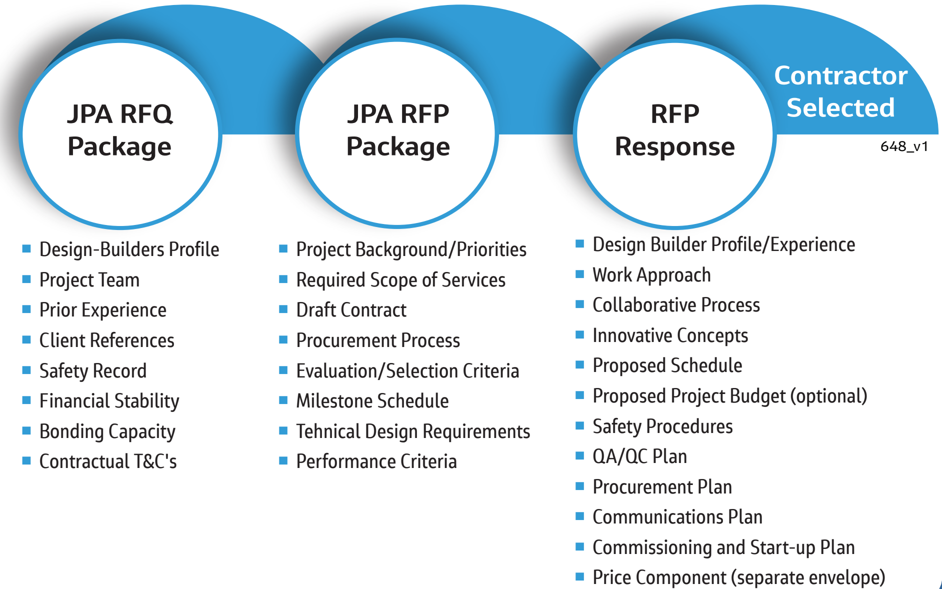
In the case(s) when the Design-Bid-Build model is utilized, Jacobs will assist the JPA with review of the construction bids for completeness and compliance with the solicitation so that the lowest responsive bidder can be selected.

In the case(s) when CMAR is the selected procurement model, Jacobs will assist the JPA in the development of the procurement documents and the selection of the CMAR contractor. Once the CMAR is selected, Jacobs will assist in the coordination efforts between the CMAR and the Design Engineer and facilitate project team workshops at the 30, 60 and 90% design levels. Jacobs will also review and validate all schedules and costs developed by the CMAR.

Implementing a Design-Build Option: If the evaluation process results in selection of a Progressive Design-Build or Fixed Price delivery, the required level of design may need to be adjusted. PDB allows for less early project definition, while FPDB procurement requires a higher level of design that is prescriptive and/or performance based. The bridging documents prepared by Jacobs will be used to provide the project definition and requirements as the basis for procurement of a design-build firm. For the procurement phase, we would recommend a two-step process with issuance of a Request for Qualifications to shortlist firms, followed by a Request for Proposal.

Prior to receiving the Statement of Qualifications (SOQ's) from the proposing teams, Jacobs would prepare a Scoring Guiding Document that provides the selection committee with guide lines in their review and scoring of the submitted SOQ's. We would work with the JPA to develop a weighting scheme for the various subsections of the submitted SOQ's. Based on the results of the SOQ evaluation process, submitters would be shortlisted to receive a RFP. Early in the proposal preparation period, it is advantageous to conduct confidential meetings with each of the proposers, which allows the proposers to ask confidential questions in an informal setting. This interaction also gives the JPA a perspective of the internal chemistry of the proposing team members, as well as with the JPA. This activity is part of the "Best Practices" as laid out by the DBIA and has been successfully used by Jacobs.

As part of the proposal evaluation, formal process interviews will be held with the individual proposers. Once interviews are completed, the proposals will be scored using a similar guiding document as with the RFQ. Once the proposals are scored, the price proposals will be opened and added to the evaluation criteria. In the case of a Fixed Price Procurement, the cost will be a completed project cost. In the case of a Progressive Procurement, the pricing only includes items within the pre-construction services.



2.3.4 TASK 4: TECHNICAL STUDIES, PERMITTING, DRAWINGS AND SPECIFICATIONS

Task 4, led by **Paul Swaim**, describes the many complex, but integrated components of the Pure Water Program. As shown earlier in the Roadmap to Completion (**EXHIBIT 2-4**), these tasks do not occur in sequence, so are described as separate, but interrelated activities, in the order listed below. Where applicable, we highlight critical considerations and innovative ideas.

- **Task 4A –** Regulatory Strategy: A Path to Approval
- **Task 4B** - Tapia WRF Flow Equalization
- **Task 4C** - Capacity Review Discharge Point 005 and Emergency Discharge
- **Task 4D** - AWTP Design Criteria Package, Bridging Documents
  - » ***Task 4D1*** *- Advanced Water Treatment Process and Treatment Requirements*
  - » ***Task 4D2*** *- Chlorine Speciation and Disinfection Byproducts and NDMA Management*
  - » ***Task 4D3*** *– A Natural Treatment System to Address RO Brine Pipeline Scaling*
- **Task 4E** - Major Pipeline Alignment Study

TASK 4A: Regulatory Strategy: A Path to Approval

Task 4A focuses on compliance with DDW, RWQCB, and CTR; Section 2.3.5 – Task 5, discusses strategies for CEQA compliance. The San Diego RWQCB recently adopted California's first Reservoir Water Augmentation (RWA – formerly Surface Water Augmentation) permit, enabling the Pure Water San Diego Program to discharge purified water into a reservoir, the source for a DDW-permitted surface water treatment plant. This recent adoption concluded a 10-year regulatory permitting process. Our team's regulatory specialists (Michael Welch – RWQCB and Erica Wolski - DDW) were integral in the success of Pure Water San Diego's regulatory permitting. They will apply lessons learned from their experience to JPA's Pure Water Program, where the goal is to expediently garner a RWQCB/DDW permit that provides operational flexibility, while minimizing costs and avoiding the challenges that San Diego experienced. This regulatory strategy to obtain an RWA permit is highlighted in the adjacent inset, and described below.

HIGHLIGHTS OF REGULATORY STRATEGY

- Replicates applicable Pure Water San Diego regulatory approval process
- Craft a conservative and practical approach
- Enhanced dilution in the Las Virgenes Reservoir
- Conservative level of advanced treatment to meet DDW requirements
- Avoids adding operational difficulty or cost
- Multi-prong strategy to address California Toxics Rule (CTR)-regulated compounds
- Leverages the Pure Water Demonstration Facility
- Early, continuous collaboration with regulators to craft workable permit language

Craft a Conservative, Yet Practical Approach: The regulatory community, DDW in particular, appreciates agencies that incorporate safeguards into their projects that exceed, rather than meet, minimum standards. A conservative approach in the eyes of RWQCB/DDW, yet practical in the eyes of the JPA project would incorporate the following components:

- Robust sanitary sewer source control program that minimizes inputs from industrial dischargers
- A wastewater treatment plant that includes flow equalization, nitrification, and tertiary filtration/disinfection
- An AWTP that provides more than minimum treatment and/or monitoring
- Multiple diversion points throughout the AWTP prior to reservoir discharge
- A well-operated and maintained DDW-permitted surface water treatment plant

Our regulatory approach will highlight the conservative aspects of the JPA operation, such as the industry-light sanitary sewer system, the plan to optimize Tapia WRF effluent quality through flow equalization and residual disinfectant smoothing, addition of free chlorine in the AWTP, and off-spec water management strategy.

Enhance Dilution in the Las Virgenes Reservoir and Sufficient Level of Advanced Treatment: A 3-D numerical hydrodynamic reservoir model has been used to evaluate a range of operating scenarios at the 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 RWA Regulations. Considering our team's overall strategy is to substantially augment recycled water flows to the AWTP during summer months, the "Emergency" scenario best represents anticipated operation, confirming the need to augment natural reservoir mixing with artificial means to assure 1:100 dilution. Maintaining 1:100 dilution will allow the JPA to limit advanced treatment to full advanced treatment (FAT) and avoid the need for a substantive, expensive and operationally complex ozone/biologically active filtration pretreatment component.

This strategy is based on the Pure Water San Diego Program permit, which represented the most aggressive category of RWA allowed by DDW, achieving only a 1:10 dilution and less than 120 days of retention in the reservoir prior to withdrawal (**EXHIBIT 2-15**). To garner DDW approval for San Diego's "special case" project, San Diego supplemented standard FAT, comprised of membrane filtration (MF), reverse osmosis (RO) and ultraviolet light-based advanced oxidation (UV-OP) with pretreatment by ozone/biologically active filtration (BAF).

EXHIBIT 2-15. RESERVOIR WATER AUGMENTATION PROJECT ALTERNATIVES

ADVANCED TREATMENT FACILITY LOG REMOVAL REQUIREMENTS (Virus/Giardia/Crypto)	DILUTION	RETENTION TIME (Days)	NO. OF REQUIRED TREATMENT PROCESSES	ADDITIONAL STATE BOARD 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	2	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

Our team recommends consideration of air curtains in Las Virgenes Reservoir to promote mixing as opposed to submerged pipe diffusers that have caused significant construction challenges on the Pure Water San Diego Program. Through the use of ballasted linear air diffuser, these air curtains are relatively easy and inexpensive to construct. Air diffusers are constructed on site, positioned over design locations by small boats and then sunk in place by flooding the ballast pipe. Proper design of the air curtains may simplify the purified water discharge into Las Virgenes Reservoir to be as simple as a point discharge, rather than a complicated network of pipes.

Provide Conservative ("Just Right") Level of Advanced Treatment: Our recommended level of advanced treatment is based on conservatively meeting DDW requirements, without causing extra operational degree of difficulty or cost. Studies to date have indicated that the JPA's proposed AWTP treatment train would include microfiltration or ultrafiltration, 3-stage reverse osmosis, ultraviolet disinfection with an advanced oxidation process (UV/AOP), product stabilization, and free chlorine disinfection, if needed. Further discussion on providing the proper amount of treatment is included later in Task 4D1.

Apply Multi-Prong Strategy to Address California Toxics Rule (CTR) Regulated Compounds: Discharges of purified water to RWQCB Basin Plan-designated surface water bodies must address two categories of water quality objectives, in addition to the DDW SWA requirements: 1) those designated in the Water Quality Control Plan, Los Angeles Region (Basin Plan); and 2) those specified in the State Board policies or federal regulations, such as California Toxics Rule.

CTR standards are more stringent for the following constituents than DDW drinking water standards, and in some cases, more stringent than current analytical detection limits: chlorinated pesticides such as DDT, Aldrin, Dieldrin, Heptachlor; polychlorinated biphenyls (PCBs); poly-aromatic hydrocarbons (PAHs); N-nitrosodimethylamine (NDMA); Bromodichloromethane; and Dibromochloromethane.

CALIFORNIA TOXICS RULE

In 2000, EPA promulgated the California Toxics Rule, or CTR (40 CFR 131), which establishes water quality standards for discharges to inland surface waters of California:

- Maximum (acute) concentration standards for toxic inorganic and organic constituents for the protection of freshwater aquatic habitat
- Continuous (chronic) standards for toxic inorganic and organic constituents for the protection of freshwater aquatic habitat
- Standards for the protection of human health (consumption of organisms and consumption of water plus organisms)

NDMA poses a unique challenge in that it tends to be ubiquitous in treated effluent, and can be created by certain treatment processes used in water recycling, including conventional disinfection and advanced treatment technologies, such as ozonation. The Pure Water San Diego Program avoided the conventional disinfection issue by sourcing the AWTP (co-located with the WRF) with filtered, undisinfected effluent. For the JPA Pure Water Project, where a distant AWTP will be sourced with disinfected recycled water, the project will need to address this potential source of NDMA. We discuss our approach to managing this aspect of NDMA / disinfection byproducts in Task 4D.

The use of a "mixing zone" in the Las Virgenes Reservoir to change the point of compliance is important for ensuring CTR compliance, as CTR standards represent water quality levels to be achieved upon completion of mixing or dilution into the receiving water. For constituents that do not persist in the environment, the designation of a mixing zone (i.e. the zone where the purified water is diluted into the receiving water) could allow the RWQCB to consider dilution effects in establishing NPDES 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 by, at least an order of magnitude.

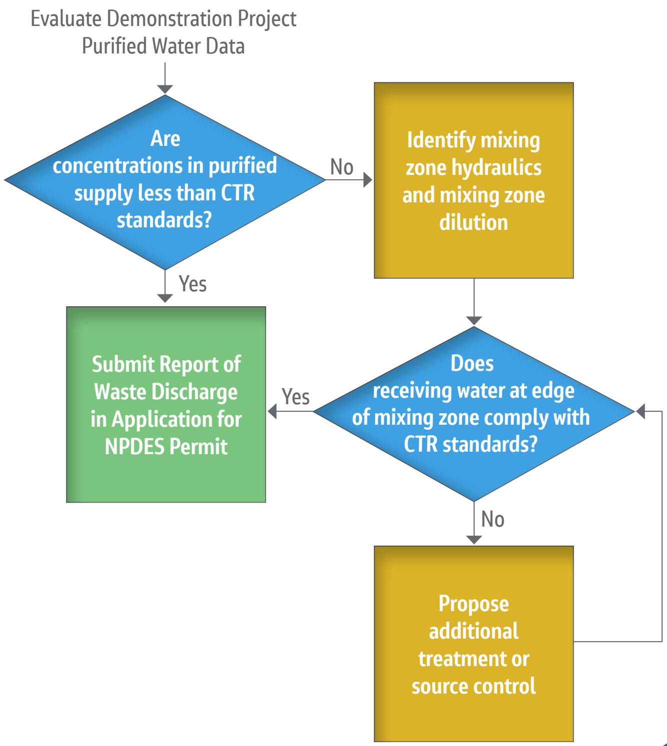
Leverage AWTP Demonstration Project: In accordance with State Board implementation policies, the RWQCB uses the "Reasonable Potential Analysis" (RPA) to determine which parameters are to be regulated through the imposition of enforceable effluent limits. The RPA, in part, takes into account a number of statistical parameters, such as the number of data points for each constituent, the detection limits for the sample results, the number of non-detected sample results, and the number of sample results with concentrations in excess of applicable standards. Proper development and implementation of the demonstration testing program is key to influencing the RPA process. As part of the Pure Water San Diego Program , for example, final pilot plant operations were directed toward:

- Assessing treatment effectiveness in removing potential problematic constituents, such as NDMA, bromodichloromethane and dibromochloromethane.
- Directing final pilot operations towards using the effective treatment technology and developing a solid data base of non-detected concentrations of NDMA, bromodichloromethane, and dibromochloromethane.

With this data base, the San Diego RWQCB agreed to regulate NDMA through a non-enforceable performance goal, and to regulate bromodichloromethane and dibromochloromethane by imposing mass emission limits on total trihalomethanes. A similar approach is recommended for the JPA by developing testing plans for the JPA's Pure Water Demonstration Facility to specifically address this issue.

EXHIBIT 2-16. DEMONSTRATION PROJECT DATABASE

Establishing a compliance point at the reservoir outlet feeding the Westlake Filtration Plant may be an additional option we will explore with RWQCB staff.



Early, Continuous Collaboration with Regulators: Through our strategies to expedite the Pure Water regulatory permitting process, we anticipate shortening the duration from the schedule that San Diego experienced to conform with the JPA's 2030 project completion goal. One lesson learned from years of working with the San Diego RWQCB and the Pure Water San Diego Program is that the 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. The JPA can influence the regulatory direction of the RWQCB 1) through early and continued coordination with regulators, 2) by providing the RWQCB with appropriate data and support, and 3) by tailoring permit application documents to support the regulatory approaches that are consistent with the JPA/s desired regulatory outcome.

Task 4B Tapia WRF Flow Equalization

The equalization volume provided at the Tapia WRF, the storage volume provided in your recycled water distribution (e.g. Reservoir No. 2), your recycled water demands, and the treatment capacity for your new AWTP, are interlinked and must be considered collectively to provide optimal operation of the Tapia WRF and your potable reuse system. Selection of the size and location of flow equalization is critical to benefitting both systems - wastewater treatment and potable reuse production.

RWQCB BIOSTIMULATORY REQUIREMENTS

Coordination with the RWQCB will be required to address compliance with biostimulatory requirements. The Los Angeles Region Basin Plan contains no numerical standards for nitrogen and phosphorus, and instead establishes the following narrative biostimulatory objective: ***Waters shall not contain biostimulatory substances in concentrations that promote algae growth to the extent that such growth causes nuisance or adversely affects beneficial uses.***

Since the LVMWD purified water discharge will contain extremely low concentrations of phosphorus, Las Virgenes Reservoir will be maintained in "phosphorus limited" conditions (e.g. conditions where the lack of phosphorus prevents algae growth) whenever the reservoir is largely comprised of purified water. Analysis will be required, however, to demonstrate that no adverse biostimulatory effects will occur under conditions where reservoir nitrogen:phosphorus (N:P) ratios may be influenced by local runoff or imported supplies.

658_v1

HIGHLIGHTS OF TAPIA WRF FLOW EQUALIZATION

- Accurate simulations for EQ sizing using Las Virgenes Digital Watershed – Systems Framework approach.
- Optimal and comprehensive EQ design, which integrates considerations for Tapia WRF, recycled water system, AWTP, and Las Virgenes Reservoir.
- Precise simulations of up to 1-minute flow frequency data to feed design criteria.

Flow and load equalization at the Tapia WRF can improve operations and performance of downstream processes by minimizing peaks for more efficient treatment, as well as smooth out effluent quality throughout the day. Additionally, the size of the equalization basin and AWTP will have significant impacts on cost and site layout, so proper evaluation and selection is critical.

Identifying the optimal size of these facilities is governed by a number of variables that affect how the facility will be operated. If the goal is to treat every drop of WRF effluent through the AWTP, a prohibitively large and expensive facility would likely be needed due to diurnal and seasonal variations in wastewater flows.

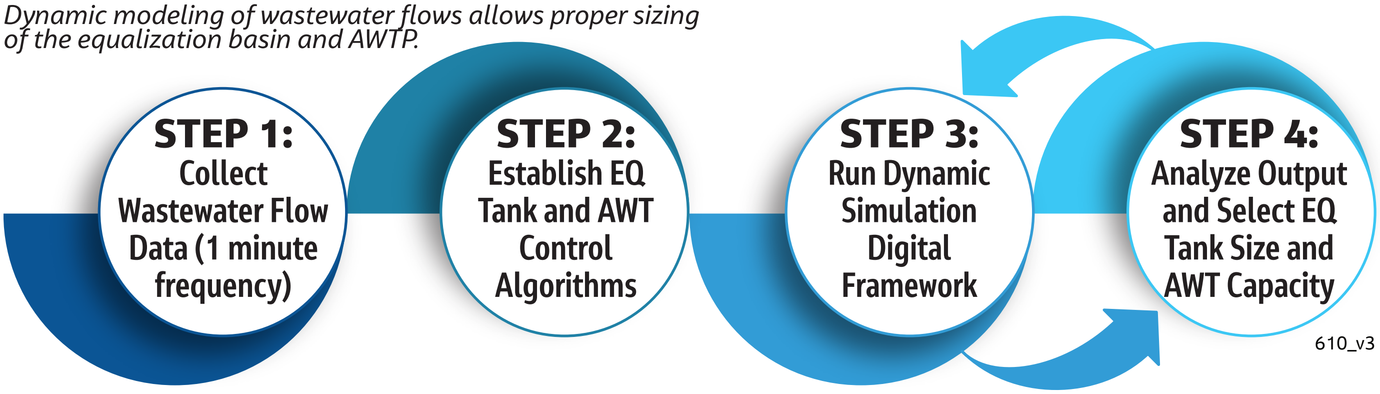
To address this challenge, Jacobs has developed an innovative in-house model to properly size the AWTP, storage reservoirs, and equalization basins specifically for potable reuse projects (**EXHIBIT 2-17**). This model uses historical 1-minute frequency flow data coupled with our dynamic simulation tool (Las Virgenes Digital Watershed Systems Framework – aka Replica™) to model water levels in the reservoirs and equalization basins, and flow changes through the AWTP over a 1-year period. The output from the model is then analyzed using two key performance metrics for a variety of basin and AWTP sizes:

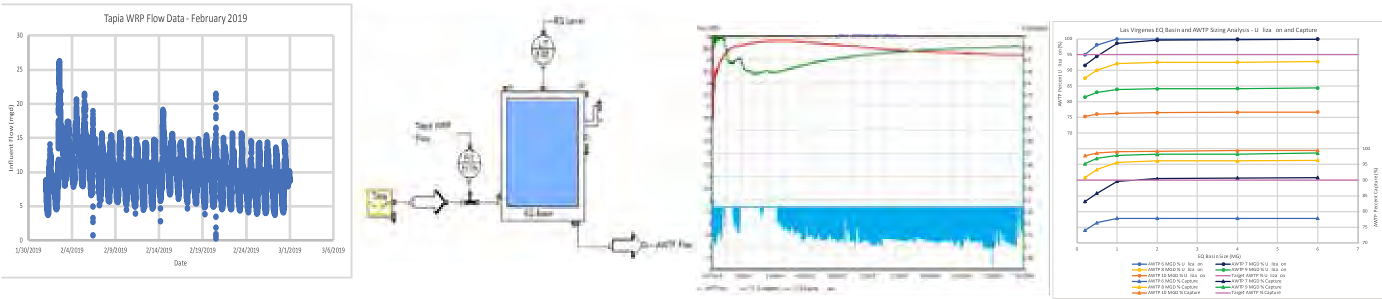
- **AWTP Percent Utilization:** The average utilization of the AWTP over the course of a year (typical target ≥ 95%)
- **AWTP Percent Capture:** The amount of available source water that is treated through the AWTP for potable reuse (typical target ≥ 90%)

Using historical 1-minute flow (2019 data) from the Tapia WRF, we've applied our dynamic simulation tool to preliminarily size your equalization basin and AWTP. We analyzed equalization basin sizes from 0.2 to 6 million gallons and AWTP capacities ranging from 5 to 10 mgd. Optimal sizing will maximize both AWTP percent capture and percent utilization at minimum equalization basin and AWTP sizes.

EXHIBIT 2-17. DYNAMIC MODEL

Dynamic modeling of wastewater flows allows proper sizing of the equalization basin and AWTP.

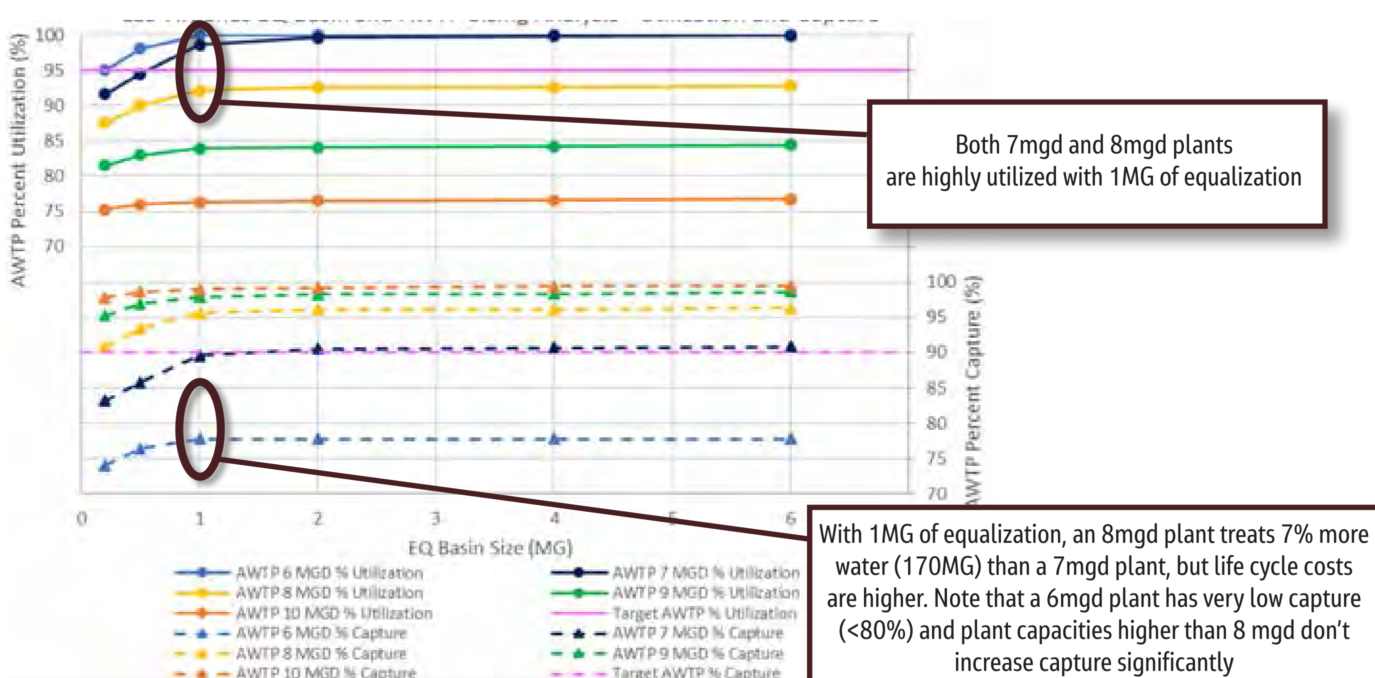




The results of Jacobs' preliminary analysis are shown in **EXHIBIT 2-18**. Careful inspection at the inflection points is important because these denote the conditions where larger sizes begin to offer only diminishing returns. The inflection points in **EXHIBIT 2-18** suggest that a 1-million-gallon equalization basin, and a 7-or 8-mgd AWTP could be appropriate, but we look forward to advancing this analysis with you to include more site-specific information, such as your operational storage controls for your recycled water system and your specific recycled water demands. In addition, mixing and dilution objectives at Las Virgenes Reservoir will be important in AWTP capacity selection. Finally, steady and consistent quality flow to the AWTP is necessary to produce high-quality purified water and to simplify your operations. The dynamic simulation tool will test various flow control algorithms for use in the full-scale plant PLCs to minimize the frequency and magnitude of flow changes at the AWTP.

EXHIBIT 2-18. TAPIA WRF EQ BASIN SIZING ANALYSIS - UTILIZATION AND CAPACITY

Properly sized equalization and AWT reduces life cycle costs and optimizes operation.



Task 4C: Capacity Review Discharge Point 005 and Emergency Discharge

Discharge Point 005 to the Los Angeles River is an approved discharge point in Tapia WRF's NPDES permit and has served as an emergency discharge point when needed during the April – November Malibu Creek discharge prohibition period. Further, pending nutrient discharge limitations to Malibu Creek heighten the need for a fail-safe backup plan should the AWTP and/or the Las Virgenes Reservoir be unable to accommodate recycled water flows, especially during winter months when Discharge Point 005 capacity could be impeded by storm flow. Although Discharge Point 005 will be a key component of this plan, our team proposes a broader review of off-spec and emergency discharge opportunities. Our team proposes a three-step process to clarify Discharge Point 005 capacity needs.

Establish Off-Spec Water Protocol: Although RWA permits provide an allowance for short-term AWTP product water non-compliance, an off-spec water protocol will need to be established to link the type of potential problem encountered at the AWTP with a combination of modified operations and diversion of either source water or off-spec product water (See **EXHIBIT 2-19**).

HIGHLIGHTS OF DISCHARGE POINT 005

- Goal is to conserve recycled water, minimize 005 discharges.
- Planning for peak emergency discharge needs, that will likely exceed 005 capacity after 2030.
- Use of Reservoir 2 as operational storage to minimize 005 discharges.
- Excess capacity in brine pipeline can be used for off spec/emergency discharge and reduce 005 discharges.

EXHIBIT 2-19.

STEPS	SITUATION	RESPONSE/ACTION	PRODUCT WATER DESTINATION
1	Potential non-performance	Problem verification	LV Reservoir
2	AWTP Trouble-Shooting	Reduce AWTP feed to 50% of design*	AWTP product water (50% design capacity) to LV Reservoir; remainder of Title 22 flow (up to 50% design capacity) to Emergency Discharge Options
3	AWTP Trouble-Shooting – Phase 2	Maintain AWTP feed to 50% of design	AWTP product water (50% design capacity) and up to 50% AWTP design capacity of Title 22 flow to Emergency Discharge Options
4	Complete shutdown of AWTP	Discontinue feed to AWTP	Up to AWTP 100% design influent capacity to Emergency Discharge Options

* Potential supplemental action of taking Westlake FP offline depending on severity of issue.

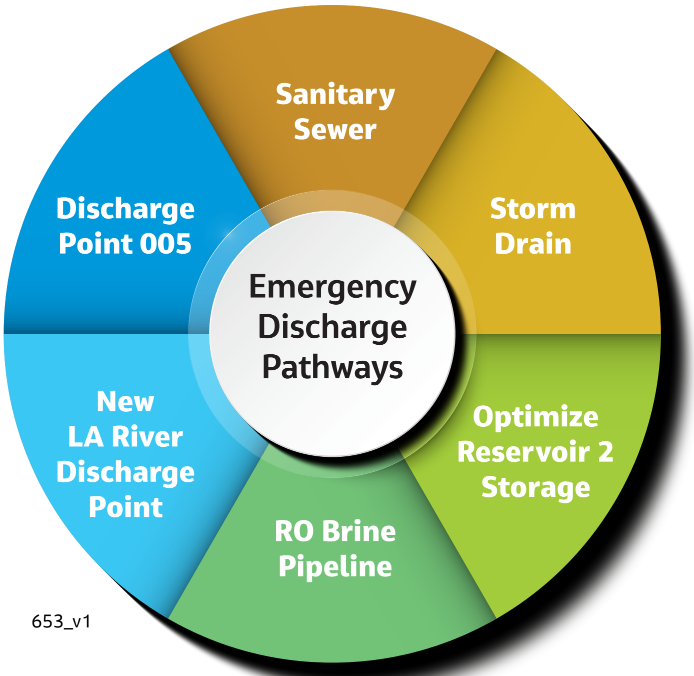
Investigate Alternative Emergency Discharge Options (Exhibit 2-20): In addition to the RFP-stipulated pathways of local sanitary sewer or storm drain systems, our team will investigate additional opportunities including:

- **Optimize Use of Reservoir 2:** Reservoir 2 is already used to manage seasonal variations in recycled water demand. Crafting an operational strategy involving drawing down Reservoir 2 prior to a wet weather event followed by filling it during the event could aid in addressing potential capacity limitations at Discharge Point 005 during peak storm flow events.
- **Use of Brine Pipeline Excess Capacity:** As noted in our Brine Management discussion, one concept our team is considering is a multi-pipeline, common trench complex to accommodate supplemental sources to the AWTP while providing maximum resiliency for brine conveyance. This multi-pipe system could be operated during emergency conditions to convey both AWTP off-spec product water and recycled water, in addition to brine to the SMP.
- **Creation of a New Los Angeles River Discharge Point:** Should improvements to Discharge Point 005 be deemed substantial, another option worth exploring is the

EXHIBIT 2-20. OFF-SPEC PROCESS

Off-spec water protocol will provide a progression of actions.

EXHIBIT 2-21. ALTERNATIVE EMERGENCY DISCHARGE OPPORTUNITIES



creation of a new discharge point to the LA River. Through a modest extension to the recycled water system, other storm drains systems feeding LA River could be connected, and would help to avoid potential costly improvements associated with Discharge Point 005.

Refine Discharge Point 005 Capacity and Need: Once emergency flow conditions and alternative options are identified, Discharge Point 005 capacity constraints will be investigated. Once system modeling and capacity analyses are completed, and capital improvements are identified, an overall emergency discharge strategy will be recommended with the goal of minimizing uncertainty, cost, and potential environmental implications.

Alignment of the Storm Drain and Caltrans Channel (section running parallel to Hwy 101) accommodating Discharge Point 005. LVMWD has a compliance schedule to address the Discharge Point 005 chloride limitation to the LA River; identifying alternative emergency discharge strategies could be part of the LA River chloride compliance plan.

TASK 4D: AWTP Design Criteria Package and Bridging Documents

As the OA/PgM, we would develop a Design Criteria Package for the AWTP to define the preferred design solution and project requirements to a 10-percent design level for use in procurement of a design consultant or design-build firm to deliver the detailed design of the AWTP. These documents will include the specific elements cited in the RFP. We'll use Jacobs early visualization tools to facilitate discussions, our CPES tool to compare alternatives based on life-cycle costs, and our dynamic simulation model for hydraulics and eventually, for controls. In addition to the criteria listed in the RFP, we recommend defining electrical requirements, defining an architectural concept, and determining any considerations for adding capacity, trains, chemicals, or processes during this stage of the project. The ensuring section highlights critical considerations for developing this document, which will serve as a bridge from the JPA's vision concept to implementation.

Task 4D1: Advanced Water Treatment Process and Treatment Requirements

As discussed under Task 4A, our team's strategy regarding the level of treatment to be included in the AWTP is to conservatively meet DDW requirements without causing extra operational degree of difficulty or cost. Therefore, we will limit advanced treatment to MF (microfiltration or ultrafiltration), 3-stage RO, and UV-AOP. The UV-AOP effluent will then be stabilized and disinfected prior to conveyance to Las Virgenes Reservoir, through the addition of carbon dioxide and lime, followed by free chlorine.

As shown in **EXHIBIT 2-22**, the FAT process will provide more than adequate pathogen log removals to meet the requirements of RWA, even under the minimum reservoir dilution and retention scenario. If RWA AWTP log virus/Giardia/Crypto

HIGHLIGHTS OF AWTP DESIGN

- AWTP will be "right sized" conservatively to meet DDW requirements without causing extra operational and treatment costs - no more, no less.
- Design strategy enhances Log removal credits by evaluating multiple feasible options.
- Potential of deploying TRASAR system is feasible option that can effectively achieve an additional 3.5 log removal.
- Design criteria to consider raw and treated drinking water augmentation for future Pure Water Program options.

removals of 10/9/10 would be necessary, FAT would provide 12.5/11.5/11.5 log removals. After passing through the reservoir, the diluted purified water will be treated by the existing Westlake Filtration Plant, which is comprised of diatomaceous earth (DE) filtration and chlorine disinfection. Pathogen log removal credits for this plant and the combined total, including FAT, are shown in **EXHIBIT 2-22**.

Enhancing AWTP Log Removals: Should discussions with DDW lead to the need for additional log removals in the event minimum dilution and or retention time should result for purified water in the Las Virgenes Reservoir, the following approaches will gaining additional log removals within the AWTP without having to utilize expensive ozone and biological filtration pretreatment:

- **Additional credit from RO.** The RO monitoring strategy at San Diego includes daily monitoring for strontium removal between the combined RO feed water and permeate from each train to validate 2.5-log of V/G/C from RO. Such monitoring would place an undue analytical burden on Las Virgenes operating staff. A less onerous approach would be to incorporate the Nalco TRASAR system, which adds a small amount of a fluorescent dye into the RO feedwater for a short period of time each day, measuring its removal across the RO system using online fluorometers. TRASAR has been shown to demonstrate 3.5 log removal, which would increase RO pathogen removals by two logs.
- **UV disinfection.** DDW has expressed a willingness to allow the use of UV disinfection in the AWTP process to gain additional log removals. Low dose UV applied to the UV-AOP effluent would provide 2-3 logs of additional Giardia and Crypto inactivation. Higher doses would be required for virus inactivation, however given the very high UV transmittance of the UV-AOP effluent, equipment and power requirements would be minimized.
- **Cartridge filtration.** Cartridge filters rated for Giardia and Crypto removal have been used for many years for surface water treatment. These filters could be utilized either before or after RO to gain an additional 2-logs of protozoan removal credit.

Of these three options, TRASAR would provide the most credit for all pathogen classes, but would not add an additional treatment process. Both UV and cartridge filtration would provide additional Giardia and Crypto removal, with UV capable of also providing inactivation of viruses and protozoa. Ideally, none of these enhancements would be required, but our team will evaluate the benefit of each if necessary.

Implications on Advanced Treatment of Raw or Treated Water Augmentation: Once DDW promulgates regulations for Raw and Treated Drinking Water Augmentation (R/TDWA) in 2023,the JPA may desire to implement one or the other, in which case there are three main factors that will impact the design and functionality of the AWTP:

- Increased pathogen log removal requirements, given the removal of a natural treatment barrier
- Inability of the WFP to meet the 'basic' (and increased) log removal requirements (for RWA)
- Additional treatment to address refractory synthetic organics

Provided the JPA achieves both1:100 dilution and >120 days residence time, R/TDWA virus/Giardia/Crypto log removal requirements by AWTP could increase from 8:7:8 to 15:13:13 log removals or higher, while the 4:3:2 log removals accredited to the WFP with SWSA would be inapplicable for meeting the higher required removals . In this case, the AWTP would need to provide 15:13:13 (or higher) log removals, compared to the 12.5/11.5/11.5 log removals listed in **EXHIBIT 2-22**. As discussed above, this 2.5/1.5/1.5 log removal deficit could be provided by the addition of UV disinfection, or UV disinfection and TRASAR, however this approach would need to be confirmed in discussions with DDW.

EXHIBIT 2-22. PATHOGEN LOG REMOVAL REQUIREMENTS FOR RWA AND REMOVALS THROUGH AWTP

	RESERVOIR			FAT LOG REMOVALS						
	Dilution/ Retention (Days)	Dilution/ Retention (Days)	Dilution/ Retention (Days)	MF	RO	UV-AOP	Chlorine Disinfection	FAT Total	Westlake WFP Log Removals	Total Log Removals (FAT + WRP)
PATHOGEN	1:100/ 120->180	1:100/ 60 <-120	1:10/ 60 <-120							
Virus	8	9	10	0	1.5	6	5	12.5	4	16.5
Giardia	7	8	9	4	1.5	6	0	11.5	3	14.5
Crypto	8	9	10	4	1.5	6	0	11.5	2	13.5

If this approach addressed the higher log removal requirements, DDW could still require additional treatment processes (e.g., ozone and biological filtration) to provide additional removal capability for synthetic organic compounds that are resistant to removal by RO and UV-AOP, unless the JPA can demonstrate that the discharge of such contaminants in their sewer is a very low risk. Jacobs will work with the JPA and DDW to develop the optimum approach to designing sufficient flexibility into the AWTP design, including how additional treatment can be incorporated into the demonstration facility for this purpose.

Modification of Chlorine Dosing Approach at Tapia WRF to Reduce Chemical Usage and Prevent NDMA Formation: A significant factor in the type of chlorine species that will form upon the addition of sodium hypochlorite is the concentration and variability of ammonia in the water. Low ammonia concentrations will favor the formation of free chlorine, while medium to high ammonia concentrations will favor the formation of monochloramine and dichloramine. Furthermore, ammonia concentrations in secondary effluent are often highly variable due to diurnal loadings and the influence of return streams, which can cause regular cycling of chlorine speciation at the point of chlorine addition (This effect is demonstrated at the Tres Rios WRF, a 50 mgd plant where **Jennifer Phillips** and **Larry Schimmoller** evaluated disinfection performance as presented in **EXHIBIT 2-23**).

NDMA and Brominated THM Management and Minimization. We have examined the water quality data from the Tapia WRF, which suggests that your plant may be experiencing similar chlorine speciation cycling caused by diurnal ammonia variations. As shown in **EXHIBIT 2-24**, the chlorine concentration in the finished water was highly sporadic during January 2019 and exhibited a pattern suggesting influence by variable ammonia concentrations that led to chlorine speciation cycling. This cyclical formation of different chlorine species will lead to the formation of NDMA when chloramines are present, and BDCM and DBCM when free chlorine is present. In addition, this condition can result in excessive chemical use and inefficient disinfection.

This issue must be addressed prior to implementation of the Pure Water Project. The use of preformed monochloramine for disinfection is one possible solution because it limits the formation of these DBPs while providing a stable residual needed for disinfection. Preformed monochloramine is a chemical solution that is 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 the 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 and BDCM/DBCM, respectively.

EXHIBIT 2-23. DURNAL CHANGES IS SECONDARY EFFLUENT

As an example, diurnal changes in secondary effluent ammonia concentration at the Tres Rios WRF (Tucson, Arizona) resulted in regular cycling between chloramine and free chlorine residuals as shown by changes in measured ORP.

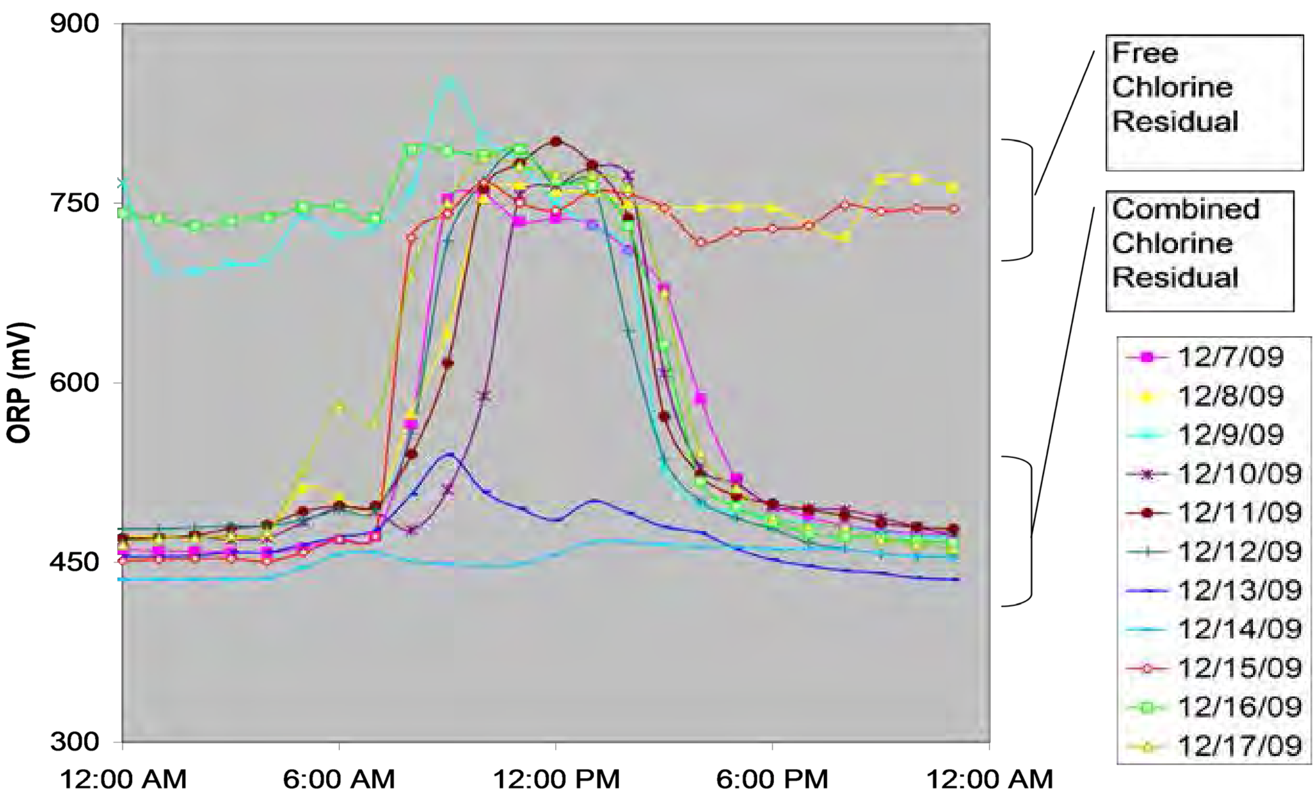
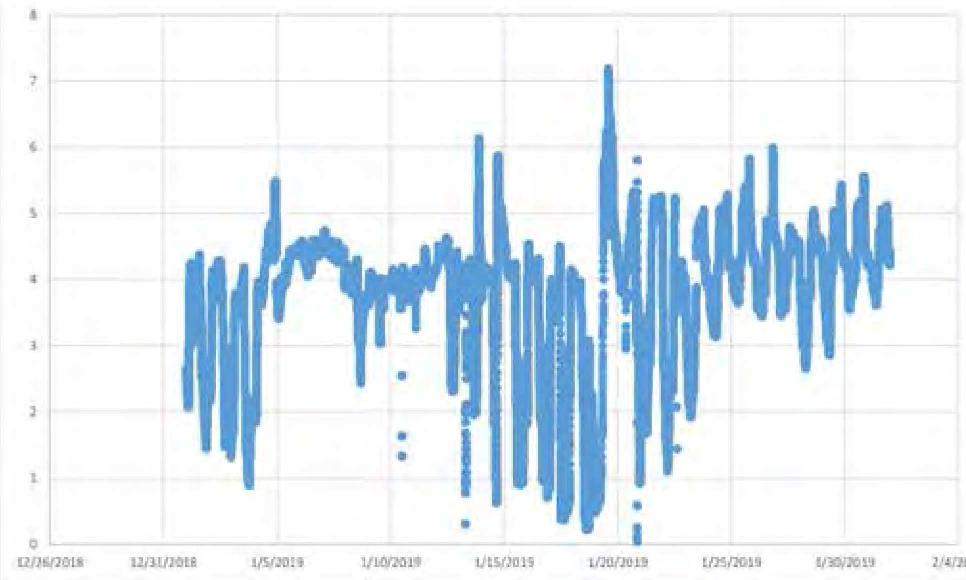


EXHIBIT 2-24. CHLORINE CONCENTRATIONS IN TAPIA WRF EFFLUENT (JAN 2019)

Rapid changes in the finished water chlorine concentration at the Tapia WRF suggest chlorine species cycling caused by variable ammonia.



We have successfully applied preformed monochloramines to limit DBP formation to very low levels for multiple utilities including for the Hampton Roads Sanitation District's SWIFT potable reuse project in Virginia, Clean Water Services' Rock Creek WWTF in Oregon, and the Luggage Point AWTF in Brisbane, Australia (**EXHIBIT 2-25**). Through delivery of these projects we have learned numerous factors important to the design and operation of preformed monochloramine systems that we are excited to apply to your project.

The use of preformed chloramines not only minimizes NDMA formation in the Tapia WRF effluent, but also provides for a chloramine residual in the AWTP influent, which is critical for control of biofouling of the MF and RO membranes. A further benefit is an enhancement to the recycled water system residual and reliability of non-potable reuse service.

Enhanced Source Control is important to the implementation of potable reuse projects: Proper characterization of the sewershed to identify and control the discharge of potentially hazardous chemicals that may be difficult to treat is essential to the success of potable reuse projects. Industrial and commercial discharges often contain the most recalcitrant chemicals, whereas domestic discharges are typically easier to treat. Fortunately, Tapia's sewershed consists mostly of domestic discharges with only three documented industrial users according to Tapia WRF pretreatment reports (Nanofilm, Calabasas Landfill and Rantec Microwave and Electronics).

EXHIBIT 2-26: Focused water quality sampling at the Tapia WRF, and possibly at the industrial discharges, may be necessary to identify constituents requiring special treatment and/or user permit modification to allow safe production or potable water. We are experts in source control and clearly understand how to properly develop an effective Enhanced Source Control Program with the JPA in a cost-effective manner.

EXHIBIT 2-25. DBP FORMATION USING PREFORMED MONOCHLORAMINE

Excellent disinfection and control of DBPs to very low levels was achieved by a preformed monochloramine system that we implemented at Clean Water Services' Rock Creek WWTF

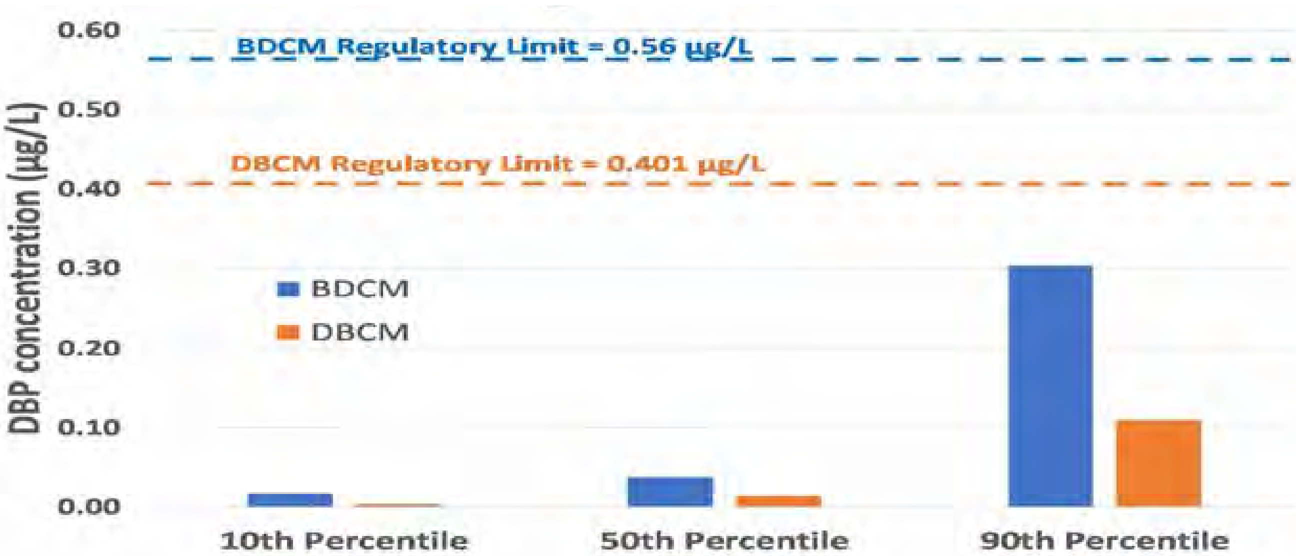


EXHIBIT 2-26. WATER QUALITY SAMPLING AT TAPIA WRF

Focused water quality sampling at the Tapia WRF, and possibly at the industrial discharges, may be necessary to identify constituents requiring special treatment and/or user permit modification to allow safe production of potable water. We are experts in source control and clearly understand how to properly develop an effective Enhanced Source Control Program with the JPA in a cost-effective manner.

We are the Principal Investigator (PI) or Co-PI on several Water Research Foundation research projects specifically targeting source control for potable reuse, including:
• WRF-4960: Review of Industrial Contaminants Associated with Water Quality or Adverse Performance Impacts for Potable Reuse Treatment
• WRF-4771: Characterizing and Controlling Organics in Direct Potable Reuse Projects
• WRF-4971: Leveraging the Role of Pretreatment Programs in One Water Initiatives: Synthesis of Best Practices and Path Forward

Task 4D2 - Chlorine Speciation and Disinfection Byproduct and NDMA Control

As shown in **EXHIBIT 2-27**, on the following page, effective control and minimization of NDMA in the purified water starts at the Tapia WRF and finishes with design of the reservoir diffuser and mixing system. The Jacobs team includes **Dr. Bill Mitch**, an internationally acclaimed expert on NDMA and DBPs, who served on the NWRI Expert Panel that evaluated mixing and water quality issues associated with augmentation of Las Virgenes Reservoir. **Dr. Mitch** and our water quality team evaluated options for UVAOP and for chlorine residuals in the pipeline to Las Virgenes Reservoir to limit the formation of NDMA, BDCM, and DBCM, which, as discussed earlier, may all be regulated by the Regional Board at very low concentrations in your discharge to Las Virgenes Reservoir. Two chemical oxidants are available for addition at the UV reactors to create an advanced oxidation process: chlorine (UV/HOCl) and hydrogen peroxide (UV/H2O2). Both systems have been approved by DDW in other potable reuse applications and will provide effective disinfection and oxidation of chemicals, but specific circumstances for your project will influence which approach is best (**EXHIBIT 2-28,** on page 2-30).

The type of chlorine species that is maintained in the pipeline to Las Virgenes Reservoir may also significantly impact formation of DBPs prior to discharge, and ultimately compliance with CTR compliance. **EXHIBIT 2-29** presents three possible pipeline disinfection options and considerations associated with each. Bench testing of these options should be considered to determine DBP formation and disinfection efficacy to assess CTR compliance, and the assumed pathogen log reduction credits associated with AWT (i.e., 5-log virus) for the various scenarios. Dr. Mitch's lab at Stanford can conduct this testing if it is agreed that it necessary.

HIGHLIGHTS
OF CHLORINE SPECIATION AND DPB AND NDMA CONTROL

- Objective is to apply most feasible DBP and NDMA control strategies throughout all treatment and conveyance systems.
- An array of options for managing DBP formation that can be validated at Demonstration Plant and Stanford University.
- Comprehensive strategy for successful NDMA control, which begins at Tapia WRF.
- Pre-formed monochloramine at Tapia WRF could be a successful and feasible NDMA control strategy.
- Post-AWTP onsite disinfection/dechlorination could provide multiple benefits.

An onsite chlorine disinfection contactor and quenching system would eliminate the operational complexity of siting a dechlorination system and additional residual monitoring at the reservoir, simplify discharge of off-spec water where it could be routed to an on-site sewer system or to the head of the treatment process, and would limit the opportunity for THM formation in the conveyance pipeline.

Maintaining a chlorine residual is necessary at various points within your proposed potable reuse system to achieve disinfection and treatment goals at both Tapia WRF, the AWTP and during purified water conveyance. However, careful consideration and control of the specific chlorine species used at different points in the overall treatment scheme (i.e, free chlorine, chloramines) is necessary to limit formation of undesirable DBPs. Balancing these requirements could be achieved by the following tactics:

- **Tapia WRF:** Dose pre-formed monochloramine to the tertiary effluent for Title 22 recycled water disinfection requirements, and biogrowth and DBP control in the conveyance pipeline to the AWT Facility.

Strategy for Minimizing NDMA and other Disinfection Byproducts in Purified Water

A wide variety of synthetic organic compounds can be present in tertiary effluent originating from discharges from industrial and medical facilities and from human ingestion and excretion. When designed and operated properly, the RO and UV-AOP processes within FAT provide a high level of removal of these compounds and minimize their presence in the purified water.

DDW has put in place two regulations for the design of UV-AOP to address removal of trace organics that persist through RO. These include:

- 0.5-log removal of 1,4-dioxane
- Maximum UV-AOP effluent NDMA concentration of 10 ng/L

These regulations can readily be achieved through proper design of the UV-AOP system. However, the RWQCB may impose requirements to control specific CTR-regulated compounds in the purified water. These include the following:

- NDMA - limit of 0.69 ng/L
- Bromodichloromethane (BDCM) - limit of 0.56 µg/L
- Dibromochloromethane (DBCM) - limit of 0.41 µg/L

Achieving these limits with FAT alone could be very challenging given their very low limits and, when combined with the planned use of free chlorine for UV-AOP, and for purified water disinfection and conveyance (to Las Virgenes Reservoir). Our team has given considerable thought to this challenge and have developed a comprehensive and multi-tiered approach to compliance attainment, illustrated below.

EXHIBIT 2-27. NDMA STRATEGY

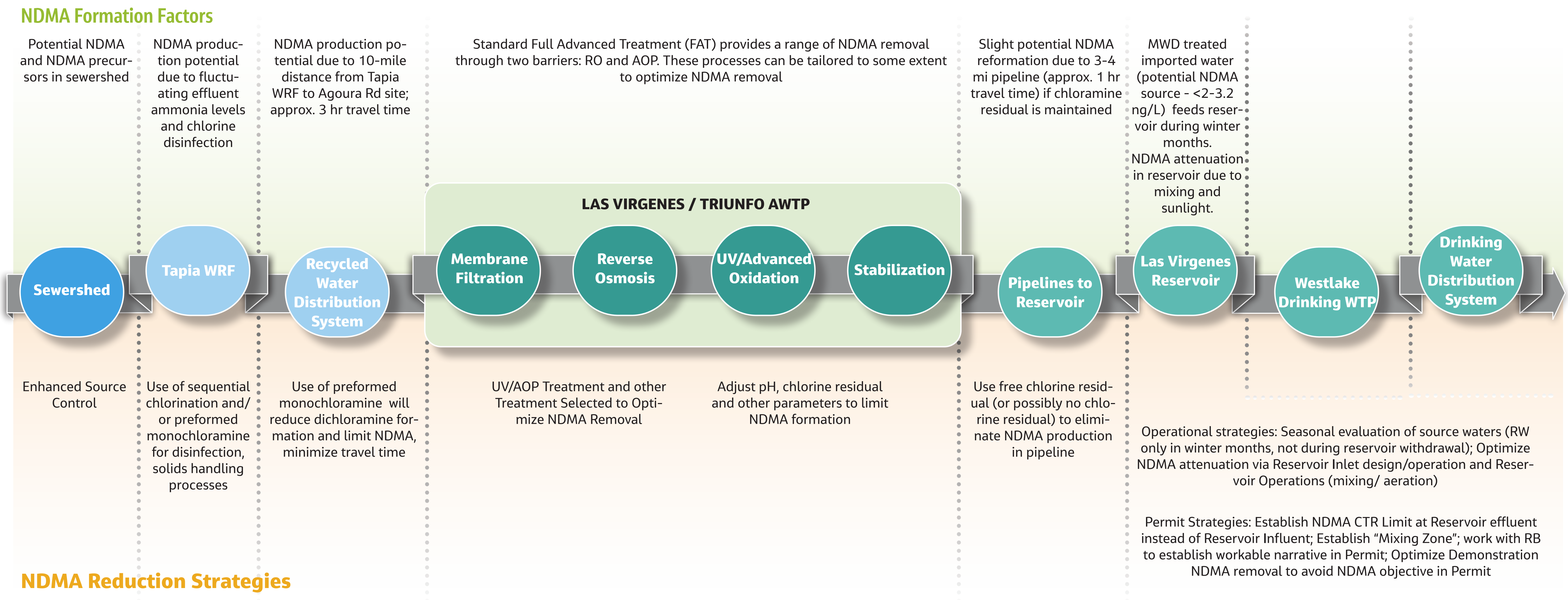


EXHIBIT 2-28. OXIDANT OPTIONS FOR UV/AOP OPTIONS

UV/HOCl	UV/H2O2
▪ Utilizes chemicals already available (sodium hypochlorite) to create advanced oxidation process, thereby eliminating the need for hydrogen peroxide. ▪ More efficiently oxidizes chemicals because of low pH condition post RP. ▪ Effluent NDMA concentration may be higher due to complex breakpoint chlorination reactions occurring in UV reactor.	▪ Requires storage and feed of a chemical not used for other purposes (hydrogen peroxide). ▪ Requires quenching of residual hydrogen peroxide prior to pumping to Las Virgenes Reservoir. ▪ Better control of NDMA compared to UV/HOCl at equivalent UV dose.

EXHIBIT 2-29. PIPELINE DISINFECTION OPTIONS

FREE CHLORINE IN PIPELINE	MONOCHLORAMINE IN PIPELINE	NO RESIDUAL IN PIPELINE
▪ Avoids NDMA formation, but may result in some BDCM and DBCM formation, which could be addressed with GAC post treatment. ▪ GAC post treatment would also provide dechlorination, which will be necessary prior to discharge to the reservoir.	▪ Minimizes BDCM and DBCM formation, but some NDMA may form which might require UV post treatment. ▪ Dechlorination required prior to discharge.	▪ No additional NDMA or THM formation. ▪ Pipe might accumulate biogrowth, but might be able to address with periodic flushing and superchlorination of pipeline. ▪ Free chlorination at the AWT site (as opposed to in the pipeline) will be required for virus inactivation.*

* An onsite chlorine disinfection contactor and quenching system would eliminate the operational complexity of siting a dechlorination system and additional residual monitoring at the reservoir, simplify discharge of off-spec water where it could be routed to an on-site sewer system or to the head of the treatment process, and would limit the opportunity for THM formation in the conveyance pipeline.

- **AWTP:** Maintain a monochloramine residual through the MF and RO systems to control biological fouling.
- **UV-AOP Process:** Dose sodium hypochlorite to the RO permeate to generate a free chlorine residual as required for advanced oxidation.
- **Purified Water Conveyance:** Maintain a free chlorine residual in the conveyance pipeline to achieve 5-log virus inactivation prior to dechlorination before the Las Virgenes Reservoir discharge.

As described earlier in the proposal, other chlorine residual management approaches are possible and we would look forward to working with you to develop the best solution for your project.

Task 4D3 – A Natural Treatment System to Address RO Brine Pipeline Scaling

RO treatment results in the production of a continuous flow, high salinity concentrate or brine waste stream. At the target RO recovery stated in the BODR (85%), most minerals present in the RO feed (MF-treated Tapia WRF effluent) will be concentrated between 6 and 6.5 times in the RO brine, resulting in supersaturation of several sparingly soluble minerals.

Jacobs analyzed a sample of Tapia WRF effluent in order to model the RO system and to estimate brine saturation levels of key sparingly soluble minerals present in the effluent. We found that CaCO3, which is also supersaturated based on a Langelier Saturation Index (LSI) of 2.04. Dosing of an anti-scalant to the RO

HIGHLIGHTS OF NATURAL TREATMENT SYSTEM

- Natural systems provide multiple benefits to control scaling by pretreatment of RO concentrate (brine) and offering a natural feature.
- Leveraging direct and local experience in applying these systems – as nearby as Oxnard.
- Natural system can be all natural or a hybrid design depending on the Pure Water Program objectives.

feed water will normally prevent mineral precipitation within the RO system, however, preventing such precipitation once the RO brine is discharged to the brine line is more challenging for two reasons:

- DDW requires that the brine be free discharged to the brine pump station (air break) to allow carbon dioxide to escape from the brine, which causes a pH rise and increases the driving force for precipitation of both calcium carbonate and calcium phosphate. Any periods where the brine is not flowing full in brine line provides an additional driving force for CO_2 evolution.
- The anti-scalant has a limited period of effectiveness. The longer the brine resides in the pipeline the greater the probability the anti-scalant will lose its inhibitory ability.

Minimizing Risks Associated with Brine Line Scaling: The combination of these two factors introduces the risk that scaling of the brine line will occur causing a loss of capacity over time. Such scaling has been experienced by other municipalities that discharge supersaturated RO brine, where this scaling resulted in the shut down of the RO facility in order to clean the line, either through chemical treatment and/or pigging. We have two approaches to prevent or minimize brine line scaling that would be implemented at the AWTP site, as described below. Our team has other innovative approaches to this critical and challenging issue as described in Task 4E

- Brine acidification. Although our research shows that the most supersaturated minerals are $BaSO_4$ and CaF_2, these minerals are present at significantly lower mass concentrations compared to $CaCO_3$ and $Ca_3(PO_4)_2$. As such, the primary scaling potential is from the latter two salts, both of whose saturation levels can be reduced through acidification. **This approach has been demonstrated at the bench scale level to stabilize $CaCO_3$ for up to 24 hours in RO brine produced at the Perris I and Menifee Desalters (Eastern Municipal Water District)**. Our modeling indicates that decreasing the RO feed pH from 7.6 to 6.1 will prevent calcium phosphate supersaturation, but the pH must be further reduced to 5.6 to prevent supersaturation of calcium carbonate. This degree of acidification requires a large dose of sulfuric acid (100 - 140 mg/L) and generates a significant amount of carbon dioxide (100 – 130 mg/L) in the RO permeate that would need to be removed prior to stabilization. As such, brine acidification is not an effective control strategy for addressing the brine pipeline scaling issue for the JPA's Program.
- Brine stabilization using a natural treatment system. A more sustainable approach would be to stabilize the brine through its treatment to reduce the concentration of calcium carbonate and calcium phosphate by co-precipitating both minerals and possibly others (e.g., silica) using a natural treatment system. While the RO brine can be stabilized with an aerated bed approach, the calcium precipitates will accumulate and provisions must be made for collection and disposal. There are two considerations to achieve precipitation while managing precipitates accumulation:
  - » ***Hybrid mechanical and natural design.*** *To facilitate removal ,an open water zone is proposed to allow for sedimentation, access for removal, and enhanced aeration potential. The initial stage receives vigorous aeration; the second stage would provide for constant separation of the precipitates in an engineered clarifier. Supernatant would flow to a wetland for polishing. This process offers the potential for separate operability, optimization of unit processes, and simplified and continuous removal of solids.*
  - » ***All natural design.*** *A passive and more naturalistic version of this concept is modeled after spring boils that occur in California, an hydrogeochemical naturally occurring system that provides a unique wetland-based ecological system. Carbon dioxide is degassed at a rate dependent on flow turbulence and the surface area exposure of water to the atmosphere (Keppel et al. 2018). This approach to introducing water into a constructed wetland system offers an attractive ecological feature for public use and educational purposes. The accumulation of calcite peripheral to the spring boil would require periodic maintenance and removal. As an example,* ***EXHIBIT 2-30*** *provides a view of the demonstration wetland integrated into the grounds of the Advanced Water Purification Facility operated by the City of Oxnard.*

Task 4E Major Pipeline Alignment Study

The JPA Pure Water Program's conveyance infrastructure carries source water to the AWTP; purified water conveyance to Las Virgenes Reservoir; residuals to the sanitary sewer; and RO concentrate to the Calleguas MWD Salt Management Pipeline (SMP). Although construction and operational issues need to be navigated for each of these conveyance systems, the conveyance and management of RO concentrate pose unique challenges.

Brine Management Pipeline: At the outset of the Pure Water initiative, a variety of RO brine management options were considered, culminating in the decision to send the brine to Calleguas MWD's SMP. The original alignment identified in the 2015 BODR is illustrated in **EXHIBIT 2-31** on page 2-33.

EXHIBIT 2-30. CITY OF OXNARD'S ADVANCED WATER PURIFICATION FACILITY.

Alignment Selection and Optimization: We will use a streamlined evaluation process (**FIGURE 2-32**, on page 2-34) that eliminates unnecessary alternatives analysis for each major pipeline system. Step 1 will consist of an initial screening (using coarse screening criteria selected jointly with the JPA) to identify the two or three alignment options for each pipeline system, for each of the two AWTP sites. Step 2 involve a detailed evaluation of the remaining alignment options to identify a recommended alignment for each AWTP site. The final step will define the recommended alignment for each pipeline system for both AWTP sites to a preliminary engineering (10-percent level of detail) to support CEQA, regulatory permitting, funding, and delivery. If needed, design development beyond 10-percent would be performed during Phase 2 of the JPA Pure Water Program.

Preliminary studies have assumed a 3-stage 85% RO recovery yielding 1.1 mgd of concentrate. Brine minimization strategies, which would further exacerbate conveyance challenges, have been considered and will be tested at the Demonstration Facility. Although the original Pure Water concept was to operate the AWTP approximately 50 percent of the time during the summer, the JPA desires to augment sources to support steady-state year-round operation. As described earlier in this section, two supplemental sources being considered originate in the City of Thousand Oaks: brackish groundwater and effluent generated by the Hill Canyon Treatment Plant. Should these supplemental sources be secured, a logical conveyance corridor to the AWTP would be the brine conveyance alignment, adding another variable in the brine pipeline alignment analysis.

HIGHLIGHTS OF PIPELINE ALIGNMENT

- Staged alignment analysis (coarse screening, alternatives evaluation).
- Detailed analysis of recommended alignment) to manage level of effort (time and budget).
- Identification of alignments that leverage partnerships and offer multiple benefits to attract outside funding.
- Pipeline design features that enhance operational resiliency.

Two brine pipeline alignments were presented in the Title XVI Feasibility Study, Title XVI Alignment, and Moorpark Avenue Alignment. As an illustration of our approach to identifying the optimum alignment, our team has identified additional preliminary alignments. **EXHIBIT 2-33**, on the next page, illustrates the use of some key evaluation criteria to assess preliminary alternative alignments.

Strategies to Enhance Brine Management Resiliency: Brine conveyance challenges (scaling) and conditioning ideas were presented earlier in this section. Our team also brings a variety of design and operational techniques to address this challenge (pipe material, operational modifications, regular maintenance) and will leverage the Pure Water project setting and apply proven design/operational practices to provide a resilient brine management strategy.

- **Pipeline Design Considerations – Material:** For brine conveyance, High Density Polyethylene (HDPE) pipe and fusible Polyvinyl Chloride (PVC) pipe are corrosion resistant and can be designed to withstand pressurized flow. These and similar pipe materials will be evaluated to determine the most suitable to meet the design parameters of the brine conveyance system.
- **Residence Time/Velocity:** When velocities within a pipeline are low, precipitation of solids and minerals tends to occur. During the design of the brine conveyance system, pipe diameters that will maintain a velocity between 5 to 7 ft per second and fulfill the design capacity will be

EXHIBIT 2-31. ORIGINAL ALIGNMENTS FROM 2015 BODR AND ALTERNATIVE ALIGNMENTS

Original alignment, alternative alignments, and location of TO brackish wells and Hill Canyon Treatment Plant.

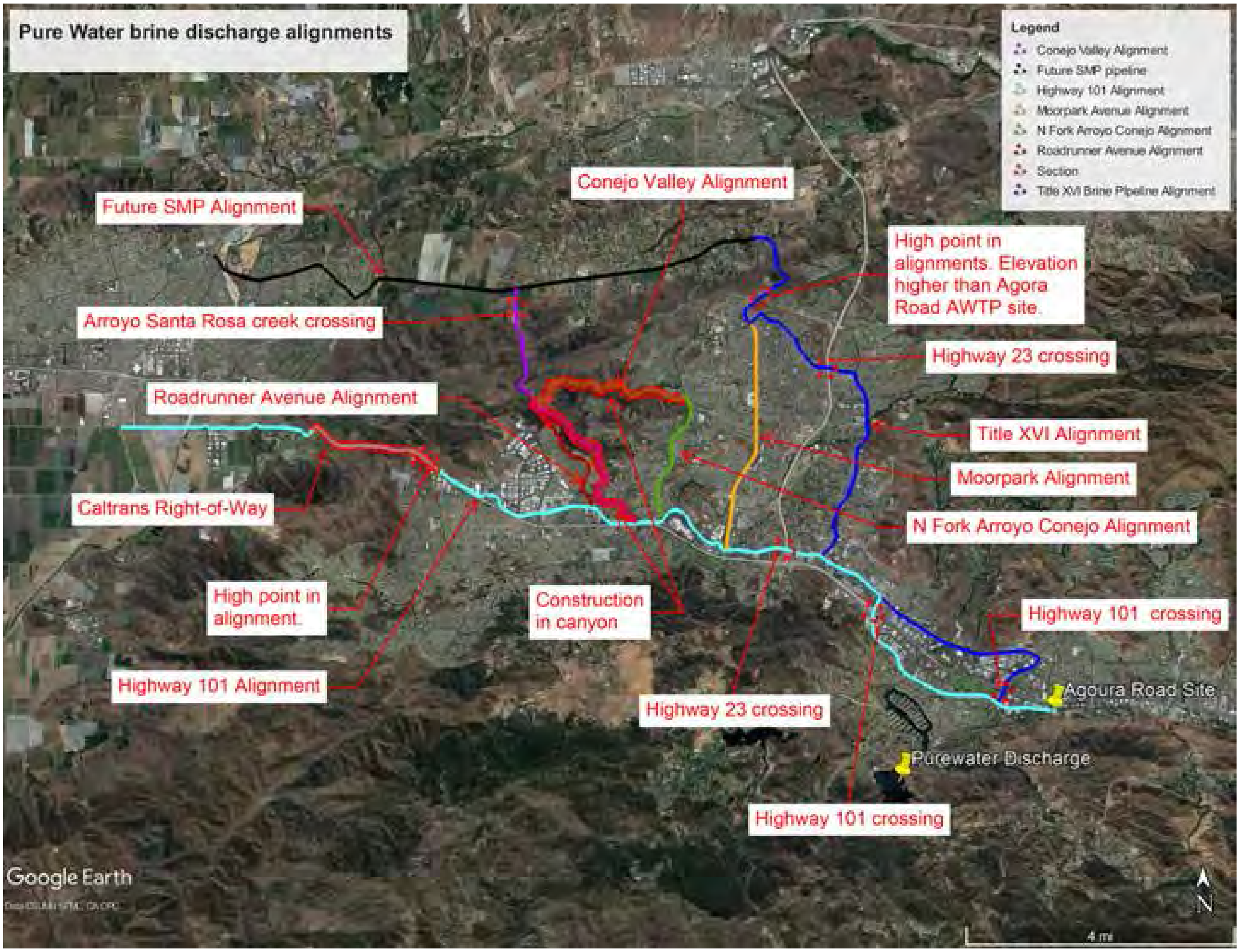
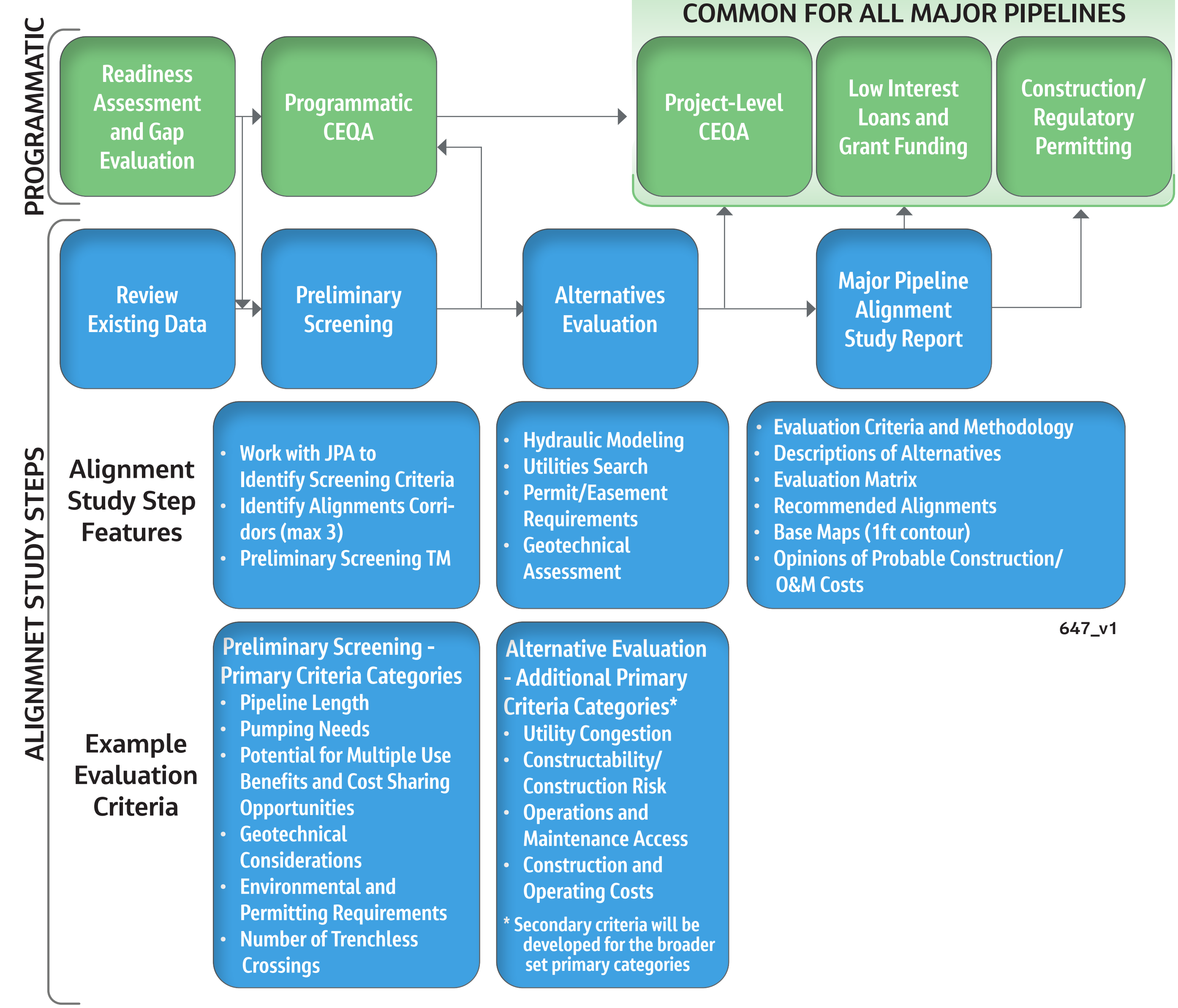


EXHIBIT 2-33. ALTERNATIVE ALIGNMENT CRITERIA

CRITERIA	PRIOR TITLE XVI FEASIBILITY STUDY: Title XVI Feasibility Study	PRIOR TITLE XVI FEASIBILITY STUDY: Moorpark Avenue	JACOBS TEAM CONCEPT: N Fork Arroyo Conejo	JACOBS TEAM CONCEPT: Conejo Valley Alignment	JACOBS TEAM CONCEPT: Roadrunner Avenue	JACOBS TEAM CONCEPT: Hwy 101
Alignment Length (Miles)	12.5	12.4	14.0	12.5	12.8	16.5
Avoids Pumping		■	■	■	■	■
Proximate to Supplemental TO Sources			■	■	■	
Reduces Calleguas SMP Extension 3.5 Miles			■	■	■	■
Avoids Canyon Construction	■	■			■	■
Avoids Caltrans Longitudinal Encroachment	■	■	■	■	■	

EXHIBIT 2-32. PIPELINE ALIGNMENT SELECTION PROCESS



evaluated. Lower velocities could potentially meet retention time criteria, and would also reduce costs. The conveyance, treatment, and regulatory teams will dialog to be sure key criteria are met, and permitting and operational performance are not compromised.

- **Dual direction operation (concept of adding supplemental sources/rotating pipe use):** Should supplemental sources from Thousand Oaks be incorporated into the Pure Water Program and the conveyance pipeline be constructed along with the brine pipeline in a common trench, a potential technique to help manage scaling would be to alternate the flow and direction in each pipe, with a given pipe rotating between brine and AWTP augmentation flow. Depending on the water quality attributes of the augmentation flows, minerals that precipitated out of the brine could potentially be dissolve, reducing maintenance needs for the pipeline. A representation of this multiple pipe configuration is shown in **EXHIBIT 2-34**.

The brine and AWTP augmentation flows would alternate between pipes at defined time intervals (e.g. seasonally). A third pipe adds operational flexibility by supplementing augmentation flow capacity or to serve as a dry backup until flows are rotated. Clean outs would also be provided at strategic locations to allow for pigging, or other cleaning methods. When switching pipeline use from brine disposal (to the SMP) to conveyance of augmented effluent to the AWTP, the line would first be flushed using either AWTP feedwater or MF filtrate before introduction of effluent from the Hill Canyon Treatment Plant.

Product Water Conveyance to Las Virgenes Reservoir: Optimizing the AWTP product water pipeline alignment from the Agoura Road site to Las Virgenes Reservoir consists of navigating two key elements, the storm channel crossings com-

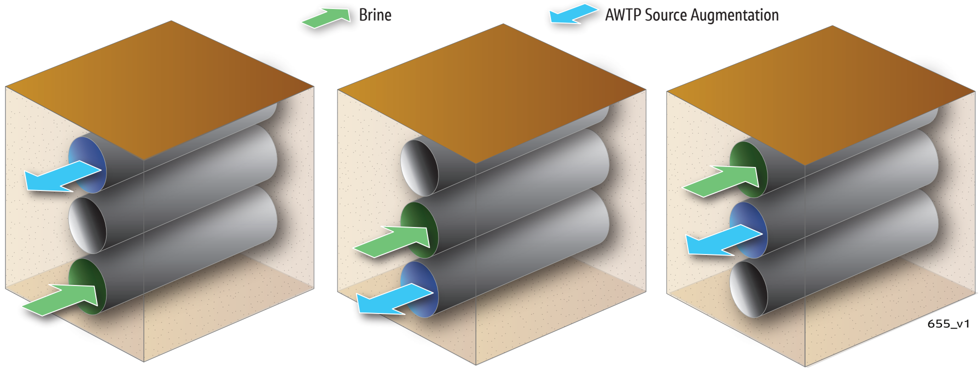


EXHIBIT 2-34 DUAL DIRECTION OPERATION

Brine pipeline alignment/rotation supports AWTP source augmentation and potential scaling mitigations.

mon to any alignment, and the environmental/constructability issues associated with Triunfo Canyon. Discussed below are two strategies to consider; the first avoids Triunfo Creek Storm Channel Crossings; and the second navigates Triunfo Canyon **EXHIBIT 2-35**).

- **Strategy to Avoid Triunfo Creek Storm Channel Crossings:** The Product Water pipeline would travel westerly in Agoura Road from the AWTP to Lindero Canyon Road where the alignment would turn in a southerly direction. This baseline alignment encounters two major Triunfo Creek storm channel crossings (including a 40-ft trapezoidal channel); Lindero Road/Agoura Road intersection and the downstream box channel crossing under Lindero Canyon Road. One option our team will explore to avoid these channel crossings and roughly 1 mile of construction in Lindero Canyon Road would be to construct the pipeline in the LA County Flood Control maintenance road running along Triunfo Creek. Innovative construction techniques, such as illustrated in **EXHIBIT 2-36**, could be used in this construction.

EXHIBIT 2-35

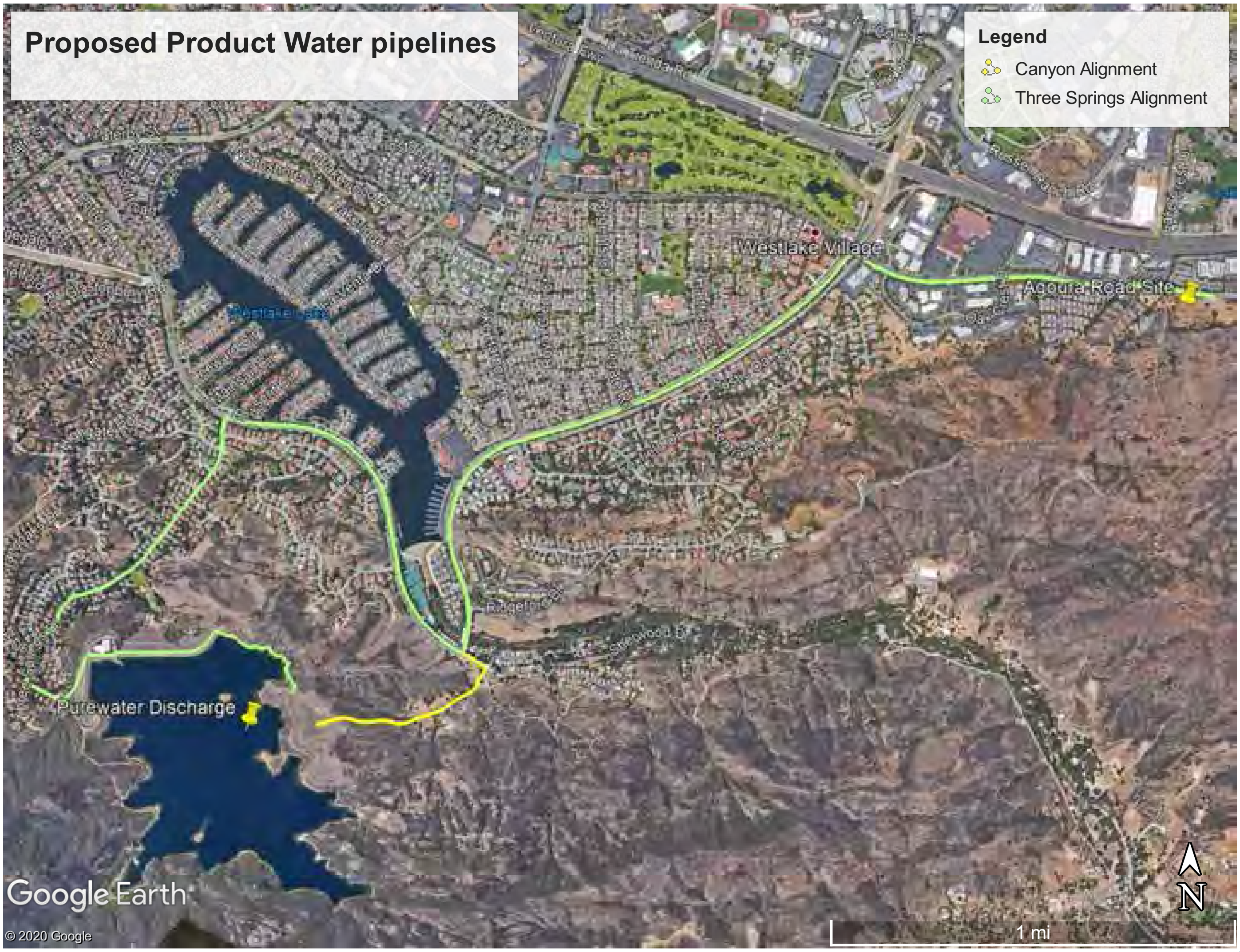
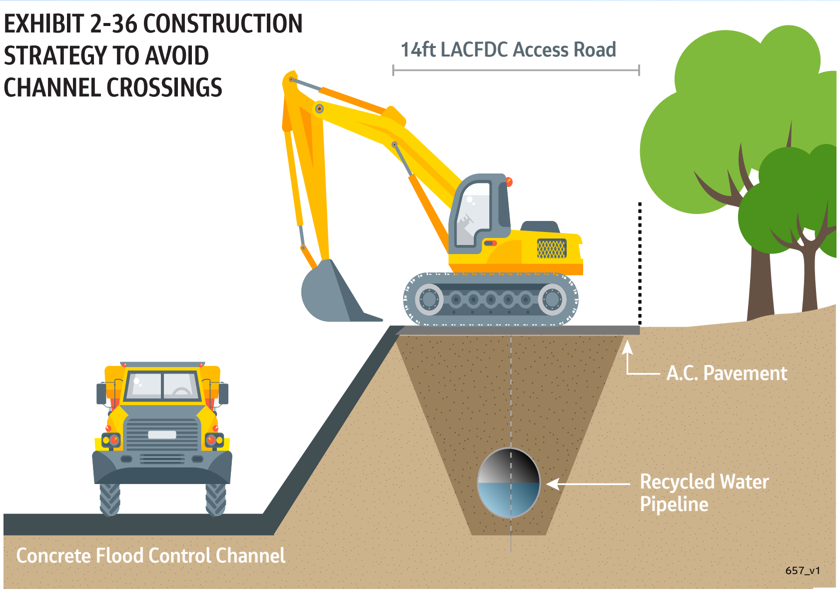


EXHIBIT 2-36 CONSTRUCTION STRATEGY TO AVOID CHANNEL CROSSINGS



- **Navigating Triunfo Canyon:** Although Three Springs Drive provides an alternative alignment to reach Las Virgenes Reservoir, our focus will be construction and mitigation strategies associated with Triunfo Canyon. The geology of the canyon is Conejo Volcanic, a volcanic rock that contains limestone embedded with marine fossils. Installation of a pipeline through this material will be difficult. Trenchless construction would require expensive rock drilling methods. Installation by traditional open cut construction may require the use of a rock trencher, or the pipeline could be installed on the surface following the hiking trail up the canyon. Of the three installation methods, trenchless construction will have the highest unit cost, followed by open cut installation. Installation of the pipeline on the surface would have the lowest unit cost, but the pipeline would be exposed to the elements and potential vandalism.

Our team recognizes that constructing a pipeline in sensitive open-space areas would involve addressing an array of environmental, aesthetic, and recreational issues. One tactic would be to leverage the 15ft to 25ft wide equipment bench needed for either open cut s or ground surface construction. Building the bench creates additional opportunities, as depicted in **EXHIBIT 2-37**.

2.3.5 TASK 5: ENVIRONMENTAL PLANNING - PATH TO REGULATORY APPROVAL

The Environmental Planning team, led by **John Schoonover**, will focus on an unimpeded environmental process for the Pure Water Program by using a programmatic approach that has been proven successful on other similar programs, such as the San Mateo Clean Water Program. This strategy will accomplish strategic permitting and environmental goals. In this section, we present our recommended approach, which we will refine during the initial Fast Start mobilization effort (described in Task 2A), including preparation of a CEQA Strategy Plan.

Pursuing a Program-Level EIR

Sufficient information is already known about the project to present a holistic view of project impacts, and the Fast Start and Technical Studies efforts will refine the current concepts into a stable project description sufficient for CEQA analysis. CEQA provides a mechanism to analyze a series of related actions even when some future actions are not well defined – a Program EIR. The Program EIR can support a broad consideration of program impacts early in project development, and thus reach an early environmental planning milestone (related paperwork reduction and streamlining benefits are described later).

Because CEQA emphasizes stakeholder and public engagement, the Program EIR is an early stakeholder engagement tool. The Environmental Planning team will collaborate with Katz and Associates and the JPA public outreach team for a coordinated effort that fulfills CEQA scoping requirements. This effort will build on the foundations already established by the JPA to demonstrate the Pure Water Program's public benefits, while providing external parties a structured process to voice their concerns. By focusing on the programmatic concepts in a public forum, adoption of a Program EIR by the JPA Board will be a "win" for the Pure Water Program – a milestone endorsement of the essential program features with mutual understanding by key stakeholders and the public.

EXHIBIT 2-37. LEVERAGING TEMPORARY CONSTRUCTION BENCH INTO PERMANENT RESOURCE

OPPORTUNITY	POTENTIAL FUNDING ATTRACTION
Conversion into Pure Water Discharge Facilities access roadway (provides chemical delivery, O&M access)	■
Conversion into an improved double track hiking trail (provides O&M access)	■
Support local fire departments in fire suppression access	■

HIGHLIGHTS OF ENVIRONMENTAL PLANNING

- PEIR approach allows getting "in-line" earlier for funding opportunities.
- Addresses important Water Code Section 1211 – Wastewater Change Discharge petition.
- CEQA "Plus" strategy allows feasible and fast compliance with federal level needs.
- PEIR "checks the box" for project level elements and minimizes CEQA supplemental needs for all other aspects.

This milestone serves a critical strategic function – opening the door for funding opportunities. Completion of a Program EIR will signal to the funding agencies (e.g., SRF, WIFIA, LRP) that the Pure Water Program is viable and ready for serious funding consideration. We expect to use the Program EIR as an essential step in adding the Pure Water Program to the "fundable" list with federal funding sources, and is the key environmental step needed for application to the MWD Local Resources Program. Of course, the federal funding programs come with added environmental review process steps, primarily to satisfy biological and cultural resource consultation processes. Balancing the level of program development – e.g., an exact pipeline route – with the need to prepare protocol-level field work is addressed below and will be an important decision-making consideration in our CEQA Strategy Plan.

Addressing Wastewater Change Petition - Water Code Section 1211: When water reuse projects decrease the amount of water in an inland waterway, the owner of the wastewater treatment plant needs to file a wastewater change petition with the State Water Resources Control Board – Division of Water Rights prior to changing the point of discharge, place of use and/or purpose of use. In order to expedite the petition process, during the Program EIR preparation, input should be solicited from SWRCB as a responsible agency in the CEQA process, as the CEQA documentation needs to include an evaluation of any impacts of reduced flows in Malibu Creek. The Tapia WRF NPDES permit for discharges to Malibu Creek includes a minimum stream flow requirement. It is assumed that the work completed previously to support this minimum flow requirement will be sufficient documentation for use in the Program EIR. The team will coordinate with SWRCB-DWR, CDFW, NMFS, and USFWS during the CEQA process to ensure that the existing documentation is sufficient and will incorporate any additional analyses into the Program EIR.

Impact Assessment: The Program EIR is the core of our Environmental Team's Phase 1 scope. The discussion above focuses on a process approach, but success depends upon substance – how well the Program EIR presents a stable project description and substantial evidence (to use CEQA legalistic jargon) appropriate for programmatic review. With the long list of topics that could be discussed in a Program EIR, we must know where to focus our efforts. The Environmental Planning team recommends three focus areas: (1) discharges, (2) federal consultation, and (3) construction disruptions.

- **Discharges:** Discharge requirements are an important driver of the need for and purpose of the Pure Water Program. The Program EIR must focus on all aspects of the discharge issues in order to present substantial evidence for the water quality impact analysis. Primarily, this applies to the point source discharges:
  - ***Malibu Creek*** *– instream flow and water quality requirements and our ability to maintain the important, negotiated standards included in the Tapia WRF NPDES permit and assure stakeholders that the key metrics will be met*
  - ***Las Virgenes Reservoir*** *– meeting regulatory standards for Reservoir Water Augmentation and communicating to a concerned public that these "new" standards have been properly vetted and scientifically accepted*
  - ***Discharge Point 005*** *– assurances that discharges to the Los Angeles River basin (either at Discharge Point 005 or a new discharge point) will be consistent with the Basin Plan and acceptable to the RWQCB*
  - ***Brine Line*** *– assurances that discharges to the brine line will be acceptable to the RWQCB and not jeopardize the Calleguas Salinity Management Pipeline NPDES permit*

Based on our recent successes and our proven approach described in Task 4, we are uniquely qualified to support the JPA. For the Program EIR, the Environmental Planning team will collaborate with Woodard & Curran to translate the technical analysis in a manner appropriate for a CEQA document. Will water quality impacts be "significant" under CEQA? We expect the answer to that question to be found by (1) following the mandates established by the various regulatory standards, and (2) using the technical analysis as substantial evidence for regulatory compliance. We do not want to make any pre-decisional statements, but we intend that our work will demonstrate a clear, defensible answer to the CEQA significance question.

These concepts will be further developed in the CEQA Strategy Plan with an eye toward future RWQCB and DDW permit approval as well as acceptable CEQA analysis. Section 2.5 presents a concept schedule for how the design, environmental, and regulatory processes work together to produce the desired end-game result: RWQCB and DDW permits to construct and operate the Pure Water Program.

Coordinating the EIR Efforts with Funding Requirements

The Program EIR as an essential step in adding the Pure Water Program to the federal (and federal look-alike) WIFIA and SRF funding lists, but securing federal funding comes with added environmental review process steps. Balancing the level of program development – e.g., an exact pipeline route – with the need to prepare protocol-level field work will be an important decision-making consideration in our CEQA Strategy Plan. Our approach is based on our experience with the "CEQA Plus" processes used by the State Revolving Fund program, including what they call "cross-cutter" federal environmental coordination obligations, but equally applies to similar programs like WIFIA. The State Revolving Fund (SRF) Environmental Package requires that we demonstrate compliance with 20 cross-cutter regulations, and two of these processes are critical success factors: the federal Endangered Species Act and the federal National Historic Preservation Act.

Federal Endangered Species Act: The JPA has been dealing with the endangered species issues for many years, primarily associated with Malibu Creek discharges and related impacts to steelhead (National Marine Fisheries Service and California Department of Fish and Wildlife) and tidewater goby (U.S. Fish and Wildlife Service). Based on the technical analysis and continued commitment to meeting Malibu Creek NPDES discharge requirements, we do not expect new or worsened impacts but the SRF program (along with many stakeholders) will require assurances. Additionally, there are other types of impacts that must be considered and evaluated in detail, such as construction disturbances on special-status species, such as California gnatcatcher. That detailed evaluation will require field review including following acceptable protocols to determine presence or absence of the target species. Following these protocols – to the extent possible based on project definition – will be important for successfully completing the funding process.

Federal National Historic Preservation Act: Cultural resource concerns may be a new topic for the JPA, but it will be important to the funding agencies. The National Historic Preservation Act requires consideration of potential impacts to archaeological and historical resources – including unknown resources, such as buried sites which have a high potential to occur within the project area. Part of this work can be performed by searching existing records but, like biological resources, field surveys following acceptable protocols will be required. The SRF technical reviewers will require a rigorous evaluation prepared by qualified subject matter experts.

As part of cultural resources process, and as required by new California law, proactive outreach following strict protocols will be required for a new stakeholder category – Native American tribes. California's new AB 52 law requires consideration of tribal cultural resources in all CEQA documents and provides broad authority for tribal participation and review. The Environmental Planning team will collaborate with the JPA and Katz & Associates to ensure that this stakeholder category is not overlooked.

Minimizing Construction Phase Disruptions

So far, we have talked about advanced environmental topics including those with a long history (Malibu Creek), new regulatory standards (Reservoir Water Augmentation), and complex review "black boxes" (CEQA Plus). However, we must also focus our attention on the highly local and potentially disruptive effects of construction activities on nearby residents. We will be constructing the AWTP adjacent to the Lexington Agoura Hills apartment complex, installing major pipelines along arterial roads in Woodland Hills and within the Triunfo Canyon area, and developing other project features with long-term benefits, but potentially short-term adverse environmental effects that must be addressed. These issues can "blow up" late in the process if not addressed early.

The Environmental Planning team recommends an approach that features 1) working closely with the design team to tease out potentially disruptive activities (e.g., pile driving) during the Task 2.32 Fast Start review; 2) working closely with the JPA and Katz & Associates to discuss potential disruptions during stakeholder outreach (especially CEQA scoping activities), and 3) invest in appropriate technical analysis for the Program EIR. In terms of technical analysis, attention is recommended in the following areas:

- **Traffic.** The Environmental Planning team will reach out to the local cities to understand any designated haul routes, access local traffic models and up-to-date traffic data, and consider how construction could result in using "sneak streets" through residential areas to avoid active job sites.
- **Noise.** The potential for noise to be disruptive is mostly associated with the AWTP and the adjacent residences. For this topic, we recommend taking baseline noise measurements at the apartment complex and modeling potential noise impacts based on anticipated construction methods taking into account the elevation differences.
- **Air Quality.** Dust generated by construction activities is a basic topic that is easily addressed; however, we recommend investing time in developing dust control BMPs that exceed minimum AQMD standards. An example is adopting a Mitigation Measure for additional site watering based on real-time monitoring. Analysis of air pollution impacts is important to demonstrate that the AWTP, air relief valves, etc., will not be new sources of odor.

CEQA Streamlining in Phase 2

The approach so far is focused on the immediate tasks in Phase 1 – the process and substantive considerations required for successful adoption of a Program EIR. However, we have an eye on the future paperwork reduction and streamlining benefits that can be achieved through proper framing of the project in the Program EIR. A simple way to think about this is to decide what project features will be developed at a sufficient level of detail to be covered at a project level in the Program EIR, and thus not requiring additional CEQA review. This is a good starting point.

CEQA requires an accurate, stable, and finite project description, which in our experience is usually developed well enough at the pre-design level (approximately a 10-percent level of development). **EXHIBIT 2-38** presents out team's initial estimate of those features we expect to cover at a project level, and those that may be limited to programmatic review only. As part of the Task 2.3.2 Fast Start effort, the Environmental Planning team will fully engage with the design team to confirm these assumptions and ask hard questions about the project features (e.g., will construction require pile driving). Our CEQA Strategy Plan will confirm our collective understanding of which program features can be evaluated at a project level. It is expected that those features will require little or no further CEQA review.

Although this program-versus-project distinction is helpful, a deeper look at CEQA and recent case law supports a more flexible approach to future documentation. For example, the procedures for evaluating the use of a Program EIR for later activities are described in CEQA Guidelines Section 15168. Pursuant to Section 15168(c)(4), a checklist approach may be used for site-specific resource evaluations of projects that were previously identified in the Program EIR but were not sufficiently developed during the Program EIR phase to rule out the necessity of further site-specific analysis. CEQA wants a lead agency to analyze potential impacts, inform the public and decision-makers about these impacts, and establish mitigation measures to demonstrate that impacts can be reduced to less-than-significant based on clear performance standards. If those tests can be met, the Program EIR Checklist approach may be sufficient such that no (or very few) subsequent CEQA documents are needed. This has been the case on our San Mateo Clean Water Program – of the approximately 24 projects not evaluated in detail in the Program EIR, only one has required a Supplemental EIR. In addition, the JPA policy principles will be applied at the Agoura Road site.

2.4 PHASE 2 SERVICES

While Phase 2 services will commence at the completion of the five tasks that comprise Phase 1, throughout Phase 1, our team will be keeping the end in mind, and poising the JPA for implementation phases – design and construction. Once the procurement and delivery models are agreed upon, which will drive the level of design services to be completed in Phase 1, the OA/PgM team will be working with the JPA to begin preparing for Phase 2 services, which would include, but not be limited to:

- Continued OA/PgM Support
- Regulatory Coordination and Permitting
- Design Management
- Construction Management
- Constructability Reviews
- Contractor Review and Selection Assistance
- Operations Commissioning Plan

EXHIBIT 2-38 PEIR APPROACH FOR PROGRAM VS. PROJECT-SPECIFIC EVALUATION UNDER CEQA

PROGRAM LEVEL	PROJECT LEVEL
Brine pipeline alignment	AWTP plant construction at Agoura Road parcel
Miscellaneous water augmentation projects	Tapia WRF upgrades (minor) to accomodate new AWTP
MBR upgrade to Tapia WWTP (major improvements)	Tapia WRF recycled water pipeline extension (within roadway, short distance)
	Existing and future discharge to Malibu creek (quantity, quality, maintianing currently committed seasonal flows for Steelhead)
	Finished water pipeline from AWTP to reservoir, open cut construction, +/-200-foot buffer (100-foot from centerline). Also possible inclusion of tunneling alternative if feasible.

2.5 PROJECT SCHEDULE

The proposed schedule for the Pure Water Program is a multi-year effort, with a target completion date of 2030. Using a programmatic approach, combined with alternative delivery, we anticipate that a 2027 completion is achievable. The program implementation includes several interim milestones and the potential for more than one delivery model. The complexities of the project require that the team envision, and prepare for, the future phases of work to assure a well-integrated plan – making the initial planning phase perhaps the most crucial, as described throughout Section 2. **EXHIBIT 2-39** schedule for the key phases of the project.

2.6 SCOPE OF WORK, KEY ASSUMPTIONS AND DELIVERABLES

EXHIBIT 2-40, on page 2-42, provides a summary of the Pure Water Program scope of work, assumptions and deliverables. A more detailed scope of work is located in Appendix B.

EXHIBIT 2-39 SCHEDULE

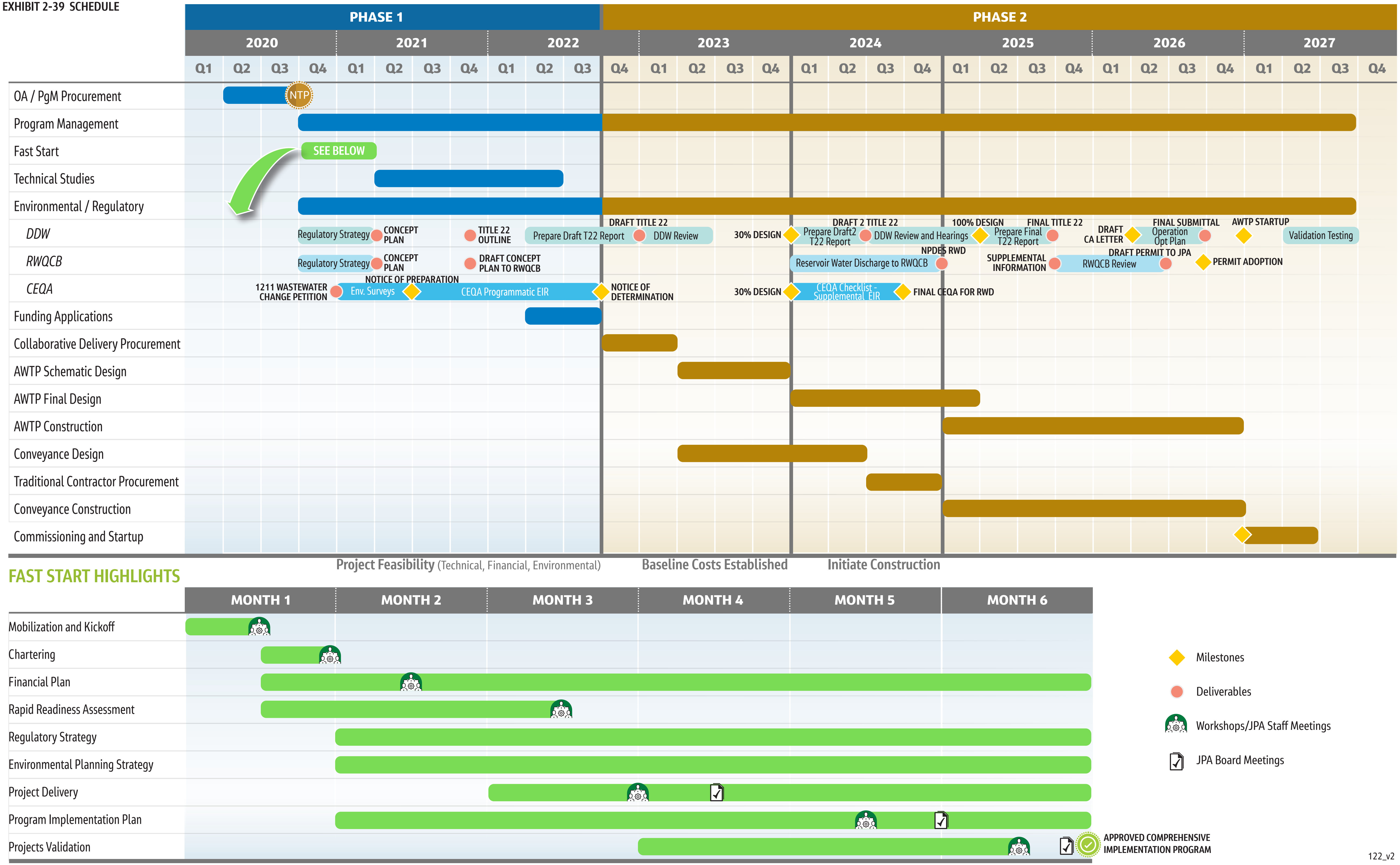


EXHIBIT 2-40 PURE WATER PROGRAM ASSUMPTIONS AND DELIVERABLES

TASK	DESCRIPTION	DELIVERABLES AND ASSUMPTIONS
1. Program Management	Virtual Program Management Office (VPMO)	• Management of the Program • Monthly Progress Reports
	Program Controls and Cost Estimates	• Monthly updates to cost-loaded, Master Baseline Schedule • Development of cost estimates for project alternatives
2. Program Priorities, Drivers, and Risks – Fast Start / Mobilization	Virtual Program Management Office (VPMO)	• Kickoff meeting to map standard policy, procedures, and objectives • Chartering session to clarify vision, mission, values and roles and responsibilities; chartering agreement for signature by team
	Program Management Plan (PMP) & Delivery Performance Tracking Portal	• Draft and final PMP that outlines the overall strategies and approaches used to execute the Program (including management, scope of work, controls, performance monitoring, change management, risk management, quality management, procurement, design management, and construction management, permitting and regulatory compliance) • Program Management Portal to house dashboards, documents, and tools for access by JPA and VPMO • Workshops to review elements and identify critical factors for JPA
	Document Management System	• Document management guidelines and web-based system to manage contract and project related documentation
	Rapid Program Readiness Assessment	• Draft and final TM • Kickoff and final workshops with JPA
	Baseline Cost – Validated Cost Estimates	• Preliminary validation of original cost estimates for project alternatives to develop Baseline Cost to be updated for the lifetime of the Program
	Funding Plan – Affordability Cash Flow Curve, TACT Model – Financial Planning, Risk & Change Management Impacts, and Cash Flow Progress Performance Model & Affordability Curve	• Draft and final plan & cash flow affordability curve • Workshops with JPA TACT baseline model to be updated for lifetime of the Program • Workshop with JPA & Quarterly Economic Summits
	Outreach Plan	• Communications Plan • Workshops with JPA
	Program Controls, Cost Estimating and Scheduling	• Development of cost-loaded, Master Baseline Schedule to be updated for lifetime of the Program • Workshop with JPA
	Program Implementation Plan (PIP)	• Draft and final PIP for overall programmatic project delivery, risk & change management, governance, delivery tools/models, and performance tracking • Workshops with JPA and JPA Board
3. Project Delivery Methodology and Procurement Support	Project Delivery Method Selection	• Draft and final Procurement Strategy TM • Kickoff and final workshops with JPA and JPA Board
	Project Delivery Method Execution Plan (PEP)	• RFQs and/or RFPs
4. Technical Studies, Drawings and Specifications	Perform Tapia WRF Equalization Study	• Draft and final Tapia Flow Equalization TM • Kickoff and development workshops with JPA
	Discharge Capacity to Los Angeles River	• Draft and final Discharge Point 005 Analysis TM • Kickoff and development workshops with JPA
	AWTP Design Criteria Package	• Draft and final Bridging Documents: - AWTP Site Evaluation TM – including survey, geotechnical, and permitting considerations - AWTP Preliminary Design Report for selected site - Collaborative Delivery Specifications - Recycled Water Chlorination Evaluation • Kickoff and development workshops with JPA
	Major Pipeline Alignment Study	• Draft and final report - Hydraulic analysis review TM - Hydraulic calculation spreadsheets for conversion to EPANet model file format - Geotechnical desktop study - Pipeline alignment study TM • Kickoff and development workshops with JPA
5. Environmental Studies and Regulatory Compliance	Environmental and Regulatory Compliance Plan	• Environmental and Regulatory Compliance Strategy Plan (including CEQA, DDW and RWQCB) • Kickoff and final workshops with JPA
	Programmatic Environmental Impact Report	• Environmental Constraints Analysis Memorandum • Draft and final PEIR • JPA Staff Report and presentation to the Board
	Regulatory coordination with DDW and RWQCB and concept approvals	• Submittals to obtain concept approval letters and clarification of regulatory conditions • Administrative Draft Title 22 Engineering Report • Draft Title 22 Engineering Report • Regulatory meetings

At-a-glance…

SECTION 3: Firm Descriptions and History

WE'RE READY TO BRING YOUR VISION TO REALITY

Jacobs' culture of innovation, combined local and global experts, trusted relationships, and strong capacity come together to support JPA and augment your staff to meet the Pure Water Program's objectives and critical success factors.

- **We're not starting at square one:** Our team of technical experts and technology specialists has been brainstorming, ideating, and developing your roadmap — setting the stage for collaborating together to launch these initial ideas.
- **We provide you direct access to local and international thought-leaders**: We offer the JPA industry leadership in water reuse and treatment technology in California and around the globe, which includes extensive relevant experience and precedent-setting regulatory achievements, such as the Pure Water San Diego Program — California's first permitted reservoir water augmentation project.
- **We assembled our strategic advisory team with expertise in key elements of your program:** Their formidable industry reputations and unique insights will enhance the success of the Pure Water Program.
- **We know how to work successfully together**: Our partner team members have worked together and with Las Virgenes Municipal Water District, including holding leadership roles on Pure Water Program related studies.
- **We have proven expertise and accomplishments** in program management, owner's advisor, and design-build delivery models.
- **We provide the depth and breadth of resources** to augment your staff and meet or expedite the Pure Water Program schedule.
- **We have the know-how to successfully support you** in navigating the delivery, legal, funding, regulatory, public, and environmental dimensions of the Pure Water Program.

SECTION 3

FIRM DESCRIPTIONS AND HISTORY

Dedicated to enabling JPA's long-term reliability and watershed leadership through delivery support, local resources, thought leadership, technical expertise, and innovative strategies.

3.1 WE ARE THE TEAM FOR YOU

We are excited to have the opportunity to work with JPA on this visionary program and help move it forward from concept to reality. As your proposed teaming partner, we offer numerous attributes aligned with your style and proven to result in successful program delivery.

- Institutional knowledge—we're not starting at square one
- History, experience, and a solid track record of performance
- A cohesive, complementary team with a history of working together
- Resource capacity and expertise to successfully deliver all aspects of the program

WHAT YOU'LL FIND IN THIS SECTION:

- ✓ Firm's History
- ✓ Firm's Resource Capacity
- ✓ Team's History Working Together
- ✓ Subconsultants (scope and role, qualifications, principals)

3.1.1 WE ARE NOT STARTING AT SQUARE ONE

Our rich 77-year history is grounded in engineering innovation-bringing value for our clients is what drives us. **Our team of technical experts and technology specialists has been brainstorming, ideating, and developing your roadmap to success for many months.** We are not starting at square one. We have enjoyed our workshops with you and the opportunity to exchange ideas—it is this spirit of collaboration and trust you can count on going forward. We understand your program objectives and have developed a path to achieving your critical success factors including:

- A collaborative, engaging and efficient process
- Innovative ideas grounded in proven technology solutions
- Staff augmentation and knowledge sharing
- Successful financing
- Timely regulatory approvals
- Cost certainty and savings
- Stakeholder and community benefit

We hand selected our partner firms and strategic advisory partners based on how their knowledge and expertise augments ours and on our history working together. Woodard & Curran (W&C) and Katz and Associates (K&A) have both served you, delivering work that ties directly to this program. Their knowledge of your operation, culture, processes, and procedures means we require minimal ramp-up time with a complementary culture and trust already in place.

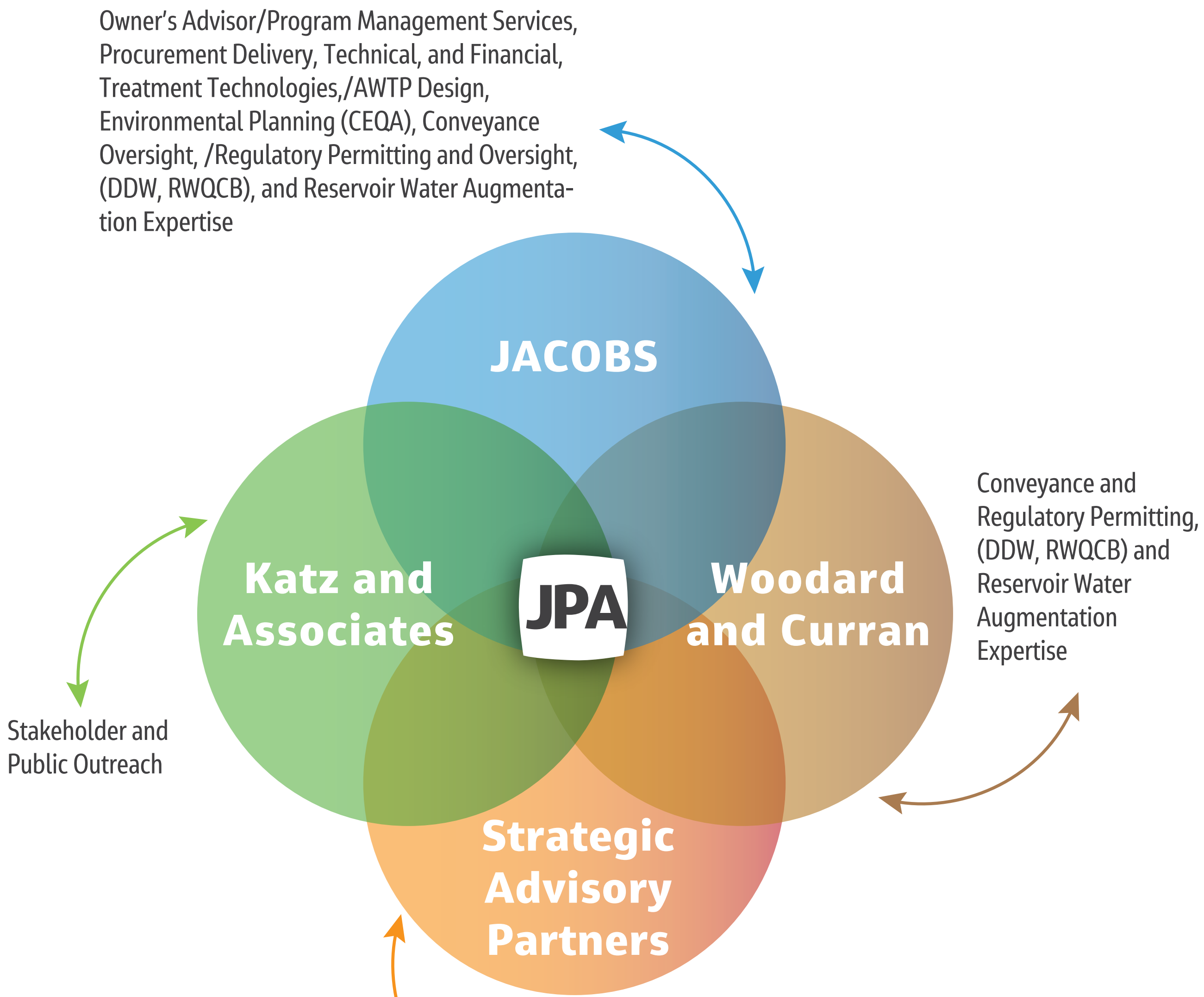
We all understand the communities you serve, your water resource system and infrastructure, and the regulatory agencies and environment you operate within. In fact, several of our team members have previously served on agency staff; we can see things from an owner's perspective. **Together, our team comprehensively understands the intricacies of this program, its importance to the region—and we know how to leverage our intel and experience to amplify the success of your Pure Water Program.**

Our Integrated, Experienced Team Is Committed to Your Objectives and Will Deliver Through Collaboration, Innovation, Insights, and Capacity.

3.1.2 WE HAVE YOU COVERED

This complex, multi-year program's many elements include conveyance, advanced water treatment, regulatory, environmental, and funding components under a program management umbrella of program management. Our assembled team has the knowledge, experience, and expertise needed to successfully deliver your program. Our team members and their roles and responsibilities are outlined in **EXHIBIT 3-1**.

EXHIBIT 3-1. A COHESIVE TEAM FULLY CAPABLE TO MEET ALL CHALLENGES



AREAS OF SERVICE

- Ron Wildemuth - Public Information
- Mike Welch - Regulatory Strategy
- Ken Weinberg - Design-Build Procurement and Legal Counsel Advisement
- Bill Mitch, PhD - Water Quality and NDMA Control

3.1.3 OUR HISTORY WORKING TOGETHER

Trust and collaboration are fundamental to successful relationships. We know and trust each of our team members not only because of their reputation and experience, but because we have worked with them successfully in the past.

Jacobs, W&C, and K&A have supported such California programs as the San Mateo Clean Water and Pure Water San Diego Programs. K&A and W&C have supported the JPA on the current Pure Water Project. Currently are working with you on the second of two White Papers studying opportunities to divert dry and wet weather flow into the Sanitary Sewer and Water Reclamation Plants to assist in MS4 compliance and create new water supplies.

Jacobs and W&C have a long history of successful teaming spanning the past 15+ years. This includes the San Mateo Clean Water Program, the Central Valley Flood Protection Plan (CVFPP) and California Water Plan (CWP), multiple Department of Water Resources (DWR) contracts, the San Diego Sustainable Groundwater Management Act (SGMA) project, and the Palo Alto Solids Facilities Plan. It also includes the South County and Habitat Lands Recycled Water, Groundwater Storage, and Conjunctive Use Program where we were successful obtaining 100% grant funding through Proposition 1 Water Storage Investment Program ($280.5 Million) and are now managing the administrative program to support permitting, funding, customer outreach, agreements, CEQA/NEPA, and other elements.

W&C has worked closely with K&A on several potable reuse projects, including the Pure Water San Diego Program, the Santa Clara Valley Water District's Expedited Purified Water Program, the City of Los Angeles Groundwater Replenishment Project, and the Carpinteria Advanced Purification Project. From 2014 -2016 W&C (formerly RMC) worked on the Strategic Plan for the Future of the State's Integrated Regional Water Management (IRWM) program. K&A led the entire outreach process, spanning over 3 years with RMC leading the technical elements.

In San Diego, W&C teamed with K&A and **Michael Welch** for the Water Purification Demonstration Project, a 3 year effort to garner public acceptance and regulatory approval of what is now called Pure Water San Diego program. As an outcome of that project, the team helped establish public support for the program and garner regulatory approvals from DDW and RWQCB.

W&C's lead principal, Tom Richardson, has worked with Sara Katz and Patsy Tennyson from K&A and with Michael Welch for more than 25 years on a wide array of projects throughout California.

Along with our work together on the San Mateo Clean Water Program, Jacobs and K&A worked together on the Fresno Recharge Program; K&A served as the lead PR firm throughout the project lifecycle, from concept to completion, with support from our program staff. THe program was completed on time and on budget—and the city of Fresno acknowledged the start-to-finish community outreach as a significant contributing factor in this success.

Dr. Bill Mitch (Stanford University) and Jacobs have an excellent professional relationship, having worked together on several water reclamation and water reuse projects. For example, Bill Mitch and **Larry Schimmoller** (Jacobs) were co-Principal Investigators on a recently published (2020) Water Research Foundation research project entitled *"Characterizing and Controlling Organics in Direct Potable Reuse Projects"*, investigating regulated and unregulated DBPs and CECs at potable reuse plants. In addition, Bill Mitch and Jacobs worked together to control trihlaomethane formation at a water reclamation plant in the Northwest, which hadextremely low regulatory limits, similar to California Toxics Rule requirements.

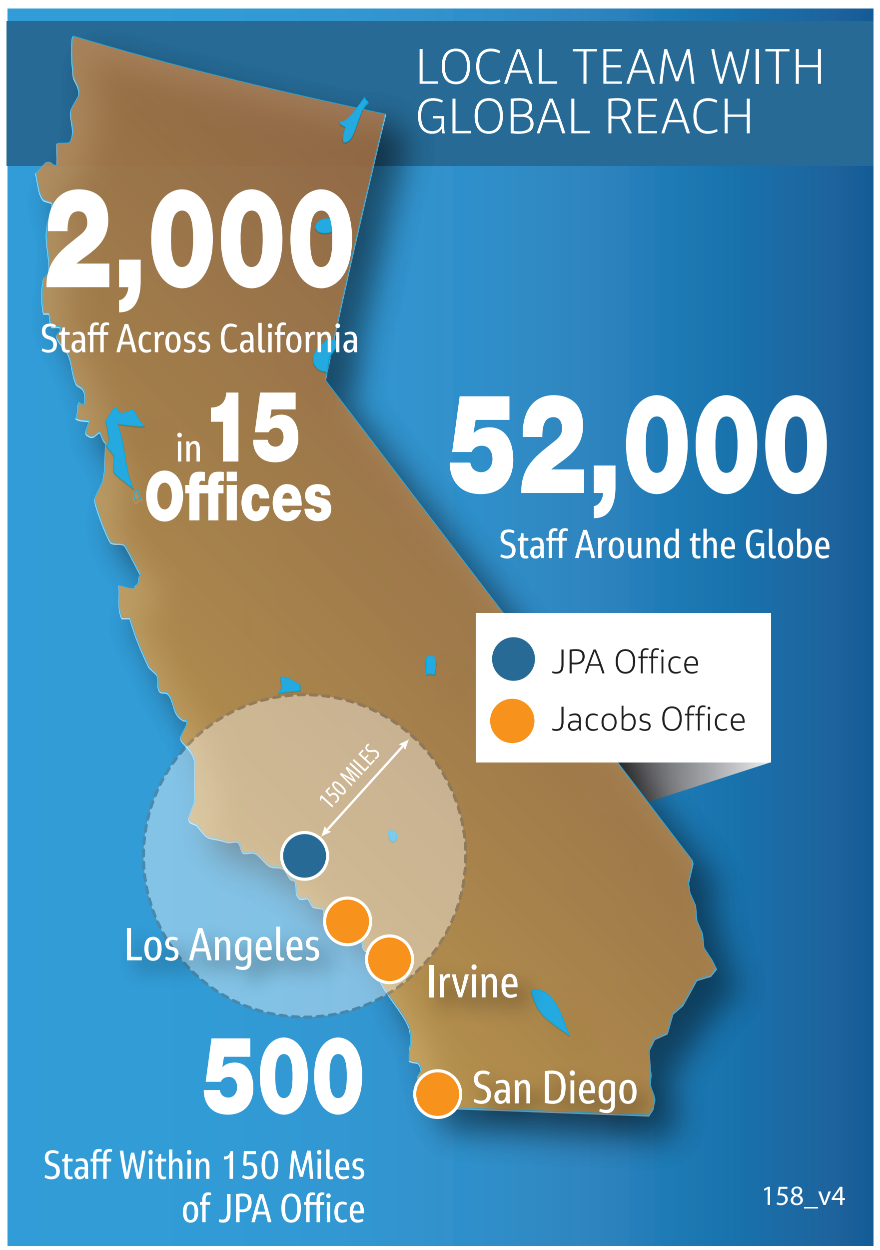
> "I am so pleased to have Woodard & Curran, Katz & Associates, and our Strategic Advisors join the Jacobs Team. We hand-picked these partners to complement and further enhance our own capabilities and add even greater value to your Pure Water Program. Together, we are excited to deliver the most successful reservoir water augmentation program ever, to serve you and your communities!"
>
> \- RICH NAGEL, PRINCIPAL-IN-CHARGE, JACOBS

Our Integrated, Experienced Team Is Committed to Your Objectives and Will Deliver Through Collaboration, Innovation, Insights, and Capacity

3.1.4 WE HAVE THE RESOURCES TO DELIVER

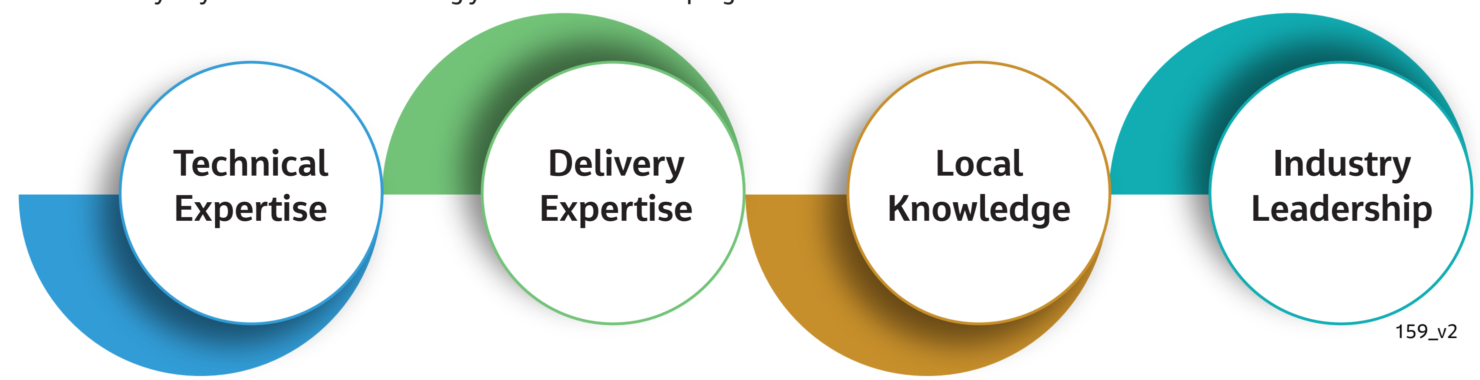
Jacobs is the company with the technical depth and breadth to meet all your needs. Established in 1947, our firm/has been in operation for 73 years. We have more than 52,000 people worldwide—including **more than 2,000 in California, and almost 200 in the County of Los Angeles alone**. Not only do we know and understand the business of water resources, delivery, and maintenance, but our local presence means we also understand the unique needs of the region.

EXHIBIT 3-2. RESOURCES AND TRACK RECORD OF SUCCESSFUL DELIVERY



3.1.5 EXPERTISE IN ALL AREAS OF YOUR PROGRAM AND BEYOND

Your program has multiple components—meaning timing and sequencing of decisions and approvals is key. It is critical to begin with the end in mind; the roadmap must be intricately woven together with an overarching understanding of the most efficient and effective way to get from here to there. Teamwork and collaboration are a must. We designed our team with this in mind, bringing together the attributes we believe are key to your success in achieving your mission on this program.



Technical Expertise
- Water/WW Treatment Expertise
- Regulatory Expertise
- Environmental Planning (CEQA/NEPA)
- Conveyance Expertise
- Advanced Water Treatement (AWT) Expertise
- Funding Grants, and Financial Specialists
- Facilitation and Public Outreach Specialists

Delivery Expertise
- Program Management Specialists
- Owners Agent
- Alternative Delivery Specialists
  - CM at Risk
  - Design-Build
  - Progressive Design-Build

Local Knowledge
- Institutional Knowledge of the Project
- Detailed Knowledge from Completing the Brine Study
- Design and Facilitation of Board Workshops
- In-Depth Interviews with Community Leaders throughout the JPA service area

Industry Leadership
- California WateReuse Association
- Southern California Water Coalition
- Water Research Foundation
- Design-Build Council
- 2015 Stockholm Industry Water Award (Stockholm International Water Institute)
- Eleven 2018 Environmental Business Journal/Climate Change Business Journal Awards

"As water issues intensify, so does awareness of the effects of water management decisions. Desisions at one point in the water cycle affect all the others - from water supplies to treatment, conveyance, wastewater treatment, reuse, and return to the natural environment. Our expertise across the water cycle puts Jacobs in a unique position to provide outstanding solutions to our clients."

- PETER NICOL, JACOBS GLOBAL DIRECTOR OF WATER

3.2 ABOUT JACOBS

Scope/Role: Prime. Owner advisor; program management—including delivery and oversight of all studies, preliminary design and engineering, procurement support, cost estimating, and scheduling; financial services; and technology expertise.

Principal: **Rich Nagel, PE,** Vice President and Principal-in-Charge

Program Manager: **Jennifer Phillips, PE**

Jacobs is recognized globally as a leader in delivering of large-scale, complex water infrastructure programs, including wastewater treatment, reuse, environmental, and conveyance elements—the four principal components of this program. Our services encompass all delivery models, from traditional planning, design, and construction management, through program management and design-build. We have been recognized as one of the world's top firms in program management, wastewater engineering, and design-build. Our portfolio includes numerous advanced treatment facilities, ranging from small to large, completed over the past 70 years.

We are honored to have been r**anked the No. 1 Most Admired Firm in the nation by** *Fortune;* **for 10 consecutive years** Jacobs has also been **named one of the most ethical companies in the world.** Ultimately, our firm is an industry-leaidng engineering company dedicated to helping our clients achieve goals in an innovative manner, tailored to achieve each project's unique objectives.

3.2.1 OUR EXPERTISE AND RESOURCES IN CALIFORNIA

We share your mission, passion, and commitment to conservation, reuse, and sustainability. Our team has delivered innovative solutions to clients throughout California; these include some of the largest, most complex infrastructure projects and programs in state history, such as the San Mateo Clean Water and Pure Water San Diego Programs, Bay-Delta (WaterFix) and antecedent efforts such as CALFED and BDCP, Sites Reservoir, Salton Sea Restoration, Colorado River, and the Water Storage Investigation Program.

3.2.2 OUR HISTORY WORKING WITH LVMWD

We are currently working with you on the Phase 2 White Paper, *"Tapping into Available Capacity in Existing Infrastructure to Create Water Supply and Water Quality Solutions."* This study is comprised of a consortium of 13 agencies in Los Angeles County led by LVMWD. The purpose is to study the opportunities to divert dry and wet weather flow into the Sanitary Sewer and Water Reclamation Plants to assist in MS4 compliance and create new water supplies in the form of water recycling. Prior to this we completed the Phase 1 White Paper, also under the leadership of LVMWD, which served as a supplemental attachment to your public comment letter during the development of Measure W - Safe Clean Water Program.

With us, you have the benefit of a local team with knowledge and expertise on business of water in this region—including the network of water resources, environmental and regulatory requirements, funding and grant opportunities, political environment, and the communities served. We bring the added benefit of providing you access to our top technologists, who deliver innovative solutions around the world, sharing their knowledge, expertise, and innovative spirit with you to support your cutting-edge program.

3.2.3 WE UNDERSTAND HOW TO GET YOU WHERE YOU WANT TO GO

As global supply and demand for water intensifies, solving California's most complex challenges demands thinking differently—and that's where we come in. Our team has been working together over the past 18 months to develop innovative ideas and recommendations to enhance your program. We are your solutions-oriented and collaborative partner—and as your owner advisor and program manager, we will continually look at ways we can make a positive difference throughout your program delivery.

ENR RANKINGS

#1 Top 500 in Design Firms

Consistently Ranked Among the Top Consultants in Relevant Categories

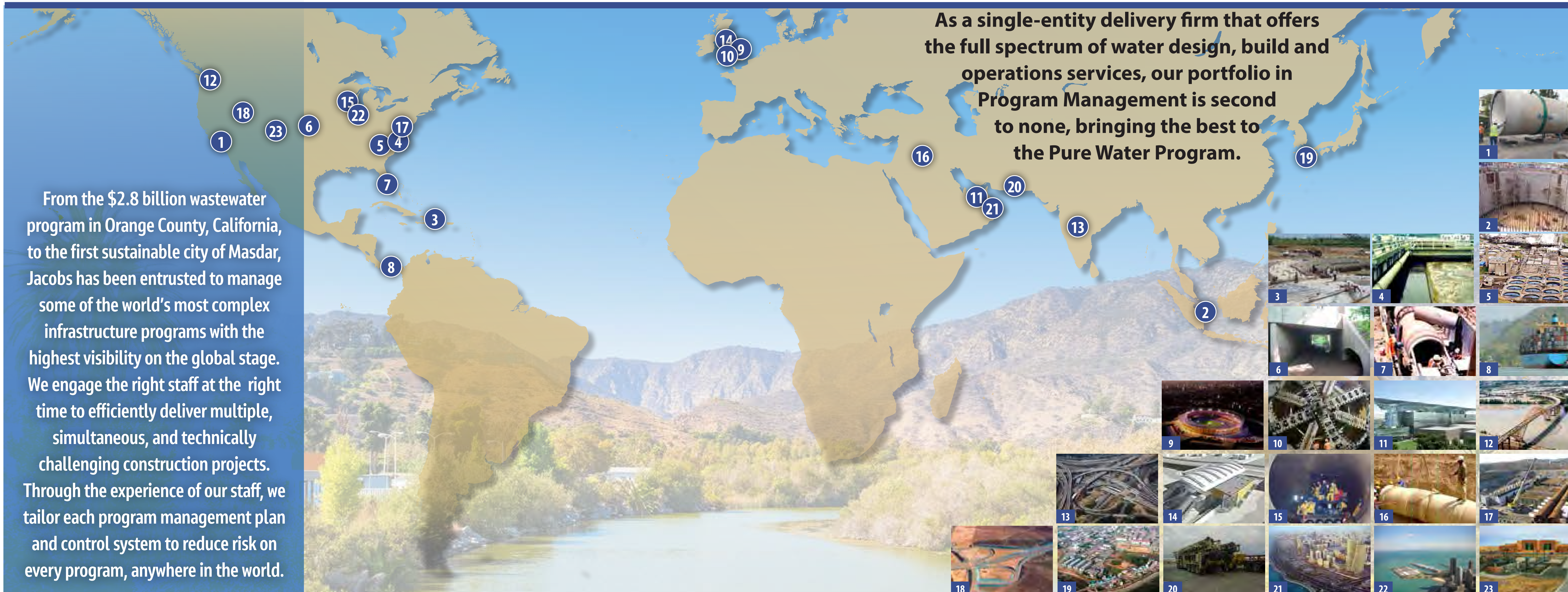
- Water Supply
- Design Builder
- Water Transmission Lines and Aqueducts
- Wastewater Treatment Plants
- Water Treatment Desalination Plants
- Sewer and Waste
- Dams and Reservoirs

Building Design and Construction Giants

- Construction Management and Project Management
- Green Building Engineering Firms

EXHIBIT 3-3. GLOBAL PROGRAM EXPERIENCE

Jacobs Global Owner's Advisory/Program Management Experience - Success Worth Repeating



1. $2.8 billion Program Management for Orange County Sanitation District, CA
Planning, design, construction and start-up of multiple, simultaneous wastewater infrastructure projects for 17-year CIP

2. $3.65 billion Deep Tunnel Sewerage System (DTSS) and Changi Water Reclamation Plant (WRP), Public Utilities Board, Singapore
Managed 12 construction contracts and 7 major equipment procurement and installations on WRP, managed 6 DB contracts for DTSS; 40 construction sites

3. $2.1 billion Island-Wide Infrastructure Program Management Support, Puerto Rico Infrastructure Financing Authority (PRIFA) and Puerto Rico Aqueduct and Sewer Authority (PRASA), Puerto Rico
Fast-track delivery to alleviate a crisis situation in the water supply and wastewater systems island-wide

4. $431 million (estimated construction) Solids Facilities Program Management, Blue Plains AWT, DC Water, Washington DC
Major element of a $2 billion capital improvement program increasing biosolids treatment capacity to meet current and future needs

5. $300 million Wastewater Infrastructure Program Management Services, Louisville and Jefferson County Metropolitan Sewer District, KY
Completed more than 150 capital projects under this program

6. $2 billion City of Omaha, NE Long-Term CSO Control Plan and Program Management Services, NE
Combined sewer service area covers approximately 43 square miles divided into 10 drainage basins

7. $691 million Waterworks 2011 Water and Wastewater Capital Improvements Program, City of Fort Lauderdale, FL
20-year modernization of the City's water and wastewater infrastructure condensed into a period of 10 years

8. $5.25 billion Panama Canal Expansion, Panama
Being constructed in one of the busiest waterways for international commerce with no service interruptions

9. $11 billion London 2012 Olympic and Paralympic Games, UK
Arenas, venues, and the best-ever Olympic transport program to integrate air, road, and rail networks

10. $5.2 billion London Tideway Tunnels, UK
One of the most challenging engineering feats in modern-day London, including 25 miles of tunnels in dense urban communities

11. $22 billion Abu Dhabi Masdar City, UAE
Creating one of the world's most sustainable urban developments powered by renewable energy

12. $3 billion Gateway Multimodal Infrastructure Program, BC, Canada
Largest transportation network program to date in British Columbia

13. $5.8 billion NOVA Mega Projects, US
Region-wide multimodal program including highway, rail, transit, and ridesharing

14. $24.4 billion London Crossrail, UK
Europe's largest construction project, the rail line expansion spans the entire city and will improve transit to key business districts

15. $2.3 billion Milwaukee Deep Tunnel System for Water Pollution Abatement, WI
First municipal program in the U.S. and first operating deep tunnel sewer system in the world

16. $2.4 billion Iraq Water Utilities Reconstruction, Iraq
Performed continuous programming of more than 600 projects

17. Construction Management for $1.4 billion New York Cat/Del Ultraviolet Water Disinfection Facility, NY
The world's largest facility of its kind; have beat all contract incentive milestones, earning maximum bonus on each

18. $1 billion Connecting Idaho-GARVEE, ID
Fast-track improvements to six major highway corridors covering more than 70 miles

19. $12.6 billion Korea Base Relocation, South Korea
Largest military relocation effort of its kind since the 1950s, will become a vital economic and transportation hub

20. $5.8 billion South Afghanistan LOGCAP IV Water Supply, Afghanistan
Largest water well drilling project in the world

21. $1 billion Abu Dhabi Wastewater Tunnel Enhancement, UAE
Covering the island and mainland, will become the largest tunneled sewerage system in the world when completed

22. $950 million Chicago Water Program, IL
Infrastructure modernization for one of the world's largest systems for withdrawal, treatment, pumping, and distribution

23. $754 million Prairie Waters Project , CO
High profile water reliability program including water treatment and infrastructure solutions.

132_v1

3.3 ABOUT WOODARD & CURRAN

Scope/Role: Lead for the conveyance elements, working together with our conveyance experts to build on the knowledge and solutions they provided in the brine study and other relevant work they have recently delivered. Additionally, they will advise, and support as needed leveraging their permitting, DDW and reservoir water augmentation (RWA) expertise.

Principals:

Tom Richardson, PE, Senior VP/ National Practice Leader

Mike Matson, Senior VP/ Senior Technical Manager

- ✓ History with Pure Water Program formulation from inception aids our team in understanding the full array of drivers and stakeholder considerations.
- ✓ Leader in California water recycling for over 20 years with focus on potable reuse setting including GWA, RWA, and direct potable reuse pathways.
- ✓ Experience planning and permitting CA potable reuse projects complements Jacobs expertise.

WOODARD & CURRAN

3.3.1 COMPLEMENTARY AREAS OF EXPERTISE

W&C is a privately held integrated engineering, science, and operations company serving utilities, cities, special districts, and state governments for over 40 years. Their services extend from initial studies and concept development through the full range of project delivery including construction and operations

W&C has been a leader in California water recycling for over 20 years, focusing on the evolving California potable reuse setting including groundwater augmentation (GWA), RWA, and direct potable reuse pathways. W&C's experience in the planning and permitting of a wide array of California potable reuse projects complements Jacob's national and international expertise in cutting-edge, technology-driven projects.

This experience with the California potable reuse setting, including successfully garnering regulatory (DDW and RWQCB permits for each of the projects) enables W&C to efficiently move your Pure Water Project toward implementation by applying lessons learned and avoiding a learning curve. **Our experience with the Pure Water San Diego Program is especially relevant as we apply that regulatory strategy to your program's setting**.

	POTABLE REUSE PATHWAY		
PROJECT NAME	Engineering Development	Regulatory Permitting	CEQA
SCVWD Expedited Purified Water Program	■	■	■
San Diego Water Purification (Pure Water) Program	■	■	
LADWP SF Valley Groundwater Replenishment Project	■	■	
Oceanside Pure Water Project	■	■	■
Carpinteria Advanced Purification Project (CAPP)	■	■	■

3.3.2 W&C EXPERIENCE WITH LVMWD IN PURE WATER PROGRAM ELEMENTS

W&Cs involvement with the formulation of your Pure Water Program from inception means our team in understands the full array of drivers and stakeholder considerations.

W&C has provided you a wide array of services in recent years, including a series of projects that have shaped your current Pure Water Program. In the early 2010's, W&C performed a **Seasonal Storage Study for the District**, identifying alternative sites and strategies to address Tapia Water Reclamation Facility's (WRF's) seasonal discharge limitation to Malibu Creek. One outcome of this study was the decision to broaden the range of strategies to manage winter-time discharges, including entering into a partnership with the City of Los Angeles (LADWP) to wheel excess recycled water into the LADWP's San Fernando Valley recycled water system, including potential delivery to Encino Reservoir.

> "Thank you and your team for the work that went into this study. This was a challenging project without much precedent and through a collaborative approach we were successful in meeting our goals and objectives."
> **- ERIC SCHLAGETER, LAS VIRGENES MUNICIPAL WATER DISTRICT TRIUNFO PRELIMINARY AWTP SITING STUDY, 2018**

W&C prepared a **Preliminary Design Report and completed CEQA for Woodland Hills/Encino Reservoir Recycled Water System Extension project**. In a follow-up study, your team evaluated the **Woodland Hills/Encino Reservoir option with a surface water augmentation potable reuse project now known as the Pure Water Program**.

W&C conducted two additional studies to further define your program: the **AWPF Preliminary Siting Study**, and a **Regional Brine Management Study**. The preliminary siting study included a multi-step screening process to reduce several hundred potential AWPF sites down to a handful of ranked sites, with Agoura Road and Las Virgenes Reservoir identified as preferred sites. In an on-going effort, W&C is conducting a regional brine management study evaluating alternative strategies to cost-effectively deliver RO brine to the Calleguas Salt Management Pipeline (SMP). Options included using the City of Thousand Oaks sanitary sewer system and Hill Canyon Treatment Plant discharge permit to avoid a lengthy, potentially operationally challenging brine pipeline.

W&C HAS A SUCCESSFUL HISTORY PARTNERING WITH YOU

Key Highlights

- Established cost and environmental difficulty in constructing RW Seasonal Study
- First concerted effort to address supply, operational, regulatory issues Pure Water will solve
- First attempt to identify alternative potable reuse means to achieve objectives

Key Highlights

- Developed alternative strategy to Pure Water
- Evaluated partnering with LADWP
- Combined new customers with seasonal storage at LADWP Encino Reservoir

Key Highlights

- Comprehensive search for the best AWTP sites
- Incrementally screened over 1,000 sites to five sites
- Provided basis for Agoura Road site purchase

Key Highlights

- Created regional partnership in brine management
- Explored brine management opportunities involving Thousand Oaks infrastructure
- Identified alternative brine pipeline alignment

3.4 ABOUT KATZ & ASSOCIATES

Scope/Role: Provides stakeholder and public outreach support activities in collaboration with your team.

Principal:
Patricia Tennyson, Executive Vice President

- Work in the water outreach business for over 35 years
- Water communication specialists
- Involvement and experience spanning the full life cycle of projects/programs
- Potable reuse experience
- Experience working with you

3.4.1 PUBLIC OUTREACH EXPERTS IN WATER RESOURCES

K&A specializes in strategic communication, public involvement, and community relations to advance essential projects. **The firm comprises nationally recognized public outreach experts in water resources, transportation, environmental planning, private sector development and land use**. Our specialists combine their backgrounds in communications, journalism, sociology, public affairs, political science, public policy, and environmental sciences to effectively translate highly technical information into language understandable to a variety of audiences. Many of their clients are public entities implementing large infrastructure and environmental initiatives. They also work with private developers seeking to entitle and build housing or commercial projects, and with organizations and groups planning major civic or community events.

Founded in 1986, K&A is a certified small and woman-owned business enterprise; headquartered in San Diego, they have offices in Los Angeles and San Francisco and a statewide team of more than 35 professionals. They have supported projects across the U.S. and internationally, working with special districts; municipalities; privately owned utilities; local, state, and federal agencies; and regional coalitions.

3.4.2 COMMUNITY BUY-IN FROM CONCEPT THROUGH CONSTRUCTION

When it comes to potable reuse projects, public outreach is the critical element in whether the project gets built or shelved. Community members need to feel comfortable with the concept of drinking water that was sewage in its recent past—which takes a robust, consistent and sustained outreach program; and, as learned with the Pure Water San Diego Program, that is only part of the battle. Once the potable reuse concept is accepted, it becomes a construction project causing numerousissues and concerns to arise for community members: digging up streets, blocking driveway, increasing traffic with construction equipment, hampering the ability to get to businesses or daycare centers or any other destination, creating dust/noise/odors, and many more. K&A has been in the water outreach business for over 35 years now, making them experts in potable reuse and construction projects. They know how to work with business owners, concerned residents, contractors and construction crews, agency personnel at every level, and more. K&A provides an unmatched depth of experience in this subject area and bring a wealth of lessons learned from construction relations support provided to water agencies throughout California and the U.S.

San Diego Pure Water Program

"I want to personally thank you for the excellent work that Katz & Associates has done implementing a comprehensive public outreach program. You and your on-site team have been invaluable in helping the City to significantly increase awareness and support for Pure Water, which in turn has allowed the City to recently break ground on the first of the Phase 1 projects."

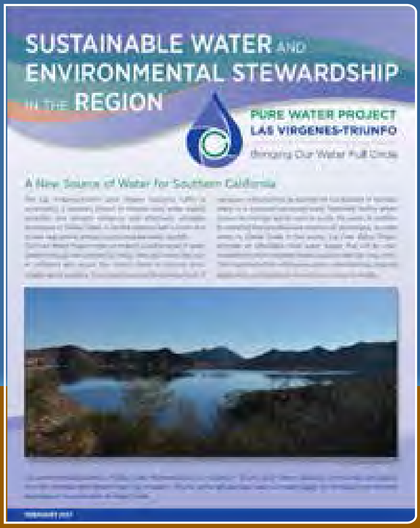
- JOHN HELMINSKI, ASSISTANT DIRECTOR, CITY OF SAN DIEGO PUBLIC UTILITIES DEPARTMENT

3.4.3 K&A HAS BEEN WORKING WITH YOU SINCE 2005

K&A has worked with you for years starting in 2005 when they designed and facilitated a board workshop to discuss TMDLs, Tapia Plant and Malibu Creek issues, and more. Recently, they worked with your staff to develop informational and talking-point/leave behind materials on seasonal storage of recycled water and stewardship for a visit to Washington, DC; conducted in-depth interviews with community leaders throughout the service area to assess their views about potable reuse; and developed a brand name and messaging for the Pure Water Project.

PURE WATER PROJECT LAS VIRGENES-TRIUNFO

As part of a robust, 18-month stakeholder participation process, you evaluated a number of options; the top two were indirect potable reuse using advanced purification followed by discharge to the Las Virgenes Reservoir or repurposing the Los Angeles Department of Water and Power Encino Reservoir for recycled water storage. K&A was then asked to develop and implement a communication program to raise awareness about the purpose, need, and alternatives under study and to brand the main option selected by your board for further study.



STRATEGY I K&A developed a comprehensive communication plan to confirm objectives, challenges and opportunities, audiences, messages, and tactics to be implemented as the decision-making process moved forward to identify the proposed Pure Water Project Las Virgenes-Triunfo.

RESULTS I K&A provided the groundwork for your board and staff to be able to share information about your Pure Water Project with community leaders, local elected officials and legislators, identifying benefits, safety, costs and funding needs. K&A also provided input as you moved forward toward designing a demonstration project, with the opportunity for public tours and education.

152_v2

3.5 ABOUT OUR STRATEGIC ADVISORY PARTNERS

Our strategic advisory partners augment Jacobs' strategic advisory panel and quality control team. They are an esteemed group of individuals, each with exceptional knowledge in their area of specialty. They are available to us as needed throughout the program for counsell, guidance, insights, and expertise. They bring unmatched California and industry-leading experience from academic, state agency and utility manager perspectives.

3.5.1 KEN WEINBERG WATER RESOURCE CONSULTING LLC

Scope/Role: As-needed advisory services in the areas of design-build and legal procurement – overall strategic advisor.

- ✓ Former Director of Water Resources – San Diego County Water Authority
- ✓ CEQA/NEPA environmental compliance and permitting for more than $3 billion in capital projects

Principal: Ken Weinberg, Principal/Owner

Ken Weinberg Water Resources Consulting LLC is an independent, multidisciplinary water resources consulting firm based in San Diego, California. The firm specializes in providing strategic advice in water supply project and facilities planning and development, alternative project delivery, environmental and regulatory compliance, economic and financial analysis, water policy analysis and water rate design. **With over 30 years of public agency water resources and facility planning experience, Ken has undertaken and led some of the most challenging projects and water resources initiatives in California.**

He brings a breadth of experience in water resources planning, capital project development and water utility management to each assignment with the philosophy that the client's needs and concerns are the reasons we are in business.

Ken has more than 30 years of water utility experience, most at an executive management level. He is knowledgeable, highly skilled, and motivated to provide the best service to our clients. Because of that experience he has excellent working and business relationships with other consultants providing high quality, specialized engineering, financial, and environmental expertise. Ken also works closely with law firms with specialized expertise in CEQA/NEPA and alternative project delivery, which can be brought in to assist clients with complex projects and needs. With his access to top notch consultants and legal firms the experience and expertise necessary to meet your needs is always readily available.

3.5.2 MICHAEL WELCH, PHD, PE

Scope/Role: Regulatory Strategist

Principal: Michael Welch, PhD, PE, Principal/Owner

- ✓ 40 years of RWB permitting experience.
- ✓ Guided the City of San Diego in obtaining California's first surface water source augmentation permit
- ✓ Key author of NDMA/Regional Board Permitting White Paper
- ✓ Regulatory consultant and permitting specialist on the City of San Diego Pure Water Project team

Michael R. Welch, Ph.D., P.E. is a one-person, sole proprietorship dedicated to providing quality, value-priced services to municipalities, water agencies, wastewater agencies, and water resources clients. Michael's focus areas are in wastewater, recycled water, groundwater, and water supply regulations, and he has over 40 years of experience in planning, permitting, and implementing Southern California water resources and wastewater projects. He has served as an independent consultant since 1994, specializing in helping municipalities and public agencies evaluate regulatory compliance with state and federal water quality and drinking water regulations, and state public health regulations.

Pioneering Surface Water Augmentation

In 1990, Dr. Welch prepared the original San Diego County Water Authority concept feasibility study assessing the potential for surface water augmentation in San Vicente Reservoir. As a follow-up in the mid-1990s, Dr. Welch and Tom Richardson, PE served as lead investigators on the City of San Diego team that developed the reservoir augmentation concept and obtained concept approval from the State of California to discharge purified, recycled water to San Vicente Reservoir. In the early 2010s, MIchael again teamed with Tom Richardson on the City of San Diego Water Purification Demonstration Project (WPDP). This project implemented pilot testing, assessed the regulatory and economic feasibility of reservoir augmentation, established the framework for the Pure Water San Diego Program, and set forth the city's plan for moving forward with the Pure Water Project purified water discharge to Miramar Reservoir.

Since that time, Michael has continued to serve as a regulatory consultant and permitting specialist on the City of Pure Water San Diego Program team that has received Regional Water Quality Control Board (RWQCB) and DDW approval to implement a 30 mgd discharge of highly purified, recycled water to Miramar Reservoir. Michael is also on the team that is assisting Padre Dam and Helix Water District in seeking regulatory approval to implement surface water augmentation at Lake Jennings.

3.5.3 RON WILDERMUTH

Scope/Role: Public Affairs Specialist

Principal: Ron Wildermuth, Principal/Owner

- ✓ One of the most thoughtful and strategic Public Information Officers (PIOs) in the industry
- ✓ Led the public acceptance campaign for the largest potable reuse project in the world —the GWRS

Ron is an expert water speaker with over 20 years of water industry knowledge and experience. Most recently he was the Manager of Public Information for West Basin Municipal Water District and the internationally known water agency expert in conservation, ocean water desalination, and water recycling as Director of Communications for Orange County Water District, a world renowned water reuse and groundwater management agency.

As the Public Information Officer (PIO) for Orange County Water Distrrict, Ron led the public acceptance campaign for the largest potable reuse project in the world—the Groundwater Replenishment System (GWRS). This included compiling letters of support from all the elected officials, non-government organizations (NGOs) and many other public opinion leaders. He also led development of the education and demonstration center for GWRS. He is respected as one of the most thoughtful and strategic PIOs in the industry.

While he was at West Basin Municipal Water District, he led the outreach on their Ocean Water Desalination Program along with an Education and Demonstration Center. Many of the successful tactics from the GWRS program were successfully applied to this program.

3.5.4 BILL MITCH, PHD, PE

Scope/Role: Water quality and nitrosodimethylamine (NDMA) expert / Advisor

Principals: Bill Mitch, PhD, PE

- ✓ Recognized leadership in water quality and NDMA
- ✓ Member of an NWRI expert panel evaluating mixing potable reuse discharges into the reservoir feeding the Las Virgenes-Triunfo drinking water plant

Bill Mitch is a Professor in the Department of Civil and Environmental Engineering at Stanford University. He has studied disinfection byproduct formation mechanisms over the past 20 years, with a particular focus on nitrosamines. His research has evaluated techniques to minimize the formation of disinfection byproducts. He obtained a BA in Archaeology from Harvard University and MS and PhD degrees in Civil and Environmental Engineering from the University of California at Berkeley. He holds a PE license in California. Bill received the 2004 Outstanding Doctoral Dissertation Award from the Association of Environmental Engineering and Science Professors and Parsons Engineering, and a NSF Career Award in 2007. He served as the Chair of the 2017 Disinfection Byproducts Gordon Conference and served on a National Water Resources Institute (NWRI) expert panel evaluating mixing potable reuse discharges into the reservoir feeding the Las Virgenes-Triunfo drinking water plant.

At-a-glance...

SECTION 4: Related Project Experience

For successful implementation, the JPA needs a proven delivery partner with the requisite track record, skills, and tools to secure the reliable water supply you seek. The Jacobs Team offers the experience and expertise as an Owner's Advisor/Program Manager to resolve the challenges you face to secure a truly successful, resilient and independent water supply.

- **Proven performance in managing comprehensive, multi-year, water and wastewater infrastructure programs** implemented under a range of delivery models
- **Expertise in areas of strategic value:** Owner's Advisor/Program Management; alternative delivery models; advanced wastewater treatment; conveyance; environmental planning and CEQA compliance; environmental permitting for water reuse (DDW and RWQCB); and financing, funding and grantsmanship.
- **Reference projects** that offer insights into benefits Jacobs delivers
  - » *San Mateo Clean Water Program (CWP), San Mateo, CA*
  - » *Sustainable Water Initiative for Tomorrow, Hampton Roads, VA*
  - » *Pure Water San Diego, San Diego, CA*
  - » *Expedited Purified Water Program, Santa Clara Valley, CA*
  - » *Recharge Fresno Program, Fresno, CA*

SECTION 4

RELATED PROJECT EXPERIENCE

4.1 PROVEN EXPERTISE IN PURE WATER PROJECT SCOPE

The Jacobs Team offers the experience and expertise as an Owner's Advisor/Program Manager to resolve the challenges you face in the six areas of strategic value: Owner's Advisor/Program Management; Alternative Project Delivery; Advanced Water Treatment; Conveyance; Environmental Studies and Planning; and Grants, Funding and Financial Services. Included below is a summary of our credentials in these six important areas.

WHAT YOU'LL FIND IN THIS SECTION

4.1 General Summary of Team Expertise in Six Areas of Strategic Value, including: Owner's Advisor/Program Management; Alternative Project Delivery; Advanced Wastewater Treatment; Conveyance; Environmental Studies and Planning; and Grants, Funding and Financial Services

4.2 Relevant Reference Project Descriptions

AREA 1: OWNER'S ADVISOR/PROGRAM MANAGEMENT

Jacobs has provided Owner's Advisory services on over $5 billion dollars in capital improvement projects. On projects where we have served as Owner's Advisor, we have achieved an industry-low change order rate of less than 1 percent, compared to the industry average of approximately 3 percent.

Top ranked by Engineering News Record, Jacobs is the go-to firm for complex infrastructure programs where budget, schedule, and risk management are essential to success. **Supporting Owners as their agent or program manager is in Jacobs' DNA – we have pioneered technology advancements, conveyance and distribution schemes, permitting and outreach campaigns, and alternative delivery strategies** for numerous Owners through work on many of California's – and the world's – most iconic projects. Whether it's the London 2012 Olympics, the Panama Canal Expansion, or pure water programs for communities like San Mateo, San Diego, or Las Virgenes, our streamlined and efficient teams muster the full suite of services from our deep bench of experts to provide delivery certainty. These are the best practices we bring to your Pure Water Program.

EXHIBIT 4-1. OWNER'S ADVISORS/PROGRAM MANAGEMENT REPRESENTATIVE EXPERIENCE

Extensive experience helping Owners reach their goals enables the Jacobs Team to provide delivery certainty.

	PROJECT LEVEL						PERFORMANCE CRITERIA				
PROJECT NAME AND LOCATION	Owner's Advisor/ Program Management	Alternative Project Delivery	AWT	Environmental	Conveyance	Grants, Funding and Financing	Similar Project	Similar Scope	Quality of Performance	Schedule Compliance	Budget Compliance
San Mateo, CA	■	■	■	■	■	■	■	■	■	■	■
Recharge Fresno, CA	■	■	■	■	■	■	■	■	■	■	■
Pure Water, San Diego, CA	■		■	■	■	■	■	■	■	■	■
Salt Lake City Water Reclamation Facility (SLCWRF)	■	■	■		■	■	■	■	■	■	■
Prairie Waters, CO	■	■	■	■	■	■	■	■	■	■	■
PRASA, Puerto Rico	■	■	■	■	■	■	■	■	■	■	■
Orange County San District, CA	■	■	■	■	■	■	■	■	■	■	■
CSO Omaha, NB	■	■	■	■	■	■	■	■	■	■	■
Twin Oaks Valley DBO, San Diego, CA	■	■	■	■	■	■	■	■	■	■	■
Fort Lauderdale, FL	■	■	■	■	■	■	■	■	■	■	■
Delta Conveyance, Central Valley, CA	■	■	■	■	■	■	■	■	■	■	■

EXHIBIT 4-2. OWNER'S ADVISORY SERVICES EXPERIENCE ON WATER/WASTEWATER INFRASTRUCTURE ALTERNATIVE DELIVERY PROJECTS

Project	SOQ Review/ Evaluation	Draft RFP Technical Requirements	Meetings with Shortlisted Firms	Contract/Risk Analysis Review	Final RFP	CMAR/DB Proposal Review	Interviews/ Selection Meetings	Contract Negotiations	GMP Negotiations	Change Management	Design Oversight Assistance	Construction Oversight Assistance
City of Tallahassee Thomas P. Smith Water Reclamation Facility Upgrades CMAR	■		■		■	■	■		■	■		■
Lower Colorado River AuthorityLane City Reservoir CMAR	■	■	■	■	■	■	■	■		■	■	■
City of Tampa Utility Capital Improvement, CMAR/Design- Build		■		■	■	■	■	■	■	■	■	■
JEA Total Water Management Plan Design-Build	■	■	■	■	■	■	■	■	■	■	■	■
Florida Keys Aqueduct Cudjoe Regional Wastewater System	■	■	■	■	■	■	■	■		■	■	■
Tampa Bay Water C.W. Bill Young Regional Reservoir Renovation Design-Build	■	■	■	■	■	■	■	■		■	■	■
Gwinnett County F. Wayne Hill Biogas Generator, FOG Receiving Station, Norris Lake Pump Station and Force Main, and South Gwinnett Pump Station Phase II Projects	■	■	■	■	■	■	■	■		■	■	■
Tampa Bay Water, FL, Roof and HVAC Renovation Design-Build	■	■	■	■	■	■	■	■	■	■	■	■
Miami Dade, FL, South District WWTP Cogeneration Facility Improvements	■	■	■	■	■	■	■	■	■	■	■	■
Sewerage and Water Board of New Orleans - HMGP Retrofit Power Distribution Network	■	■			■		■	■	■			

Jacobs full suite of programmatic tools includes a program management information system that tracks performance, budgets, schedules, change, risk, and compliance.

133_v1

> "Your program management team has delivered excellence in every facet of the program. Together, we chartered the program in 2014 that resulted in the Program's mission vision, goals, and brand, to build momentum across the City's rate payers, City Council, and the achieve best value, Our Program's vision is to ***"Create the Clean Water Gem for our Community and Bay."*** This program will deliver this vision!"
>
> **- BRAD UNDERWOOD, PUBLIC WORKS DIRECTOR, CITY OF SAN MATEO**

127b_v2

AREA 2: ALTERNATIVE PROJECT DELIVERY

Across the country, **Jacobs has used Alternative Project Delivery models, such as Progressive Design Build, to deliver more than 145 water and wastewater treatment plants valued at $4.2 Billion, including $1Billion+ worth of AWT projects over the last 60 years**. We are a founding member of the Water Design Build Council, a partner agency to DBIA, focused on alternative delivery requirements in the water/wastewater industry and recognized as a leader in this field. We enhance alternative delivery models by providing early estimates to help clients re-align scope and budget expectations, minimizing late surprises with GMP costs, avoiding exit ramps, and delivering desired project goals.

Under the umbrella of an Owner's Advisors framework, Jacobs has provided support for projects delivered under Design Build, Design-Build-Operate, Construction Management at Risk, and Public Private Partnerships contracts. **Because we deliver as contractors, we understand how to help guide the process, delivering early cost certainty**. San Mateo, Fresno, and Woodland-Davis are recent successes. Transparency, collaboration, cost certainty and input into decision making helped to make these programs successful.

EXHIBIT 4-3. ALTERNATIVE DELIVERY EXPERIENCE

Local knowledge minimizes risks and enables early wins and approval victories that gain community confidence.

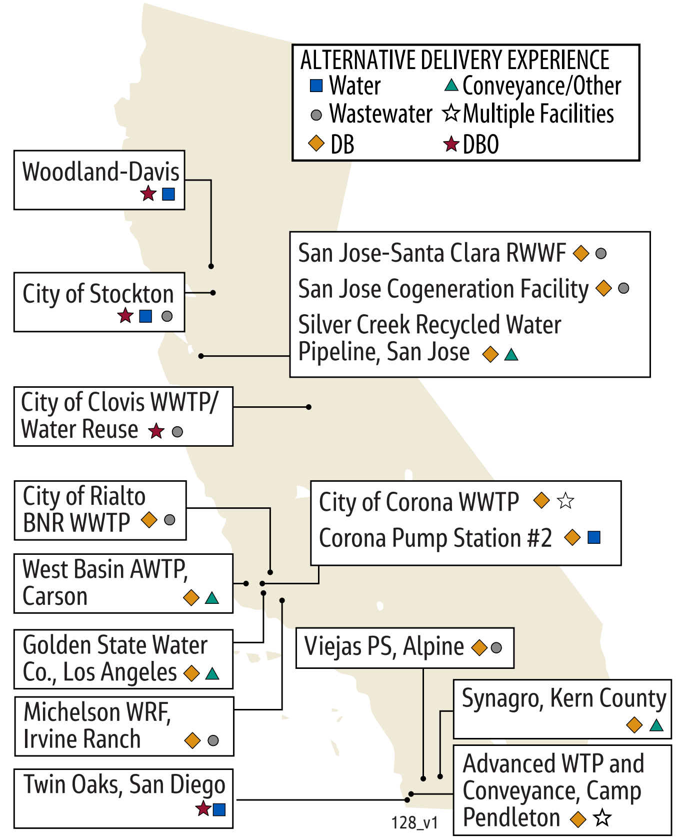


EXHIBIT 4-4. ALTERNATIVE PROJECT DELIVERY REPRESENTATIVE EXPERIENCE

Understanding delivery options provides flexibility to choose the best case for each component.

PROJECT NAME AND LOCATION	PROJECT LEVEL: Alternative Project Delivery	PROJECT LEVEL: Conveyance	PERFORMANCE CRITERIA: Similar Project	PERFORMANCE CRITERIA: Similar Scope	PERFORMANCE CRITERIA: Quality of Performance	PERFORMANCE CRITERIA: Schedule Compliance	PERFORMANCE CRITERIA: Budget Compliance
Woodland-Davis Alt. Delivery, CA	■	■	■	■	■	■	■
NE Water Purification Houston, TX	■	■	■	■	■	■	■
Cutter WTP, NM	■	■	■	■	■	■	■
Salt Lake City Water Reclamation Facility (SLCWRF)	■	■	■	■	■	■	■
Northern Treatment Plant, CO	■		■	■	■	■	■
Twin Oaks, San Diego, CA	■		■	■	■	■	■
Goodyear WTP, AZ	■	■	■	■	■	■	■

Jacobs Delivers Goodyear's $130 million Design-Build-Operate Project

"Since day one, Jacobs has been our trusted partner in delivering innovative solutions for Goodyear's critical infrastructure needs. Jacobs has successfully coordinated with other stakeholders and infrastructure projects that add to the complexity of critical projects."

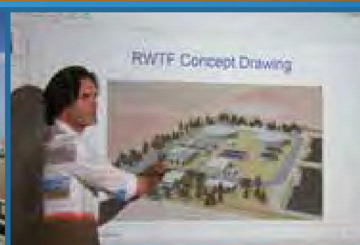
- BARBARA CHAPPELL, DEPUTY DIRECTOR PUBLIC WORKS, CITY OF GOODYEAR, AZ

ALTERNATIVE DELIVERY MODEL SELECTED TO SECURE RELIABLE WATER SUPPLY

The Woodland-Davis Water Supply Project, Woodland, CA

Jacobs' contract for the Woodland-Davis facility was an integrated design-build-operate-finance contract, in which Jacobs held full responsibility for all design, permitting, commissioning, project management, and long-term operations of the new facility, plus construction financing for a portion of the capital cost value through the acceptance test. Jacobs and the JPA developed an open-book process for demonstrating that not only were the targeted net present value savings achieved, but also that the price that the owner was paying was fair and competitive As part of the scope, Jacobs dedicated a talented commissioning team consisting of designers, constructors, and operations specialists who executed the commissioning phase of the project, ensuring that all equipment and systems were fully tested.

Completed in 2016 (3 months ahead of schedule), the $146 million Woodland-Davis Regional WTF Design-Build-Operate (DBO) project includes a river intake and pump station, 5 miles of raw water pipeline, a 30 mgd WTP which included clarification, ozone, biological filtration, finished water pump station, and 10 miles of transmission pipeline.



RELEVANCE TO JPA'S PURE WATER PROGRAM

- ✓ Similar infrastructure for Advanced Treatment, Conveyance and Pump Station
- ✓ Operational strategy to optimize operations and transition to new plant
- ✓ Delivery provides lessons learned on effective and collaborative DB delivery
- ✓ Permitting strategy to meet timeframe and regulatory requirements
- ✓ Funding and Financing support to save $150 million in program costs

"Jacobs brought a very competent and experienced team to the project. Jacobs' team did a great job communicating with the Agency throughout the project and ultimately the project was finished ahead of schedule and under budget."

- JIM BUSH, GENERAL MANAGER, WOODLAND-DAVIS CLEAN WATER AGENCY

170_v1

AREA 3: ADVANCED WATER TREATMENT TECHNOLOGIES

As CH2M, we pioneered water reuse in the early 1960s for the South Lake Tahoe Water Reclamation Plant and for the landmark Upper Occoquan Service Authority (UOSA) Regional Water Reclamation Plant. With the globally significant Changi NEWater Treatment Plant, we advanced the technology and overcame stakeholder concerns about reuse to deliver one of the world's most sophisticated treatment systems. Our more than $1 billion AWT portfolio spans over 60 years and ranges in size from demonstration/pilot plants to full-scale operational facilities. This experience enables us to maximize your water resources, securing the reliable, new supply needed by the communities you serve. Our design of the Denver Potable Reuse Demonstration Plant, Gippsland and Luggage Point WRFs, and Singapore NEWater projects were milestones in the advancement of potable water recycling technology and health effects testing. Continuing our leadership in AWT technologies, the Hampton Roads Sanitation District (HRSD) SWIFT Program is the next innovation on the path to potable reuse advancements. The depth and bread of our global reach and the talent residing in our California offices enables us to solve problems quickly and efficiently with significant, industry-changing results.

W&C's experience in potable reuse projects includes the SCVWD Expedited Purified Water Program, the San Diego Water Purification (Pure Water) Program, the LADWP SF Valley Groundwater Replenishment Project, the Oceanside Charles P. Boepple, Executive Director Pure Water Project, and the Carpinteria Advanced Purification Project (CAPP). This experience in the California potable reuse setting, including successfully garnering DDW and RWQCB permits for each project, enables W&C to efficiently move your project toward implementation by leveraging lessons learned and avoiding a learning curve. Our experience with the San Diego Pure Water project is especially relevant as we apply that regulatory strategy to your program.

SIWI STOCKHOLM INDUSTRY WATER AWARD

The 2015 Stockholm Water Industry Award was awarded to CH2M HILL, now Jacobs, recognizing the firm's initiative in reuse, including for developing and advancing methods to clean water and to increase the public acceptance of recycled water – an honor not extended to any other firm in the water industry. **Larry Schimmoller**, who will be an advisor to JPA's Pure Water Program, has been an instrumental force behind this award, driving the firm's advances in water reuse.

EXHIBIT 4-5. ADVANCED TREATMENT TECHNOLOGIES REPRESENTATIVE EXPERIENCE

Jacobs leads the industry in advanced treatment technologies worldwide.

	PROJECT LEVEL				PERFORMANCE CRITERIA				
PROJECT NAME AND LOCATION	Owner's Advisor/ Program Management	Alternative Project Delivery	AWT	Grants, Funding and Financing	Similar Project	Similar Scope	Quality of Performance	Schedule Compliance	Budget Compliance
HRSD SWIFT, Hampton Roads, VA	■		■		■	■	■	■	■
Tuas NEWater, Singapore	■	■	■	■	■	■	■	■	■
San Luis Obispo, CA	■	■	■	■	■	■	■	■	■
Luggage Point, Australia		■	■		■	■	■	■	■
Oxnard, CA			■	■	■	■	■	■	■
San Mateo, CA	■	■	■	■	■	■	■	■	■
Beenyup, Australia		■	■		■	■	■	■	■
Aurora Binney, CO	■		■		■	■	■	■	■
Changi NEWater, Singapore	■	■	■	■	■	■	■	■	■
Gippsland, Australia		■	■		■	■	■	■	■

EXHIBIT 4-6. GLOBAL EXPERIENCE IN ADVANCED TREATMENT TECHNOLOGIES

Jacobs leads the industry in advanced treatment technologies worldwide.

INTERNATIONAL

- Allona, Australia
- Gippsland, Australia
- Luggage Point, Australia
- Wetalla, Australia
- Tuas NEWater, Singapore
- Changi NEWater, Singapore

> "We at UOSA are very proud that CH2M (now Jacobs) and its employees have been great stewards of our charge to provide consistently reliable treatment of wastewater to drinking water standards. CH2M's ability to design and implement forward-thinking wastewater treatment and water reuse innovations combines with UOSA's operational expertise and commitment to deliver operational excellence."
>
> **– CHARLES P. BOEPPLE, EXECUTIVE DIRECTOR**

AREA 4: CONVEYANCE AND ALIGNMENT STUDIES

Treating recycled water for potable reuse is only one side of the equation. Moving it to where it is needed and storing it when not present equal challenges to sustaining a reliable water sup- ply. **Our team brings the conveyance and facilities expertise necessary to provide you with an effective pipeline system design, enhanced constructability, and optimum alignment selection.** Our team's portfolio of successful conveyance project delivery for California and other U.S. clients demonstrates our ability to meet this project's critical elements. Our portfolio of work—ranging from supporting multi-billion-dollar wet weather programs to designing pumping stations, dams, hydropower and pipeline systems, and more—speaks to the value our team of core technologists and global service leaders bring your project. Recent experience on your Preliminary AWTP Siting Study, the City of Santa Rosa Permitting Task, and the City of San Mateo Basin 1a Sewer Project demonstrates our track record of success both technically and in collaboration with the communities we serve. **This understanding means we consider lifecycle costs, materials used, corrosion, and brine concentrate management in our conveyance design.**

EXHIBIT 4-7. CONVEYANCE REPRESENTATIVE EXPERIENCE

Proven expertise moving water enables a reliable, safe, and consistent water supply.

	PROJECT LEVEL						PERFORMANCE CRITERIA			
PROJECT NAME AND LOCATION	Owner's Advisor/ Program Management	Alternative Project Delivery	AWT	Environmental	Conveyance	Grants, Funding and Financing	Similar Project	Quality of Performance	Schedule Compliance	Budget Compliance
Expedited Purified Water Program, Santa Clara Valley Water District, CA		■	■		■		■	■	■	■
Pure Water, City of San Diego, CA	■		■		■		■	■	■	■
Groundwater Replenishment Project, Los Angeles Department of Water and Power, CA			■		■		■	■	■	■
Pure Water, City of Oceanside, CA	■		■	■	■	■	■	■	■	■
Groundwater Recharge Project , Carpinteria Valley Water District, CA	■		■	■	■	■	■	■	■	■
Southern Delivery System, CO				■	■	■		■	■	■
Freeport, CA				■	■	■		■	■	■
Provo River Canal Enclosure, UT		■		■	■	■			■	■
Central Utah Water Conservancy District		■		■	■	■			■	■
Recharge Fresno	■	■		■	■	■	■	■	■	■
City of Goodyear, AZ		■		■	■		■	■	■	■
City of San Mateo, CA	■	■		■	■	■	■	■	■	■
Davis-Woodland, CA		■		■	■		■	■	■	■

PRIOR WORK IN SUPPORT OF YOUR PURE WATER PROGRAM
Las Virgenes Municipal Water District and Triunfo Sanitation District Joint Powers Authority (JPA)

As noted above, a key component of your Pure Water Program is the brine management pipeline from the advanced water treatment plant (AWTP) to the Calleguas MWD Salt Management Pipeline (SMP). Recognizing there may be alternative means of conveying the brine to the SMP using adjacent agency infrastructure and partnerships, a group of agencies, led by the Las Virgenes-Triunfo JPA, and including the City of Thousand Oaks, Camrosa Water District, and Calleguas Municipal Water District, commissioned a Regional Brine Management Study. The goal of the study was to identify the costs and benefits of various brine pipeline alignments and various treatment scenarios at the regional Hill Canyon Treatment Plant (HCTP) in the City of Thousand Oaks. The primary focus of the study was to determine whether a portion of the City of Thousand Oaks sanitary sewer and the HCTP effluent stream could plausibly convey the Pure Water AWTP brine to either the SMP, the Conejo Creek, or as a supplemental source to the Camrosa Water District, potentially offsetting substantial Capital and operations and maintenance brine conveyance costs.

W&C developed a model to analyze the effects of the new brine discharges on HCTP water quality if the brine was added to the City of Thousand Oaks' sewer system. For this scenario, the brine would blend with raw sewage and be treated at HCTP prior to discharge to Conejo Creek. The model predicted the HCTP effluent quality with and without additional treatment processes, including adding a desalter to reduce salts to levels that would not impact surface water discharge to Conejo Creek. The area is prone to high chloride levels in surface water due to the local geology. The water quality model analyzed a total of 11 scenarios to identify the most cost-effective strategy to managing brine within the region. This study also includes the development of project descriptions for several treatment and infrastructure options under evaluation.

ADVANCED WATER TREATMENT PLANT (AWTP) PRELIMINARY SITING STUDY

As one of a suite of technical studies to define your program, W&C conducted a service-area wide comprehensive siting study for a new Advanced Water Treatment Plant. Through a series of screening steps, W&C compared/contrasted several hundred potential sites in the area, winnowing the candidate site pool with a broader set of criteria to a final pool of a dozen sites. W&C conducted a more rigorous evaluation of the final pool and crafted a prioritized list, before identifying two preferred sites, Agoura Road and the Las Virgenes Reservoir site. To support the siting analysis, W&C developed two alternative AWPF site layouts (including process buildings, clear well and operational storage, parking and access roads); one representative of a typical arrangement, and a second that incorporated space-saving features including multi-story and subterranean storage. Key siting criteria included proximity to key infrastructure (i.e., the original recycled water infrastructure, the salinity management brine line, and Las Virgenes Reservoir), land use/property ownership, geology, new infrastructure cost, alignments lengths, adjacent neighborhoods, and short and long term environmental and social impacts (residents and businesses).

169_v2

AREA 5: ENVIRONMENTAL STUDIES AND PLANNING

Our **long term presence in California** provides an in-depth understanding of CEQA's environmental requirements, **enabling us to design permit compliance for now and for the future** into our solutions from the beginning. For California's largest water resources program, Delta Conveyance (formerly Waterfix), Jacobs led the NEPA, CEQA, and California ESA processes and assisted with permits and mitigation planning. We performed similar work for the Tracy WTP expansion environmental impact report (EIR), the San Mateo Clean Water Program and San Diego Pure Water Program. We will use these experiences to address Government Water Code Section constraints, and environmental planning and permitting requirements to deliver the benefits you need while aligning with regulatory parameters.

> "Just wanted to mention that it's great working with you…thanks for being patient and providing terrific service."
> - **COLIN CHASE, CITY OF SANTA ROSA, 2018, PERMITTING**

EXHIBIT 4-8. ENVIRONMENTAL STUDIES AND PLANNING REPRESENTATIVE EXPERIENCE

Expertise in all phases of environmental planning and permitting eliminates surprises.

	PROJECT LEVEL										PERFORMANCE CRITERIA			
PROJECT NAME AND LOCATION	Environmental	CEQA Plus/NEPA	Section 1211 Petition	Title 22 Permitting	NPDES Permitting	Drinking Water Permit	Construction Nuisance	Compliance Support	Grants, Funding and Financing	Similar Project	Similar Scope	Quality of Performance	Schedule Compliance	Budget Compliance
San Bernardino Valley Water District SNRC	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Pure Water, City of Oceanside, CA	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Groundwater Recharge Project, Carpinteria Valley Water District	■	■	■	■	■	■	■	■	■	■	■	■	■	■
San Mateo Clean Water Program	■	■					■	■	■	■	■	■	■	■
Tracy WWTP Permitting Support, Planning, and Capital Improvement Project	■				■			■	■	■	■	■	■	■
Davis Woodland Water Supply Project	■	■				■	■	■		■	■	■	■	■
Recharge Fresno Program	■	■				■	■		■		■	■	■	■
Malibu Mesa Water Reclamation Plan Refurbishment	■			■						■	■	■	■	■
Temecula Regional Water Reclamation Facility (TVRWRF) Expansion	■	■		■					■	■	■	■	■	■
Hill Canyon Wastewater Reclamation Project - Water Rights Application 20408	■		■					■		■	■	■	■	■
Chiquita Canyon Landfill Master Plan Revision EIR	■						■	■			■	■	■	■
Tehachapi Renewable Transmission Line	■						■	■			■	■	■	■
Horsethief Canyon Water Reclamation Facility	■			■						■	■	■	■	■
OMI-Thames Water Stockton	■	■						■		■	■	■	■	■
Pure Water, City of Oceanside	■	■		■		■		■	■	■	■	■	■	■
San Dieguito Valley Groundwater Desalination Design Project	■	■			■	■	■	■	■		■	■	■	■
Carpinteria Advanced Purification Project	■	■		■	■	■	■	■	■	■	■	■	■	■

AREA 6: GRANTS, LOANS AND FINANCIAL SUPPORT – MODELING, CASH FLOW, FUNDING

Jacobs takes a holistic view of projects, providing technical and financial expertise. Our goal is to use proven financial prioritization approaches, near-real time cash flow projections and market-specific cost estimating **models to track performance and accountabilities to provide best for money returns** during this short- and long-term period of revenue and costs uncertainty. Programmatic delivery benefits will be key to the Pure Water Program's overall short- and long-term funding strategies, as well as provide project delivery creditability to financial agencies and providers and to your board and customers. For the San Mateo Clean Water Program, our programmatic approach and introduction of alternative funding mechanisms, such as low-interest loans like WIFIA and SRF, are expected to eliminate $150–$200 million in additional interest costs resulting from the bond market interest rates. Our financial strategies include predictive models that help align cash flow with project priorities, reducing the cost of debt. In addition, grantsmanship strategies will help **capture the maximum of LRP and other monies available** within the required timeframe for application submission.

EXHIBIT 4-9. GRANTS, LOANS AND FINANCIAL REPRESENTATIVE EXPERIENCE

Value added financial services support facilities construction and operations resilience.

	PROJECT LEVEL			PERFORMANCE CRITERIA				
PROJECT NAME AND LOCATION	Grants, Funding and Financing	WIFIA or SRF Loan Support	Support Securing Bonds or Grants	Similar Project	Similar Scope	Quality of Performance	Schedule Compliance	Budget Compliance
San Mateo Clean Water/San Mateo-Foster City Public Finance Authority, CA	■	■	■	■	■	■	■	■
Fresno Water Program, CA	■	■	■	■	■	■	■	■
Orange County Program, CA	■			■	■	■	■	■
Financing and Delivery Options Evaluation and "Value for Money" studies, Miami Dade Water and Sewer Authority, FL	■	■		■	■	■	■	■
Funding Strategies for Open Space in Detroit, MI	■	■	■	■	■	■	■	■
Capital Funding Imperatives Research Study	■	■		■	■	■	■	■
Development of Financial Strategies for Water and Wastewater Projects, Great Lakes Water Authorit, MI	■	■	■	■	■	■	■	■
CIP Project Prioritization Framework Update; Sanitary and Stormwater Asset Management Plan, City of Ann Arbor, MI	■	■		■	■	■	■	■
Financial Plans, Cleveland Division of Water (CWD) and Division of Water Pollution Control (WPC), Cleveland, OH	■	■	■	■	■	■	■	■

"As Director of Engineering for the Hampton Roads Sanitation District (HRSD), I can confirm that CH2M Hill Engineers, Inc. [now Jacobs] has conducted a number of management and financial studies for HRSD, which support both management and financial processes of our organization. CH2M HILL has done an outstanding job in completing these services in a timely and cost efficient manner. CH2M HILL developed a Consulting Engineer's report to aid HRSD's sale of $150 Million in revenue bonds to support its capital improvement program. The independent review of HRSD's assets and financial forecast was included in the official statement for the bond offering. The report was cited as one of several factors that contributed to HRSD receiving an upgrade to its credit rating by Standard & Poor's and HRSD received a competitive average interest rate of 3.68% for the bond offering."

- BRUCE W. HUSSELBEE, PE, DIRECTOR OF ENGINEERING, HRSD

4.2 REFERENCE PROJECTS OFFER INSIGHTS INTO BENEFITS JACOBS DELIVERS

Our reference projects provide a detailed look at what we do, how we do it, and the benefits offered to clients through our approach. You noted in the RFP that key selection criteria for this contract include experience as an owner's advisor/program manager for advanced wastewater treatment systems, including for projects implemented through design build delivery. Expertise in California regulatory requirements, conveyance, and financing are also critically important. As such, the reference programs summarized in the table below demonstrate our capabilities in all these areas of strategic value to your project's sustainable success. As illustrated in Exhibit 4.10, we have successfully delivered several or all of the areas of strategic value within each.

EXHIBIT 4-10. REFERENCE PROJECTS AND EXPERIENCE IN AREAS OF STRATEGIC VALUE

Jacobs Team's diverse experience supports all components of the Pure Water Project.

PROJECT NAME AND LOCATION	Owner's Advisor/ Program Management	Alternative Delivery Models	AWT	Environmental	Conveyance	Grants, Funding and Financing
San Mateo Clean Water Program (CWP), San Mateo, CA	■	■	■	■	■	■
Sustainable Water Initiative for Tomorrow, Hampton Roads, VA	■	■	■		■	■
Pure Water San Diego, San Diego, CA	■	■	■	■	■	■
Expedited Purified Water Program, Santa Clara Valley, CA		■	■	■	■	■
Recharge Fresno Program, Fresno, CA	■	■		■	■	■

RECHARGE FRESNO PROGRAM IMPROVED PIPELINES AND WATER SYSTEM FACILITIES, FRESNO, CA

The Recharge Fresno Program is a Capital Improvement Program (CIP) of over $500 Million in water supply, treatment, and distribution infrastructure, intended to offset groundwater use. The CIP includes more than 30 miles of pipeline (approximatley 17 miles of which is 60 inches in diameter or greater), to convey raw water to the City's various surface water treatment facilities, and potable water through 30 miles of 8-inch to 54-inch water pipeline.

Jacobs is the city's program manager, providing project delivery, engineering oversight, environmental studies and permitting, and construction management for all of the projects within the program. Our staff, including Pipeline Lead Jeff Smith, performed optimization of proposed pipeline sizes and alignments and reduced costs by more than $50 Million.

Our experience in providing efficient delivery of a complex conveyance program under an accelerated timeline will be an advantage for the Sites Reservoir Project.

156_v2

SAN MATEO CLEAN WATER PROGRAM (CWP)

SAN MATEO, CA

FIRM & ROLE
JACOBS, Program Manager/Owner Advisor, Construction Manager

PROJECT COST
$1 billion

PROJECT DURATION
2014 - ongoing

CLIENT NAME AND REFERENCE
Brad Underwood, Public Works Director, City of San Mateo

T: (650) 522-7303

bunderwood@cityofsanmateo.org

SIMILARITIES AND RELEVANCE

- Owner's Advisor/ Program Management
- Program Controls
- Advanced Treatment
- Alternative Project Delivery
- Water Resources/Water Supply Management/ Conveyance
- Environmental Permitting And Regulatory Compliance
- Grants, Funding, and Financial Services Support

PROJECT SCOPE AND SIZE

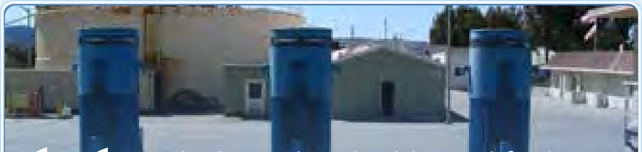
The San Mateo CWP is a 10-year, $1 billion capital improvement program to replace aging infrastructure, build wet weather capacity, meet current and future regulatory requirements, and align with the City of San Mateo's sustainability goals. Jacobs is providing full-scale, multi-year program management services to champion these improvements with the City. These projects and upgrades include: a significant upgrade and expansion to the City's 60 MGD WWTP, including new headworks, primary treatment, biological nutrient removal/membrane bioreactor processes, and biological and chemically enhanced high-rate wet weather treatment facilities and other plant upgrades including odor control; sewer system improvements, including an Underground Flow Equalization System (a 5.3 million gallon storage structure to help eliminate sewer system overflows), and improvements to several sewer pipes and pump stations.

Consultant's Role and Responsibilities

Our efforts include providing technical support, project management, construction management, contract management, procurement, public outreach, economic and financial consulting, program controls, and environmental and permitting support. Our team is co-located with the city at a program management office, where together we work as one team. The program is an outstanding demonstration of how we seamlessly integrate with clients, drive sustainable solutions, and provide premier, industry leading services, end to end. The team is truly dedicated to making the program an icon for delivery for our client and other agencies in California.

The program is meeting sustainability goals as well as regulatory requirements to eliminate sanitary sewer overflows and comply with discharge permit requirements. In addition to meeting the current requirements, the CWP is "future-proofing" the wastewater treatment plant to meet anticipated nutrient removal requirements. To achieve this, the City is integrating capacity upgrades with innovative treatment technologies. This forward-looking investment will prevent diluted raw sewage from contaminating streets, waterways, and the San Francisco Bay. The innovative upgrades to the wastewater treatment plant will also support future water reuse in this drought vulnerable region.

The CWP is innovating in five key areas: programmatic environmental approach, early contractor involvement, innovative wastewater treatment approach, economic modeling, and proactive public outreach. The Program developed a Programmatic Environmental Impact Report to assess potential impacts and mitigation measures for a variety of project alternatives under consideration



"Jacobs brought a highly qualified program management team and an innovative solution to [our] problems that combines flow management with best-in-class treatment technology innovations…Our delivery strategy compressed the Program from 20 to 10 years to meet regulatory requirements, anticipate pending regulatory requirements, and save residents more than $250 million…Jacobs is our trusted teammate and leads the program in the areas of program management, program controls, project and construction management, master plan validation, environmental compliance, economic modeling, public outreach, stakeholder engagement, and procurement… They have been a true and honest partner and a critical part of the Public Works Department and Clean Water Program."

- BRAD UNDERWOOD, PUBLIC WORKS DIRECTOR, CITY OF SAN MATEO

127_v1

to address CEQA and allow for early funding pursuits. The Program is using a Construction Manager At Risk (CMAR) delivery method for the wastewater treatment plant upgrade and expansion project, which is the largest in the program. To support this effort, Jacobs performed preliminary engineering for the technical solution, prepared bridging documents, supported procurement of the CMAR contractor, and managed the GMP review and subsequent negotiation. Coupled with conducting an early value engineering exercise, this has brought best value and cost certainty, while allowing the financial team to confidently set rates and bonds to meet cash flow requirements. The innovative advanced wastewater engineering component of this program is its Biologically and Chemically Enhanced Treatment approach to treat wet weather flows, while minimizing capital expenditures. By implementing this process in parallel with a membrane bioreactor and on-site flow equalization capacity, the new wastewater treatment plant will have the capacity for extreme wet weather events, while producing a high-quality effluent, supporting the potential for future water reuse. Extensive outreach with the community enabled the siting of a controversial underground storage facility for high collection system flows during wet weather events.

Financing and Funding Support

As a leading provider of financial planning, design, construction and operations services, Jacobs brings a holistic view of how towns and cities develop and finance their facilities and infrastructure. By combining cutting-edge analysis tools with a collaborative funding identification process—using both conventional and alternative financing mechanisms—Jacobs is helping cities around the world fund and accelerate their most important projects.

Jacobs' Economic Modeling Platform (TACT) was used to evaluate monetary criteria and implementation options. Using a proprietary scheduling optimization algorithm, the program was compressed from 20 years to 10 years, while still ensuring that the program is delivered within the annual affordability constraints identified by the City and saving $250M in escalation costs.

ACCOMPLISHMENTS AND OUTCOMES

Five years into this 10-year program, key accomplishments include:

- ✓ Securing a multi-year rate increase of 14% per year for the next five years, after a 36% rate increase in the previous year to fully fund the Program.
- ✓ Completing over 58,000 work hours without safety incident.
- ✓ Obtaining key environmental and building permits.
- ✓ Successful siting of a controversial wastewater storage facility in the community through a robust public outreach approach.
- ✓ Progressing designs and value engineering studies for all projects.
- ✓ Re-organized the program functional leadership and services organizational chart to successfully transition the CWP from design to construction
- ✓ Completed a certified CEQA Program EIR with several project-specific environmental assessments and permitting analyses.
- ✓ Developed a financial model and a cost loaded schedule to establish funding requirements specific to City's current rate and funding approaches.
- ✓ Completed detailed State Revolving Fund (SRF) Applications for the CWP that includes detailed environmental, engineering design, economic analysis, and general loan application packages.
- ✓ Completed detailed Water Infrastructure Finance and Innovation Act (WIFIA) Applications for the CWP that includes detailed environmental, engineering design, economic analysis, and general loan application packages.

May 31, 2018

Mr. Steve Demetriou
Chairman & CEO
Jacobs
1999 Bryan St. #1200
Dallas, TX 75201

RE: City of San Mateo's Public Works Department Endorsement for Project Excellence Award and Joseph J. Jacobs Master Builder Award for the San Mateo Clean Water Program

Dear Mr. Demetriou:

I am writing to express strong and hearty support for the Jacobs Program Management Advisor team to be awarded a Joseph J. Jacobs Master Builder Award for their efforts on our Clean Water Program.

We began this partnership with CH2M, now Jacobs, four years ago, and have been truly delighted by the services your team has provided to the Department and City. This forward looking program investment of $1 billion is critical to repair, rehabilitate, and replace infrastructure that is more than 70 years old, and comply with a Cease and Desist Order to eliminate sewage overflows that contaminate our streets, waterways, and the San Francisco Bay. Jacobs brought a highly qualified program management team and an innovative solution to these problems that combines flow management with best-in-class treatment technology innovations. This program delivery approach is a first for the City and this infrastructure investment is the largest the City has ever made.

The technology approach makes us the Bay Area leader in nutrient removal and achieves our City-wide goals while setting the bar for sustainability in surrounding communities. Jacobs brought in the best technologists in the industry to develop this innovative solution. This program serves 140,000 residents of San Mateo County, and benefits more than 7 million people that call the Bay Area home.

Your program management team has delivered excellence in every facet of the program. Together, we chartered the program in 2014 that resulted in the Program's mission, vision, goals, and brand, to build momentum across the City's rate payers, City Council, and to achieve best value. Our Program's vision is to "Create the Clean Water Gem for our Community and Bay". This program will deliver this vision!

Our program delivery strategy compressed the Program from 20 to 10 years to meet regulatory requirements, anticipate pending regulatory requirements, and save residents more than $250 million. The selected technology innovations also significantly saved costs over traditional approaches by more than $150 million. Additionally, we recently secured an endorsement from two U.S. Senators and two Representatives for Federal funding. Jacobs is our trusted teammate and leads the program in areas of program management, program controls, project and construction management, master plan validation, environmental compliance, economic modeling, public outreach, stakeholder engagement, and procurement.

Jacobs brings a strong, qualified, and diverse team of experts to our program who fit well with the diversity of our City staff. Of the 210 staff involved with the program, 110 are women, and 4 out of 7 functional groups are led by women, and the City's Clean Water Program Manager is a highly qualified woman. Jacobs' principles of diversity, ethics, and safety have strengthened the City's core values through our co-located office and sharing of Jacobs best practices, standards, safety culture, and strategies. We are impressed with the results delivered by the Jacobs team, they meet their deadlines, commit the right resources at the right time to ensure a successful project delivery, and are a true partner.

The Jacobs acquisition transition was seamless from our perspective, and we feel that this project is a fantastic example of how well CH2M complements Jacobs' standards of excellence and safety culture. I've enjoyed meeting both former CH2M and new Jacobs management team members this year. They have provided me a sense of trust and focus on helping address any issues that arise when implementing a $1 billion program. For these reasons and the on-site Jacobs program management team's efforts, we look forward to recommending to City Council an extended contract renewal for the next three to five years to ensure this Jacobs team remains with us through construction and commissioning.

We strongly endorse their receipt of this award, recognizing this team as raising the bar for high-quality program delivery, providing program and technology innovations, and their strong collaborative working environment with my Public Works staff. They have been a true and honest partner and a critical part of the Public Works Department and Clean Water Program. Feel free to contact me at +1 (650) 522-7303 to further discuss your team's contributions to the Clean Water Program's successful delivery.

Respectfully submitted,

Brad B. Underwood
Public Works Director
City of San Mateo

SUSTAINABLE WATER INITIATIVE FOR TOMORROW
HAMPTON ROADS, VA

As Owner's Advisor since 2013, we will continue to support HRSD's SWIFT program through 2030

FIRM & ROLE
JACOBS, Owner's Advisor

PROJECT COST
Estimated $1Billion when completed

PROJECT DURATION
2013 - 2030

CLIENT NAME AND REFERENCE
Hampton Roads Sanitation District
1434 Air Rail Ave
Virginia Beach, VA 23455
Laura Zuravnsky, Chief of Design and Construction, Sustainable Water Initiative for Tomorrow (SWIFT)
LZuravnsky@hrsd.com

SIMILARITIES AND RELEVANCE
- Owner's Advisor
- Potable Water Reuse/ Advanced Water Treatment
- Implementing an O3/ BAC/GAC/ UV process for treatment prior to groundwater injection
- Secured regulatory permitting by collaborating with EPA, EQ, VDH, and local stakeholders
- Overseeing construction, including supervision of subcontractors and contractors
- Grants, funding, and financial services support

> Jacobs has served as the Owner's Advisor, performed preliminary design, helped prepare bridging documents, and helped in identification and selection of contractors for two DB projects – the Williamsburg SWIFT facility and the James River TP improvements project.

Over the course of the last decade, CH2M now Jacobs has advised the Hampton Roads Sanitation District (HRSD) with a myriad of planning, design, construction, commissioning and start-up activities for their watewater treatment and conveyance system.Specific to the scope of this program, in 2015, Jacobs was selected by HRSD to evaluate the feasibility of using reclaimed water for managed aquifer recharge, which is now known as the Sustainable Water Initiative for Tomorrow (SWIFT). The evaluation has included process modeling of advanced treatment trains, development and implementation of advanced treatment pilot plants, groundwater modeling, geochemical modeling to understand the compatibility of the reclaimed water with native groundwater and aquifer material, evaluation of candidate facilities to understand building/ property constraints, and working with the U.S. Environmental Protection Agency (EPA), Department of Environmental Quality (DEQ), Virginia Department of Health, and stakeholders to develop a regulatory framework for SWIFT. Currently, we are piloting injection, acting as the owner's agent on a demonstration scale facility, and developing preliminary design documents for the first full-scale facility.

PROJECT DESCRIPTION AND SERVICES PROVIDED

The Hampton Roads Sanitation District (HRSD) is a regional wastewater treatment agency that owns and operates 13 wastewater treatment plants (WWTPs) in southeastern Virginia. Seven of these facilities have been identified as candidates for advanced treatment whose effluent may be injected into the aquifer to enhance the reliability of the regions water supply. This groundbreaking potable reuse project will inject up to 120 mgd of recycled water into the Potomac Aquifer System to alleviate depleted groundwater levels, and significantly reduce HRSD's nutrient discharge to the Chesapeake Bay.

Our team has served as the owner's advisor and the pilot program manager since 2013. We oversaw side-by-side pilot testing of two advanced water treatment process trains. Based on this effort, HRSD selected the ozone, biological activated carbon, granular activated carbon, and ultraviolet (O3/BAC/GAC/UV) treatment scheme to eventually be incorporated at seven WWTPs. In addition, we evaluated equipment and process feasibility, completed the preliminary design of the advanced water treatment facilities, estimated project costs, evaluated groundwater recharge scenarios and geochemical compatibility, provided regulatory and permitting support, and evaluated enhanced source control strategies. Jacobs has served as the Owner's Advisor, performed preliminary design, helped prepare bridging documents, and helped in identification and selection of contractors for two DB projects.

Critical Project Challenges

- **Regulatory Engagement.** No one in Virginia had implemented direct injection of recycled water before this project; the regulatory approval process was unclear and posed a significant project risk. By engaging with regulatory agencies to develop an approach endorsed by all, we secured formal program approval by EPA in February 2018.
- **Bromate formation.** Adding ozone to recycled water can produce elevated bromate concentrations, for which
- EPA's maximum contaminant level (MCL) is 10 µg/L. We conducted bench and pilot mitigation tests to determine the most effective approach to reduce bromate levels. The selected alternative—adding preformed monochloramine upstream of ozone application—has successfully controlled bromate concentrations consistently below the MCL.
- **AWT Use.** To maximize plant use and groundwater injection and minimize costs, it was important to be able to capture a large percentage of secondary effluent for advanced treatment without overbuilding the AWT plant. We achieved this by collecting historical flow records to evaluate combinations of equalization, storage and AWT plant capacities and determined the best combination to optimize plant use, water capture, and project cost.
- **Source Control.** An enhanced source control program is crucial to safely operate potable reuse plants and prevent difficult-to-treat or otherwise problematic compounds from entering the WWTP and carrying on to the AWT facility. We conducted a targeted sampling campaign at the WWTPs and collection system to identify challenging constituents for advanced treatment. We then developed a framework to determine when limits on industrial discharges were necessary to protect AWT operation.

ACCOMPLISHMENTS AND OUTCOMES

With the success of the pilot program to date, Jacobs will continue to support the SWIFT program with operational and research support and identifying the required treatment processes and design criteria for each full-scale project through 2030.

Among the financial services provided, Jacobs develop and tested an enhanced capital improvement plan (CIP) prioritization strategy for its considerable capital improvement program. The objective of the project was to work with a team that represented the Executive Director's office and leaders from all key divisions within the utility to test the value and efficiency of a decision-analysis approach to assist capital budget decisions by documenting the contribution of

candidate capital projects toward accomplishing HRSD's core values. After evaluating the benefits of the enhanced prioritization process, HRSD decided to implement the enhanced prioritization process for its full CIP program. HRSD used the results of the prioritization analysis to identify roughly $150 Million of low-priority near-term projects that could be deferred at least five years; this allowed HRSD to stay within bonding targets set by the utility's financial and management team. The prioritization process allowed the utility's management team to reach consensus on the projects to advance during the first half of the 10-year CIP planning cycle. In addition to the prioritization effort, Jacobs provided follow-up financial planning and rate development support to HRSD as task orders under the consulting agreement.

Additionally, Jacobs is providing program management services to assist HRSD in the administration and management of their Pump Station and Interceptor System SCADA Upgrades Program. We worked closely with HRSD staff to develop a plan for the development and implementation of the upgrades.

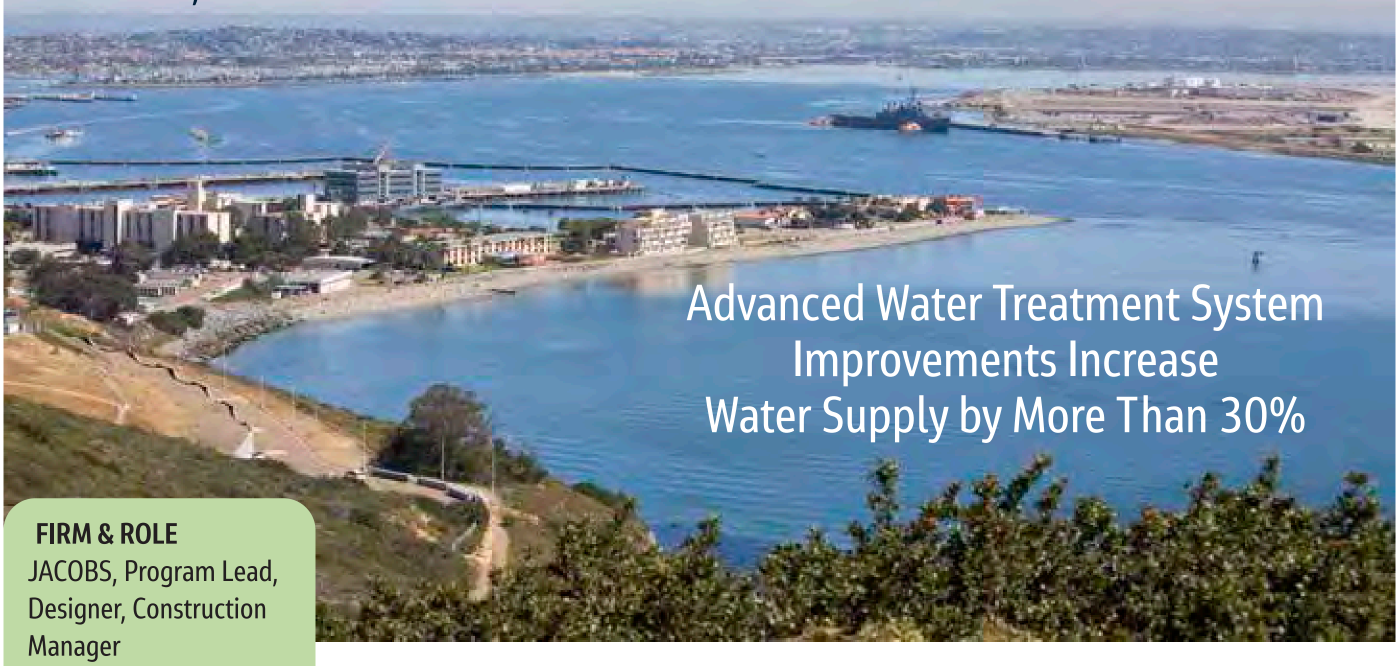
The prioritization process enabled the utility's management team to reach consensus on the projects to advance during the first half of the 10-year CIP planning cycle.

"…this effort has now become a part of HRSD. I think we have pushed the organization forward in a very positive way!"

- BRUCE HUSSELBEE, DIRECTOR OF ENGINEERING, HRSD, SPEAKING ON THE PRIORITIZATION PROCESS

PURE WATER SAN DIEGO

SAN DIEGO, CA



FIRM & ROLE
JACOBS, Program Lead, Designer, Construction Manager

PROJECT COST
$1 Billion

PROJECT DURATION
2016 - ongoing

CLIENT NAME AND REFERENCE
City of San Diego, Public Utilities Department
Amer Barhoumi,
Senior Project Manager
T: (858) 292-6364
ABarhoumi@sandiego.gov

SIMILARITIES AND RELEVANCE

- Advanced Water Treatment improvements to increase water supply
- Program Management
- Environmental/CEQA
- Funding, Financing, Grantsmanship
- Multiple Stakeholder Coordination

Pure Water San Diego—a phased, multi-year, $1 billion program—will provide up to one-third of the City of San Diego's potable water supply by 2035. Phase one facilities will be constructed and in operation by 2022. We are the sole consultant leading, designing, and providing construction support for major program elements, including expanding the North City Water Reclamation Plant (NCWRP), constructing a new advanced water treatment plant known as the North City Pure Water Facility (NCPWF), upgrading the Metropolitan Biosolids Center (MBC)—the plant's biosolids treatment facility, and adding new wastewater and purified water pump stations and nearly 30 miles of conveyance pipelines.

PROJECT DESCRIPTION AND SERVICES PROVIDED – JACOBS

Jacobs is serving as lead designer of the water reclamation plant expansion and biosolids facility projects. We are also the construction manager for all conveyance facilities, totaling over $400 million in infrastructure. This includes over 18 miles of 48-inch diameter pipe and over 10 miles of 36-inch diameter pipe through heavy urban, suburban, and residential areas within the City of San Diego; nine tunneled crossings including multiple Interstate, freeway, and major roadway crossings; a dechlorination facility; a 34-mgd wastewater pump station, and a 32mgd purified water pump station. In addition to our role as construction manager of conveyance facilities, we are also lead designer of a 42-mgd tertiary treated effluent pump station and 42-inch diameter effluent pipelines, as well as all pipelines at all three treatment plants, ranging up to 90-inches in diameter.

Critical Project Challenges

- **Leveraging Project Understanding:** Our understanding of the entire Pure Water San Diego program led us to develop a system-wide hydraulics and controls dynamic simulation model enabling the client to simulate various scenarios in preparation for startup, commissioning, and operation.
- **Programmatic Approach:** During design, we provided programmatic support in the development of all technical master specifications for all Pure Water projects, as well as systemwide SCADA integration strategies. We developed a systemwide model to replicate

> "K&A's expertise in community relations and strategic communications, as well as your experience in the water industry, has helped San Diego move the needle on poitable reuse to advance the Pure Water Program so that we have a sustainable local water supply for San Diego ."
>
> **- JOHN HELMINSKI, ASSISTANT DIRECTOR, CITY OF SAN DIEGO PUBLIC UTILITIES DEPARTMENT**

154_v1

the hydraulics, controls, and process performance of the integrated system. Using this model, we developed overall system and facility control strategies (including all treatment plants and pump stations) to simulate system performance. We used the process model to predict RO scale potential and finished water stability indices, adjust chemical feed rates to meet water quality goals, validate design criteria, and optimize start-up and commissioning. Jacobs also worked with the City to develop master specifications for all Pure Water projects, program-wide SCADA integration strategies and specification, and program-wide start-up and commissioning specifications.

- **Knowledge of Urban Construction:** Our knowledge of the requirements for constructing pipelines and conveyance infrastructure in urban environments enabled us to provide the scheduling, sequencing, and coordination needed to achieve on-time construction and system startup.
- **Stakeholder Coordination and Public Outreach:** Katz and Associates worked with the City of San Diego to make the case for the program and to inform the public of construction activities to promote safety and mitigate construction impacts.
- **Innovative Solutions:** Developed a system-wide hydraulic and controls dynamic simulation model allowing the client to simulate various scenarios in preparation for startup and commissioning.

ACCOMPLISHMENTS AND OUTCOMES

Jacobs has completed two major program components and established a programmatic framework to track performance, compliance, schedule, budget, change, risk, and reports.

North City Water Reclamation Plant Expansion: The project is a $200 million expansion of the existing NCWRP, increasing capacity from 30 mgd to an average annual flow capacity of 52 mgd (where 42 mgd of the treated effluent will be sent to a new advanced water treatment facility). Expansion includes adding new influent screens, primary clarifiers, and bioreactor basins; retrofitting aeration basins for first stage bioreactor basins, retrofitting secondary clarifiers for second stage bioreactor basins; and constructing new filters, circular secondary clarifiers, and chemical facilities.

MBC Improvements: We are the design engineer for $30 million in upgrades to the city's central solids handling facility to support increased flow at the NCWRP. The MBC will receive raw sludge from the NCWRP, which it will process before mixing with digested sludge from another city WWTP; it will then dewater and dispose of the combined sludge.

PROJECT DESCRIPTION AND SERVICES PROVIDED – WOODARD & CURRAN

Woodard & Curran's involvement in this program, which has transitioned into Pure Water San Diego, began with the formulation of a Demonstration Project concept plan, which City staff used to solicit support from a wide array of regional stakeholders. Once a critical mass of stakeholder support was achieved, the City hired Woodard & Curran to manage the Demonstration Plan with the objectives of 1) refining the technical components of the program, 2) conduct sufficient research (AWPF performance and reservoir modeling) to demonstrate the regulatory feasibility of a surface water augmentation concept, and 3) to engage and inform the public on the issues and opportunities of this potable reuse strategy for the greater San Diego area. As part of this program management effort, Woodard & Curran served as Owner's Advisor overseeing the design, construction, and operation of a 1-mgd demonstration-scale advanced water purification facility at North City. The purpose of the Demonstration facility was three-fold; gather performance and water quality data to validate that the advanced water treatment technologies meet regulatory requirements for reservoir augmentation, train city staff on the operation and maintenance of advanced treatment technologies, and to demonstrate to the public that a "drinkable" product could be produced. A Demonstration Project Summary Report (authored by Woodard & Curran) was submitted to DDW and the Regional Board. Based on this documentation, the regulatory agencies issued concept approval for this first-of-its-kind surface water augmentation project. Based on the results of the demonstration project, the Woodard & Curran completed the facilities planning for a 25-mile, 36-inch conveyance system to deliver advanced-treated recycled water from the City's North City Water Reclamation Facility (North City) to San Vicente Reservoir.

ACCOMPLISHMENTS AND OUTCOMES

- ✓ Provided overall management of all facets of Demonstration Phase, including technical assessments, regulatory coordination, community engagement, and demonstration facility design, construction, and initial phase operation.
- ✓ Developed a regulatory strategy to address DDW and Regional Board requirements for the project
- ✓ Coordinated with PUD leadership and Mayor's Office to achieve support from a wide array of institutional and public stakeholders
- ✓ Assessed the interaction between Water Purification deliveries and operation of the North City non-potable system to determine the optimum AWPF capacity to minimize capital expenditures and maximize yield
- ✓ Served as Owner's Advisor overseeing the design, construction, and operation of a 1-mgd demonstration-scale advanced water purification facility
- ✓ Demonstration facility served as focal point for education and outreach opportunities, which fulfilled three critical purposes; introducing the purification technology and multiple-barrier treatment approach, communicating information about continuous monitoring of treatment processes to enhance trust in the reliability of a safe and clean supply of water and placing the AWPF in a water-cycle context to reframe mental models about how water is used and reused.

PROJECT DESCRIPTION AND SERVICES PROVIDED – KATZ & ASSOCIATES

The City of San Diego Public Utilities Department

Katz served as an extension of the City of San Diego Public Works staff to implement and manage the day to day activities that make up Pure Water's comprehensive public outreach program. Their responsibilities included facilitating Pure Water Demonstration Facility tours, planning and staffing community events, producing engaging collateral materials and more. As a direct result of K&A's work, the City has been recognized with dozens of industry awards for Pure Water's public outreach efforts.

K&A's expertise in community relations and strategic communications helped San Diego move the needle on potable reuse to advance the Pure Water Program so that the City secured the sustainable local water supply it needed. K&A facilitated partnerships between the City and local businesses to showcase the safety of advanced-treated recycled water – a truly unique approach to winning broad community support. K&A planned and executed the Phase 1 Working Group meetings to address community concerns and questions and to provide valuable input on how to avoid or minimize construction impacts.

ACCOMPLISHMENTS AND OUTCOMES

- ✓ Contributed to the positioning of San Diego as a national leader in potable reuse.
- ✓ Facilitated and executed a comprehensive public involvement and outreach program as an extension of the City's staff and as a trusted partner.
- ✓ Initiated partnerships between the City and businesses to showcase the safety of and to advance acceptance of advanced treated recycled water.

EXPEDITED PURIFIED WATER PROGRAM – PRELIMINARY ENGINEERING

SANTA CLARA, CA

FIRM & ROLE
Woodard & Curran, Preliminary Engineering/ Planning Consultant

PROJECT COST
Preliminary Program Assessment: $1.3 million (previous phase)
Preliminary Engineering: $4.5 million (this phase)

PROJECT DURATION
2016 - ongoing

CLIENT NAME AND REFERENCE
Hossein Ashktorab, Deputy Operating Officer, Santa Clara Valley Water District (SCVWD)
T: (408) 265-2607, ext. 312
hashktorab@valleywater.org

SIMILARITIES AND RELEVANCE
- Owner's Advisor/ Consulting Engineer
- Planning and Design of Potable Water Reuse
- Advanced Water Treatment
- Conveyance
- Environmental and Permitting Assistance
- Alternative Project Delivery

To meet the Santa Clara Valley Water District's (SCVWD's) need for a sustainable long term water supply, W&C conducted preliminary studies identifying up to 45,000 AFY of potable reuse potential. The study concluded that, beyond a baseline amount of non-potable reuse, potable reuse would best achieve the region's long term recycled water goals. Based on this strategic planning, SCVWD decided to expedite implementation of the Purified Water Program framed by the South Bay Water Recycling (SBWR) master plan also completed by W&C and the City of San Jose in December 2014 . SCVWD is now targeting construction of advanced treatment, conveyance, and groundwater replenishment facilities to support indirect potable reuse (IPR) by 2020 rather than the 2035 target date in the master plan.

PROJECT DESCRIPTION AND SERVICES PROVIDED

W&C conducted a preliminary assessment to refine the program components and is conducting preliminary engineering to provide the basis for establishing a program plan. This stage also supports environmental certification, regulatory permitting, and procurement of project execution (e.g., design-build) services. This will result in a program plan supporting programmatic elements of implementation, such as final design (or design-build), environmental documentation, financial planning, and public outreach.

Critical Project Challenges

- Siting and technical assessments of three AWPFs, each treating potentially different source water (e.g., secondary, Title 22 Tertiary, membrane bioreactor)
- Alignment study for 17-miles purified water conveyance to potable water receptor facilities
- Siting of 24 injection wells and a new percolation pond
- Facilities planning for conveyance and receptor facilities, supporting a Class 4 cost estimate
- Stakeholder technical assessment, facilities planning, and final recommendations workshops to narrow options and identify the ultimate program components and staging Injection Well O&M Assessment
- Dissolution Study to assess presence of arsenic and mitigation product water conditioning measures

> "Woodard & Curran was very good in delivering technical information to the different staff levels and departments within the District in a way that was easily understandable. Woodard & Curran was always available to discuss any technical issues or questions that we had."
> **- HOSSEIN ASHKTORAB, MANAGER, PURIFIED AND RECYCLED WATER UNIT**

- RO Concentrate NPDES analysis and Chronic Toxicity Testing to support use of San Jose/Santa Clara's Regional Wastewater Facility outfall
- Regulatory strategy and support for both Division of Drinking Water (DDW) and Regional Board permitting

The client added services to the scope in June 2017. The district asked W&C to prepare a facilities plan for a 24 mgd (expandable to 34 mgd) direct potable reuse (DPR) treatment and conveyance system. The district is the first agency in California to push the DPR envelope beyond concept and feasibility studies. In parallel, the team is developing a DPR regulatory strategy for the district, addressing the array of preliminary criteria DDW and the DPR expert panel identified in their 2016 report to the legislature.

ACCOMPLISHMENTS AND OUTCOMES

- ✓ **Surface Water Augmentation and Groundwater Recharge.** The program includes a variety of advanced treatment facility sources, varying in quantity and quality. We evaluated critical factors for source water, including secondary effluent characteristics, such as level of industrial contribution, type of secondary treatment, residuals management, and flow equalization.
- ✓ **Treatment Technology.** W&C has participated in ongoing advanced treatment research and is applying it to preliminary engineering and operational assessments for the SCVWD program.
- ✓ **Regulatory Setting.** W&C brings an understanding of the sensitivities and preferences of local regulatory staff regarding potable reuse and the regulatory process to complete permitting. W&C has gained this knowledge through 1) participating on a select working group with DDW to finalize the 2013 Groundwater Recharge Regulation, 2) developing the technical basis and regulatory approach for the draft DDW Surface Water Augmentation regulation (pending release) through our work with the City of San Diego, and 3) participating on California's initial DPR Committee coordinating early policy and regulatory discussion.
- ✓ **Benefits and Beneficiaries.** W&C assessed the benefits and beneficiaries (e.g., wastewater jurisdiction, water wholesaler, water retailer, land use entity) during the strategic plan to understand the drivers and opportunities needed to carry a potable reuse project forward; they then developed a path forward to implement the plan.

RECHARGE FRESNO PROGRAM

FRESNO, CA

FIRM & ROLE
Jacobs, Owner's Advisor/ Program Manager

PROJECT COST
$350 million

PROJECT DURATION
2013-2019

CLIENT NAME AND REFERENCE
Michael Carbajal, Director of Public Utilities, City of Fresno, CA

T: (559) 621-8610

michael.carbajal@ fresno.gov

PARTICIPATING/ OVERSIGHT AGENCIES

- City of Fresno
- State Water Resources Control Board
- USBR
- USACE
- USFWS
- EPA
- CDFW

SIMILARITIES AND RELEVANCE

- Owner's Advisor/Program Management
- Alternative Project Delivery
- Conveyance
- Potable Water Reuse
- Environmental Support and Permitting
- Financing, Funding, and Grantsmanship

The Recharge Fresno Program is focused on helping the City of Fresno secure its water future. By completing major water supply, treatment, and distribution projects, the program will enable the replenishment of groundwater aquifers and improve water supply sustainability and drought tolerance through the conjunctive use of available groundwater and surface water resources.

PROJECT DESCRIPTION AND SERVICES PROVIDED

The City of Fresno has historically relied heavily on groundwater supplies, which has been detrimental to their local aquifers. More than 80% of the city's current potable water demands are met with groundwater, causing an average groundwater level decrease of over 100 feet in the last 80 years.

In an integrated collaboration with the City of Fresno's Department of Public Utilities, we served as program manager for this program. Our team began working in August 2013, initially focused on developing program procedures, systems, and tools. We then began the delivery phase, including program management and administration; budget planning and financial support; program cost, schedule, and document controls; CIP project management, engineering oversight, and risk management; construction management; permitting and land acquisition management; and public outreach and community relations.

Critical Project Challenges

As part of the program, which is now almost complete, the city has invested over $350 million to construct major infrastructure, including:

- **Program Management for Water Supply:** An 80 million gpd surface water treatment facility with conveyance, permitting, and financing elements.
- **Conveyance:** Over 30 miles of 30- to 72-inch pipeline to bring raw surface water from nearby waterways to treatment facilities and deliver treated water to Fresno residents and businesses.

- **Potable Water Reuse:** Over 18 miles of 8-inch to 54-inch pipeline to deliver recycled water from a new water recycling facility to landscape and agricultural users throughout the southwest part of the city. Through these projects, this fifth-largest city in California has made great strides toward creating water sustainability.
- **Financing, Funding, and Grantsmanship:** Jacobs worked collaboratively with State Revolving Fund (SRF) to obtain over $340 million in low-interest loans to finance projects.

ACCOMPLISHMENTS AND OUTCOMES

As important as the fact that this project is helping create water stability for the city to secure their future is that, through the diligent work of each program team member, we helped the city deliver projects at a level they had not previously experienced, to numerous positive outcomes.

The program was delivered on time, which included accelerating the pipeline implementation so it was ready when the WTP came online. The initial budget for the program was about $500 million, which was then reduced to $400 million following initial cost validation by our team. The final cost was approximately $350 million, with most of the cost savings resulting from optimization of the treated water system pipelines in both size and alignment without compromising service.

"Since mobilization of our program management team in 2013, Jacobs has worked collaboratively with the City of Fresno to establish robust and effective processes and tools to support implementation of the City's Water CIP Program… Through improved data access and clarity of expectations, these new processes and tools have allowed us to advance our project management focus and capabilities, better manage cost and schedule risk, and improve accountability and transparency, and will allow us greater success in meeting capital program cost and schedule limitations."

- **MICHAEL CARBAJAL, DIVISION MANAGER, CITY OF FRESNO DPU WATER DIVISION**

At-a-glance...

SECTION 5: Staffing and Organization

Our staffing strategy features a blend of California-based and globally-experienced professionals with proven, award-winning expertise delivering state-of-the-art advanced treatment and conveyance facilities, under a variety of delivery models.

- **Integrated Team Addresses All Elements of Pure Water Program:** Our OA/PgM team provides the JPA the myriad of technical, delivery, environmental, and regulatory skills needed to complete this multifaceted program, and provide overarching support to the JPA for the life of the program.
- **Unique Owner's Advisor and Program Management Prowess:** The Jacobs team provides specialists with expertise in both aspects of owner's advisory and program management services, having engaged in major industry-recognized water and wastewater infrastructure programs that span the globe.
- **Our California-Based Team Supplemented with Experts from Our Global Bench:** As a partner to the JPA, we provide access to lessons learned and best practices gained from both local and global programs; principal team members who are former utility leaders offer insights into utility management and operations, to keep the Program focused on the end result – a fully compliant, well operated plant.
- **Superior Program Leadership Sets the Stage for Success:** At the pinnacle of our organization are **Rich Nagel**, as principal-in-charge and **Jennifer Phillips**, as program manager. **Rich and Jen bring strong credentials in California water and reuse trends.** They are supported by experienced task managers. Collectively, the team offers a blend of related technical expertise, successful program management experience on similar projects and programs, a strong knowledge and practical experience working within various delivery models, and a collaborative working style.
- **A "Fast Start" Mobilization Team Sets the Program in Motion:** Our "Fast Start" mobilization is led by **Jay Witherspoon**, one of Jacobs' most senior program managers, who brings worldwide experience to the Pure Water Program. Jay will lead a strong team focused on establishing the program management systems and tools that will enable effective management of the Program through its lifecycle.
- **Strategic Advisory and Quality Control Teams:** Complementing our program leaders are our strategic advisory and quality control teams, who provide an in-depth understanding of both California and industry treatment technologies and alternative delivery. They include **Bill Mitch** for Water Quality; **Mike Welch** for Regulatory Strategies; **Ken Weinberg** for Procurement and Legal Guidance; **Ron Wildermuth** for Public Involvement; **Susan Moisio** for Steady State Operations; **Gwen Buchholz** for environmental planning; **Tom Richardson** for Conveyance and Brine Management; **Larry Schimmoller** for Advanced Treatment; and **Jeff Smith** for Conveyance.
- **Project Delivery Team Managers and Technical Support Resources:** Successful program implementation will depend on the contribution of many technical and support professionals over the life of the program. We have chosen individuals who have the expertise and a proven track record delivering similar work.
- **Staff Experience on Similar Programs and History of Working Together:** Members of our team have a working relationship and a proven track record on similar assignments, demonstrating their ability to function as a cohesive unit, and contributing to their ability to deliver exceptional performance, inspire innovative ideas, and focus on quality outcomes.

SECTION 5

STAFFING AND ORGANIZATION

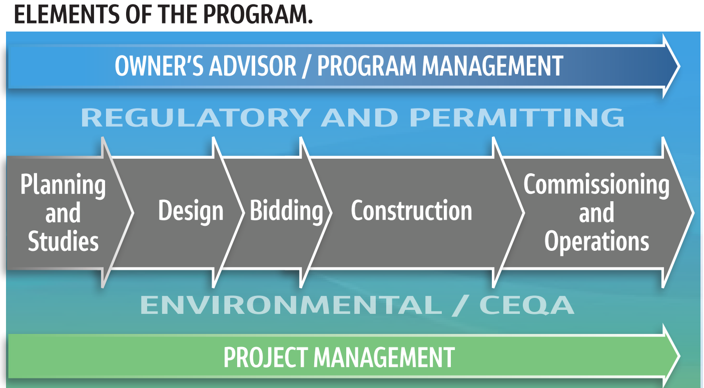
Our staffing strategy features a blend of California-based and globally-experienced professionals with proven, expertise delivering award-winning, state-of-the-art advanced treatment and conveyance facilities, working within program management and alternative delivery models.

To successfully realize the implementation of the Pure Water Program and attain the visionary, but ambitious goal of creating an efficient alternate water source through a new advanced wastewater treatment plant and infrastructure, the JPA has crafted a unique scope of work that combines Owner's Advisory and Program Management (OA/PgM) services. Partnering with the Jacobs team as your OA/PgM will avail the JPA staff of the myriad of technical, delivery, environmental, and regulatory skills needed to complete this multifaceted program (**EXHIBIT 5-1**). We will seamlessly integrate into your organization, augmenting your staff and providing overarching support to you for the life of the program.

This section of the proposal provides a description of our staffing strategy – explaining the make up of the team, and the rationale for selection of the individuals assigned to each role. The section includes the following:

- Team Attributes, Organization, and Structure
- Staff Assignments and Roles
  - » *Leadership and Project Task Managers*
  - » *Fast Start and Mobilization Team*
  - » *Strategic Advisors and QA/QC Team*
  - » *Project Delivery Team*
  - » *Technical Support Resources*
- Highlights of Qualifications and Similar Program Experience
- History of Working Together
- Professional Licenses
- Resumes

EXHIBIT 5-1. OUR TEAM ASSIGNMENTS AND ORGANIZATIONAL STRUCTURE WERE DESIGNED TO ADDRESS ALL INTEGRATED ELEMENTS OF THE PROGRAM.



WHAT YOU'LL FIND IN THIS SECTION:

- ✓ Team Attributes
- ✓ Organization and Structure
- ✓ Staff Assignments and Roles
- ✓ Highlights of Key Staff Experience and Qualifications
- ✓ History of Working Together
- ✓ Professional Licenses and Resumes

5.1 TEAM ATTRIBUTES, ORGANIZATION AND STRUCTURE

The program management function provides the framework, processes, resources, and tools to support efficient implementation of tasks and activities, including control of scope, schedule, costs, risks and integration of interrelated projects. The OA function focuses on advising on procurement and delivery model activities. Combining the two functions will realize exceptional efficiencies for the JPA, and potentially will expedite the completion of the program, to enable the JPA to go on-line even earlier than planned.

5.1.1 EXPERIENCE IN ALL ASPECTS OF THE PURE WATER PROGRAM

Our team is unique - we bring expertise in both aspects of owner's advisory and program management services in an integrated team that will support the lifecycle of the program, and industry-recognized expertise in the technical, delivery, environmental planning, and operational components of the program. We have an in-depth understanding of the OA/PgM role through several attributes of our team:

- An extensive number of programs that we have managed that have incorporated OA/PgM services
- Procurement method evaluation and oversight of alternative delivery models

- Industry knowledge in consulting and utility management, which includes team members who are former utility owners
- Experience operating water and wastewater facilities for owners

Through this experience, we have developed world-class program management systems and tools for complex programs around the world that can be tailored to the JPA needs.

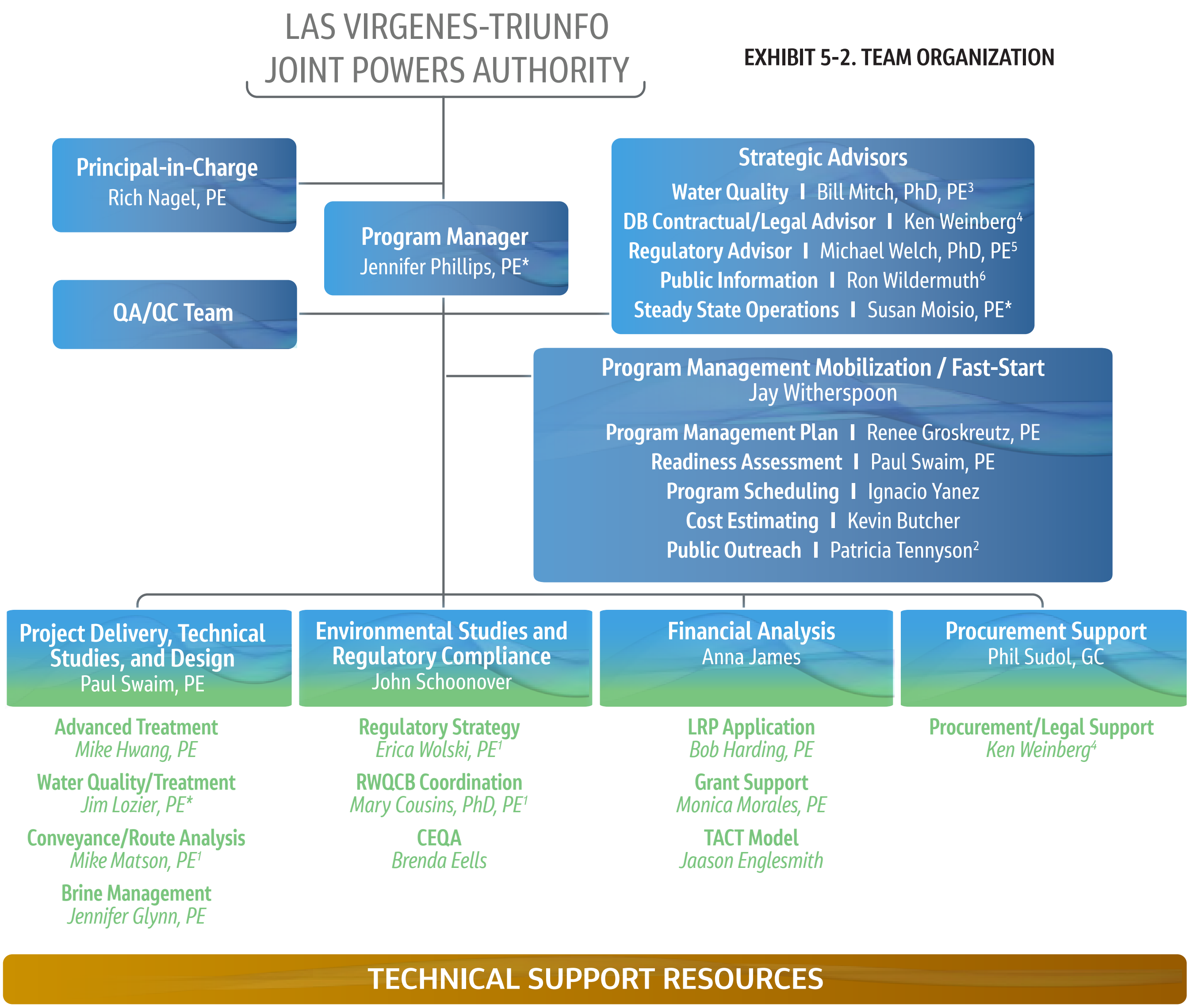
5.1.2 CALIFORNIA-BASED TEAM AUGMENTS THE JPA STAFF AND PROVIDES ACCESS TO LESSONS LEARNED ON SIMILAR PROGRAMS

The individuals comprising our team have both local and global experience –this unique combination will provide the JPA the flexible support it needs to realize its goal. With a strong base in California, as described in Section 3, we offer exceptional experience in relevant projects in California, as well as the world (described in Section 4), and the team we have selected bring specific and targeted experience both locally and globally. The JPA will benefit from the many lessons learned and best practices gained from this level of experience, contributing to the number of innovations presented throughout Section 2.

5.1.3 TEAM ORGANIZATION AND STRUCTURE

In designing a program organization that would benefit the JPA we sought to build a streamlined team that would efficiently cover the lifecycle of the program - one that would provide strong leadership for the duration of the program, strong project and task managers to complete discrete projects and tasks along the way, and the breadth and depth discipline-specific resources that could be accessed when needed. As shown in the organization chart in **EXHIBIT 5-2**, and explained in greater

EXHIBIT 5-2. TEAM ORGANIZATION



* PE in State other than CA (see resumes in Appedix A) 102_v6

SUBCONSULTANTS I [1] Woodard Curran [2] Katz & Associates STRATEGIC ADVISORS I [3] Bill Mitch, PhD [4] Ken Weinberg [5] Mike Welch [6] Ron Wildemuth detail below, our proposed team includes expertise not only in OA and program management, but also in the technical areas that will be trickiest to solve – advanced water treatment and quality (including NDMA and DBP management); watershed modeling to achieve steady state operations; conveyance planning and design; regulatory specialists for current and future permit compliance; expertise in brine management and reservoir discharges; public information; environmental planning and stewardship; and financial analyses and grant-writing support.

5.2 STAFF ASSIGNMENTS AND ROLES

We hand-picked the individuals based on their technical expertise related to the JPA needs, knowledge of the local issues, track record providing innovative solutions, collaborative working styles, and successful experience working together.

5.2.1 SUPERIOR PROGRAM LEADERSHIP SETS THE STAGE FOR SUCCESS

Rich Nagel will be our hands-on principal-in-charge; Rich is well-known to the JPA for his tireless work on southern California water and reuse issues, including holding a key role with the California WaterReuse Association, which was instrumental in shaping the reservoir water augmentation rule, which enabled the Pure Water Program to proceed. Rich will support the JPA and **Jennifer Phillips** by ensuring that the Pure Water Program needs are met, and that the program has the resources it needs to meet the JPA's program commitments.

A key decision we made was who would be the best person to lead the team as program manager. In making that decision, we wanted an individual with related technical expertise, successful management experience on similar projects and programs, a strong knowledge and practical experience working within various delivery models, and a collaborative working style. Our choice for program manager is **Jennifer Phillips**, who has just completed a leadership role on the very similar San Mateo Clean Water Program (described in Section 4) and sees the JPA's program as the perfect fit for her personal passion and skills. As the program manager, Jennifer will focus on establishing collaborative technical working groups to begin addressing the implementation of the program, exploring its many opportunities, and tackling its challenges. A glimpse into Jennifer's background is found in the inset on Page 5-5.

Key to Jennifer's leadership team is her task manager team - four highly credentialed individuals who will lead critical aspects of the program – **Paul Swaim**, **John Schoonover**, **Anna James** and **Phil Sudol**. The roles and responsibilities of this group who will help Jennifer deliver the program are shown in **EXHIBIT 5-3**.

Highlights of the qualifications of this program leadership team are summarized in **EXHIBIT 5-4**, on page 5-4. This is a superior team, who have experience working on programs with elements that are very similar to JPA's Pure Water Program, as presented in **EXHIBIT 5-5** on page 5-6.

5.2.2 A "FAST START" MOBILIZATION TEAM SETS THE PROGRAM IN MOTION

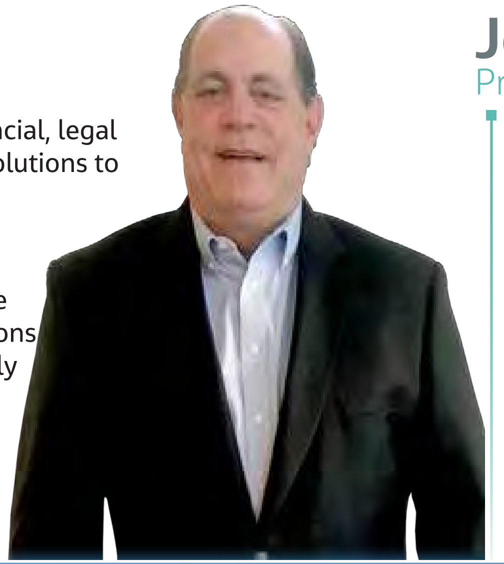
Our "Fast Start" mobilization approach is described in Section 2, Task 2, and is a critical stage of the program that occurs in the first six months. This Fast Start team is led by Jay Witherspoon, one of Jacobs' most senior program managers, who brings worldwide experience to the JPA's Pure Water Program, including his recent assignment as program manager in San Mateo. Jay will lead a strong team that will focus on developing a Fast Start Strategy, and establishing the program management systems and tools that will enable Jennifer and the JPA to monitor and manage the program through its lifecycle. Their working relationship and technical and delivery expertise are second to none, and are the foundation for this program's success. Jay's Fast Start Mobilization Team includes the following individuals; highlights of their qualifications are captured in **EXHIBIT 5-6** on page 5-10.

EXHIBIT 5-3. ROLES AND RESPONSIBILITIES OF TASK MANAGERS

PAUL SWAIM	JOHN SCHOONOVER	ANNA JAMES	PHIL SUDOL
▪ Leads Project Delivery, Technical Studies and Design; facilitates Readiness Assessment ▪ Oversee the teams undertaking studies and designs to make sure the results are integrated into the overall program.	▪ Guide teams to anticipate and develop strategies to meet the regulatory and environmental requirements for overall program success – including for CEQA and brine management.	▪ Work with our financial experts to provide financial analyses and grant applications that will support program implementation - including the LRP application and TACT model	▪ Leverage expertise in design-build delivery to help the JPA decide how to implement program facilities, and to lead team(s) in procuring services based on the selected delivery method.

EXHIBIT 5-4. PROGRAM LEADERS

Rich Nagel, PE
Principal-in-Charge



- »30 years of experience integrating financial, legal and regulatory strategies to create to solutions to southern California water challenges
- »As President Elect of the CA WateReuse Association, Rich played an active role in SB 918 Kuehl (2010) which led to the Reservoir Water Augmentation regulations and AB 574 Quirk (2018), and ultimately to additional regulation updates
- »Successful leadership of several major facility expansions, including two expansion of the Edward C. Little Water Recycling Facility

Jennifer Phillips, PE*
Program Manager

- »Program lead and project manager for San Mateo's $427 million wastewater plant upgrade to meet regulatory requirements
- »Led the design of San Luis Obispo's WRRF upgrade to provide capacity for 30 mgd wet weather flows and ~8 mgd of California Title 22 recycled water and potable reuse
- »Successful track record leading integrated teams for DB and CMAR projects and leading process and operations startup and commissioning for plants from 4 to 50 mgd

Jay Witherspoon
Fast Start / Mobilization

- »Over 38 years of experience across all areas of program and project management including 190 water, wastewater, water reuse, conveyance and sustainability projects
- »Program manager for San Mateo's $900 million Clean Water Program to meet regulatory requirements and replace aging infrastructure under the umbrella of the City's sustainability and water reuse goals.
- »As a former manager at a large water and wastewater utility in Oakland, California, brings unique insights to build an integrated team that understands the challenges facing utilities

"What Their Clients Have to Say

Delivers Highest Quality of Work

Creative Thinking

Displays **Tireless Effort**

Technically **Savvy**

PROVEN LEADERSHIP WILL DELIVER YOUR VISION

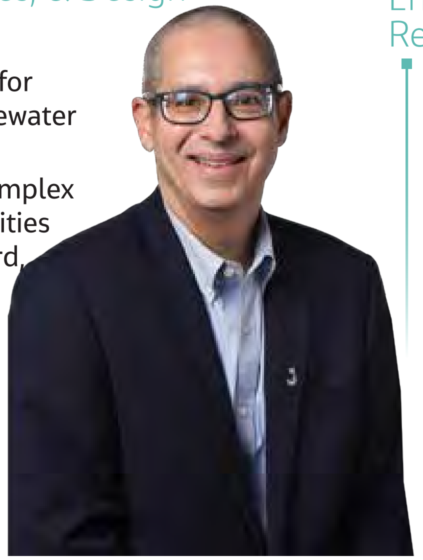
Exceptional **Responsiveness**

Meets Commitments

Endless **Dedication**

Provides **Innovation and Tireless Knowledge**

Paul Swaim, PE
Project Delivery, Technical Studies, & Design



- »Internationally recognized expert in disinfection and advanced oxidation for drinking water, water reuse and wastewater treatment applications
- »Successful track record delivering complex drinking and reuse projects with facilities up to 300 mgd for the cities of Oxnard, California; Henderson, Nevada; Park City, Utah; and Aurora, Colorado. Experience with regional agencies includes the Southern Nevada Water Authority, Metropolitan Water Reclamation District of Greater Chicago, and Metropolitan Water District of Southern California

John Schoonover
Environmnetal Studies & Regulatory Compliance

- »Expertise in California and federal permitting processes and environmental documentation - CEQA, USACE 401/404, CDFG 1600 LSAA, CESA/ESA, RWQCB 401 Certifications and Section 106 consultations
- »Providing permitting and outreach for the City of San Mateo's Clean Water Program which is under a RWQCB order, including CEQA, CEQA-Plus for SRF funding and permit tracking for the entire program

Anna James
Financial Analysis

- »Led state and federal funding efforts for the San Mateo Clean Water Program; prepared successful letters of interest and loan applications for WIFIA funding and a financing agreement with the California State Board to obtain SRF assistance.
- »Design engineer and facility lead SFPUC's biosolids digester which is part of the City's sewer system improvement program

Phil Sudol, GC
Procurement Support

- »A licensed Commercial General Contractor, with 25 years of water/wastewater delivery experience throughout the US including the City of San Jose, California and North Texas Municipal Water District in Texas
- »Developed and managed multi-million-dollar lump sum/fixed price projects
- »Managed contract operations for 67 water and wastewater facilities in four states

STRONG LEADERSHIP PROVIDED BY AN EXPERIENCED PROGRAM MANAGER

Jennifer's experience managing major water infrastructure projects, her solid foundation in wastewater treatment technology, her varied delivery experience in traditional and alternative delivery, and her collaborative management style make her the perfect choice to work with the JPA to lead the Pure Water Program.

Jennifer's process engineering and alternative delivery expertise provides the foundation to lead this program – her understanding of the technical details (and the range of delivery options) will enable her to successfully integrate the disciplines required to complete the program. Complementing this technical know-how is her collaborative and inclusive personal style which sets the stage for collaboration from the beginning. Evidence of this winning combination is seen in her successful programs and projects:

- Led an integrated team of design consultants and a CMAR for the wastewater treatment plant upgrade and expansion on the **San Mateo Clean Water Program**
- Created a collaborative environment between the Owner, the program manager and design team on San Luis Obispo's wastewater treatment plant
- Coordinated the design team, CMAR and operators to successfully start up the Tres Rios and Aqua Nueva water reclamation facilities for Pima County.

"What is notable about Ms. Phillips' involvement in PCRWRD operations is not just her technical savvy and her process experience, but her pleasant demeanor and her professionalism. Her personal skills have allowed her to work side-by-side with wastewater operators and explain complex processes in terms of language that allowed a very diverse workforce, with a wide set of skills sets and experience, to understand and share in the upgrades...."

- JACKSON JENKINS, PIMA COUNTY RWRD DIRECTOR

142_v3

- **Renee Groskreutz** - Program Management Plan
- **Paul Swaim** – Readiness Assessment
- **Ignacio Yanez** – Program Scheduling
- **Kevin Bucher** – Cost Estimating
- **Patricia Tennyson** – Public Outreach

5.2.3 OUR STRATEGIC ADVISORY AND QUALITY CONTROL TEAMS PROVIDE AN IN-DEPTH UNDERSTANDING OF CALIFORNIA WATER COMPLEXITIES AND INDUSTRY BEST PRACTICES

Complementing our program leaders are the individuals on our strategic advisory and quality control teams. We selected these individuals because of their expertise in the challenges specific to this program, their in-depth understanding of the complexities of California water, and their industry leadership in water reuse, advanced water treatment; conveyance and regulatory strategies. This unique blend of experience will help guide the JPA and program team to efficiently identify innovative and implementable solutions. Specific credentials of these team members follow.

Strategic Advisory Team

- **Bill Mitch** has an in-depth understanding of water quality issues, including NDMA management. He brings foundational experience to this program, through his work on the NWRI expert panel that evaluated the mixing of potable reuse discharges into the reservoir feeding the Las Virgenes-Triunfo drinking water plant.
- **Mike Welch**, **Ken Weinberg** and **Ron Wildermuth** bring their experience working on seminal programs in southern California reuse for Orange County Water District, San Diego County Water Authority and West Basin to advise the JPA on successful strategies for constructing future infrastructure and gaining state and public acceptance. For instance, Mike Welch, who played a key role in developing

EXHIBIT 5-5. PROGRAM LEADERS' EXPERIENCE

1. Clean Water Program, San Mateo, CA
2. WRRF Expansion, San Luis Obispo
3. West Basin Municipal Water District, CA
4. Water Replenishment District, CA
5. Department of Water and Power, Los Angeles, CA
6. GREAT Program, Oxnard, CA
7. Delta Conveyance, DWR, Sacramento, CA
8. Southeast Biosolids Project, SFPUC, San Francisco, CA
9. Davis-Woodland Conveyance and WTP, Woodland, CA
10. Alternative Delivery Program, City of Riverside, CA
11. DB and CMAR Projects, San Jose, CA
12. DB and CMAR Projects, Upper Trinity Water District, TX
13. Agua Nueva and Tre Rios WRF, Pima County, AZ
14. 3Kings and Quinn's Junction WTPs, Park City, UT
15. Calumet Water Reclamation Plant, Chicago, IL
16. Water Main Replacement Program, Chicago, IL
17. Masdar City, UAE
18. Watercare Service, NZ

	OA/Program Management	DB Delivery	AWT	Conveyance	Environmental and Regulatory	Financial Planning
Jennifer Phillips	●	●		●	●	●
Jay Witherspoon	●	●	●	●	●	●
Rich Nagel	●	●	●	●	●	●
Paul Swaim	●	●	●	●	●	●
John Schoonover	●			●	●	●
Anna James	●			●	●	●
Phil Sudol	●	●				

and implementing the regulatory strategy for the Pure Water San Diego Program – California's first ever permitted reservoir water augmentation project – will advise the team on regulatory strategies for JPA's Pure Water Program

- **Susan Moisio**, Jacobs' Global Solutions Director for Conveyance and Storage offers 37 years' experience in wastewater planning, operations, and engineering; Susan served as a former principal with Cincinnati Metropolitan District, and brings hands on operations experience as a utility manager, and industry-leading experience in hydraulic modeling in collection and conveyance systems that will allow the JPA to understand the optimal solutions for long-term steady state operations.

QA/QC Team

The individuals comprising our quality control team will provide detailed review of all project activities and deliverables. We have chosen individuals with unparalleled track records and who have committed to support the team.

- **Gwen Buchholz** and **Tom Richardson** bring over decades of experience integrating the planning, institutional and regulatory facets into the engineering of complex water projects throughout California. Gwen is an environmental planning specialist; her experience includes leading the environmental planning and CEQA activities for one of the most complex projects in the state - Delta Conveyance. Tom has specialized in California potable reuse for 30 years, with project experience in Orange County, San Diego, Los Angeles and San Jose. Their experience provides a sound foundation for how best to steer the program to success.

- **Larry Schimmoller** and **Jeff Smith** are senior technologists with Jacobs in advanced water treatment and conveyance, respectively. They bring industry-leading engineering expertise in the elements comprising the program, offering innovative and efficient solutions from California and around the world and an in-depth understanding of best practices to ensure long-term operational success.

Highlights of the qualifications of our Strategic Advisory and QA/QC team members are summarized in **EXHIBIT 5-7** on page 5-11.

5.2.4 PROJECT DELIVERY TEAM CONTRIBUTE TO INNOVATIVE SOLUTIONS FOR PROGRAM ELEMENTS

Within our team, we have identified project delivery and task managers who will undertake specific efforts to support the program, and include the individuals listed below, along with their assigned roles. As noted in the organization chart, they report to the four task managers noted above. Highlights of their qualifications and background re summarized in **EXHIBIT 5-8** on page 12.

- Advanced Treatment – Mike Hwang
- Water Quality / Treatment – Jim Lozier
- Conveyance / Route Analysis - Mike Matson
- Brine Management – Jennifer Glynn
- Regulatory Strategies - Erica Wolski
- RWQCB Coordination - Mary Cousins
- CEQA – Brenda Eels
- LRP Application - Bob Harding
- Grant Applications – Monica Morales
- TACT Modeling – Jaason Englesmith

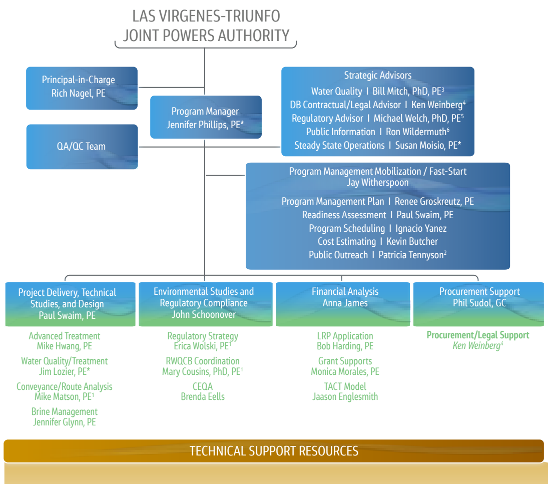


EXHIBIT 5-9. TECHNICAL SUPPORT RESOURCES

Supporting the OA/PgM team throughout Phase 1, and eventually Phase 2, are technical support resources who will engage on an as-needed basis to support a task, a project need, or to address a JPA requirement.

TECHNICAL SUPPORT RESOURCES

PROGRAM SUPPORT

Chartering
Dan Speicher

Performance Portal
Tyler Heuhmer

Risk Management
Mia Lindsey, PE

Scheduling/Cost Control
Tommy Salas

Document Control
Samantha Wadsworth

Sustainability
Das Topash, PhD

Constructability
Mike DiNapol (Facilities)
*Quentin Clark (Conveyance), PE**

Construction Management
Chris Bessa, PMP, CM

Hard-bid Cost Estimator
Kristian Benson, PMP

TECHNICAL STUDIES

Steady State Strategy
Amanda Heise, PE
Jagjit Kaur, PhD

Flow Equalization
Monica Morales. PE

Capacity Review
Monica Morales. PE

Water Quality/Treatment
Ling Wang-Staley, PhD, PE

Natural Habitats
Jim Bays

Operations
Howard Brewen

Source Control
Tyler Nading

Reservoir Modeling
*David Austin, PE**

CONVEYANCE DESIGN

Hydraulic Modeling
Chris van Lienden, PE [1]

Surge Analysis
Daniel Morse

Alignment Analysis
Matt Elsner, PE [1]

Permitting/Easements
Dave Haug, PE [1]

DISCIPLINES

Civil Engineering
Gino Nguyen, PE

Landscape Architecture
Jeff Townsend, FASLA, FAIA

Architecture
Julia Carroll, AIA

Structural Engineering
Tom Paige, PE

Mechanical Engineering
Qingshan Wang, PE

Electrical Engineering LEED
Michael Molinari, PE

I&C/SCADA
Dhumal Aaturaliye, PE

Smart Systems
*Susan Moisio, PE**

CAD/BIM
April Gorden

Geotechnical Engineering
Ping Tian, PhD, PE, GE

Surveying
Aaron Willis, PLS

* PE in State other than CA (see resumes in Appedix A)   Subconsultants I [1] Woodard Curran   103_v6

5.2.5 TECHNICAL SUPPORT RESOURCES WILL BE CALLED UPON, AS NECESSARY, TO COMPLETE PROGRAM- AND PROJECT-LEVEL ACTIVITIES

Successful program implementation will depend on the contribution of many technical and support disciplines. The individuals with these skills will not be needed on a daily basis, but can be called on, as necessary. Based on our experience on similar programs, we have identified the disciplines that may be needed over the life of the program, during both phases. We have chosen individuals who have the expertise and a proven track record delivering similar work. The staff comprising our technical and support resources are illustrated in **EXHIBIT 5-9** on page 5-7.

5.3 TEAM EXPERIENCE ON SIMILAR PROGRAMS AND HISTORY OF WORKING TOGETHER DEMONSTRATE PROVEN SUCCESSES

Many of our team members have a history of working together, and a proven track record of success, demonstrating the ability to collaborate as a cohesive unit, and contributing to their ability to deliver exceptional performance, inspire innovative ideas, and focus on developing solutions to program challenges. As an example, most recently, many members of our proposed program team delivered the City of San Mateo's Clean Water Program, very successfully. Using this same team as the foundation for the JPA's Pure Water Program, we bring a team that has a trusted relationship with each other, and similar experience in managing a program of this magnitude and complexity. Our team is proud of their performance on this and other programs and projects; we encourage you to call our references presented in Section 4 (See exhibits below and on page 5-9).

LEVERAGING THE SKILLS OF THE SAN MATEO CLEAN WATER PROGRAM TEAM PROVIDES EFFICIENCY AND FOUNDATION FOR PROGRAM SUCCESS

As noted in previous sections, we are providing multi-year program management services to the City of San Mateo to support the City in implementation of their $1Billion capital improvement program. Because the Clean Water Program is past the halfway mark, several members of that team are available to support the JPA's program and have proven skills - in contract management and procurement; program controls; technical support; environmental documentation and permitting; project and construction management; public outreach; and economic and financial analyses. By leveraging these skills across the lifecycle of the program, our team has a solid foundation from which to tailor program activities to meet the needs of the JPA.

Team members who worked together on San Mateo will bring that coheisiveness and shorthand to the Pure Water Project

LEADERSHIP I Jennifer Phillips , Jay Witherspoon, Anna James, John Schoonover

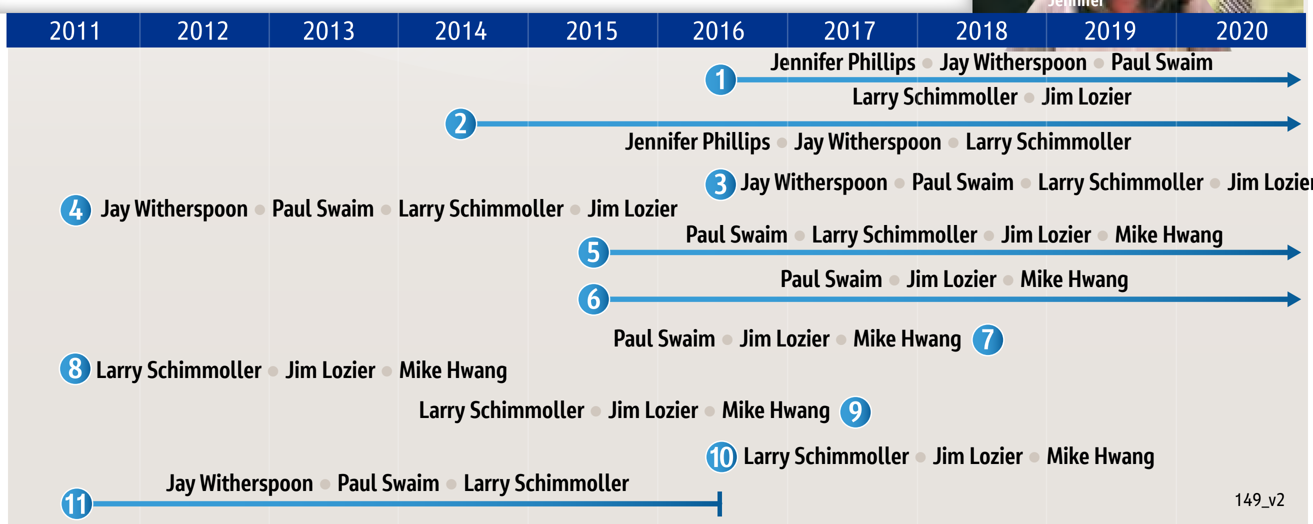
ADVISORS I Larry Schimmoller, Susan Mosio

PROJECT AND TASK MANAGERS I Ignacio Yanez, Jaason Englesmith, Jim Lozier

TECHNICAL AND SUPPORT DISCIPLINES I Howard Brewen, Dhumal Aturaliye, Tommy Sales, Mike DiNapoli, Tom Paige, Dan Speicher

148_v2

1. San Luis Obispo Water Resource Recovery Facility, CA
2. Agua Nueva Water Reclamation Facility (DBO) and Tres Rios Water Reclamation Facility (CMAR), AZ
3. Beenyup Advanced Water Recycling Plant, Perth, Australia
4. Luggage Point Advanced Water Treatment Plant, Brisbane, Australia
5. Hampton Roads Sanitary District Sustainable Water Initiative for Tomorrow (SWIFT), VA
6. Quinns Junction and 3 Kings Water Treatment Plants, UT
7. Metropolitan Water District of Southern California Cost Validation for AWTP, CA
8. Leo J. Vander Lans AWTF, CA
9. AZ Pure Water Brew Challenge Mobile Advanced Water Treatment Plant, AAZ
10. PWRRF 13-09 Research Project: Potable Reuse Pilot Testing Investigation for Inland Locations, AZ
11. Metro Wastewater Reclamation District Northern Treatment Plant (DB), CO



5.4 PROFESSIONAL LICENSING CONFIRMS QUALIFICATIONS OF PROPOSED STAFF

Our staff are licensed in their respective disciplines - professional engineers in the State of California and other states, as well as other licensing bodies such as the Construction Management Association of America, the Project Management Institute, the Society of Wetland Scientists and many software companies. Proof of this licensing is presented in Appendix A.

5.5 RESUMES OF ASSIGNED STAFF

In addition to the brief profiles provided in the exhibits in this section, resumes of our assigned staff and technical support resources are included in Appendix A.

C. PgM MOBILIZATION/ FAST START

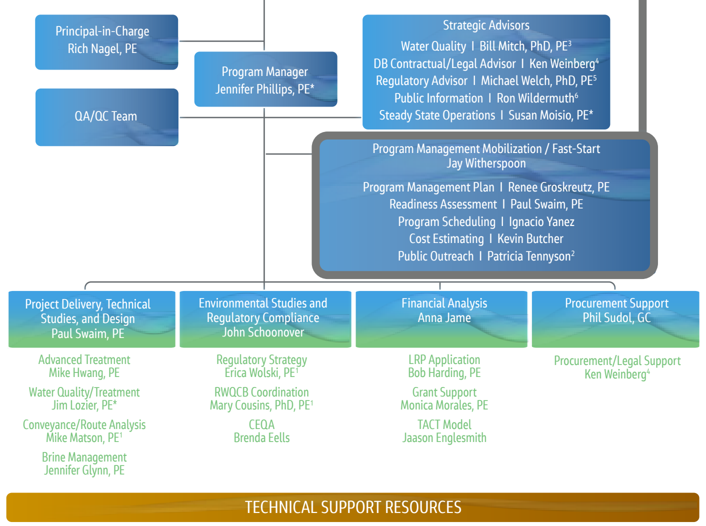


EXHIBIT 5-6. FAST START PROGRAM MOBILIZATION TEAM

The Fast Start Team will fully engage during the first six months to address Task 2 activities, establishing the program management framework that will guide the Program through completion.

Jay Witherspoon

C. PgM Mob/Fast Start Lead

- Over 38 years of experience across all areas of program and project management including 190 water, wastewater, water reuse, conveyance and sustainability projects
- Program manager for San Mateo's $900 million Clean Water Program to meet regulatory requirements and replace aging infrastructure under the umbrella of the City's sustainability and water reuse goals.
- As a former manager at a large water and wastewater utility in Oakland, California, brings unique insights to build an integrated team that understands the challenges facing utilities

Renee Groskreutz, PE

C. PgM Mob/Fast Start Program Management Plan

- Experience developing and implementing comprehensive quality, training and mentoring programs
- Manages budget, schedule, and quality for multi-disciplinary teams designing and constructing water and wastewater treatment facilities in southern California
- Ability to leverage excellent communication skills to develop and facilitate effective meetings and presentations

Paul Swaim, PE

C. PgM Mob/Fast Start Readiness Assessment

- Internationally recognized expert in disinfection and advanced oxidation for drinking water, water reuse and wastewater treatment applications
- Successful track record delivering complex drinking and reuse projects with facilities up to 300 mgd for the cities of Oxnard, California; Henderson, Nevada; Park City, Utah; and Aurora, Colorado. Experience with regional agencies includes the Southern Nevada Water Authority, Metropolitan Water Reclamation District of Greater Chicago, and Metropolitan Water District of Southern California

Patricia Tennyson

C. PgM Mob / Fast Start Public Outreach

- Over 25 years of experience implementing community and government relations programs and communication and public affairs strategies for water agencies in southern California and nationwide
- Expertise communicating about the science of water purification technology and potable reuse
- Co-principal investigator for WateReuse Research Foundation projects about direct potable reuse and desalination

Kevin Butcher

C. PgM Mob/Fast Start Cost Estimating

- Seasoned cost estimator with 20 years of experience developing project costs and cash flow schedules for water and wastewater capital improvement projects in the construction and design phases
- His focus is southern and central California, and has close involvement in the design process from conceptual design to the bid documents, as well as change order management during the actual construction period.

Ignacio Yanez

C. PgM Mob/Fast Start Program Scheduling

- More than 15 years of program/project controls, scheduling, and document management experience encompassing all areas of program management
- Managed and led diverse teams for large water, wastewater, and conveyance programs, overseeing change management and risk assessment
- Program Controls Lead for City of San Mateo, Program Management for Clean Water Program $990 million CIP

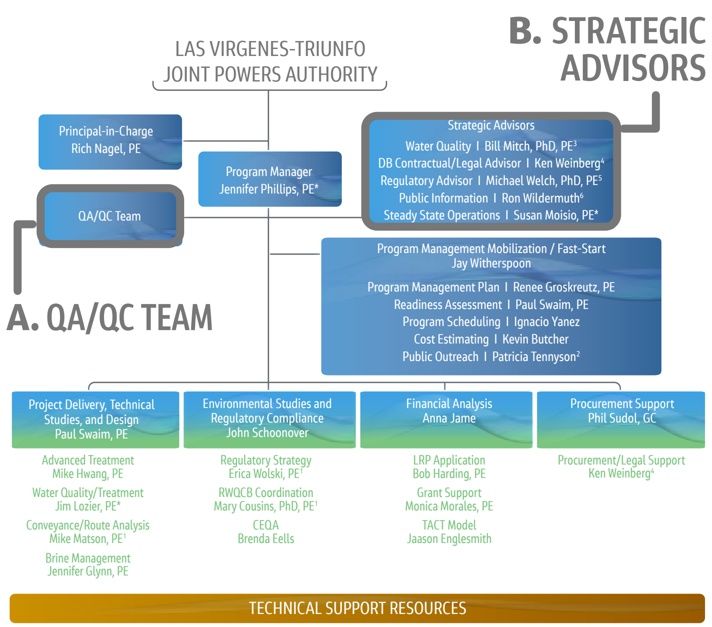


EXHIBIT 5-6. STRATEGIC ADVISORS AND QA/QC TEAM

Strategic Advisory and QA/QC Teams experience quides guides identification of optimal solution, innovative ideas, and practical experience to ensure program success.

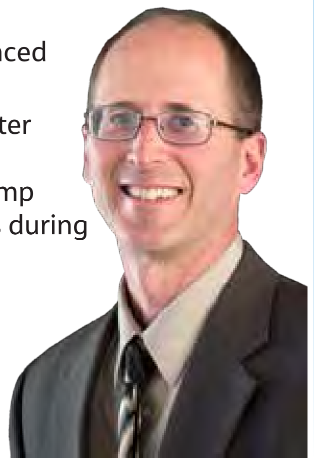
Gwen Buchholz, PE
A. QA/QC TEAM Environmental Compliance

- Over 41 years of California water resources planning experience
- Expertise integrating engineering and environmental requirements during planning, design and construction of water projects throughout California
- Extensive experience supporting public outreach for diverse interest groups on controversial programs, including Delta Conveyance

Tom Richardson, PE
A. QA/QC TEAM Brine Management

- Active in California water recycling since 1990, including work on several
cutting-edge potable reuse projects in Orange County, San Diego, Los Angeles and San Jose
- Expertise integrating the institutional, regulatory, environmental and funding strategies on complex projects
- Experience includes regional planning, site-specific master plans, and preliminary and final design

Larry Schimmoller, PE*
A. QA/QC TEAM Advanced Water Treatment



- Expertise in indirect potable reuse, removal of microconstituents, disinfection processes, and advanced reuse treatment processes
- Experience includes design of water and wastewater processes and treatment facilities, pipelines, pump stations and engineering services during construction
- Member of WaterReuse Research Foundation's Research Advisory Committee, which develops the research agenda

Jeff Smith, PE
A. QA/QC TEAM Conveyance

- 31 years of experience planning and designing transmission, distribution, and collection systems in California
- Managed more than 60 projects involving pipelines, pump stations and reservoirs for raw and potable water systems
- Expertise in procurement, route analyses, material comparisons, contractor bidding coordination and construction inspection and management

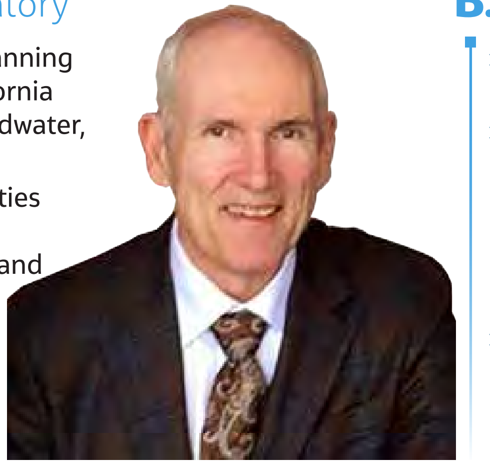
Bill Mitch, PhD, PE
B. Strategic Advisor Water Quality

- Served on NWRI expert panel evaluating mixing of potable reuse discharges into the reservoir feeding the Las Virgenes-Triunfo drinking water plant
- Over 20 years of experience researching disinfection byproduct formation mechanisms with a focus on nitrosamines
- Professor in the Department of Civil and Environmental Engineering at Stanford University

Ken Weinberg
B. Strategic Advisor Procurement/Legal

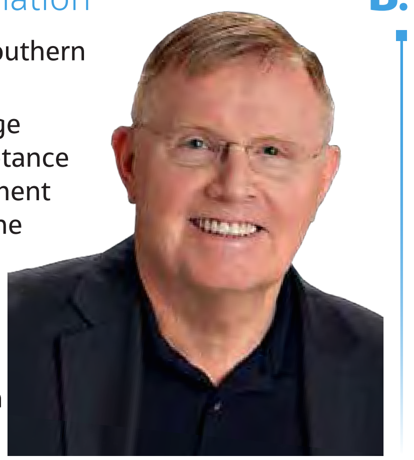
- Successful experience implementing alternative project delivery for major capital projects and developing a Public Private Partnership
- Former executive for the San Diego County Water Authority where he was responsible for long-term water supply and drought management planning
- Expertise in water supply and capital facilities planning, local water supply project development, environmental and regulatory compliance and alternative project delivery

Michael Welch, PhD, PE
B. Strategic Advisor Regulatory



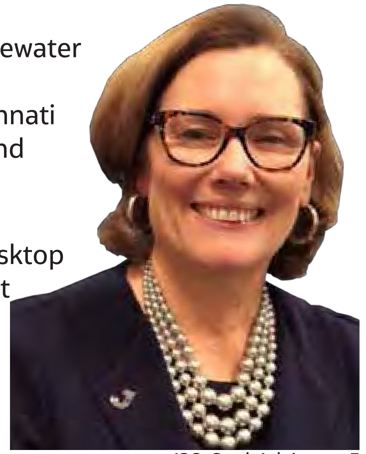
- Over 40 years of experience in planning and implementing southern California recycled water, wastewater, groundwater, water and desalination projects
- Specializes in assisting municipalities and public agencies in evaluating regulatory compliance with state and federal water quality and drinking water regulations and with state public health regulations

Ron Wildermuth
B. Strategic Advisor Public Information



- More than 20 years of experience in the southern California water sector
- As the Public Information Officer for Orange County Water District, led the public acceptance campaign for the Groundwater Replenishment System (GWRS) and the development of the education and demonstration center for GWRS.
- While at West Basin Municipal Water District, led public outreach for their Ocean Water Desalination Program and an Education and Demonstration Center

Susan Moisio, PE*
B. Strategic Advisor Steady State Operations



- Technical experience includes: 30 years' experience in wastewater infrastructure, served 6 years in the Wastewater Collection Division of the Metropolitan Sewer District of Greater Cincinnati in hydraulic modeling, SSES studies and utility operation and management
- Extensive operation experience for wastewater collection projects involving emergency field operations, field and desktop assessment of capacity problems and condition assessment and rehabilitation
- Recognized as a leading industry professional in collection system analysis; received the Water Environment Federation (WEF) Award

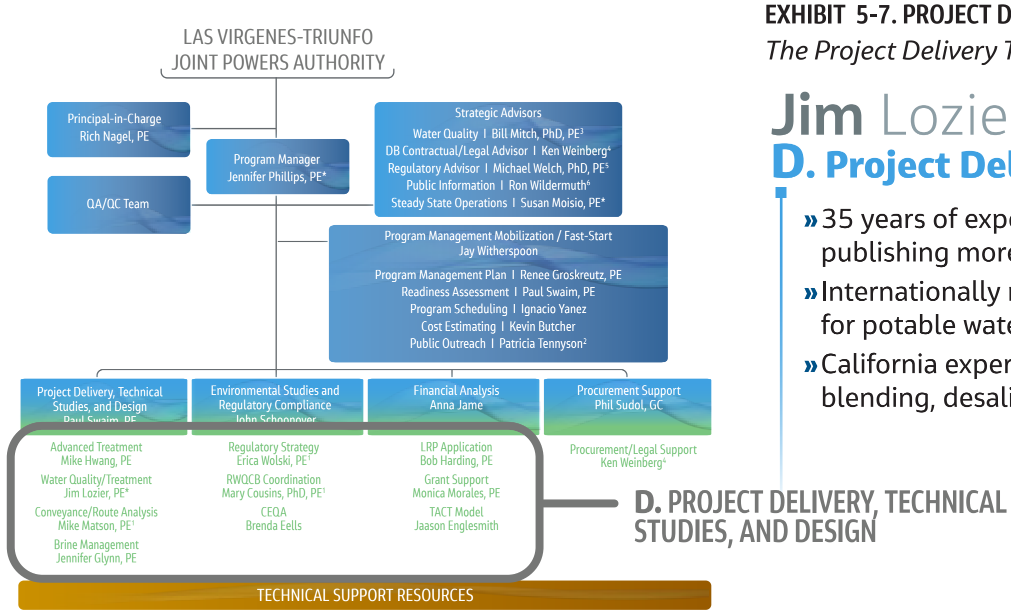
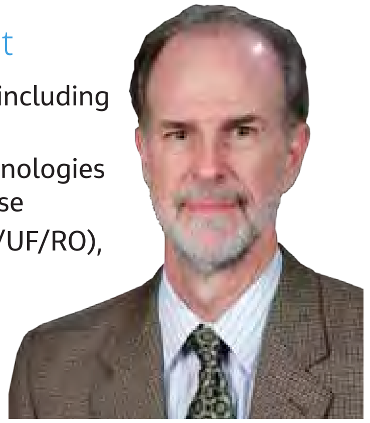


EXHIBIT 5-7. PROJECT DELIVERY, TECHNICAL STUDIES, AND DESIGN TEAM

The Project Delivery Team will work with the task managers to support the implementation of the program in their respective areas of expertise.

Jim Lozier, PE*
D. Project Delivery Water Quality/Treatment

- 35 years of experience in the water treatment industry, including publishing more than 60 articles and book chapters
- Internationally recognized authority on membrane technologies for potable water treatment, desalination and water reuse
- California experience includes advanced treatment (MF/UF/RO), blending, desalination and brine-concentrate studies

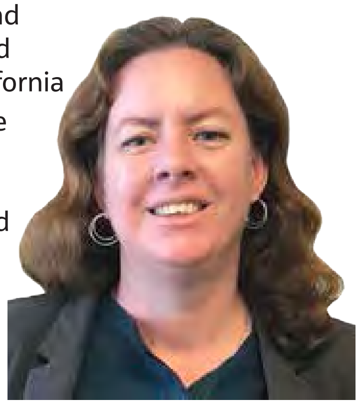


Mike Hwang, PE
D. Project Delivery Advanced Treatment

- Los Angeles-based-advance water treatment technologist, focused on RO, MF, UV processes
- 13 years of experience in advanced water and wastewater treatment planning and designs for a wide range of industries throughout California and southwest region
- Specialized expertise in disinfection byproduct control strategies

Erica Wolski, PE
D. Project Delivery Regulatory Strategy

- 19 years of experience in regulatory compliance for drinking and recycled water projects and programs throughout California
- While working for the State Water Resources Control Board, Division of Drinking Water (DDW), she prepared DDW permits and Title 22 reports for recycled water

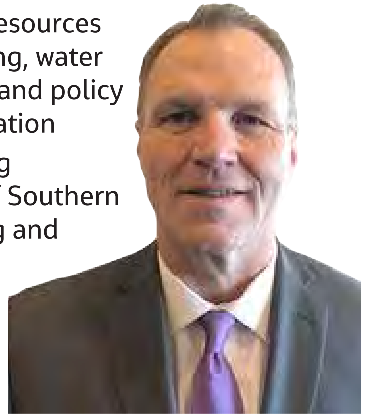


Mary Cousins, PhD, PE
D. Project Delivery RWQCB Coordination

- 13 years of experience with expertise in water quality, hydrodynamics and regulatory compliance
- Experience planning and permitting recycled water projects throughout California
- Experience conducting hydraulic modeling of distribution systems for drinking water and recycled water

Bob Harding, PE
D. Project Delivery LRP Application

- Expertise in California water resources strategic and financial planning, water supply and demand projects, and policy development and implementation
- 20 years of experience leading Metropolitan Water District of Southern California's Resource Planning and Development Section
- Led Metropolitan's Local Resources Plan (LRP) update



Mike Matson, PE
D. Project Delivery Conveyance/Route Analysis

- 35 years of experience in planning, design and construction of water infrastructure projects throughout California
- Led the design of over 150 miles of up to 96-inch diameter water and recycled water pipelines, 12 miles of up to 36-inch diameter sanitary/storm sewer pipelines, 13 pump stations up to 193 mgd and six reservoirs up to 10 million gallons

Jennifer Glynn, PE
D. Project Delivery Brine Management

- Conveyance specialist with 24 years experience in pipeline design in Southern and Central California, including more than 120 miles of pipeline ranging in diameter from 2 to 108 inches
- Served on the Executive Board of Directors for the North American Society for Trenchless Technology (NASTT) and currently serving on the Board of Directors for the Western Regional Chapter of NASTT; NASTT course instructor for Pipe Bursting Good Practices and Introduction to Trenchless Rehabilitation.

Brenda Eells
D. Project Delivery CEQA

- Los Angeles based environmental planner with 16 years of experience in CEQA and NEPA environmental planning for water and other public infrastructure projects
- Specializes in agency coordination and public outreach

Monica Morales, PE
D. Project Delivery Grant Support

- Monica is an experienced water and wastewater infrastructure engineer, based in Los Angeles;
- Her experience includes conveyance and storage, corrosion control, and sustainable and resilient design solutions.
- Recently served as conveyance design manager for the City of San Diego's Pure ; Water Program's Pure Water Facility, a 30-mgd AWTP program

Jaason Englesmith
D. Project Delivery TACT Model

- More than 20 years in financial planning, with experience as owner's agent
- Developed advanced economic modeling tools, including TACT, to assist water utilities improve their operational efficiency and effectiveness
- Program experience includes San Mateo Pure Water and Fresno

APPENDICES

A. Resumes
B. Scope of Work
C. Quality Management
D. Insurance Certificate
E. Consulting Agreement Response
F. Example Project Management Plan (PMP)

APPENDIX A
Resumes

PROGRAM LEADERSHIP

RICH NAGEL, PE

PRINCIPAL-IN-CHARGE

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
34 years

EDUCATION
BS, Civil Engineering, San Diego State University

LICENSES & CERTIFICATIONS
Professional Engineer: CA, No. C048472, Expires – 6/30/2022

WHY RICH?

- Proven water industry general manager, program implementor and leader active in the affiliated professional associations
- Deep understanding of technical, financial, board management, and public outreach needs to deliver large water reuse programs
- Deeply committed to Pure Water Program success and the benefits it provides the JPA and region

Rich has proven experience managing multiple major water industry programs, projects, and multi-disciplinary project teams, integrating management, financial consulting, engineering, and innovation to address complex challenges facing water utilities. His leadership includes managing contract operations and construction for the Edward C. Little Water Recycling Facility (ECLWRF), and its satellite facilities and distribution system. To date, over $650 million in capital improvement projects have been successfully invested in the facilities, providing significant benefits to the end users and residents. Under his guidance, West Basin Municipal Water District obtained the first permit in California to deliver 100 percent indirect potable reuse water to the Los Angeles County Department of Public Works' West Coast Barrier injection well system. This was followed by two plant expansions ($100 million) to achieve the 17,000 acre- feet per year (AFY) target use.

Rich was a founding member of the Greater Los Angeles County Integrated Resources Water Management Program. He is past president of the California WateReuse Association, vice chair of the Urban Water Institute, and board member of the Council for Watershed Health and the Southern California Water Coalition and is co-chair of its stormwater task force committee. Rich brings strong understanding of the region from past leadership and management roles at the West and Central Basin Municipal Water Districts and the Los Angeles Department of Water and Power, where he forged stakeholder customer agency input to create successful regional platforms.

Rich brings his deep program leadership and utility background, building on his experience as general manager for West Basin Municipal Water District, to support your program delivery; meet leadership, staff, and board expectations; and help keep our team on track to meet budget and schedule needs.

RELEVANT PROJECT EXPERIENCE

Phase 1 and Phase 2 White Papers on Tapping into Available Capacity in Existing Infrastructure to Create Water Supply and Water Quality Solutions, Las Virgenes Municipal Water District (LVMWD) | Jacobs Vice President and Principal in Charge

Rich served as the Jacob's Vice President and Principal-in-Charge for Phase 1 and Phase 2 of the white papers to evaluate the feasibility of using Low Flow Diversions (LFDs) within Los Angeles County for controlled introduction of dry weather urban runoff and first-flush storm flow into the wastewater system. Two significant benefits include production of a new source of recycled water and potential reduction of pollutants discharged to receiving waters. The Phase 1 White Paper provided a high-level analysis to assess the potential benefits of providing controlled connections from the stormwater system to the wastewater system. The Phase 2 White Paper will further evaluate existing LFDs and develop a framework for regulatory compliance.

RICH NAGEL, PE (CONTINUED)

PRINCIPAL-IN-CHARGE

Edward C. Little Water Recycling Facility (ECLWRF), Phase V Program Design-Build Expansion | General Manager, West Basin Municipal Water District

The $70 million project involved expanding Title 22 pretreatment capacity by 10 mgd to achieve a total treatment capacity of 40 mgd, along with expanding barrier water production from 12.5 mgd to 17.5 mgd and the low-pressure boiler feed water production from 1.7 to 2.2 mgd to serve single-pass RO water to NRG's El Segundo Power Plant. Rich managed contract operations for the ECLWRF, satellite facilities, and distribution system.

The $40 million Phase IV included upgrading and expanding the advanced treated purified wastewater capacity from 7.5 mgd to 12.5 mgd and tertiary water capacity from 30 mgd to 40 mgd at West Basin's ECLWRF. Major components included providing new cartridge filters, immersed microfiltration and reverse osmosis facilities, and a new ultraviolet process for disinfection and oxidation of trace organics, including NDMA. A 14.7 mgd microfiltration unit replaced the barrier system's lime clarification unit, which was converted for tertiary treatment.

Rich managed the installation of 60,000 SF of fixed-tilt photovoltaic panels at the ECLWRF. The system produces 900,000 kWh annually, with a rated power output of 500 kilowatts.

Water Replenishment District of Southern California (WRD), Regional Brackish Water Reclamation Program Feasibility Study, Lakewood, CA | Principal in Charge

This program is to remediate a saline plume trapped in the West Coast Basin to improve groundwater quality and increase available storage in the basin. Development of the feasibility study included project siting, conceptual development, and screening, as well as evaluation of alternatives for treatment, brine disposal, and power supply. Rich helped coordinate with stakeholders and provide resources to deliver the study on time and within budget.

WRD and the Los Angeles Department of Water and Power (LADWP), Joint Los Angeles Basin Replenishment and Extraction Master Plan, Los Angeles, CA | Principal in Charge

The master plan uses a regional approach to identify a comprehensive list of existing and potential new replenishment water sources, treatment facilities, and replenishment and extraction locations. Screening these system components enables the client to develop implementable, complementary projects that can be initiated upon completion of the plan. The ultimate goal of the master plan and resulting projects is to maximize use of local resources (through groundwater augmentation) and increase regional water supply reliability through reduced reliance on imported water. On this planning effort, Rich provides project oversight and engagement of key personnel throughout the life of the project.

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
21 years

EDUCATION
MS, Environmental Engineering, Virginia Polytechnic Institute and State University

BS, Civil Engineering, University of Virginia

LICENSES & CERTIFICATIONS
Professional Civil Engineer: AZ, No. 37317, Expires – 3/31/2023

WHY JENNIFER?

- Senior program/project manager in water industry
- Extensive experience in alternative and traditional project delivery
- Powerful, collaborative leader with a long record of successful program deliveries and satisfied clients
- Senior process engineer with strong technology and process innovations project successes

JENNIFER PHILLIPS, PE

PROGRAM MANAGER

Jennifer is a senior project manager with extensive experience in process design and management of major wastewater projects and programs. Her background includes a focus on biological nutrient removal and tertiary treatment for water reclamation and reuse. Jennifer is the program lead and project manager for San Mateo's $427 million wastewater treatment plant upgrade, where she is executing strategic elements similar to your needs—including a programmatic approach, conveyance upgrades, advanced treatment, environmental compliance, funding management, and alternative delivery. Her skills and outstanding delivery abilities place Jennifer in high demand with a successful track record leading integrated teams for traditional delivery, design-build, and CMAR projects.

RELEVANT PROJECT EXPERIENCE

City of San Mateo's Clean Water Program (CWP), San Mateo Wastewater Treatment Plant (WWTP) Upgrade and Expansion, CA | Program Treatment Functional Lead and Program Project Manager

Jennifer originally served as wastewater treatment functional lead, overseeing a team of project managers delivering seven large, bundled WWTP design project packages. She facilitated delivery standardization and consistency with city requirements, served as owner agent for delivery, and provided value engineering (VE), procurement, quality promotion, and technical/process quality oversight. She is now the program manager for an integrated team of design consultants (HDR) and a CMAR (general contractor SUNDT) to deliver a new, $427 million WWTP upgrade and expansion. The project provides wet weather flow capacity up to 80 mgd and implements nitrogen removal for maximum month flows of 21 mgd. It requires aligning with concurrent conveyance upgrades to deliver an integrated wet weather approach for the collection system and WWTP.

San Luis Obispo Water Resources Recovery Facility (WRRF) Expansion Program, San Luis Obispo, CA | Assistant Project Manager

As prime design consultant to upgrade the WRRF capacity for wet weather flows up to 30 mgd, we are replacing aging infrastructure to meet new regulatory requirements for disinfection byproducts and nitrogen removal, enhance reliability, produce California Title 22 recycled water, and set up for future potable reuse. Jennifer coordinated design team activities with the project goals for a $115 million liquid and solids stream upgrades construction project to provide 8.4 mgd maximum month capacity. Upgrades include complete primary clarifier equipment retrofits, new 2-mm primary effluent fine screening facility, new and upgraded bioreactor basins with nitrogen removal, membrane bioreactor, UV disinfection, new primary and secondary sludge thickening facilities, new and upgraded digestion facilities, sludge loadout facility, and a new water resource center housing utility and operations staff. Jennifer interfaced with the owner and program manager and led

JENNIFER PHILLIPS, PE (CONTINUED)

PROGRAM MANAGER

design review workshops to obtain input and agreement on process and equipment selections. Alternative selections were made through triple bottom line analysis.

Pima County Regional Wastewater Reclamation Department (PCRWRD), Agua Nueva Water Reclamation Facility DBO Project, Tucson, AZ | Process Startup Lead

Jennifer oversaw process operation during startup for this new 32-mgd WRF DBO project. The project includes design and construction of an innovative treatment process that uses DAF clarification for primary treatment, a 5-stage Bardenpho enhanced with step-feed capabilities, and deep tank secondary clarification. Stringent disinfection requirements are met through tertiary treatment using cloth disk filters and disinfection through chlorination.

Pima County Regional Wastewater Reclamation Department (PCRWRD), Tres Rios WRF Capacity and Effluent Upgrade Project, Tucson, AZ | Assistant Project Manager and Lead Process Engineer

Jennifer coordinated activities of the design team with the CMAR, owner, and operations staff for a $242 million liquid and solids stream upgrades construction project to increase plant capacity from 37.5 mgd to 50 mgd, with enhancement for nutrient removal. She led phased process startups by coordinating activities with operations staff and the contractor, recommending process set points, and applying troubleshooting techniques to achieve effluent quality goals and design equipment performance.

City of Phoenix, 91st Avenue Wastewater Treatment Plant Unified Plant 2001 (UP01) and UP05 Designs, Phoenix, AZ | Process Manager

Jennifer led design of the liquid stream treatment strategy for phases one and two of the Unified Plant, at 38.5 mgd per expansion. She used the GPS-X™ process model to evaluate the effect of proposed process changes on the nitrogen removal capability, including multi-phased anaerobic digestion, dedicated centrate nitrification, and aeration basin modifications. The process components included biological treatment and nitrogen removal, primary and secondary sedimentation, and disinfection to meet Arizona Class B+ reclaimed water standards. Jennifer managed and contributed to content development for the conceptual design report, coordinating efforts among the client, internal staff, and several subconsultants to produce draft and final deliverables.

91st Avenue Wastewater Treatment Plant Centrate Treatment and Odor Control Evaluation, City of Phoenix, AZ | Process Engineer

Jennifer was the process engineer for planning and operation of full-scale pilot testing to reduce nitrate through the primary sedimentation basins. The test simulated discharging oxidized nitrogen from a dedicated centrate nitrification system to provide denitrification upstream of the main activated sludge facilities. This process showed significant reduction in oxidized nitrogen and gaseous and liquid phase sulfide concentrations—a cost-effective alternative to covering 12 primary sedimentation basins and providing conventional odor control technologies to achieve odor compliance required by the air permit.

91st Avenue Wastewater Treatment Plant Unified Plant Centrate Treatment Facility, City of Phoenix, AZ | Design Engineer

Jennifer led the full-scale design, including centrate pumping, cooling, aeration basins, process air blowers, and secondary sedimentation basins. In addition to deputy project management, which included coordinating design details with the client, internal staff, subconsultants, and the contractor, managed and contributed to content development for the final design report and acted as the design engineer for the aeration basins through the preparation of detailed drawings and specifications.

She forged strong relationships with the men and women of PCRWRD and a myriad of contractors…I believe she could herd cats on a hot tin roof walking on a tight rope and juggling chainsaws.

--Jackson Jenkins, Pima County RWRD Director

JAY WITHERSPOON, BCEE

MOBILIZATION/FAST-START LEAD

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
38+ years

EDUCATION
MS, Chemical Engineering, University of California

BS, Chemical Engineering, University of Colorado

WHY JAY?

- Proven fast-start lead with extensive programmatic experience in tools set-up, using delivery and financial models and providing program delivery guidance successes
- Works well in a collaborative environment with our program delivery team and your staff
- Developed, used, and implemented programmatic tools, models, and guidance documents for several large international and California programs
- Former California Public Utility environmental compliance manager

Jay has served both as fast-start lead and senior program manager on several international and California programs. In this role, he reports to our program manager, working directly with her, our team, and your delivery staff to quickly mobilize and implement programmatic delivery tools, processes, models, the project performance tracking portal, and delivery guidance. To support this work, he brings key skills from more than 38 years of experience encompassing program management. He has managed and led diverse teams in over 190 water, water reuse, conveyance, tunnels, biosolids, air quality, sustainability, and wastewater projects globally and sustainable infrastructure, water and wastewater facilities, and buildings developments for 3 major eco-cities; this means there are few delivery challenges he has not addressed through his collaborative approach to solving complex economic, social, and environmental issues. Jay has worked on water and wastewater programs in the U.S., Australia, Kingdom of Saudi Arabia (KSA), United Arab Emirates (UAE), Singapore, Hong Kong, UK, Canada, and New Zealand.

RELEVANT PROJECT EXPERIENCE

City of San Mateo, Program Management for Clean Water Program (CWP), San Mateo, CA | Senior Program Manager Director

This is the city's first major program effort using CMAR delivery and implementing significant rate increases for funding. Jay led the team programmatically delivering this 10-year, $990 million capital improvement program to meet regulatory requirements, replace aging infrastructure, and align with city sustainability and water reuse goals. It required fast-start mobilization and leading-edge delivery for its more than 200 part-time employees; there are approximately 10–25 full-time equivalents (FTEs) on site to meet program key performance indicators, regulatory compliance, future treatment needs, and deliverables. Jay worked with the city and portal designers to develop the program management plan, implementation plan, financial TACT model, and performance tracking portal to monitor project and project manager performance, provide data warehousing and control, and house seven functional lead service areas. He set up quarterly economic summits using the TACT model to proactively manage cash flow performance, looking ahead at the program risk register for mitigation needs to keep the city board and delivery staff updated and informed. The program is being constructed using traditional and alternative delivery.

Masdar City Technology Innovations & Program | Abu Dhabi Future Energy Co. | UAE | Program Manager & Technology Innovations Director

Jay mobilized and led the fast-start team and, as program manager, managed a large development program ($16 billion) to create one of the world's first true eco-cities. This demonstrates Jay's commitment to innovation, which he brings to this project—facilitating

JAY WITHERSPOON, BCEE (CONTINUED)

MOBILIZATION/FAST-START LEAD

technology tools and model improvements during mobilization and to promote you as a leader in sustainable approaches to manage your assets. Jay's efforts included delivering phased projects on schedule and budget, tracking delivery and construction progress performance, providing construction management oversight, and developing the technology, financial, and social innovations roadmap. He also directed a team of energy, waste and water management, transportation, and information communications technologists to handle Masdar City's innovation technology branding needs, set up a performance tracking portal, and used our TACT Model for cash flow progress tracking and delivery accountabilities.

Project Manukau WWTP Upgrade Program, Watercare Service, Auckland, NZ | Fast-Start Lead, Fellow Technologist and Senior Advisor

Jay led the program's fast-start team to set up programmatic tools, process models, the performance tracking portal, project management plan, and TACT/economic model in completing this program. He developed a project implementation plan that provided for project delivery while meeting owner, local community, New Zealand Environmental Protection Authority, and environmental regulatory requirements and acceptability needs.

King Abdullah City for Atomic and Renewable Energy, Kingdom of Saudi Arabia | Principal-in-Charge and Sustainability Program Lead

Jay led sustainability, total water management, conveyance, and green infrastructure aspects of a new, sustainable, 100 percent renewable-powered city of over 200,000. Estimated cost at completion is an estimated $52 billion. A key factor was developing the sustainability performance tracking tool incorporated into the program portal to verify we met client sustainability goals.

East Bay Municipal Utilities District, CA | Air Quality Program Manager/ Environmental Compliance Officer

Jay managed a staff responsible for obtaining air permits, conducting air quality audits and assessments, completing air emissions inventories and risk assessments, conducting public outreach working sessions, developing compliance programs, preparing program budgets and schedules, and communicating with regulators about achievable, publicly owned treatment work control technologies. He developed cost-effective, alternative approaches for air quality emissions controls requirements and permitting strategies for the District. Jay was also responsible for setting up a new department charged with developing an integrated environmental action plan to address effects of air, wastewater, water, and sludge activities on WWTP operations.

Strategic Tunnel Enhancement Program, Abu Dhabi | Lead Program Odor Control Technologist

Jay led an odor control assessment and design for the deep sewage collection tunnel program valued at over $1 billion. Tasks included conducting pilot odor control assessments, modeling tunnel odor emission rates and discharge impacts, and providing public outreach to gain acceptance of the optimal solution.

We found CH2M HILL flexible and collaborative in their approach to working with Masdar City contractors and key stakeholders. Jay worked in partnership with our team to build capability in terms of tools and knowledge transfer and have demonstrated a wealth of technical support to help resolve technical challenges in an innovative, robust way. CH2M HILL delivered all of the above services on time and to budget.

*—**Stephen Severance**, Development Program Manager, Strategy and Innovation, Masdar City*

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
12 years

EDUCATION
MS, Environmental Engineering, University of California, Berkeley

BS, Civil Engineering, Washington University, St. Louis, MO

LICENSES & CERTIFICATIONS
Professional Civil Engineer: CA, No. C61071, Expires – 12/21/2020

WHY RENEE?

- Strong Southern California project delivery experience on large water programs
- Senior project manager with programmatic tool and treatment background and design and planning experience

RENEE GROSKREUTZ, PE

DEPUTY FAST-START LEAD AND PROGRAM MANAGEMENT PLAN

Renee helps our team quickly mobilize the program tools, models, and delivery guidance before moving over to support program implementation and delivery—the linking pin between our fast-start and program delivery teams. She has led several Southern California, multi-million-dollar planning, design, and construction projects in water and wastewater treatment for large municipalities. She uses her project delivery experience to develop the program management plan, providing delivery guidance and governance through the project implementation plan. She accesses expertise from our world-renowned technical and economic experts and advisors in funding, cash flow, rates, conveyance, portal development, and treatment processes to address your emerging technical, logistics, sequencing, environmental, economic, and regulatory challenges. Renee's proven delivery experience results in high-quality, on-time, on-budget performance, along with timely and clear communication throughout each project.

RELEVANT PROJECT EXPERIENCE

Las Virgenes Municipal Water District, Las Virgenes Biosolids Master Plan and Biosolids Handling Improvements, Calabasas, CA | Assistant Project Manager, Project Engineer

This project provided a long-term plan for biosolids handling and reuse for the district. Renee's responsibilities included evaluating existing facilities and coordinating the technical memoranda. After completing the master plan, the district implemented short-term recommendations, retaining Renee to prepare the design documents and facilitate services during construction.

Eastern Municipal Water District (EMWD), Perris Water Filtration Plant Expansion Program, Perris, CA | Project Manager/Project Engineer

Renee led the planning, conceptual design, detailed design, and engineering services during construction to increase plant capacity from 10 mgd to 20 mgd. The design added chemical pretreatment to accommodate a range of source-water characteristics, doubling membrane filtration capacity and adding ultraviolet disinfection, a high-lift station, a UV building, and new electrical service. Project engineer responsibilities included preparing the preliminary design report, evaluating the UV disinfection process, and providing required documentation to the Department of Health. As project manager, she managed a team of engineers and designers to prepare detailed drawings and specifications and engineering services during construction; she also provided overall project oversight.

RENEE GROSKREUTZ, PE (CONTINUED)

DEPUTY FAST-START LEAD AND PROGRAM MANAGEMENT PLAN

EMWD, Perris Water Filtration Plant, Perris, CA | Project Engineer/Project Manager

Renee led conceptual, preliminary, and final design of a new 10-mgd potable water treatment plant to increase EMWD's reliability and availability of potable water. The design included a raw water pump station, mechanical screens, membrane filtration, chemical feed systems, chlorine contact basin, and finished water pump station. The primary water source at time of design was Colorado River water. As project engineer, she coordinated the design team and subcontractor efforts and delivered preliminary and 30-, 60-, and 90-percent complete design drawings and specifications. As project manager, she completed the final design document and engineer's cost estimate for construction and provided engineering services during construction.

EMWD, Dechlorination Facility Design, Perris, CA | Project Manager

Renee managed the design of three dechlorination facilities including double contained polyethylene chemical storage tanks and chemical feed pump systems and controls. As project manager, her responsibilities included preparing a technical memorandum for the basis of design and scope of work for the design of the new chemical feed stations at the three existing pump stations. The team conducted field investigations to gather data to develop 3-D conceptual drawings to show potential interferences and connections with existing facilities. The team developed a streamlined purchase order with the required technical information for a contractor to install the system on a fast-track schedule.

Metropolitan Water District of Southern California, Mechanical and Electrical Master Specification Development, Hemet, CA | Project Manager

Renee managed this project to develop 23 master mechanical and electrical specifications. Each master specification included notes to specifier (NTS), review of current regulations and standards, and evaluation of district preferences and current equipment use. She coordinated and communicated preferences of the engineering, maintenance, and contract departments to her team and facilitated timely submittal of drafts and final specifications to the client.

EMWD, Raw Water Augmentation Pump Station, Perris, CA | Project Manager

Renee managed the preliminary design of a 7-mgd pump station at the inlet to the Perris Water Filtration Plant to augment recycled water flows to industrial users. Her responsibilities included overseeing the team of engineers designing the pump station to increase reliability and water source for industrial users, along with site evaluation and development of design criteria.

San Diego Water Authority, Ammonia Injection Facility, San Diego, CA | Project Engineer

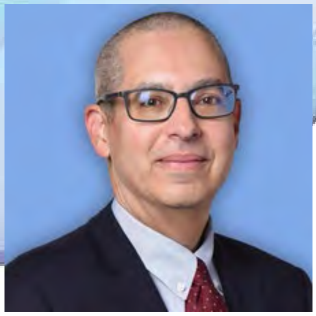
Renee's responsibilities included management and process evaluation for the remote ammonia injection facility to create chloramines in the conveyance system. Design included close coordination with future residential developers to minimize disturbance of future sidewalks and roads and construction scheduling.

Title 22 Engineering Report Development, Waste Discharge Permit, and State Revolving Fund (SRF) Loan Application for the Laguna County Sanitation District, Santa Maria, CA | Project Engineer

These documents were prepared as part of a general plant expansion and total dissolved solids (TDS) reduction project, which added membrane bioreactors, reverse osmosis, and UV disinfection.

Victor Valley Regional Wastewater Reclamation Plant Expansion, Victorville, CA | Project Engineer, Assistant Project Manager

Technical responsibilities included capacity evaluation of each plant process; confirming design criteria; preparation of California Title 22 Report and State Revolving Fund (SRF) Loan application; field studies; preliminary design of two secondary clarifiers; sizing of a returned activated sludge (RAS) pump station; and coordination of design, bidding services, and services during construction.



PAUL SWAIM, PE

READINESS ASSESSMENT / PROJECT DELIVERY, STUDIES, AND DESIGN LEAD

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
30 years

EDUCATION
MS, Civil and Environmental Engineering, UC Berkeley

BS, Civil Engineering, UC Berkeley

LICENSES & CERTIFICATIONS
Professional Engineer: CA, #C51195, exp 9/21; CO, #40991, exp 10/21; UT, #7990915-2202, exp 3/21

PROFESSIONAL AFFILIATIONS

- Past President of International UV Association and Past Chair of AWWA Disinfection Committee
- Trustee of AWWA Water Science and Research Division
- Recipient of AWWA Golden Spigot Award in 2013
- Co-chair of AWWA inaugural International Symposium for Potable Reuse (2016)

WHY PAUL?

- Successful track record leading delivery of complex water treatment and water reuse projects

Paul leads the program implementation plan's readiness assessment and assists with project prioritization and sequencing during the fast-start team mobilization; he will then move over to lead our team in project implementation and delivery and engineering studies. He applies his 30 years of experience of designing, delivering, and leading wastewater treatment, water reuse, conveyance, and drinking water projects from initial process selection through constructed-facility startup and completion. He is an internationally recognized expert in disinfection and advanced oxidation for drinking water, water reuse, and wastewater treatment applications. This combination of treatment and conveyance expertise, as well as technical and design delivery, provides Paul the strong qualifications to lead our project delivery team. His successful track record leading the delivery of complex drinking and reuse projects and conveyance systems with includes the City of Henderson, Nevada; Southern Nevada Water Authority; Metropolitan Water Reclamation District of Greater Chicago; Park City, Utah; and the City of Aurora, Colorado. His experience also includes the Oxnard GREAT Program AWT Facility in Oxnard, California. He served as a technical advisor for Clovis, California; Aurora Water's Binney Advanced Water Purification Facility indirect potable reuse facility in Colorado; and indirect potable reuse projects in Australia.

RELEVANT PROJECT EXPERIENCE

Oxnard GREAT Program Advanced Water Treatment Facility, Oxnard, CA | Senior Consultant

Paul provided senior oversight of AWT/UV advanced oxidation process design for this 6.25 mgd UV system with low-pressure, high-output UV reactors designed to provide 1.2-log NDMA destruction and 0.5-log destruction of 1,4-dioxane.

Park City Municipal Corporation, 3Kings Water Treatment Plant, Park City, UT | Project Manager

Paul managed a desktop study to select a treatment approach meeting myriad, stringent limits for mining-influenced water in Park City's potable water supply. He managed bench-top and pilot testing to demonstrate treatment performance, as well as design of the greenfield treatment plant. The plant produces potable water or water for stream discharge meeting the requirements of an Amended Stipulated Compliance Order. The conventional treatment design includes specialized media for metals removal and on-site hypochlorite generation. The $77.5M facility's unique architectural theme suits the mountain community and the compact plant fits between two holes of the municipal golf course, while also meeting Park City's net zero energy requirements.

PAUL SWAIM, PE (CONTINUED)

READINESS ASSESSMENT / PROJECT DELIVERY, STUDIES, AND DESIGN LEAD

Aurora Reservoir Aeration Study and Preliminary Design, Aurora Water, CO | Project Manager

Aurora Reservoir is a terminal reservoir in Aurora Water's system serving two water treatment plants with combined capacity over 130 mgd. Over the last decade, the quality of the water stored in the reservoir has declined, indicated by rising concentrations of phosphorus, manganese, and chlorophyll-a following reservoir turnover. This project implemented hypolimnetic oxygenation to improve water quality in Aurora Reservoir—a proactive improvement approach superior to reactively addressing the impacts of decreased raw water quality at the treatment facilities. The improvements have paid for themselves since startup in 2016.

Quinns Junction Water Treatment Plant (WTP) Process, Capacity, and Energy Management Project, Park City, UT | Project Manager

Paul managed the evaluation of alternative treatment approaches to upgrade and uprate the plant's reliability in handling turbidity, organics, and manganese peaks. He then managed three phases of improvements projects worth more than $10 million to add more UF membrane capacity, more post-filter GAC capacity, manganese dioxide contactors, and other plant improvements.

Metropolitan Water Reclamation District of Greater Chicago, Calumet Water Reclamation Plant (WRP) Disinfection Facilities, Chicago, IL | Project Manager

The project involved design and construction of liquid chlorination and dechlorination facilities for this 480-mgd peak flow water reclamation plant. The innovative design included modifying the chlorine contact basin (CCB) to provide sufficient contact time for disinfection and dechlorination. The design includes a disinfection chemical building housing chemical storage and feed facilities for both sodium hypochlorite and sodium bisulfite. The team completed hydraulic modeling and computational fluid dynamics to identify internal wall modifications within the CCB, significantly reducing headloss, preserving chlorine contact time, and enabling the CCB to accommodate the peak flowrate without costly booster pumping. The facility, which did not previously disinfect, joined the world's largest hypochlorite facilities at startup in 2015. The project was completed ahead of schedule and under budget.

Binney Water Purification Facility, Prairie Waters Project, Aurora Water, Aurora, CO | Task Manager

Paul managed water quality and treatability testing tasks for the project, leading water quality sampling and regulatory assessment tasks and design, construction, startup, and operation of two pilot studies supporting regulatory approval. The pilot studies evaluated conventional treatment and filter loading rates up to 10 gpm/sf at the 80-mgd Wemlinger WTP and softening and filter loading rates up to 12 gpm/sf for the future 50-mgd Aurora Reservoir Water Purification Facility. Paul planned and led treatability testing to evaluate UV advanced oxidation for a 50-mgd application as part of the award-winning project. Facility design was based on testing results evaluating removal of micro-pollutants and nitrosamines. He also provided oversight during pre-design and design, and developed procurement document for equipment supply. The facility began operation in late 2010.

Luggage Point Advanced Water Treatment Plant for the Western Corridor Program, Brisbane, Queensland, Australia | Senior Consultant

Paul was the process lead/senior consultant for the 70 mld (18.5 mgd) UV advanced oxidation system for this plant. Low-pressure, high-output UV reactors were selected. Detailed design and construction are completed, and the UV advanced oxidation system is currently operational. Paul developed the pilot testing plan for clarification, membrane filtration, RO, and UV-AOP.

IGNACIO YANEZ

PROGRAM CONTROLS AND SCHEDULING LEAD

Ignacio will lead setting up program document controls and developing the master schedule and baseline cost during the fast-start mobilization. He recently joined Jacobs, bringing over 15 years of program/project controls, scheduling, and document management experience. He has managed and led diverse teams over multiple business lines. He delivers programs on time and on budget, with a clear understanding of overseeing change management and risk assessment for each challenge, and developing a proactive risk register, and managing multiple projects' documentation and scheduling needs.

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
15+ years

EDUCATION
BS, Computer Engineer, IPVG, Chile.

LICENSES & CERTIFICATIONS
OSHA 30 hours Certified
Primavera 6.17 Web Environment
SME Cobra Cost, Plan view Resources Planning
Risk assessment - mining project programming
Baseline Centric Execution
Primavera 6 Advanced Level

WHY IGNACIO?

- Experienced program controls and document management expert
- Applies a collaborative controls and documentation delivery approach, helping delivery teams stay on schedule and budget
- Sets up and manages key programmatic delivery tools, models, and performance tracking reports

RELEVANT PROJECT EXPERIENCE

City of San Mateo, Program Management for Clean Water Program, San Mateo, CA | Program Controls Lead

Ignacio led the project controls team delivering this $990 million CIP to meet regulatory requirements, replace aging infrastructure, and align with the city's sustainability and water reuse goals. He worked with the city and program delivery teams to align work breakdown structures for standardized delivery; he also aligned cost and schedule systems to proactively provide relevant key performance indicators, enabling the team to make informed management decisions while keeping an eye toward risks, changes, and changing delivery environment and market conditions. His team also manages the program's performance tracking portal and monthly progress reports, oversees TACT modeling updates for quarterly economic summits, and meets with each project manager to update delivery progress, cost, and schedule information. He has established a comprehensive document control and management system to preserve key delivery documents, contracts, and information in one-place and easily retrievable.

Fluor Corporation, Regional Project Controls Manager, San Francisco, CA | Multi Project Controls Lead

Ignacio's responsibilities included managing cost and schedule for medium to large EPCMQ projects, including Bayer ($150 million), Genentech ($200 million), Gilead ($300 million) and Amgen ($40 million) clients. He developed methodic program controls documentation guiding consultants and contractors schedule and cost requirements. Ignacio was part of a team charged with setting construction sequences in conjunction with the construction management team to optimize construction delivery.

Fluor Corporation, Project Controls Manager, Greenville, USA | Project Control Lead

Ignacio was the project control lead for clients such as P&G (1.5B), CSL (0.8B). He was part of the construction of a P&G Plant in Lima, Ohio, where he was the main scheduler for the storm water collection system. Ignacio provided accurate schedules and proactive risk management and was included in the Watson IBM Research Board on analytics and prediction models. These models are currently used to provide early indication of what risks may arise on each project.

KEVIN BUTCHER

COST ESTIMATING

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
20 years

EDUCATION
Construction Technologies, Shasta College, Redding

PROFESSIONAL AFFILIATIONS
Association for Advancement of Cost Engineering (AACE)

WHY KEVIN?

- Knowledge and experience in water storage, conveyance, and treatment systems
- Skill developing project costs and cashflow schedules
- Cost estimator for various water conveyance and wastewater conveyance and treatment projects

Kevin is a cost estimator with 20 years of experience developing project costs for facility planning reports, capital improvement projects, programs and studies, engineering services, and cash flow schedules. He is closely involved in design for various water and wastewater projects, from conceptual design to finalized bid documents. Kevin brings vast experience in water storage, conveyance, and treatment systems and project delivery in the construction and design arenas. He has worked on many water intake facilities—screened, unscreened, and with or without fish bypasses or pumping plants. He also works on change orders as an owner's agent and has managed projects during the construction period. Additionally, Kevin has performed construction management services on many projects, including water conveyance and wastewater conveyance and treatment.

RELEVANT PROJECT EXPERIENCE

Eastern Municipal Water District, Temecula Valley Regional Water Reclamation Facility (TVRWRF) 23 MGD Expansion, Temecula, CA | Lead Cost Estimator

This project included design and permitting of the TVRWRF 23 mgd expansion, which uses membrane bioreactor and chlorine disinfection. The project also upgraded the original wastewater treatment facilities.

Lake Arrowhead Community Services District (LACSD), Water Reclamation and Integrated Water Resources Plan, Lake Arrowhead, CA | Lead Cost Estimator

This project was to design and permit the water reclamation facilities (denitrification filters, membrane filtration, UV disinfection, and reclaimed water distribution) for LACSD's Grass Valley Wastewater Treatment Plant' and expand the wastewater treatment facilities. We designed, cost-estimated, and delivered the new, reclaimed water distribution system on budget and schedule.

Eastern Municipal Water District, Perris Water Filtration Plant (PWFP) Expansion, Perris, CA | Lead Cost Estimator

The PWFP upgrade and expansion included two phases: adding 10 mgd capacity (for a total of 20 mgd) and subsequent expansion to 24 mgd at buildout.

Santa Rosa Subregional Water Reclamation System, Santa Rosa, CA | Cost Estimator

Kevin helped develop the engineer's estimate on the $160 million Geysers Recharge Project, part of the Subregional Water Reclamation System. The project involved design of 41 miles of 30- to 48-inch-diameter steel pipelines and pump stations to deliver reclaimed water to the Geysers Geothermal Steamfield, which recharges declining steam reserves.

Rochester Water Reclamation Plant, Rochester, MN | Cost Estimator

Kevin assisted in developing the engineer's estimate on both the $27 million expansion and the $25 million upgrade to the WRF.

KEVIN BUTCHER (CONTINUED)

COST ESTIMATING

Tahoe-Truckee Sanitation Agency, Truckee, CA | Lead Cost Estimator

Kevin provided cost estimates for the water reclamation plant expansion.

Olivehurst Wastewater Treatment Plant, Water Reclamation Plant Expansion, Olivehurst, CA | Cost Estimator

Kevin assisted in developing the engineer's estimate on the $23 million, Phase 1A expansion and upgrade to the WWTP.

City of Loveland, Loveland Wastewater Treatment Expansion and Capital Improvements Plan, Loveland, CO | Lead Cost Estimator

Kevin provided cost estimates for the WWTP expansion and capital improvements plan.

Lake County Sanitation District, Southeast Regional Wastewater System Improvements and Geysers Effluent Pipeline Project, Lakeport, CA | Cost Estimator

Kevin developed the engineer's cost estimate to construct improvements to this wastewater system. The project included a new 6.0-mgd regional wastewater collection system and treatment facility, and construction of the 26-mile-long, 20- and 24-inch-diameter Geysers Effluent Pipeline.

Colusa Basin Drainage District, South Fork Willow Creek Detention Basin Project, Willows, CA | Lead Cost Estimator

Kevin provided engineer's cost estimates for construction of an earthen dam creating a detention basin for flood control. The project included concrete structures, outlet piping, spillway, and the relocation of a section of county roadway. The detention basin detains a peak inflow of 9,120 cubic feet per second (cfs) during the 1,000-year, return interval flood event; an un-gated outlet reduces the flow downstream of the detention basin to approximately 400 cfs. The outlet system is capable of releasing half of the maximum reservoir capacity in 7 days and will not retain water longer than 30 days. The spillway enables discharge of flows greater than those associated with a 1,000-year event into the creek downstream of the dam.

PATRICIA TENNYSON

PUBLIC OUTREACH ADVISOR

CREDENTIALS

COMPANY
Katz & Associates

EXPERIENCE
25+ Years

EDUCATION
Master of Science, Public Administration, San Diego State University

Master of Science, Library Science, Texas Women's University

Bachelor of Arts, Social Sciences, Southern Methodist University

PROFESSIONAL AFFILIATIONS
- Water Environment Federation
- CA Water Environment Association
- WateReuse California, former member of the Board of Trustees
- American Water Works Association: Technical and Educational Council, Former Chair, Public Affairs Council
- American Water Works Association, California/Nevada Section

WHY PATRICIA?
- Institutional knowledge of your Pure Water Project
- Unparalleled experience communicating about the science of water purification technology and potable reuse

Patricia is a water specialist with over 25 years of experience in the industry. She develops and helps implement community and government relations programs and communication and public affairs strategies for water agencies nationwide. She provides strategic counsel, designs presentations informing policy-makers and communities about a variety of technical issues, develops and implements public outreach and involvement strategies, and facilitates community workshops, environmental scoping meetings, and citizen advisory committees. This includes informing and involving the public on important topics related to water conservation, supply, resources, and quality; water and wastewater systems planning; water, recycled water, and wastewater infrastructure construction; conjunctive use and groundwater recharge; and water sustainability and resiliency. In addition, Patricia brings unparalleled experience on communicating about the science of water purification technology and potable reuse.

Patricia was co-principal investigator for two WateReuse Research Foundation research projects on public outreach: one for desalination and the other for direct potable reuse. She has developed public outreach strategies and informational materials for a variety of recycled water projects, including potable reuse projects for the Orange County Water District, City of Aurora, Santa Clara Valley Water District, El Paso Water, Las Virgenes Municipal Water District, City of Tampa and the City of San Diego. She also provided public outreach assistance and guidance to Flagstaff, Arizona, Santa Fe, New Mexico and Westminster, Maryland for their initial examination of potential potable reuse projects.

Before joining Katz & Associates, Patricia directed the San Diego County Water Authority's public affairs department. Other experience includes a decade of work in a number of City of San Diego departments, including Intergovernmental Relations, which she directed from 1987 to 1989.

Patricia is a member of American Water Works Association's (AWWA) technical and educational council, as well as the former chair of the AWWA public affairs council. She is also a former member of the Board of Trustees for WateReuse California.

PATRICIA TENNYSON (CONTINUED)

PUBLIC OUTREACH ADVISOR

RELEVANT PROJECT EXPERIENCE

Las Virgenes Municipal Water District | Public Outreach Advisor

Patricia has provided a variety of community engagement and outreach support to the District for the past 15 years, beginning with developing messages and communication strategies related to TMDL issues and Malibu Creek, planning and facilitating workshops with the Las Virgenes – Triunfo Joint Powers Authority boards, staff and interested community group members, and assisting with developing the brand, logo and tagline for the Pure Water Project Las Virgenes – Triunfo, conducting in-depth interviews with community leaders about the potable reuse project concept, and developing the project communication plan and related informational materials.

City of San Diego, Pure Water San Diego Program, San Diego, CA | Public Outreach Advisor

Patricia supervised the award-winning, comprehensive public education and outreach program for the City of San Diego Water Purification Demonstration Project, now known as Pure Water San Diego. She continues to lead outreach efforts pertaining to the full-scale project and its benefits as a new, local water supply. K&A uses a variety of techniques to inform residents and alleviate concerns about potable reuse and raise awareness about the importance of local water resources. As part of the outreach team, Patricia develops key messages, provides strategic communication counsel and planning services, conducts speaker and media training, and continuously supports strategic oversight and implementation of the Pure Water San Diego Working Group—a diverse committee of more than 40 stakeholders that serve as a sounding board for the City of San Diego and ambassadors for the multi-year program.

City of Clearwater, Clearwater Groundwater Replenishment Project Technical Advisory Committee, Clearwater, FL | Public Outreach Advisor

Patricia served as public outreach advisor on the technical advisory committee (TAC) for the design and permitting phase of the Clearwater Groundwater Replenishment Project. She reviewed and provided guidance regarding the public outreach and communication plan, developed informational materials, and recommended outreach strategies and tactics for the project.

El Paso Water Utilities, Direct Potable Reuse Program, El Paso, TX | Public Outreach Advisor

Patricia assisted El Paso Water Utilities management build relationships and raise awareness for their direct potable reuse project. She conducted focus groups; helped plan meetings to explain the program to underserved populations; assisted in developing the pilot project tour and associated tour brochure, tour guide speaking points, and signage; developed an article for placement in the local medical society's publication; and more.

Eastern Municipal Water District Groundwater Reliability Plus Program, Perris, CA | Public Outreach Lead

Patricia is leading the public outreach consulting team to develop the community engagement program informing residents of EMWD's service area about the Groundwater Reliability Plus program, including its newest project: Purified Water Replenishment. EMWD is one of a very few water agencies that beneficially reuses 100 percent of the recycled water it produces for agricultural and landscape irrigation as well as a variety of industrial uses. The potable reuse project complements EMWD's water banking projects that improve the quality and quantity of local groundwater available to meet water supply needs.

Model Communication Plans for Increasing Awareness and Fostering Acceptance of Direct Potable Reuse, CA | Co-Principal Investigator

Patricia was the co-principal investigator for this published research project. In addition to public opinion research and in-depth interviews with water agency staff, California legislators, regulators, and representatives of business and environmental groups, this published research project includes state-level and local model communication plans to increase awareness and foster acceptance of direct potable reuse. These plans are designed to be blueprints on how to develop potable reuse public outreach programs nationally, with an emphasis on California..

BILL MITCH, PHD, PE

STRATEGIC ADVISOR – WATER QUALITY

CREDENTIALS

FIRM
Stanford University – Department of Civil and Environmental Engineering

EXPERIENCE
27 years

EDUCATION
PhD, Civil and Environmental Engineering, University of California, Berkeley

MS, Civil and Environmental Engineering, University of California, Berkeley

BA, Summa Cum Laude, Anthropology (Archaeology), Harvard University

LICENSES & CERTIFICATIONS
Professional Civil Engineer: CA

WHY BILL?

- Recognized leadership in water quality and NDMA
- Member of NWRI expert panel evaluating mixing potable reuse discharges into the reservoir feeding the Las Virgenes-Triunfo drinking water plant

PUBLICATIONS
95 Refereed Journal Publications

4 Non-refereed Conference/Symposia Proceedings

Dr. Mitch is a Professor in the Department of Civil and Environmental Engineering at Stanford University. He has studied disinfection byproduct formation mechanisms over the past 20 years, with a particular focus on nitrosamines. Dr. Mitch brings our OA/PM team unique and insightful expertise and skills to advise on technology and process innovations to best treat wastewater to become a viable water reuse product. His research has evaluated technique to minimize the formation of disinfection byproducts. He obtained a BA in Archaeology from Harvard University and MS and PhD degrees in Civil and Environmental Engineering from the University of California at Berkeley. He received the 2004 Outstanding Doctoral Dissertation Award from the Association of Environmental Engineering and Science Professors and Parsons Engineering, and a NSF Career Award in 2007. He served as the Chair of the 2017 Disinfection Byproducts Gordon Conference. He served on a NWRI expert panel evaluating mixing of potable reuse discharges into the reservoir feeding the Las Virgenes-Triunfo drinking water plant. He holds a PE license in California.

Academic/Professional Appointments

Professor, Depart. of Civil and Environmental Engineering, Stanford University, 2017-present.

Associate Professor, Depart. of Civil and Environmental Engineering, Stanford University, 2013-2017.

Associate Professor, Depart. of Chemical Engineering, Yale University, 2008-2013.

Assistant Professor, Depart. of Chemical Engineering, Yale University, 2003-2008.

Research Assistant, University of California at Berkeley, 2000-2003.

Water Industry Advisor Roles

Awards and Honors

2018	ACS Editors' Choice Award for a paper in *Environmental Science and Technology*
2017	Best Science Paper Award in *Environmental Science and Technology*
2017	Elected Chair of the 2017 Disinfection Byproducts Gordon Conference, Mt. Holyoke College
2013	Excellence in Review Award *Environmental Science and Technology*
2012	Elected Vice-Chair of the 4th Disinfection Byproducts Gordon Conference in 2015.
2010	Top 10 most-accessed articles, 2nd Quarter, *Environmental Science and Technology*
2010	Appointed to the US EPA Scientific Advisory Board Drinking Water Committee
2007	NSF CAREER Award
2005	Arthur Greer Memorial Prize for teaching and research excellence by a junior faculty member at Yale University

Outstanding Doctoral Dissertation Award from the Association of Environmental Engineering and Science Professors and Parsons Engineering.

BILL MITCH, PHD, PE (CONTINUED)

STRATEGIC ADVISOR – WATER QUALITY

Synergistic Activities

Associate Editor – Chemosphere

Editorial Advisory Board – Environmental Science & Technology

Editorial Advisory Board – Journal of Environmental Science

EPA Science Advisory Board – Drinking Water Committee – 2010-2017

Science Advisory Board, Carbon Capture and Storage Program, Finland

Professional Engineer License #61429 in California

Invited Talks (partial list)

1. Mitch, W.A. A Black Carbon-Based Electrochemical System for the Capture and Degradation of Pesticides in Stormwater Runoff. Second International Conference on Bioresources, Energy, Environment and Materials Technology, June 11, 2018, Hongcheon, South Korea.
2. Mitch, W.A. A new approach to regulating DBPs: potable wastewater reuse as a challenge study. Second IWA conference on disinfection and disinfection byproducts, Beijing, May 17, 2018.
3. Parker, K.M.; Mitch, W.A. Importance of halogen radicals formed in seawater for degradation of microcystin. Environmental Science and Technology Award for Best Science Paper of 2017. American Chemical Society 2018, New Orleans, LA, March 19, 2018
4. Mitch, W.A. Chlorotyrosines as byproducts of food disinfection. Pittcon 2018, Orlando, FL, February 28, 2018.
5. Mitch, W.A. New Frontiers in DBPs. Xiangshan Conference. Beijing, China, December 1, 2017.
6. Mitch, W.A. Gordon Research Conference Chair's Introduction, Mt. Holyoke, MA, August 4, 2017.
7. Mitch, W.A. Importance of bromide for natural photodegradation processes in estuaries. Beijing Symposium 2016 on Environmental Processes and Risks of Chemical Contaminants. Xiamen, China, December 1, 2016.
8. Mitch, W.A. DBPs at the Water-Energy Nexus. 2015 Gordon Disinfection Byproducts Conference, Mt. Holyoke, MA, August 12, 2015.
9. Mitch, W.A. Nitrosamines in wastewater recycling: Predicting precursors and solutions. DBPs 2014, Mulheim, Germany, October 28, 2014.
10. Mitch, W.A. N-DBPs in swimming pools. World Aquatic Health Conference, Portland, OR, October 9, 2014.
11. Mitch, W.A. Effect of halides on UV/hydrogen peroxide and UV/persulfate AOPs in saline waters. EUCHEM, Istanbul, September 3, 2014.
12. Mitch, W.A. Black Carbon-Mediated Destruction of Hydrophobic Contaminants By Sulfides Relevance to Marine Sediments. Keynote address at the 10th International Symposium on Persistent Toxic Substances at the University of Alberta at Edmonton, August 15, 2013.
13. Mitch, W.A. Predicting Drinking Water DBPs and Applications to Other Fields. Disinfection Byproducts Gordon Conference, Mt. Holyoke College, MA, August 6, 2012.
14. Mitch, W.A. N-DBPs: Formation, Control, Precursors and New Frontiers. International Conference on Drinking Water Safety, Security and Sustainability. Hangzhou, China. October 9-12, 2011.
15. Mitch, W.A. Impact of Halides on Engineered and Natural Photo-Initiated Destruction of Organics: From EDCs to Global Warming. Environmental Sciences – Water Gordon Conference, June, 2010

KEN WEINBERG

STRATEGIC ADVISOR – DESIGN-BUILD AND LEGAL PROCUREMENT

CREDENTIALS

COMPANY
Ken Weinberg Water Resources Consulting LLC

EXPERIENCE
32 Years

EDUCATION
Bachelor of Science, State University of New York College at Buffalo

Master of Public Administration San Diego State University

PROFESSIONAL AFFILIATIONS

- California Delta Stewardship Council, Council Member 2016-2020, Appointed by Governor Jerry Brown

WHY KEN?

- Former Director of Water Resources – San Diego Water Authority
- CEQA/NEPA environmental compliance and permitting for more than $3 billion in capital projects
- Led some of the most challenging projects and water resource initiatives in California

Ken Weinberg is a former utility executive with 32 years of public agency experience. In 2015 he founded Ken Weinberg Water Resources Consulting LLC and serves as the firm's principal /owner. Ken Weinberg Water Resources Consulting LLC provides strategic advice and analysis for a wide array of water resources planning issues. Ken personally assists clients in water supply and capital facilities planning, local water supply project development, environmental and regulatory compliance, alternative project delivery and analysis of water policy issues.

Prior to forming Ken Weinberg Water Resources Consulting LLC, he served as director of water resources for the San Diego County Water Authority for 17 years where he was responsible for long-term water supply and facilities planning, drought management and environmental compliance and permitting for $4 Billion of water authority capital projects.

He has been involved in facilitating a variety of stakeholder involvement processes forging consensus on capital projects, long range planning documents, shortage allocation and rate structure design. He has extensive experience in obtaining governing board approval of complex projects and issues and can assist clients in successfully navigating that process.

Ken was involved in implementing alternative project delivery for major capital projects and successfully led the Water Authority's years' long effort to develop and approve a public private partnership (P3) and water purchase agreement for the 50 million gallons per day Carlsbad Desalination Project. As a consultant he has advised clients on planning, constructing, and operating large scale potable reuse and seawater desalination projects.

WORK HISTORY

Ken Weinberg Water Resources Consulting, LLC | Principal/Owner

California State University San Marcos | Adjunct Lecturer

San Diego County Water Authority | Director of Water Resources

San Diego County Water Authority | Acting Assistant General Manager

San Diego County Water Authority | Water Reclamation Supervisor

City of San Diego |Project Manager

MICHAEL R. WELCH, PHD, PE

STRATEGIC ADVISOR – REGULATORY STRATEGIST

Michael is our Strategic Advisory Partner providing guidance on regulatory strategies. He provides quality, value-priced services to municipalities, water agencies, wastewater agencies, and water resources clients. Michael brings over 40 years of experience planning and implementing Southern California recycled water, wastewater, groundwater, water, and desalination projects. He has served as an independent consultant since 1994, specializing in helping municipalities and public agencies evaluate regulatory compliance with state and federal water quality regulations, state and federal drinking water regulations, and state public health regulations.

CREDENTIALS

COMPANY
Sole Proprietor

EXPERIENCE
40+ Years

EDUCATION
PhD, Civil Engineering, University of California, Irvine, CA

MS, Civil Engineering, Stanford University, Stanford, CA

BS, Civil Engineering, Stanford University, Stanford, CA

LICENSES & CERTIFICATIONS
Civil Engineer: California, 1979, No. 30990

PROFESSIONAL AFFILIATIONS
- American Society of Civil Engineers
- American Water Works Association
- California Water Environment Association
- Water Environment Federation

WHY MICHAEL?
- 40 years of RWB permitting experience
- Key author of NDMA/Regional Board Permitting White Paper

WORK HISTORY

Pioneering Surface Water Augmentation. In 1990, Michael prepared the original San Diego County Water Authority concept feasibility study assessing the potential for surface water augmentation in San Vicente Reservoir. As a follow-up in the mid-1990s, Michael and Tom Richardson, P.E. (Woodard & Curran) served as lead investigators on the City of San Diego team that developed the reservoir augmentation concept and obtained concept approval from the State of California to discharge purified recycled water to San Vicente Reservoir. In the early 2010s, Michael again teamed with Tom on the City of San Diego Water Purification Demonstration Project (WPDP). This project implemented pilot testing, assessed the regulatory and economic feasibility of reservoir augmentation, established the framework for the City of San Diego Pure Water Project, and set forth the city's plan for moving forward with the San Diego Pure Water purified water discharge to Miramar Reservoir.

Since that time, Michael has continued to serve as a regulatory consultant and permitting specialist on the San Diego Pure Water team that has received RWQCB and DDW approval for implementing a 30 mgd discharge of highly purified recycle water to Miramar Reservoir. Michael is also on the team assisting Padre Dam and Helix Water District in seeking regulatory approval for implementing surface water augmentation at Lake Jennings.

Wastewater and Recycled Water Permitting. Michael's experience in municipal wastewater discharge regulations and permitting includes:

- Serving as lead consultant for the City of San Diego's NPDES permit application for the Pure Water Discharge to Miramar Reservoir
- Serving as lead consultant for the City of San Diego's successful 1995, 2001, 2007, and 2014 applications to EPA and RWQCB for Clean Water Act Section 301(h) modified secondary treatment requirements for the Point Loma WWTP
- Preparing NPDES permit application documents and assessing impacts of effluent discharges for each of the San Diego Region's seven wastewater ocean outfalls.
- Preparing NPDES permit application documents, assessing Basin Plan surface water quality objectives, and assessing recycled water stream discharge compliance for the Padre Dam MWD recycled water discharge to the Santee Lakes
- Preparing recycled water permit application documents and assessing compliance with Basin Plan groundwater quality objectives for almost all major San Diego Region water recycling facilities and agencies

MICHAEL R. WELCH, PH.D., P.E. (CONTINUED)

STRATEGIC ADVISORY PARTNER – REGULATORY STRATEGIST

Salt and Nutrient Management Plans. In coordination with the Southern California Salinity Coalition, San Diego Regional Water Board, and regional water and recycled water agencies, in 2010, Michael prepared regional-board-endorsed guidelines for developing salt and nutrient management plans (SNMPs) in accordance with implementation provisions of the State Recycled Water Policy. Michael has served as a technical consultant or technical reviewer on each of the SNMPs prepared in the San Diego Region, including the SNMP prepared by the Padre Dam MWD for the Santee Basin.

Groundwater Evaluations. Michael has served as lead investigator in a wide variety of groundwater quality or groundwater management efforts, in part including:

- Preparing a county-wide groundwater resource development plan for the San Diego County Water Authority, assessing groundwater resources and identifying and evaluating potential groundwater projects in each major watershed
- For the City of San Diego, assessing groundwater availability developing concept-level extraction, treatment, and conveyance facilities for a proposed groundwater demineralization facility near Qualcomm Stadium
- Participating on a team that investigated the potential for recycled water groundwater recharge within the Santee/El Monte basin as part of projects for the Padre Dam MWD and Helix Water District
- Performing initial feasibility studies, evaluating groundwater pumping impacts, and preparing CEQA documents for the original and expanded versions of the City of Oceanside Mission Basin Groundwater Purification Facility

Watershed Evaluation and Protection. Watershed evaluation projects where Michael served as lead investigator, in part, include:

- Serving as lead technical author on the original 2007 San Diego Region Integrated Regional Water Management (IRWM) Plan and participating on the team that updated the San Diego Region IRWM Plan in 2014
- Participating on teams that prepared watershed source control/sanitary surveys for City of San Diego reservoirs
- Preparing sanitary survey/vulnerability assessments evaluating compliance with source water protection regulations for City of San Clemente and City of Oceanside groundwater facilities
- Preparing a study for the San Diego County Water Authority assessing salinity impacts and salinity management options for the region's imported water supplies, local groundwater supplies, and local recycled water supplies.

NBS/Lowry Experience. Prior to becoming an independent consultant, Michael served 14 years as a vice president and principal engineer with NBS/Lowry Engineers and Planners. While there, Michael led a team to modify Basin Plan ground and surface water quality objectives within the San Diego River basin to accommodate and support existing and proposed Padre Dam MWD recycled water operations.

Regional Water Board Experience. During 1977-1980, Michael served as an associate engineer with the California RWQCB in San Diego.

RON WILDERMUTH

STRATEGIC ADVISOR – PUBLIC INFORMATION

CREDENTIALS

FIRM

Independent Consultant

EXPERIENCE

20+ years

EDUCATION

Honors Graduate, Mass Communications Program, University of Oklahoma

MS, Naval Science, Naval War College

MS, Public Relations, American University

BA, International Relations and Sociology, St. Ambrose College

WHY RON?

- ✓ One of the most thoughtful and strategic PIOs in the industry
- ✓ Leader of the public acceptance campaign for GWRS—the largest potable reuse project in the world

Ron led the public acceptance campaign for the largest potable reuse project in the world, GWRS

Ron is our Strategic Advisory Partner providing guidance on public information. He is an expert water speaker with over 20 years of water industry knowledge and experience. Most recently he was the manager of public information for West Basin Municipal Water District and an internationally known water agency expert in conservation, ocean water desalination. and water recycling. He was director of communications for Orange County Water District, a world-renowned water reuse and groundwater management agency. Ron provides proven and tested, water-specific public outreach strategies and community information sharing approaches valuable to your public outreach team and communication efforts during all delivery phases—from planning (CEQA & design) to final commissioning. He is the go-to advisor for potable water reuse public outreach needs in Southern California.

As the Public Information Officer (PIO) for Orange County Water District, Ron led the public acceptance campaign for the largest potable reuse project in the world-the Groundwater Replenishment System (GWRS). This included compiling letters of support from all elected officials, NGOs, and many other public opinion leaders. He also led the development of the GWRS education and demonstration center. He is highly respected as one of the most thoughtful and strategic PIOs in the industry. Also, while he was at West Basin Municipal Water District, he led the outreach on their Ocean Water Desalination Program along with an education and demonstration center. Many of the successful tactics from the GWRS program were successfully applied to this program.

RELEVANT EXPERIENCE

West Basin Municipal Water District | Public Information & Conservation Manager
Committed to water reliability, water quality, sound resource and financial management, customer service and environmental stewardship (retired).

Orange County Water District | Communications Director
A worldwide leader in groundwater management and water reuse (1997- 2008).

Parsons Corporation | Director of Corporate Relations
One of the top international engineering and construction firms in the world, ranked the #1 design firm by *Engineering News-Record* (1992-l997).

U.S. Navy | Public Relations Advisor
Public Relations advisor to General H. Norman Schwarzkopf before, during and after the Gulf War, and supervisor of the entire Gulf War in-theater public relations effort (1989-1992). Now retired Navy Captain.

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
34 years

EDUCATION
MS, Civil Engineering, Youngstown State University, Ohio

BS, Engineering, Arkansas State University, Arkansas

LICENSES & CERTIFICATIONS
Professional Engineer: OH, No. 55644, Expires – 12/31/2021; NY, No. 102772, Expires – 4/20/2022

WHY SUSAN?

- Recognized Global Technologist Expert in Water Conveyance and SSOs planning, modeling and elimination
- Has both Water and Wastewater Conveyance and Collection System Technologist Experts available to assist in quality review and advise for Pure Water Validated Conveyance System Project Delivery planning and delivery

SUSAN MOISIO, PE

STRATEGIC ADVISOR – WATER & WASTEWATER CONVEYANCE SYSTEMS / STEADY STATE OPERATIONS

As Jacobs Global Solutions Director for Conveyance and Storage, Susan stewards over 100 senior-level technologists focused on water conveyance and wastewater collection system services, conveyance planning, design and construction approaches, delivery tools, and process flow models. She developed an innovative model and processes to enhance wet weather planning and implementation to meet regulatory requirements focused on sanitary sewer overflows (SSOs). Recently, she was strategic advisor for San Mateo's Clean Water Program conveyance SSO elimination strategy and project delivery approach, including reviewing design of a new, large SSO storage basin and associated conveyance system and pump stations project in a densely populated city housing community. A recognized global technologist expert in total water conveyance systems, she brings 34 years of experience delivering wastewater projects. She provides senior quality assurance and control reviews on global water conveyance projects, including several in California, and is experienced in planning and executing capital program projects focused on regulatory compliance and water reuse strategies. Susan has extensive operation experience for wastewater collection projects involving emergency field operations, including assessment of emergency repairs, bypass pumping, repairs, cleaning, and public relations; field and desktop assessment of capacity problems, including SSO maintenance and operations and control; condition assessment for emergency operations, routine maintenance, and capital projects; and rehabilitation projects, including cured-in-place and gunite.

RELEVANT PROJECT EXPERIENCE

Las Virgenes Municipal Water District (LVMWD), Dry Weather Diversions, Los Angeles, CA | Technical Advisor

LVMWD is leading an effort with 12 other stakeholder agencies to evaluate using dry weather diversions within Los Angeles County for controlled introduction of dry weather urban runoff and first-flush storm flow into the wastewater system. Two significant benefits include producing a new source of recycled water and potentially reducing pollutants discharged to receiving waters. The Phase 1 white paper provided a high-level analysis to assess the potential benefits of providing controlled connections from the stormwater system to the wastewater system. The Phase 2 white paper will further evaluate existing LFDs and develop a framework to use these facilities as a tool for regulatory compliance.

Sanitation District Number 1 of Northern Kentucky, Condition Assessment Costing Tool, KY | Technical Advisor

Susan was responsible for developing cost tables and advised on strategy development for the costing tool. The team used SCREAM technology to evaluate repair and rehabilitation decisions and cost the selected alternative.

SUSAN MOISIO, PE (CONTINUED)

STRATEGIC ADVISOR – WATER & WASTEWATER CONVEYANCE SYSTEMS – STEADY STATE OPERATIONS

City of Baton Rouge/East Baton Rouge Parish, SSO Control and Wastewater Facilities Program, Baton Rouge/East Baton Rouge Parish, LA | Flow Strategy Leader

Susan was responsible for the flow strategy to develop a capital improvement plan to control SSOs and basement flooding. This included flow routing between the treatment works to optimize the system, which includes 304 pump stations, a manifold system, and three wastewater treatment plants. This is a multi-year program where CH2M HILL (now Jacobs) was the program manager. Susan's duties also include modeling team QA/QC and development of processes and protocols to evaluate the sewer system.

City of St. Petersburg, Wet Weather Overflow Mitigation Program, St. Petersburg, FL | Technical Lead

Susan's tasks included analyzing the city's collection system for inflow and infiltration (I/I) (e.g., data collection, data inventory, I/I characterization, modeling assessment, alternatives analysis) and developing recommendations to mitigate future overflows through I/I removal to compare against solutions focused on improvements to the water reclamation facility.

Ocean Outfall Legislation Program, Miami-Dade County Water and Sewer Department, Hydraulic Modeling/Capacity Assessment, FL | Conveyance Leader

The $5.2 billion, 11-year program is driven by a regulatory mandate from the Florida Legislature to eliminate all wastewater discharge to the Atlantic Ocean by 2025. As program manager, CH2M HILL (now Jacobs) provided system master planning and managed overall delivery of a comprehensive, long-term program encompassing the design, procurement, construction, and commissioning of an estimated 28 major capital projects. A critical aspect of the program is rerouting wastewater flows from the east (Atlantic Ocean) to the west, where a newly designed and constructed MBR treatment plant will to treat the flows. After treatment, more than 450 mgd of treated effluent will be injected into deep wells for reuse and disposal. Susan served as the conveyance leader, providing technical guidance for the evaluation, validation, and ongoing support for the hydraulic modeling, pump stations, and force mains to improve water quality.

Metropolitan Sewer District of Greater Cincinnati (MSDGC), Conveyance System-Wide Model Project, Cincinnati, OH | Project Manager

This conveyance computer modeling project became the cornerstone of all future planning in the district. Susan's responsibilities included budgeting, planning, marketing, technical guidance, and review and supervision of MSDGC's project team.

City of Calgary, Design Criteria Review, Alberta, Canada | Technical Leader

Susan provided technical guidance in the review of per capita flow rates, design storm return interval, I/I rates, and maximum surcharge allowed. The guidance will be used in future development of greenfield and infill.

Allegheny County Sanitary Authority (ALCOSAN), Thompson Run Turtle Creek Basin, Wet Weather Plan, Pittsburgh, PA | Lead Modeler

Susan was responsible for updating and calibrating a SWMM5 hydrologic and hydraulic model of 29,000-acre basin. This system includes 60 overflow locations, both sanitary and combined. Project is in the alternatives development stage of developing a wet weather plan to meet ALCSOAN's consent decree requirements. Susan developed project work plans, QA/QC, calibration protocols, and sanitary sewer overflow analysis and planning protocol.

GWEN BUCHHOLZ, PE

QUALITY TEAM - ENVIRONMENTAL

CERTIFICATIONS

FIRM
Jacobs

EXPERIENCE
41+ years

EDUCATION
MS, Civil/Environmental Engineering, University of California, Davis

BA, Physics, California State University, CA

LICENSES & CERTIFICATIONS
Professional Civil Engineer: CA, No. CE28982, Expires – 10/31/2021

WHY GWEN?

- Experience in integrating engineering and environmental water resources requirements during planning, design and construction
- Steady hand when communicating with the public on complex water resources solutions
- Over 40 years of environmental planning and permitting experience in California

Gwen brings her water resources planning expertise in integrating engineering and environmental requirements during planning, design, and construction of water projects throughout California. She has worked on more than 65 water resource projects within the Bureau of Reclamation's Mid-Pacific Region and has worked on Reclamation projects for more than 20 years. She has extensive experience supporting public outreach for diverse interest groups on controversial programs and has managed water resources planning projects throughout the western U.S. for over 41 years.

RELEVANT PROJECT EXPERIENCE

San Diego County Water Authority, Twin Oaks Valley Water Treatment Plant, San Diego, CA | Lead Permit Engineer (Design-Build)

Gwen led permitting and coordination with regulatory agency efforts for this design-build of a 155 cfs water treatment plant. The plant is surrounded by residential land uses and required close coordination with the community to minimize effects of noise, traffic, dust, and light and glare. For example, arrival and departure of all construction workers and delivery trucks were required to occur within specific time limits to avoid traffic congestion during commute hours near a neighboring community college. Close coordination occurred with Caltrans to enable delivery of large equipment fabricated offsite to reduce some construction activities within the valley with numerous residences. The project also required close coordination with the USFWS and CDFW to allow for site clearing and other major construction activities during nesting periods for the coastal California gnatcatcher.

Delta Diablo Sanitation District, Wastewater Reclamation Study, Antioch, CA | Task Lead

Gwen led a study to identify marketing opportunities for up to 10 mgd of wastewater. The study considered use of the recycled water for irrigating freeway landscaping, school landscaping, golf courses, and front-yard landscaping. The study recommended use of recycled water by USS/POSCO and Dow Chemical for industrial reuse during the first phase of the project. Both industries were located adjacent to the treatment plant, making transmission of the recycled water less expensive than for other uses. However, the industries were concerned about the water quality. As a result, a 1 mgd filtration and RO pilot plant was implemented at the treatment plant. Gwen managed the pilot plant study. Due to availability of water from the Central Valley Project at a lower cost than the recycled water, this project has not been fully implemented at this time.

Union Sanitary District, Mowry Avenue Interceptor, Fremont and Newark, CA | Project Manager (Planning, Design, and Construction Management)

Gwen managed the engineering planning, design, and construction management of a 10,000-foot pipeline through Fremont and Newark. This project was required to provide a new crossing of the expanded I-880 corridor. The pipeline design and construction criteria included several unique constraints, including crossing the Hayward Fault in a double sleeve and performing construction adjacent to the Bay Area Federal Aviation Administration Air Traffic Control Center.

GWEN BUCHHOLZ, PE (CONTINUED)

QUALITY TEAM - ENVIRONMENTAL

Bay Delta Conservation Plan (BDCP), California WaterFix Biological Assessment, Reclamation, CA | Project Manager

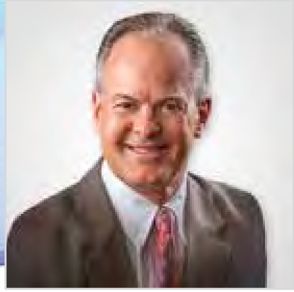
Gwen's responsibilities included overall management of biological assessment preparation for Reclamation and DWR to evaluate the proposed action from the BDCP/WaterFix EIR/EIS. She worked with Reclamation and DWR to develop descriptions of construction methods of proposed facilities, and managed water modeling efforts. Gwen participated in facilitation of discussions related to the engineering aspects with the regulatory agencies. She also facilitated discussions between engineering and environmental teams. Through the facilitation process, the resource agencies became more familiar with the actions and limits required during the construction phase. The biological opinions were issued by both NWFS and USFWS.

Sites Project Authority, Draft EIR/EIS for Sites Reservoir Project, Maxwell, CA | Staff Engineer

Gwen participated in preparation of the surface water, water supply, water quality, geomorphology, and climate change chapters of the EIR/EIS; alternative screening appendix; and cumulative impact analyses. The project includes a 1.8 million acre-foot reservoir and associated conveyance and pumping facilities to divert excess Sacramento River water for beneficial use. The project was developed in close coordination with Reclamation, DWR, and local stakeholders. Gwen developed sound technical information to support development of the EIS/EIR, which was delivered on time and within budget. The team adapted quickly to changing needs and provided timely analysis results, enabling Reclamation to evaluate new operational opportunities under the WIIN Act.

USACE, Rio Salado Environmental Restoration Project, Los Angeles District, Phoenix, AZ | Principal-in-Charge

Gwen provided technical and management oversight to ensure the success of design and construction management of this $66 million environmental restoration project comprising 500 acres along a 5-mile reach of the Salt River. The project aimed at restoring native wetland and riparian habitats historically associated with the Salt River ecosystem, while creating passive-use amenities to foster civic participation in environmental restoration, environmental education, and passive outdoor recreation. Gwen guided the team to help resolve potential project problems during regular status meetings and reviewed the conceptual modifications of all project bid documents, beginning with Phase 1A. Project components included design and construction of wetlands, hiking and interpretive trails, and recreational facilities; development of environmental educational awareness programs; and habitat restoration.



THOMAS RICHARDSON, PE

QA/QC – BRINE MANAGEMENT

Tom has 35 years of experience and specializes in domestic, recycled water, and wastewater systems planning and design and water resources planning. His experience includes regional planning, site-specific master plans, rate studies and financial plans, analyses of institutional arrangements, and preliminary and final design. Tom has managed several large, complex projects demanding integration of institutional, regulatory, environmental, and funding strategies. He has been active in water recycling since 1990 and was involved in several of California's most cutting-edge potable reuse projects (Orange County, San Diego, Los Angeles, and San Jose). He is a recognized leader in the state's direct potable reuse initiative. Tom brings detailed Pure Water Program project delivery experience and lesson learned, completing several Las Virgenes related projects, helping quickly mobilize, and solving water reuse and conveyance planning, environmental, regulatory, and design issues. Tom is well known to you and will share his insight during chartering and project prioritization and sequencing.

CREDENTIALS

COMPANY
Woodard & Curran

EXPERIENCE
35 Years

EDUCATION
Masters, Water Resources & Environmental Engineering, California State University-Long Beach

Bachelors, Environmental Engineering, California Polytechnic State University-San Luis Obispo

LICENSES & CERTIFICATIONS
Professional Engineer - CA, 35356

PROFESSIONAL AFFILIATIONS
- WateReuse Association: Potable Reuse Committee - Immediate Past Chair

WHY TOM?
- Institutional knowledge of the JPA Pure Water Program
- Trusted relationship with the JPA
- History of working with Jacobs and Katz and Associates.

RELEVANT PROJECT EXPERIENCE

Las Virgenes Pure Water Program, CA | Principal-in-Charge

Tom has served as principal-in-charge for two LVMWD-Triunfo Pure Water-related studies; Preliminary AWTP Siting Study, and Regional Brine Management Study. The siting study identified the two preferred AWTP sites to be further investigated in the Phase 1 Technical Studies component of the Program Management/Owners Advisor services. The Regional Brine Management Study investigated alternative potential cost-saving strategies involving City of Thousand Oaks and downstream agencies infrastructure to manage the AWTP RO concentrate (brine).

City of San Diego, Water Purification Demonstration Project, San Diego, CA | Project Manager

This was a series of program management and technical assessments for the initial phases of what came to be knows as Pure Water San Diego. As project manager, provided project coordination support to the city team for the overall demonstration phase of the City's reservoir augmentation project with emphasis on regulatory approval, outreach, and owner representative on the design and construction of a 1 mgd AWT facility. Technical assessments included 3-dimensional ELCOM modeling of San Vicente Reservoir, alternative purified water conveyance alignments spanning 25 miles from the advanced treatment facility to the reservoir, and a flow analysis balancing the North City Water Reclamation Plant's sourcing of both the existing non-potable system and the advanced treatment facility. Served as owner's agent for the design and construction of a 1 mgd demonstration AWPF. Managed the preparation of technical proposals to both DDW and RWQCB soliciting concept approval for California's first surface water augmentation project. Managed under this contract a parallel community outreach program supported by Katz & Associates. Project yielded both DDW and RWQCB concept approval for this first-of-its-kind project and strong public and policy-maker support.

THOMAS RICHARDSON, PE (CONTINUED)

QA/QC – BRINE MANAGEMENT

Santa Clara Valley Water District, Expedited Purified Water Program Preliminary Engineering, Santa Clara, CA | Project Manager

Project manager responsible for providing technical direction and overall project management for the District's program to achieve up to 45,000 AFY of potable reuse. Program components include an array of advanced water reclamation facilities (4-10 mgd), purified water conveyance (three separate conveyance systems, with alignments ranging from 6 miles to 17 miles in length), and receptor infrastructure including injection wells, percolation ponds, an 8,000 AF surface water reservoir, and direct connection to existing surface water infrastructure feeding two DDW-approved surface water treatment plants (Penitencia WTP and Rinconada WTP). Managed preliminary engineering (10% design, Class 3 cost estimate) for facilities with a total program CIP was roughly $800M. Technical services include siting studies, regulatory (DDW and Regional Board) IPR and DPR assessments, RO concentrate management strategy, and preliminary engineering. Project development included two steps; first a series of technical assessments defined the basic project components, sizes/capacities, and preferred alignment corridors, and second, preliminary engineering (10%) was performed to define the program to a level conducive to either a design-build or public/private partnership (P3) project delivery mechanism.

Los Angeles Department of Water and Power, Recycled Water Master Planning, Los Angeles, CA | Project Director

Project director for one of the most cutting edge and comprehensive recycled water planning efforts in the country. The project included five separate planning efforts in the areas of indirect potable reuse, non-potable reuse, satellite treatment, system reliability, and long-term recycling vision. Facility plans and concept plans were developed to rapidly expand L.A.'s recycled water systems to meet the Mayor's target of 50,000 AFY by 2019 and up to 200,000 FY long-term. Managed facilities planning (10% design/ Class 3 cost estimate) for the City's San Fernando Valley Groundwater Replenishment project, a 30 mgd advanced treatment facility (MF/RO/AOP) project to replenish the groundwater basin through percolation in Hansen Spreading Grounds. Initiative included fabrication and operation of a pilot advanced water purification facility.

Orange County Water District, Groundwater Replenishment System Preliminary Engineering, CA | Project Manager

Project manager for preliminary engineering that supported the environmental clearance of the district's project to expand WF 21 to achieve potable reuse of up to 100 mgd of treatment, including membrane filtration, reverse osmosis, and UV disinfection, as well as 15 miles of 72-inch pipeline, and a pump station. This project later became the Groundwater Replenishment System. Supported the district in regulatory (DDW and RWQCB) coordination and facilitated workshops with the regulators and partner agencies.

Water Replenishment District of Southern California, Reclaimed Water Use Feasibility Study, Dominguez Gap Barrier, CA | Project Manager

Project manager for study to address the technical and regulatory issues surrounding the injection of advanced treated reclaimed water into a domestic supply groundwater basin. Alternative advanced treatment technologies, including reverse osmosis, carbon adsorption, and chemical treatment, were evaluated. California Department of Health Services Title 22 and groundwater recharge guidelines were addressed, along with Regional Water Quality Control Board requirements.

City of Lancaster, Groundwater Recharge Feasibility Study, Lancaster, CA | Principal-in-Charge/Project Manager

Principal-in-charge/project manager for a valley-wide groundwater recharge (GWR) Feasibility Study aimed at assessing the feasibility of implementing a GWR project in the study area, providing a roadmap to project implementation should the city and partner agencies decide to move forward, and providing the basis to pursue outside funding. Specific objectives of this study include facilitate interaction among project partners and stakeholders; identify fatal flaws that would prevent the City/region from moving forward with GWR; develop a recommended plan, including steps and strategies for implementation; and, prepare pilot/demonstration project work plan. The initiative was designed to explore the incorporation of recycled water into the region's groundwater recharge/banking program. This project involved the creation of a stakeholder group consisting of utility, land use, and environmental and agricultural interests to participate in project formulation and evaluation.

LARRY SCHIMMOLLER, PE, PMP

QUALITY TEAM – ADVANCED WATER TREATMENT

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
29 years

EDUCATION
MS, Environmental Engineering, University of Illinois
BS, Civil Engineering, Clarkson University, New York

LICENSES & CERTIFICATIONS
Professional Engineer: CO, No. 32335; VA, No. 0402029956

Certified Project Management Professional (PMP)

WHY LARRY?

- Senior global technologist in AWT with a successful planning, piloting, and project delivery experience that provides lessons learned in addressing and delivering water reuse projects
- Leads over 20 global technologists focused on advanced water treatment for reuse schemes, developed process and design models, and cost estimating approaches that capture the full picture for water reuse planning and delivery
- Was the project manager for Denver Water Recycling Plant—winner of the 2004 AAEE National Grand Prize for Design

Larry brings 29 years of experience in global water treatment and water reuse planning, piloting, process selection, design, and construction projects. He will provide planning and design oversight and quality review for your project's advance water and reuse treatment facilities design. Larry has a proven track record of delivering high-quality projects on time and at or under budget. He has experience in designing and analyzing water and wastewater treatment facilities, designing pipelines and pump stations, developing I/I management programs, and engineering services during the construction of water and wastewater treatment plants. Larry was a senior process engineer for design, construction, and commissioning of the Luggage Point AWTP—part of Brisbane, Australia's multi-billion-dollar advanced water recycling and indirect potable water reuse storage reservoir scheme. This is very similar to your program strategy and indirect water reuse scheme. Larry provides his insight from direct experiences faced during Luggage Point AWTP planning, piloting, design, construction, and commissioning. He was also the project manager for the Denver Water Recycling Plant—winner of the 2004 AAEE National Grand Prize for Design. This project is also similar to your program, meaning he can build on those lessons learned to effectively and efficiently move your program forward.

RELEVANT PROJECT EXPERIENCE

Western Corridor Recycled Water Project—Luggage Point AWTP, Brisbane, Australia | Senior Process Engineer

Larry supported design, construction, and commissioning of the 70-megaliter-per-day (MLD) Luggage Point AWTP. This plant provides water to two power plants, and during times of drought, supplies water to the Wivenhoe Dam—Brisbane's largest drinking water reservoir. Significant nutrient removal was specifically designed into the facility through chemical precipitation of phosphorus and physical removal of nitrogen (RO) to limit nutrient loading on the receiving water. He also served as senior process engineer for extensive piloting conducted prior to and during design that provided critical information related to the advanced treatment processes. The Luggage Point AWTP is part of the Western Corridor Recycled Water Project, a multi-billion-dollar project involving construction of three new AWT facilities with a combined capacity of more than 200 MLD and 200 kilometers of pipeline to provide water to end users. This project, in association with the Western Corridor Recycled Water Project, won the Global Water Intelligence 2009 Water Reuse Project of the Year.

Leo Vander Lans Advanced Water Treatment Facility, Long Beach, CA | Senior Process Engineer

Larry oversaw preliminary design of the 5-mgd expansion of this advanced indirect potable reuse plant. The high-purity treated water is used for groundwater injection into barrier wells to prevent the migration of seawater into the adjacent potable water aquifer. Plant processes

LARRY SCHIMMOLLER, PE, PMP (CONTINUED)

QUALITY TEAM – ADVANCED WATER TREATMENT

include MF, RO, and UV-AOP. Innovative approaches implemented on this project include treatment and recycle of MF backwash water to increase plant recovery, treatment of RO concentrate with a secondary RO system to increase plant recovery, acidification of RO feed water to reduce scaling, and final water stabilization without the use of lime.

Wastewater Treatment Plant Advanced Disinfection Study, City of Tracy, CA | Senior Process Engineer

Larry supported this evaluation of advanced disinfection schemes at the Tracy water reclamation plant for compliance with strict total trihalomethane limits (below potable MCLs) and California Title 22 regulations of total coliform less than 2.2 cfu/100ml. Advanced disinfection schemes tested included chloramination, sequential chlorination, ozone, UV disinfection, and ozone coupled with UV. Advanced control of the nitrogen removal processes was studied to determine the feasibility to disinfect with monochloramines and/or free chlorine.

Pima County Regional Wastewater Reclamation Department (RWRD), Agua Nueva Water Reclamation Facilities (WRF), AZ | Senior Process Engineer

To comply with new regulatory requirements set by the Arizona Department of Environmental Quality, the Pima County RWRD needed to reduce total nitrogen concentrations in effluent discharged into the Santa Cruz River. Using DBO delivery, CH2M HILL (now Jacobs) provided the design, construction, acceptance testing, operation, and maintenance of this new 32-mgd WRF. For nutrient removal, RWRD required a 5-stage Bardenpho process. Our team incorporated step feed and simultaneous nitrification and denitrification—creating North America's first ammonia control strategy to integrate step feed with dissolved oxygen control to manage secondary effluent ammonia levels. This configuration optimizes the disinfection process, minimizes chemical use, improves operational flexibility, and delivers a more reliable plant. The plant included tertiary filtration and monochloramine disinfection for compliance with bacteria and virus-free water.

Aurora Reservoir Water Purification Facility (ARWPF), Aurora Prairie Water's Project, Aurora, CO | Quality Control Manager

Larry managed quality for the design of the $80 million natural purification system and $200 million ARWPF. The natural purification system incorporates riverbank filtration and soil aquifer treatment to reduce nitrates, pathogens, and micropollutants. Further treatment is provided through softening, advanced UV oxidation, BAF, and GAC adsorption.

Aurora Treatment Master Plan, Aurora, CO | Treatment Task Manager

This involved development of a master plan analyzing facility planning requirements at four Aurora treatment facilities. The work included design review, operational evaluation, and full condition assessment. Capital improvement plans were developed for all facilities with a cumulative value in excess of $100 million over a 30-year planning period.

PS Miller Founders Water Treatment Plant Process Evaluation, Castle Rock, CO | Project Manager/Lead Engineer

Larry evaluated design criteria, hydraulics, and the operation of treatment processes. He recommended improvements to the plant operation and specifically addressed air binding issues in the granular filters.

Ina Road Water Reclamation Plant, Ina Road Advanced Disinfection Study, Pima County, AZ | Senior Process Engineer

Larry evaluated advanced disinfection schemes at the this water reclamation plant for compliance with strict limits for total trihalomethanes, NDMA, and E. coli. Schemes tested included chloramination and sequential chlorination. Testing showed that sequential chlorination, which included free chlorine disinfection followed by preformed chloramination, could provide effective disinfection (E. coli non-detect in 4 out of 7 samples) while limiting total trihalomethanes below 60 µg/L and NDMA below 10 ng/L. Significant nutrient removal was designed into this plant to meet strict effluent limits, resulting in low effluent ammonia concentrations requiring breakpoint chlorination.

JEFF SMITH, PE

QUALITY TEAM – WATER, WATER REUSE, AND WASTEWATER CONVEYANCE

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
33 years

EDUCATION
MM, Management, Southern Oregon University

MS, Agricultural Engineering, Oregon State University

BS, Agricultural Engineering, Oregon State University

LICENSES & CERTIFICATIONS
Professional Civil Engineer: CA, No. 44196 Expires – 6/21; OR, No. 14707; NV No. 10436; TX No. 129348

WHY JEFF?

- Senior project manager on many water and wastewater conveyance projects and integrated support and pumping systems
- Knows California regulatory and water conveyance permitting requirements, providing important insights for your program's water conveyance team, providing project delivery effectiveness and efficiency

Jeff has managed more than 60 projects involving pipelines, pump stations, and reservoirs related to wastewater and raw and potable water systems. A senior conveyance technologist and project manager, Jeff has performed on-site resident engineering and inspection; project procurements; route analyses; subsurface utility research; material comparisons; right-of way acquisitions; permitting; conceptual, preliminary, and final design; contractor bidding coordination; and construction management. He brings the team a solid conveyance project delivery background that will greatly assist in your program's water, wastewater, and water reuse conveyance planning, permitting, alignments, routing, design, construction and commissioning. He has over 33 years of experience focused on meeting conveyance delivery needs and a long list of successfully managed and delivered water conveyance projects, including for City of Fresno and City of San Mateo's Clean Water Program.

RELEVANT PROJECT EXPERIENCE

City of Fresno, Recharge Fresno Program, Fresno, CA | Project Manager

The program's purpose was to reduce reliance on groundwater by constructing surface water conveyance and treatment facilities to take advantage of the city's surface water allocations. The projects consisted of a 13-mile, 6-foot-diameter raw water pipeline; a 5-mile, 5-foot-diameter raw water pipeline; and a 13-mile, 66- to 30-inch-diameter finished water pipeline, all of welded steel with welded joints. Jeff served as an extension of city staff for technical delivery of several major pipeline projects within a tight schedule and a limited budget. He provided design and QC, developed standard details and specifications, coordinated permitting and land acquisition, prepared City Council reports, and coordinated with numerous other city departments, especially related to traffic control. Jeff has been instrumental in educating city staff on the unique design features of large-diameter pipelines and has worked closely with engineering and operations and maintenance staff. During preliminary design, Jeff led an effort to optimize the piping layout and design criteria provided in the masterplan, resulting in a savings of over $50 million, without compromising the required delivery design requirements. The approach was to understand the system criteria and develop a hydraulic model run thousands of times, resulting in data for input to an economic and non-economic evaluation spreadsheet using Monte Carlo analysis.

City of San Mateo, San Mateo Clean Water Program, San Mateo, CA | Quality Control Manager

This is the city's first major program effort using CMAR delivery and implementing significant rate increases for funding. Jacobs is programmatically delivering this 10-year, $990 million capital improvement program to meet regulatory requirements, replace aging infrastructure, and align with city sustainability and water reuse goals. Jeff was QC manager, responsible for coordinating quality reviews for all deliverables with senior technical staff and providing senior reviews. The program is in construction using both traditional and alternative project delivery approaches.

JEFF SMITH, PE (CONTINUED)

QUALITY TEAM – WATER, WATER REUSE, AND WASTEWATER CONVEYANCE

Saline Water Conversion Corporation, Yanbu-Madina Phase 3 Water Transmission Project, Kingdom of Saudi Arabia | Quality Control Manager

Jeff served as the Quality Control Manager for the design of a large water transmission project in the Kingdom of Saudi Arabia. CH2M HILL (now Jacobs) provided design and procurement support of this $700M engineer-procure-construct (EPC) project. The project comprised over 400 miles of large diameter welded steel pipe, five large pump stations, eight 50-million-gallon water tanks, and additional facilities at over 20 sites. Jeff coordinated quality reviews for all deliverables with senior technical staff and provided senior review of all pipelines. He was instrumental in coupling AWWA water standards with traditional oil and gas pipeline standards commonly used in the Middle East for pipeline design.

Pajaro Valley Water Management Agency, Import Pipeline and Coastal Distribution System, Watsonville, CA | Design Manager

CH2M HILL (now Jacobs) provided comprehensive engineering, permitting, and environmental services for the Import Pipeline and Coastal Distribution System projects. These projects address groundwater overdraft and seawater intrusion in the Pajaro Basin, helping stop seawater intrusion and protect the local fresh water supply. Jeff led the design of 20 miles of pressurized irrigation distribution system comprising 36- to 12-inch-diameter welded steel and PVC pipe, 45 irrigation turnouts, numerous air valves and blowoffs, the retrofit of 25 existing turnouts, three Caltrans tunneled crossings, one railroad tunneled crossing, and two booster pump stations. Because the pipelines are routed through high-value crop areas, consistent and ongoing coordination with the growers was required. This coordination minimized the project's impact on the growers' operations and profit. Jeff worked closely with the growers and the client to develop agreed-upon design criteria and, essentially, a basis of design that defined the project and allowed the design team to move forward on this fast-paced project. Use of different pipe materials, where applicable, helped save project costs and standardized farmer turnouts.

Placer County Water Agency, Ophir Road/Taylor Road Pipeline Project, Placer County, CA | Project Manager

Jeff managed the preliminary and final design of 10 miles of a potable water transmission system consisting of 60- and 42-inch-diameter welded steel pipe, a large pressure-reducing station, and numerous appurtenances. The project included evaluating several tunneling techniques for a 60-inch-diameter pipeline through a variety of ground conditions (hard rock to sand). During preliminary design, several alternative alignments were evaluated using multiple criteria and compared to determine the preferred alignment. The route required excavation inside a road tunnel, which resulted in significant coordination with the Union Pacific Railroad (UPRR), Caltrans, and Placer County Public Works. The team prepared plats and legals and supported the process to obtain these from property owners.

San Francisco Public Utilities Commission (SFPUC), Hetch Hetchy Water and Power, Moccasin, CA | Project Manager

Jeff managed a variety of projects for the Hetch Hetchy Water and Power System related to large water transmission systems. He developed scopes of work and fees and managed individual tasks related to condition assessments and hydraulics for various large tunnels, canals, reservoirs, penstocks, and pipelines. Jeff also managed a task associated with developing project controls, including integration of Primavera P6 and SharePoint with the client's software, Maximo.

JOHN SCHOONOVER

ENVIRONMENTAL STUDIES AND REGULATORY COMPLIANCE LEAD

John brings comprehensive expertise in California and federal permitting, regulatory requirements, and environmental documentation from preparation to approval, including CEQA, USACE 401/404, CDFG 1600 LSAA, CESA/ESA, RWQCB 401 Certifications and Section 106 consultations. His all-permits management plans and tracking systems for major capital improvement infrastructure programs proactively confirm regulatory requirements are tracked and met, set reasonable permit compliance conditions, and demonstrate compliance from construction through asset commissioning using compliance monitoring and documentation. He leads permitting and public and board outreach for the City of San Mateo's CWP under RWQCB, including CEQA, CEQA-Plus for SRF funding, and permit tracking for air, land, and water regulatory requirements. He closed a Federal and State jurisdictional wetland on a CWP WWTP site within 12 months after 404 permit application, at a one-to-one mitigation offset requirement.

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
16 years

EDUCATION
BS, Environmental Science, California State University

PROFESSIONAL AFFILIATIONS
Association of Environmental Professionals (AEP)

WHY JOHN?

- Proven expertise in California and federal environmental and regulatory water industry permitting and approval
- Management of many complex and environmentally sensitive CEQA and permitting needs for public agencies that required public outreach and board presentations
- Detailed working knowledge of regulatory agencies and how to get permits completed and approved quickly

RELEVANT PROJECT EXPERIENCE

City of San Mateo, Program Management for Clean Water Program, San Mateo, CA | Permitting and Public and Board Outreach

John implemented an all-permits planning and tracking system on the performance tracking portal for this 10-year, $990 million program to meet regulatory requirements, replace aging infrastructure, and align with city sustainability and water reuse goals. The portal proactively tracks project and project manager performance, provides data warehousing and control, and houses seven functional lead service areas: environmental permitting, procurement, construction management, public outreach, program controls, and WWTP/conveyance project management.

Cities of Woodland and Davis, Davis-Woodland Water Supply Conveyance and Treatment Plant Program, CA | CVFPB Permitting Support

John led the CVFPB Floodplain Encroachment permitting effort for this design-build, new water supply and intake conveyance project. He implemented his all-permits planning and tracking system and established strong working relationships with state and federal regulatory agencies and cities to obtain permits. He developed construction and post-asset commissioning compliance monitoring and documentation requirements.

Confidential Rail Client, Various locations, CA,OR,WA,NV | Environmental Compliance Permitting Lead

John is permitting technical consultant for this rail bridge replacement program. Many of the 24,000 bridges throughout the client's service area cross anadromous waterways with endangered salmonid populations. For several years we provided strategic permitting support for the most technical permitting assignments. The program averages 10-20 bridge replacement projects annually in highly challenging locations from the Central coast to the Tahoe basin. John is tasked with first responder environmental compliance assignments for significant railroad emergency work, including derailments and bridge failures from flood and fire events. John's experience working with multi-jurisdictional regulatory agencies in high-pressure reconstruction situations includes the largest oil-spill derailment and fire in U.S. history. Under this program, John recently permitted the removal and replacement of the Emma Woods State Beach railroad bridge near Ventura, CA. This bridge included significant Tidewater goby and other ESA issues.

JOHN SCHOONOVER

ENVIRONMENTAL STUDIES AND REGULATORY COMPLIANCE LEAD

Two-Mile Bar Tunnel Project, Oakdale Irrigation District, Oakdale, CA | Permitting/ Planning Lead

John directed permitting and planning for a 5,270-foot tunnel to bypass a high-hazard area of the main canal system. The project is directly below sensitive vernal pool habitat for California tiger salamander (CTS) and fairy shrimp and is near the pristine Stanislaus River fly water near Goodwin Dam. The work included wetland delineation, rare plant surveys, and CTS negotiations with USFWS under Section 10.

Cape Horn Tunnel Rehabilitation Project, Oakdale Irrigation District, Oakdale, CA | Permitting/ Planning

John led permitting and planning for a 2,600-foot tunnel rehabilitation near sensitive vernal pool habitat with CTS, fairy shrimp, and Valley elderberry longhorn beetle. Project included wetland delineation, rare plant surveys, and CTS negotiations with USFWS.

Modesto Irrigation District Programmatic EIR, Modesto, CA | Project Manager

John is currently the project manager for the Modesto Irrigation District Programmatic Environmental Impact Report (PEIR) process located in Modesto, CA. The District initiated a capital improvement project for numerous system upgrades that required a programmatic approach to system integration. The project includes water balance modeling, irrigation system analysis, and environmental review of project alternatives.

North Side Regulating Reservoir Project, Oakdale Irrigation District, Oakdale, CA | Permitting/ Planning/ CEQA

John led permitting and planning for a new regulating reservoir near sensitive vernal pool habitat with known Endangered Species Act (ESA) habitat. The project included significant time constraints and known challenges related to wetland impacts within the project area. This project was selected for an ASCE award.

City of Redding, Clear Creek Wastewater Treatment Plant Rehabilitation Project, Redding, CA | Task Manager

John managed environmental permitting efforts for the $25 million WWTP upgrade. This included 18-month negotiations with NMFS, USACE, DFG, State Lands Commission, and RWQCB to obtain clearance for in-river construction of a new outfall structure in this biologically sensitive section of the Sacramento River. Solutions included a temporary river diversion of approximately two-thirds of the Sacramento River and a website-based, real-time turbidity buoy system for live monitoring by regulating agencies.

"Mr. Schoonover has been a mainstay. His tireless efforts, endless dedication, creative thinking, professionalism, innovation and knowledge of his profession allowed OID to successfully permit the project in less than one year and begin construction as planned in late August. Given the current bid environment this allowed OID to save approximately $3M on capital construction costs alone, an outcome that would make any client happy. In short, Mr. Schoonover is a huge asset to your company, a team play and one that I will take on my project team whenever possible."

- *John B. Davids, PE, District Engineer, Oakdale Irrigation District*

ANNA JAMES

FINANCIAL ANALYSIS

As financial lead, Anna brings our team her comprehensive knowledge of procurement, financial modeling, and state and federal funding for large conveyance and WWTP infrastructure program projects. She has skills in sustainable and innovative water infrastructure design and experience in a variety of water and water reuse infrastructure projects, including pipeline design, wastewater and water reuse process design, and capital improvement program management. Anna has supported delivery of major infrastructure projects, including several in San Francisco and the Bay Area, as well as strong connections with state and federal loan agencies; local, state and congressional politicians; the California State Water Board; and the EPA. She is serving as San Mateo CWP's deputy program manager, where she also leads procurement, collection systems, project delivery, and state and federal funding. She has developed successful strategies and approaches to obtain over $500 million in state and federal low-interest loans and helped secure a well-below-average bond interest loan rate of 3.62%. She has explored other grants and loan programs for the CWP, which we will revisit for your program.

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
8 years

EDUCATION
BSE, Civil and Environmental Engineering, University of Michigan

PROFESSIONAL AFFILIATIONS

- American Society of Civil Engineers
- Water for People
- American Water Works Association
- American Academy of Environmental Engineers

WHY ANNA?

- Successfully obtained over $500 million in low interest state and federal loans
- Well-versed in financial requirements to set up the TACT Model and manage quarterly pure water economic summits
- Has strong connections with local, state, and federal congressional delegations and elected officials

RELEVANT PROJECT EXPERIENCE

City of San Mateo, San Mateo Clean Water Program, San Mateo, CA | State and Federal Funding Lead

Anna has coordinated multiple successful letter-of-interest efforts (two low-interest loans from the Water Infrastructure Financing and Innovation Act [WIFIA] program) resulting in invitations to apply for loans for up to $364 million; she also completed and submitted one full loan application. She is leading negotiation and closing of the first loan and development of the second full loan application with the EPA. Anna coordinates directly with the EPA and local, state, and congressional delegations to usher projects through the EPA's environmental review processes. Additionally, she is leading coordination of a financing agreement with the California State Water Board to obtain State Revolving Fund assistance (approximately $137 million). This includes confirming the project meets state and federal loan requirements, coordinating regularly with state and federal agencies on behalf of the city and the city's public financing authority, and closely coordinating with the CWP program controls and economic management team using Jacobs's TACT Model and economic summits to update cash flow projections. Anna worked directly on the environmental review of the wastewater treatment plant project.

City of San Mateo, San Mateo Clean Water Program, San Mateo, CA | Deputy Project Delivery Lead

Anna's main objective in this role is to ensure project success by supporting the project delivery lead in driving consistency, prioritization, collaboration, and a programmatic perspective for all of the individual projects in the CWP. This is achieved primarily through:

- Regularly coordinating with project managers to understand project status, upcoming milestones, risks, and concerns
- Providing leadership and mentoring for project managers and supporting them on project implementation

ANNA JAMES (CONTINUED)

FINANCIAL ANALYSIS

- Providing consistency across projects and maintaining focus on how changes and decisions impact the broader CWP
- Understanding all aspects of potential project risks (provided by project managers) and for the CWP
- Leading and communicating change management for projects (provided by the project managers) and for the CWP
- Conducting bi-weekly change management board meetings with a consistent process
- Managing sensitivity of change and impacts of change across all projects
- Prioritizing support service (functional) activities for projects
- Communicating project activities to program leadership and facilitating resolution of decisions, issues, and direction
- Considering combined schedules, costs, and cash flow of all projects and providing consistency

Other duties include leading two separate Water Infrastructure Finance and Innovation Act (WIFIA) efforts, a full loan application, and a letter of interest; coordinating hydraulic modeling efforts to support the program; and supporting and interfacing with the other program functions (i.e., program controls, public outreach, environmental and permitting, and construction management).

City of San Mateo, Program Management for Clean Water Program, San Mateo, CA | Project Delivery and Engineering Lead

As project delivery lead (PDL), Anna oversees all activities related to WWTP and collection system projects. Her responsibilities include coordinating with project managers; bundling projects (as needed) and scheduling start dates; identifying project managers for upcoming projects in coordination with the program management team (PMT); providing project updates to the PMT; leading meetings to make key decisions related to project coordination, change, and risk; and prioritizing support services and resources for projects. The PDL confirms project managers use proper tools, update the P6 schedule, hold consultants and contractors accountable, and manage cost and schedule in coordination with the project controls manager. Anna leads the change management process, which is accomplished in close coordination with the program's change management board.

Port of San Francisco, Seawall Earthquake Safety Program, San Francisco, CA | Task Lead

The Seawall Earthquake Safety Program is a phased approach to seawall resilience, with focus on assessment of asset conditions, identification of capital backlog and revenue constraints and opportunities, and developing an understanding and response to the dual threads of earthquake and flooding. Anna successfully led coordination of early deliverable for the Seawall Earthquake Safety Program, setting us up for success to consider delivering subsequent reports and deliverables. She coordinated multiple subconsultants and section authors to produce the Existing Data Inventory Report on schedule and on budget. This memo set the tone for follow-on deliverables and provided an outline and approach for successfully delivery of related reports. Anna has additionally led and supported other tasks including: Aerial Mapping and Survey review and coordination; and United States Army Corps of Engineers Civil, Urban, and Cost Estimating – Focused Array, which includes generation of factsheets to describe structural and nature-based flood measures that will be used in support of the San Francisco Waterfront Resiliency Study.

City of Chicago, CTR Joint Venture, Chicago, Il | Water Main Designer

The City of Chicago went through a $140 million water main replacement program. Anna created water main construction plans, completing over 15 miles of new design and 50 unique projects. She resolved all underground utility conflicts, achieving approval from 24 reviewing members of the City of Chicago's Office of Underground Coordination for each project. Anna oversaw successful construction of each project, ensuring on-time execution of design plans, accurate and to budget. Anna also developed tailored training curriculum for new employees and on-boarded several new engineers. She continued to provide guidance in ongoing training and mentorship role. Anna streamlined the design process for all engineers by creating a design checklist and served as point person for coordination between designers and several supporting groups within the program.

PHIL SUDOL

PROCUREMENT SUPPORT

As OA/PM's Procurement Support Lead, Phil brings proven experiences as owner's advisor on traditional procurement, design-build and CMAR projects for public water clients that include the City of San Jose, North Texas Municipal Water District, and the Upper Trinity Water District in Texas. Phil has gained an excellent track record of working with Owners in the development of procurement strategies to deliver successful projects. He has over 25 years of proven success in business management, procurement strategies, and development, with outstanding leadership capabilities. During his career, Phil has proven his ability to achieve top performance from team members through motivation, collaboration, and communication. He has introduced and successfully developed an at-risk design build business model for public utilities, as well as developing an internal process for project development, procurement, and execution. Phil has recently joined Jacobs Engineering and brings his water industry experiences in traditional and collaborative project delivery procurement and contractual management to the Pure Water Program.

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
25+ years

EDUCATION
EMBA, Pennsylvania State University

BS, Resource Management, Syracuse University

LICENSES & CERTIFICATIONS
Licensed Commercial General Contractor, OR

WHY PHIL?

- Extensive water industry alternative and traditional procurement and project delivery experience with proven delivery record
- Successfully manages public utilities as they embrace alternative project delivery, by providing presentations, sharing information, and setting up procurement and contractual agreements

RELEVANT PROJECT EXPERIENCE

Wapakoneta Public Works, Lime Softening Water Treatment Plant, Wapakoneta, OH | CMAR Procurement Lead/ Owner's Advisor

The City of Wapakoneta had a critical schedule to meet in the delivery of quality potable water to meet the demand of caused by an influx of water intensive industrial users. Phil and the team work with the City and the State of Ohio to determine the most advantageous means to deliver the project. Being Wapakoneta's first use of non-traditional hard bid contracting the process began by educating the staff of the various options available. When through a series of meeting/workshops it was determine that the CMAR procurement model best fit the project requirements. Phil led the team in the development of the procurement documents proposal review and ultimate selection of a CMAR contractor.

The Nature Conservatory, Pensacola East Bay Oyster Habitat Restoration Program, Pensacola, FL | Procurement Lead

After receiving little interest from the construction community to hard bid the construction of an Oyster Reef. TNC was looking for alternative delivery methods that would be more appealing to the construction community. Phil led the team in evaluating the various options. Working with the local construction industry and TNC it was determined that CMAR would be the most appropriate model. The team gained approval from The National Fish and Wildlife Foundation, the funding agency, to utilize the CMAR model. Phil led the team in the development of the procurement procedures and all required documents.

PHIL SUDOL (CONTINUED)

PROCUREMENT SUPPORT

City of San Jose / Santa Clara Regional Wastewater Facility Cogeneration Project, San Jose, CA | Owner's Procurement Advisor

Led by Phil, the team conducted a thorough evaluation of the various procurement models. The evaluation included: regulatory review, internal staff capabilities, resources and a market analysis. After the evaluation The City of Jose took the decision to use Progressive Design-Build to deliver the $90 million Cogeneration facility. This was their first time using the PDB model and required the approval of all the member agencies. The team conducted a series of workshop with the stakeholders to gain their approval Phil led the team in the development of the procurement procedures and managed the development of all required procurement documents. Phil also acted as the procurement advisor in negating the final contract with the PDB firm.

City of Richmond, Wet Weather Mitigation Facility, Richmond, CA* | Design-Build Manager

After entering into a court ordered agreement to prevent further discharges of untreated waters to the San Francisco Bay, the City of Richmond utilized the first Progressive Design-Build procurement in the State. Phil managed the project through design, regulatory approval and construction. The project was completed 6 months ahead of its 24-month schedule eliminating the risk of further court actions. The project was completed using more than 45% local small and minority business entities.

East Valley Water District, Biological Perchlorate Removal Treatment System, Rialto, CA* | Design-Build Manager

Since the discovery of the contaminant perchlorate in in the Rialto-Colton groundwater basin, the Water District was required to take several its water supply wells off line. As drought conditions intensified, the district needed to quickly put these wells back into use. To meet their critical schedule the District used a Progressive Design-Build delivery model, Phil worked with the District and State Regulators and managed a team that allowed for the first biological perchlorate removal system in the State. The project was designed, permitted, constructed and commissioned months early allowing the District to have a reliable source of water for the summer months.

North Texas Municipal Water District, Wylie Water Treatment Facility Expansion, Wylie, TX* | Project Procurement Lead/Owners Advisor

Due to increased water demands in the region, NTMWD required an 8 mgd expansion of their Wyle water Treatment Plant. Phil acted as the Owners Procurement Advisor. The various procurement options were evaluated including Design-Bid Build, Construction Management at Risk and Design Build. Through a series of workshops, it was determined that the CMAR model would best fit the Owner's and project needs. Phil managed a team that evaluated the delivery options and ultimately developed the procurement documents and strategy. Phil also facilitated the bidder interviews and final contract negotiations.

* *Project completed prior to joining Jacobs*

PROJECT AND TASK MANAGERS

MIKE HWANG, PE

ADVANCED TREATMENT

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
13+ years

EDUCATION
MS, Chemical Engineering, University of California

BS, Chemical Engineering, University of Colorado

LICENSES & CERTIFICATIONS
Professional Civil Engineer: CA, No. 79756, Expires – 9/30/20; UT, No. 11477086-2202, Expires – 3/31/21

WHY MIKE?

- Technology specialist experienced in and focused on advance water treatment planning and designs accepted by regulators and built using the latest technologies
- Collaborates well with teams to provide project planning and designs leading to implemented projects over a wide range of industries
- Selected for his planning, RO, and MF experience to help with your program's design-related oversight

Mike is on point to assist Paul Swaim in advance water treatment planning, analysis, and design needs, based on his similar experiences with several recent water and wastewater treatment projects. He has worked on alternative analysis, parametric cost estimation, conceptual and preliminary design, pilot studies, bench testing and full-scale testing for several advanced water treatment projects. He also has expertise in hydraulic modeling for water distribution systems to apply to this program. He and Paul have worked closely together in this technology focus area and have a successful, combined water project planning and design portfolio.

RELEVANT PROJECT EXPERIENCE

Naval Facilities Engineering Command (NAVFAC), Owners Agent for Potable Water Treatment/Blending Facility for Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, CA | Project Engineer

Mike helped prepare a request for proposals and 30 percent design documents on this design-build procurement for a new, 3.0 mgd, RO, drinking water treatment plant. The request for proposals entailed treating groundwater from two aquifers with elevated levels of arsenic, hexavalent chromium fluoride, boron, and total dissolved solids.

Cottonwood Water & Sanitation District, Joint Water Purification Plant (JWPP) Retrofit Design, Arapahoe County, CO | Project Engineer

Mike supported 60 percent design to retrofit JWPP, enabling parallel operation of RO and microfiltration (MF) to treat surface water after riverbank filtration. He performed process review to evaluate modifications required to upgrade the original RO and MF systems and developed a matrix for plant operations from 0.5 mgd to 9.0 mgd.

Confidential Industrial Client, Advanced Water Treatment Plant Design and Feasibility Study, Prineville, OR | Project Engineer

Mike performed preliminary design and developed procurement specifications for RO and ultrafiltration (UF) systems for a new advanced water treatment facility. The purpose was to treat secondary effluent from wastewater lagoons and produce service water to feed a data center.

City of Chandler, Chandler Water/Wastewater Master Plan Update – Water Quality Task, Chandler, AZ | Project Engineer

Mike reviewed the city's water quality data from 2010 to 2015 to assess compliance with current drinking water regulations. The evaluation focused on compliance with stage two of the Disinfection Byproducts Rule and on monitoring results for unregulated contaminants under rounds four and five of the Unregulated Contaminant Monitoring Rule. Mike forecasted the impact of potential future regulatory action related to arsenic, hexavalent chromium, and strontium.

MIKE HWANG, PE (CONTINUED)

ADVANCED TREATMENT

City of Chandler, Reclaimed Water Master Plan, Chandler, AZ | Project Engineer

Mike evaluated the sources of system wastewater flows and their relative contributions to total dissolved solids (TDS) in reclaimed waters produced by the Ocotillo Airport and Lone Butte water reclamation facilities.

City of Scottsdale, Chaparral Water Treatment Plant Membrane Integrity Improvements, Scottsdale, AZ | Project Engineer

Mike performed preliminary design of plant modifications needed to enable operation of the Zenon ZeeWeed 500 UF in the original feed-and-bleed mode and in batch mode to address the loss of membrane integrity.

City of Long Beach, Preliminary Design for the Expansion of Leo. J. Vander Lans Advanced Water Treatment Facility, Long Beach, CA | Staff Engineer

Mike assisted in preliminary design of this AWT facility expansion from 3 mgd to 6 mgd. He assessed optimization strategies for operating the original MF and RO facilities.

City of Freeport, Alternatives Evaluation for New Water Treatment Plant, Freeport, TX | Project Engineer

Mike reviewed Brazos River water quality and bench testing data to support the evaluation of treatment alternatives for a new, 30 mgd plant. The first alternative assumed clarification followed by pressurized MF/UF and the second alternative assumed submerged UF.

Chaparral Water Treatment Plant Bench and Full-Scale Testing, Scottsdale, AZ | Project Engineer

Mike performed bench testing and developed a full-scale test protocol to evaluate aluminum chlorohydrate (ACH) as an alternative coagulant to ferric sulfate to reduce the rate of short-term fouling in the City's Zenon ZeeWeed 500 UF system.

Yuma Desalting Plant, Long-Term Operational Alternatives Study, Yuma, AZ | Project Engineer

Mike performed conceptual design and preliminary cost estimates for 10 long-term operating alternatives for the Yuma Desalting Plant to mitigate the imbalances between supply and demand in the Colorado River watershed.

City of Scottsdale, Water Master Plan Update, Scottsdale, AZ | Project Engineer

Mike performed a review of the city's water quality data from 2008 to 2012 to assess compliance with current and future drinking water regulations.

Water and Wastewater Reuse Master Plan and Programming, Chandler, AZ | Project Engineer

Mike completed a water and wastewater reuse master plan project for a confidential industrial client to accommodate expansion of the original production facilities.

JIM LOZIER, PE

WATER QUALITY/TREATMENT

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
39+ years

EDUCATION
MS, Chemical Engineering, University of Arizona

BS, Biology, State University of New York

LICENSES & CERTIFICATIONS
Professional Civil Engineer: AZ, No. 46341, Expires - 6/30/2022; FL, No. 46999; Expires - 2/28/2021

WHY JIM?

- Leading and recognized global technologist in using membrane processes for water treatment, desalination, and water reuse
- Extensive California water reuse experience and proven leadership in planning and design of membrane processes for water utilities
- Technology innovator with over 39 years of experience in water and water reuse strategies

Jim, working with Paul Swaim, provides expertise specialized in applying membrane processes for water treatment, desalination, and water reuse, as well as other treatment used in association with those processes, including coagulation, clarification, oxidation, and various chemical treatments. Jim's California experience includes advanced treatment (MF/UF/RO), blending, desalination, and brine-concentrate studies. He applies his experience where these processes are used individually for seawater, groundwater, and surface water desalting; particle removal; and other single purpose applications. He also applies this expertise for multi-process (integrated) treatment facilities to address a variety of treatment challenges, treatment of various source waters for high-quality industrial process water, and treatment and reclamation of industrial wastewaters, including the use of membrane bioreactors. He has over 39 years of experience in the water treatment industry, including publishing more than 60 articles and book chapters.

RELEVANT PROJECT EXPERIENCE

San Diego County Water Authority, Desalinated Water Quality Blending Study, San Diego, CA | Senior Technical Consultant

The team conducted a water quality study intended to define the interaction between desalinated seawater (DSW) to be produced by the Carlsbad Seawater Desalination Facility and original potable supplies distributed by the authority, with particular emphasis on maintaining chloramine disinfectant residual. Jim conducted a literature review on the impacts of blending DSW with two different treated surface waters (TSWs); review results were used to prepare a bench–scale testing protocol. A comprehensive series of experiments were conducted to quantify chloramine reduction following DSW/TSW blending at different blend ratios, DSW bromide level, and residence time between DSW chloramination and blending and point of rechlorination. The results helped establish design criteria for additional chlorine boosting facilities at the Authority's Twin Oaks Valley WTP, to maintain a target chloramine residual in blended and distributed waters.

Southern California Regional Brine-Concentrate Study, Reclamation, Temecula, CA | QA/QC

Jim provided senior QA/QC oversight to study brine-concentrate management and disposal alternatives. He also provided QA/QC to assess available brine-concentrate technologies. This involved using a multi-attribute decision model to incorporate multi-stakeholder input to identify and recommend projects.

San Diego County Water Authority, Blending Study, San Diego, CA | Senior Technical Lead

Jim led a study assessing the impacts of blending desalinated and disinfected seawater with conventionally treated surface waters. The study comprised a literature review regarding impacts on chloramine residual and corrosion from blending of desalinated and conventional water supplies in a distribution system, based on differing levels of bromide, alkalinity, calcium, and pH. The results of the literature review enabled development of bench-scale testing protocol to empirically assess the impacts of these factors, as well as blend ratio, on the need for chloramine residual boosting following blending.

JIM LOZIER, PE (CONTINUED)

WATER QUALITY/TREATMENT

City of Chandler, Chandler Reclaimed Water Plan Update and TDS Study, Chandler, AZ | Task Lead/Principal Technologist

Jim evaluated various water sources and their contributions of TDS to the Chandler reclaimed water system, including wastewater treatment plants, industrial users, and the ASR operations. He also identified apparent trends in reclaimed water system quality and TDS levels and provided recommendations regarding a path forward for proposed TDS management and mitigation strategies.

Beneficial Brine Use Study, Masdar City, United Arab Emirates | Senior Technical Advisor

This project identified current and in-development technologies used to recover salts from hypersaline groundwater for sale in the open market, both regionally and globally. Fresh water suitable for drinking and other high-quality purposes will also be produced. Jim's responsibilities included reviewing and commenting on draft project documents and attending required workshops.

Confidential Semiconductor Chip Manufacturer, Water Wastewater Reuse Master Plan and Water/Wastewater Programming Study | Lead Process Engineer

The plan and study identified water supply needs and wastewater treatment requirements for up to five additional semiconductor fabrication facilities (fabs). Jim's responsibilities included overseeing development of water balance (model) for current and future fabs, inclusive of all water uses, such as waste streams resulting from semiconductor processing and from production of ultrapure water (UPW). He developed process alternatives for treatment and recovery of waste concentrate resulting from UPW production and subsequent reclamation by RO, including lime stabilization, high-efficiency using ion exchange pretreatment or vibratory sheer enhancement, and brine treatment using enhanced evaporation and mechanical vapor recompression.

North City Water Reclamation Facility, TDS Reduction Study, San Diego, CA | Lead Process Engineer

TDS reduction from 1,300 mg/L to less than 1,000 mg/L will be achieved by treating a portion of the tertiary effluent with RO following pretreatment by MF and blending the product with the remaining effluent. Jim's responsibilities included performing process selection and sizing, developing facility layouts, and preparing order-of-magnitude cost estimates.

MICHAEL MATSON, PE

CONVEYANCE SYSTEMS

CREDENTIALS

COMPANY
Woodard & Curran

EXPERIENCE
20+ Years

EDUCATION
B.S., Civil Engineering, University of California-Berkeley

LICENSES & CERTIFICATIONS
Professional Engineer – CA, 42546

PROFESSIONAL AFFILIATIONS
- AWWA
- ASCE
- Water Environment Federation
- Bay Area Water Works Association
- California Water Environment Association

WHY MIKE?
- Extensive California-based water and water reuse conveyance system experience with many miles of pipe and facilities in the ground
- Proven planning, design, and construction of projects in California
- Team player with clear communications and collaborative working approaches

Mike has extensive experience in conveyance system planning and water infrastructure project design and construction, including hydraulic evaluations, water and recycled water systems, and facilities planning for water, wastewater, and recycled water systems. This provides important expertise for your conveyance-related deliverables. Mike has participated in design of 150 miles of up to 96-inch diameter water and recycled water pipelines, 12 miles of up to 36-inch diameter sanitary/storm sewer pipelines, 13 pump stations up to 193 mgd, and 6 reservoirs up to 10 million gallons, bringing his resulting knowledge of best practices benefit your program. Mike has comprehensive water and water reuse conveyance system experience on many California projects.

RELEVANT PROJECT EXPERIENCE

Del Puerto Water District (DPWD), North Valley Regional Recycled Water Program (NVRRWP), Modesto, CA | Lead Designer

Mike provided technical oversight for preliminary design of all facilities and to design 13 miles of 42-inch recycled water pipeline from Modesto to the federally owned Delta-Mendota Canal (DMC), including discharge facilities. The program delivers up to 59,000 AFY of recycled water for agricultural use in the DPWD service area and for state and federal wildlife refuges in the San Joaquin Valley. This project phase also included permitting and grant administration services.

City of Pleasanton, Recycled Water Infrastructure Expansion – Phase 1A, Pleasanton, CA | Project Manager

Mike managed engineering design and bid assistance to expand recycled water distribution serving a business park and sports park. This included topographic and utility surveys, corrosion investigation and mitigation design, geotechnical investigation, permitting, engineering design, and bid assistance. This includes 52,850 linear feet (LF) of 4-inch to 20-inch distribution pipelines; two recycled water supply flow metering and control valve stations and associated communication and SCADA system design; connections and new pipeline segments; and 135 service lines to customer meter boxes, delivered under an aggressive 3.5 month design schedule.

Napa Sanitation District, Milliken-Sarco-Tulocay Recycled Water Pipeline Project, Napa, CA | Project Manager

Mike managed design of over 5 miles of 8-inch to 24-inch recycled distribution pipeline and a booster pump station. This project involves four creek crossings, where trenchless construction was evaluated. The pipeline alignment also required utility research. The work also included developing a customer metering approach that could be upgraded to include automatic meter reading/advanced metering infrastructure (AMR/AMI) in the future.

MICHAEL MATSON, PE (CONTINUED)

CONVEYANCE SYSTEMS

City of Los Angeles, Existing System Reliability Plan, Recycled Water Master Plan, Los Angeles, CA | Task Manager

Mike managed the reliability plan portion of the overall master plan, focused on evaluating the operational issues impacting the original recycled water systems and developing approaches and projects to improve overall reliability to meet operational goals.

Del Puerto Water District, Del Puerto Canyon Reservoir, Del Puerto, CA | Task Manager

Mike led preliminary design development of the proposed reservoir and associated facilities, including a 300 cfs diversion/outfall and pumping plant, an electrical substation, and approximately 1 mile of large-diameter transmission pipeline.

City of Lodi, Water Meter Project and Mainline Replacement, Lodi, CA | Program Manager

Mike led this 7-year program to meter parcels served by the city water system, comprising about 13,000 residential properties and 3,000 commercial, industrial, and public properties. The work also includes replacing 25 miles of undersized and inaccessible water main. The $34 million program is important to the city's overall strategy to effectively manage water supplies, promote conservation, and meet its long-term water supply needs.

City of Mountain View, Shoreline Sailing Lake Water Supply Project, Mountain View, CA | Project Manager

The project developed a reliable, environmentally friendly, cost-efficient, long-term supply strategy for the Sailing Lake. The original water supply was pumped from the Inner Charleston Slough (ICS). The Bay Conservation and Development Commission encouraged siltation in the ICS to develop and enhance wetland habitat; at the same time, the city faced increasing and unpredictable operations and maintenance costs to keep the slough and the pump station sump open. W&C's approach combined interactive workshops involving city staff and other stakeholders with a rigorous alternatives evaluation process. The project included hydrodynamic, water quality, and sedimentation modeling of water source bodies, the Sailing Lake, and the discharge body (Permanente Creek). W&C developed final design for the selected alternative and supported project bidding and construction.

City of Berkeley, Salt Water Pipeline, Berkeley, CA | Project Manager

The project was planning and preliminary design of a 27,000 LF, 24-inch and 30-inch diameter steel pipeline providing fire-fighting salt water from San Francisco Bay, following a magnitude 7.0 earthquake on the nearby Hayward fault. Mike established alignments through crowded city streets, coordinating with agencies and public interest groups and developing a pipeline design able to survive significant ground shaking forces. The design includes a 12-inch-diameter, flexible hose system to convey fire water from the buried pipeline to the lower portions of the city. Critical issues associated with this system were deployment devices and development of tactical scenarios used by the fire department to operate the system.

Central Coast Water Authority, Reaches 5B and 6, Coastal Branch Aqueduct of the State Water Project, CA | Project Manager

This 28-mile, 42-inch diameter welded steel pipeline traverses rich agricultural areas, several small communities and rugged terrain in a seismically active region of California's Central Coast. With pressures up to 450 psi, the pipeline was designed to achieve a level toughness and ductility enabling it to withstand significant ground shaking and other induced stresses from large magnitude earthquakes. The design also included terminus facilities, comprising two, 2.5 million- gallon prestressed concrete reservoirs. The tank site is in a sensitive habitat area and contains overflow events using large earthen berms to surround and screen the tanks.

Delta Diablo, Bridgehead Pump Station and Conveyance System Phases 1 and 2, Delta Diablo, CA | Project Manager

The master plan identified facilities and schedule to implement capacity increases associated with wastewater flow from developing southeast Antioch. W&C designed the initial capacity expansion project, a parallel 24-inch force main to augment the conveyance capacity of the original, 11,600 LF, 14-inch PVC force main. Mike managed Phase 2 facilities design, including a new pump station, emergency storage basin, and refurbishments to convert the original pump station for emergency diversion.

JENNIFER GLYNN, PE

BRINE MANAGEMENT

Jennifer's recent experience completing brine management, brine pipeline condition assessment, and pipeline rehabilitation for Santa Ana Watershed Project Authority brings insight into finding a viable water reuse solution for your program. She has completed many pipeline condition assessments and designed over 120 miles of water and water reuse pipeline, ranging from 2 inches to 108 inches in diameter. She has addressed required brine management with special attention to sensitive design and permitting issues, including endangered species habitat preservation. Her background includes preparing plans and specifications, permitting, cost estimating, managing project budget and schedules, and coordinating and negotiating with state, local, and federal agencies. Jennifer is also a recognized expert in trenchless technology and focuses on using the most advanced technologies in the field. She is especially proficient in the use of large-diameter replacement and renovation systems. She served on the North American Society for Trenchless Technology (NASTT) executive board and is currently on the board for NASTT's Western Regional Chapter. She is also an NASTT course instructor for Pipe Bursting Good Practices and Introduction to Trenchless Rehabilitation.

CREDENTIALS

COMPANY
Woodard & Curran

EXPERIENCE
24 Years

EDUCATION
BS, Civil Engineering, University of New Hampshire

LICENSES & CERTIFICATIONS
Professional Engineer – CA, 61303, Expires - 6/30/2021

WHY JENNIFER?

- Pipeline condition assessment expert with brine management and brine pipeline experience to support water reuse solutions for Pure Water
- Recognized expert in trenchless pipe technology and pipeline condition assessments providing insights into regional conveyance systems impacting private and public property and roads
- Skill in large- and small-diameter pipeline design

RELEVANT PROJECT EXPERIENCE

Santa Ana Watershed Project Authority (SAWPA), Inland Empire Brine Line Reach V Pipeline Condition Study, Santa Ana, CA | Project Manager

Jennifer managed a condition assessment study of the brine line, including capacity analysis and rehabilitation alternatives for appropriate repair and/or replacement methods. W&C's study included risk assessment and surge analysis of the 24-inch, PVC line, which failed in 2011 due to poor construction quality. The study defined the limits of needed repair work and recommended rehabilitation and replacement methods for highest-risk locations along the alignment. W&C recommended installing 26 maintenance access structures, including plug isolation valves and access tees for future bypass pumping, enabling cured-in-place pipeline (CIPP) rehabilitation. Installation includes 12,900 feet of pressure CIPP in the near term and an additional 8,200 feet in the long-term. W&C also recommended replacing air release valves.

SAWPA), Reach 4D Rehabilitation Work Plan, Santa Ana, CA | Project Manager

This condition assessment was for 7 miles of 42-inch reinforced concrete pipe (RCP) installed between 1990 and 1995, with T-Lock lining 270 degrees around the inside diameter of the pipe, leaving 90 degrees unlined. W&C performed CCTV assessment of the entire pipeline and man-entry physical inspections, and concrete testing of the manholes and pipeline at select locations—all in a 24-hour period at an accelerated schedule. Jennifer estimated useful remaining life of the pipeline and manholes based on the condition assessment data, evaluated potential rehabilitation methods, and identified a preferred method with large volume bypass; she then summarized the data, information, and results in a detailed work plan with a project schedule, cost estimate, and required environmental documentation for the recommended method.

Orange County Sanitation District (OCSD), District 6 Trunk Sewer Upgrades, Orange County, CA | Project Engineer

Jennifer led pipeline design, including increased capacity through pipe bursting or other methods, repair of pipe deficiencies such as corrosion or lateral cracking, and improvements to manhole access. The sewer alignment is in the Caltrans right-of-way; W&C coordinated permit requirements and utility information from multiple agencies, including Caltrans

JENNIFER GLYNN, PE (CONTINUED)

BRINE MANAGEMENT

.**City of Mountain View, Shoreline Park Trunk Sewer Rehabilitation, Mountain View, CA |** Project Engineer

Jennifer prepared plans and specifications to rehabilitate approximately 4,000 feet of 36- to 42-inch trunk sewer experiencing groundwater and seawater infiltration. The alignment traveled through Burrowing Owl mitigation land, a capped and abandoned landfill, and an 18-hole public golf course.

City of Santa Rosa, Llano Trunk Lining, Utilities Field Office and West 3rd Street, Santa Rosa, CA | Project Manager

This included a condition assessment, rehabilitation alternatives analysis, and design for 4,000 feet of the 48- to 54-inch sewer, which is hydraulically impacted, conveying over 20 mgd peak dry weather flow. Challenges included high sediment volume in the sewer, schedule restrictions, and design of a major bypass system through a residential area and down a heavily trafficked roadway.

City of Santa Rosa, Sewer Master Plan and Condition Assessment Project, Santa Rosa, CA | Technical Lead

Jennifer supported inspection, condition assessment, remaining useful life predications, and project prioritization for 13 miles of trunk sewer ranging from 33- to 66-inch diameter. Once asset conditions were determined and projects were identified, we used our experience and industry knowledge to select appropriate rehabilitation solutions correctly addressing pipe condition, assuring constructability, minimizing permitting, and maximizing the City's available budget.

City of Santa Rosa, Robles Trunk Lining – Walker Avenue Easterly to Confluence, Santa Rosa, CA | Project Manager

This involved rehabilitating 1,800 feet of 48-inch reinforced concrete pipe trunk sewer using CIPP lining. It also included rehabilitating five sanitary sewer manholes and bypass pumping approximately 6 mgd of peak dry weather flow.

Encina Wastewater Authority, Aeration Piping Condition Assessment and Rehabilitation Alternatives Analysis, Encina, CA| Technical Lead

Jennifer analyzed, assessed, and provided relative cost estimates for viable rehabilitation alternatives for a 42-inch diameter cement mortar coated, epoxy-lined steel, high-temperature aeration pipe. She also provided design and construction support for the selected alternative.

City of Daly City, Mission Street Sewer Replacement Project, Daly City, CA | Project Manager

Jennifer managed a team of engineers preparing plans and specifications for 1,300 feet of 8- to 15-inch-diameter gravity sewer line. She negotiated through project challenges, including to install a new pipeline within a Caltrans right-of-way, a congested utility corridor, and a roadway with heavy traffic. She developed and tracked project budget and schedule and negotiated the initial contract and contract amendments.

Delta Diablo, Parallel Force Main Preliminary Design Study, CA | Project Manager

Project Manager for preliminary design of a parallel force main. The District was interested in doing an alternative alignment review and developing a better-defined scope, project costs, and timeline for implementation of the preferred alignment. Woodard & Curran prepared preliminary design documentation and a draft preliminary design technical memorandum (TM). The TM included an implementation plan and updated cost estimate of the District's preferred alternative based upon field visits, review of City mapping, and review and update of existing CEQA, permitting, design, and right-of-way acquisition documents for plans that were deferred in 1994.

ERICA WOLSKI, PE

DDW COORDINATION AND TITLE 22 ENGINEERING REPORT

Erica's unique background in drinking water and recycled water regulatory compliance as a consultant and former DDW staff provides Pure Water Program clear understanding and direction on how to collaboratively address drinking water permitting needs. She has worked for the State Water Resources Control Board and for DDW in the field operations branch for the Sonoma, Santa Ana, San Bernardino, and San Diego Districts and in the Recycled Water Unit; this means she is highly familiar with Southern California related water compliance needs and approaches. Her project experience includes designing water and wastewater treatment facilities, assisting with DDW permitting, and preparing Title 22 reports for recycled water. While working in the field branch at DDW, Erica inspected and permitted water systems, assisted in developing recycled water policy as a member of the DDW recycled water committee, and gave presentations on behalf of DDW. While working in the Recycled Water Unit, she reviewed Title 22 reports for potable reuse projects and participated in developing potable reuse regulations.

CREDENTIALS

COMPANY
Woodard & Curran

EXPERIENCE
22 Years

EDUCATION
Bachelors, Civil/Environmental Engineer, California State Polytechnic University-Pomona

LICENSES & CERTIFICATIONS
Professional Engineer - CA, 67594, Expires - 6/30/2021

WHY ERICA?

- Unique and powerful combination of work experience as a former DDW staffer, to support your program's drinking and water reuse strategies and compliance approaches
- Proven project manager in design of water reuse and wastewater treatment facilities, including deep connections with the DDW for permitting insights and preparing Title 22 reports for recycled water schemes

RELEVANT PROJECT EXPERIENCE

Santa Clarita Valley (SCV) Water Agency, New Drop Concept Technical Memorandum, Santa Clarita, CA | Project Manager

Erica helped SCV Water develop a technical memorandum to document their tracking and verification program to avoid a Section 1211 Water Rights Petition (Wastewater Change Petition) with the State Water Resources Control Board Division of Water Rights. Section 1211 petitions are not needed for new wastewater flow that has never been discharged to a river. The New Drop program tracks and estimates wastewater flows from new developments, including infill development; verifies the estimates with targeted sewer flow monitoring; and generates quarterly reports for submittal to the Regional Water Quality Control Board as part of SCV Water's recycled water permit. The project uses and tracks potable water makeup at SCV Water's recycled water tanks, reserving recycled water sent to the Santa Clarita River for future use.

Vallecitos Water District (VWD), Evaluation of San Marcos Valley Groundwater Basin Supply Options, San Marcos, CA | Project Manager

Erica supported development of a feasibility study for evaluating the San Marcos Valley Groundwater Basin as a supply of municipal potable or non-potable water for the Vallecitos Water District. The study included reviewing the use of the basin as a source of non-potable irrigation water, source water for a drinking water desalter, and potential use for groundwater recharge and extraction of advanced treatment recycled water. Project work included developing project alternatives and costs for each option and a list of funding programs from which VWD could request planning and design funds for each option.

ERICA WOLSKI, PE (CONTINUED)

DDW COORDINATION AND TITLE 22 ENGINEERING REPORT

Carpinteria Valley Water District (CVWD), Carpinteria Advanced Purification Program (CAPP) Indirect Potable Reuse Project, Carpinteria, CA | Task Lead

The CAPP project will treat up to 1.2 mgd of effluent currently discharged to the ocean at a new AWPF and inject it into the Carpinteria Groundwater Basin for extraction and resuse by CVWD. Erica has managed the overall program since May 2019, including developing the funding and financing plan, developing stakeholder outreach materials, and completing the Clean Water SRF funding application. Erica is also the task lead for the DDW and RWQCB permitting tasks, including preparing the Report of Waste Discharge for the advanced treated water injection into the basin, the Report of Waste Discharge for the brine discharge to the ocean, and the Title 22 Engineering Report for DDW approval. The Report of Waste Discharge tasks include preparing an antidegradation analysis for boron and nitrate for basin injection and an Ocean Plan Compliance Evaluation for the brine discharge to the ocean.

City of Oceanside, (Pure Water Oceanside) Indirect Potable Reuse Project, Oceanside, CA | Task Lead

While in the DDW Recycled Water Unit, Erica attended project meetings and provided feedback on the proposed project and the draft Title 22 Engineering Report. Since joining W&C in September 2018, Erica is the task lead for completing the Title 22 Engineering Report and Report of Waste Discharge, which are anticipated to be submitted to DDW and RWQCB in early 2020. Since January 2019, Erica has also been assisting the city with coordinating DDW and RWQCB meetings, preparing meeting materials and completing regulatory review of the design engineer's plans and specifications.

Los Angeles Department of Water and Power (LADWP), Headworks Direct Potable Reuse Evaluation, Los Angeles, CA | Task Lead

Erica is leading development of the roadmap technical memorandum, which lays out the assessments needed and proposed schedule for LADWP to construct a 1.0 mgd DPR demonstration facility and later modify it into a 1.0 to 10 mgd, full-scale DPR facility for discharge to the Headworks Reservoir Complex. Erica also helps LADWP coordinate DDW meetings and prepare meeting materials.

Yucaipa Valley Water District (YVWD), Wilson Creek Basins Indirect Potable Reuse, Yucaipa, CA | Task Lead

YVWD plans to spread up to 5,000 AFY of tertiary recycled water into the Wilson Creek Basins. While in the DDW Recycled Water Unit, Erica attended project meetings prior to submittal of the Title 22 Engineering Report in October 2018. Erica now attends DDW and RWQCB meetings on behalf of YVWD. Currently, the project is on hold while waiting for the tracer study to be completed to determine the time of travel between the Wilson Creek Basins and YVWD's nearest downstream wells. After the tracer study is completed, Erica will be the task lead for revising the Title 22 Engineering Report.

East Valley Water District (EVWD), Sterling Natural Resources Center Indirect Potable Reuse Project, Highland, CA | Task Lead

EVWD plans to recharge up to 8 mgd into the Bunker Hill-B groundwater basin through the use of a losing stream (City Creek) and Redlands Basins. While in the DDW Recycled Water Unit, Erica attended project meetings and reviewed the Title 22 Engineering Report for the project. She prepared the slides and presented them at the public hearing in 2017. She also reviewed the design plans for the membrane bioreactor (MBR) and UV disinfection system on behalf of DDW. Erica is now the task lead for DDW and RWQCB permitting and has submitted a revised Title 22 Engineering Report and Antidegradation Analysis (for TDS and nitrogen) for DDW and RWQCB review. Development of a TDS management plan is currently underway and will be submitted for RWQCB review in mid-2020. The project is currently in construction and is anticipated to start up in fall 2021.

City of San Diego, Pure Water Program, Phase 1 - San Vicente and Miramar Reservoirs, San Diego, CA | Task Lead

The city plans to implement the first phase of the program by 2022, which will treat 30 MGD of wastewater flows to Point Loma for potable reuse. Erica attended multiple IAP meetings for the project, reviewed test protocols and reports for the city's pathogen and filter loading rate studies at the North City WRP, reviewed and commented on the Title 22 Engineering Report for the project, and participated in the public hearings in August 2018.

MARY COUSINS, PHD, PE

RWQCB COORDINATION AND REPORT OF WASTE DISCHARGE

Mary will support our RWQCB communications, coordination, and, most importantly, our collaboration on the Pure Water Program under John Schoonover. She has expertise in the renewal of NPDES permits for many California wastewater treatment plants, strong contacts with the RWQCB permitting team, and planning and permitting for recycled water projects. Her background also includes hydraulic modeling of distribution systems for drinking water and recycled water. Mary recently successfully assisted in negotiating a favorable discharge permit for Novato Sanitary District, justifying exemption to shallow water discharge prohibitions.

CREDENTIALS

COMPANY
Woodard & Curran

EXPERIENCE
20 Years

EDUCATION
Doctorate, Civil and Environmental Engineering, University of California, Berkeley

Masters, Civil and Environmental Engineering, Stanford University

Bachelors, Civil Engineering, Stanford University

LICENSES & CERTIFICATIONS
Professional Engineer - CA, C63613

WHY MARY?

- Successfully completed several NPDES Permit Renewals for similar Pure Water Program needs, including establishing coordination with Regional Water Quality Boards
- Diverse background on renewal permitting strategies that benefit the environment and discharger

RELEVANT PROJECT EXPERIENCE

Novato Sanitary District (NSD), NPDES Permit Renewal, San Francisco, CA | Project Manager

Mary helped the district with its NPDES permit renewal for discharge to San Francisco Bay. She prepared the Report of Waste Discharge, which includes analysis of effluent and receiving water data, technical information to support dilution credits, and a justification for exemption to shallow water discharge prohibitions.

Central Marin Sanitation Agency (CMSA) NPDES Permit Renewal, San Francisco, CA | Project Engineer

Mary helped CMSA with its NPDES permit renewal for discharge to San Francisco Bay. She led preparation of a dilution study for inclusion in the Report of Waste Discharge. The dilution study was used to justify dilution credits for copper, cyanide, silver, and ammonia.

Town of Windsor, NPDES Permit Renewal, Windsor, CA | Project Engineer

Mary supported this NPDES permit renewal for discharge to a tributary of the Russian River. She prepared the Report of Waste Discharge, including analysis of effluent and receiving water data, reasonable potential analysis, and justification for exemption to discharge prohibitions. She assisted with permit negotiations in 2013 and assisted the town with permit implementation activities, such as a receiving water special study.

Union Sanitary District (USD), NPDES Permit Renewal for Wet Weather Discharge, Alameda, CA | Project Manager

Mary helped USD with its NPDES permit renewal for wet weather discharge to Old Alameda Creek. She prepared the Report of Waste Discharge, including an updated mixing zone analysis. She also assisted USD with permit negotiations related to monitoring requirements.

Livermore-Amador Valley Water Management Agency, NPDES Permit Renewal, Pleasanton, CA | Project Manager

Mary supported LAVWMA with its NPDES permit renewal for wet weather discharges. She prepared a mixing zone analysis for wet weather discharges in accordance with USEPA guidelines and state requirements. She also analyzed effluent and ambient background data, conducted reasonable potential analyses and compliance feasibility analyses, calculated effluent limits, and prepared the Report of Waste Discharge.

MARY COUSINS, PHD, PE (CONTINUED)

RWQCB COORDINATION AND REPORT OF WASTE DISCHARGE

Sanitary District No. 5 of Marin County, NPDES Permit Renewal, San Francisco Bay Area, CA | Project Manager

This was an NPDES permit renewal for discharge from Paradise Cove Treatment Plant to San Francisco Bay. Mary analyzed effluent data, conducted reasonable potential analysis, and prepared the Report of Waste Discharge. She led preparation of mixing zone analyses and assisted with antidegradation analysis, both for inclusion in NPDES permit application.

Napa Sanitation District, CA - NPDES Permit Renewal | Project Engineer

Mary assisted the District with its NPDES permit renewal for discharge to the Napa River. She also assisted with preparation of mixing zone analysis and justification for dilution credits.

Del Puerto Water District and U.S. Bureau of Reclamation, Study of Recycled Water Quality, San Joaquin Valley, CA | Project Engineer

Mary prepared a water quality characterization for the North Valley Regional Recycled Water Program. The study was used to help assess the feasibility of delivering recycled water to the Del Puerto Water District and to wildlife refuges in the San Joaquin Valley.

City of Manteca, Reclaimed Water Facilities Master Plan, Manteca, CA | Project Manager

The city's wastewater treatment plant provides tertiary treatment; the master plan included a market assessment to identify feasible customers for this water, including local and regional water users. The project included detailed assessment of landscape irrigation demands, a hydraulic model developed to evaluate potential service alternatives, and extensive public outreach.

Central Contra Costa Sanitary District (CCCSD) and Contra Costa Water District (CCWD), Refinery Recycled Water Yield Study, Martinez, CA | Project Engineer

Mary completed a study identifying the water supply benefit of providing recycled water to two refineries in Martinez for use in cooling towers and as boiler feed water. The study was completed as a preliminary step in the preparation of a Title XVI Recycled Water Feasibility Study for the U.S. Bureau of Reclamation.

City of Pleasanton, Water Master Plan Update, Pleasanton, CA | Project Engineer

As a member of the modeling team, Mary helped create a new model of the city's water distribution system, which was used to determine system deficiencies.

City of Cloverdale, NPDES Permit Renewal, Cloverdale, CA | Project Manager

Mary helped the city with preparation of an NPDES permit application for its wastewater discharge to percolation ponds adjacent to the Russian River. The application included information about the City's pretreatment program and included preparation of a water quality study examining the impacts of the discharge on the Russian River.

Goleta Sanitary District, Antidegradation Analysis, Goleta, CA | Project Manager

Mary helped the district prepare the analysis addressing an increase in the average dry weather flow allowable in the district's re-issued NPDES permit for discharge to the Pacific Ocean. The report focused on the water quality impacts of the increase in dry weather flow in combination with the district's recent plant upgrades.

City of Santa Rosa, Agronomic Rate Analysis, Santa Rosa, CA | Project Manager

Mary helped the city prepare estimates of hydraulic and nutrient loading to recycled water customers and assess compliance with agronomic rate requirements. The analysis was prepared for inclusion in public reports.

City of Petaluma, NPDES Permit Renewal, Petaluma, CA | Project Manager

Mary assisted the city with its NPDES permit application for its wastewater discharge to the Petaluma River. She prepared the permit application, including sections related to the city's exemption from the shallow water discharge prohibition. She also assisted with permit negotiations, which resulted in a successful permit reissuance.

BRENDA EELLS

CEQA COORDINATOR

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
21 years

EDUCATION
Master of Planning, University of Wyoming

BS, Geography, Wittenberg University

MEMBERSHIPS/AFFILIATIONS
Association of Environmental Professionals

WHY BRENDA?

- Strong experience in CEQA/NEPA document development through final approved documents, supporting the ability to quickly implement your project CEQA documentation
- Experience on several Southern California draft and final EIR projects
- Strong regulatory connections and public outreach skills to support public commenting periods and presentations

Brenda uses her environmental planning experience to help effectively conduct and coordinate Pure Water Program's CEQA and NEPA environmental analysis. She has successfully completed several CEQA projects for water, transportation, private and public utilities, power generation, and solid waste; she also has experience with agency coordination and public outreach. Brenda has experience providing quality review for environmental permitting and construction compliance documentation, environmental compliance support, and monitoring during construction. She is well versed in Southern California CEQA and NEPA requirements and recently assisted in getting final EIR approval for a large water storage basin in Los Angeles, requiring significant regulatory agency coordination and collaboration.

RELEVANT PROJECT EXPERIENCE

Waste Connections, Inc, Chiquita Canyon Landfill Master Plan Revision, Los Angeles County, CA | Project Manager and Senior Technical Consultant

Brenda directed all aspects of environmental studies required to prepare a comprehensive EIR for landfill expansion, seeking a revision enabling the landfill to continue operations and extend the waste footprint within the original site boundary. She served as environmental spokesperson for the client and lead agency (LA County Department of Regional Planning) during the EIR development and approval process and coordinated intensively with the lead agency and the LA County Department of Public Works. She managed all aspects in accordance with scope and schedule, leading the environmental team, serving as primary contact for client and lead agency, and overseeing project delivery, including the certified final EIR and conditional use permit (CUP) for master plan revision. She is currently providing CUP compliance support, environmental support during construction and operation, and waters and wetland permitting with USACE, RWQCB, and CDFW.

Southern California Edison (SCE), Tehachapi Renewable Transmission Project (TRTP), Los Angeles, Kern, and San Bernardino Counties, CA | CEQA Lead, Senior Technical Consultant, and Quality Assurance/Quality Control Manager

Brenda was extensively involved in all aspects of the compliance monitoring for Segments 4-11, on a team providing environmental compliance support to SCE during TRTP construction, in accordance with NEPA/CEQA, to deliver up to 4,300-MW of renewable energy to the Los Angeles Basin and the western Inland Empire. TRTP construction included 173 miles of new and upgraded transmission lines, a new substation, and major upgrade of an original substation and of ancillary facilities. Brenda provided CEQA/NEPA review and comment support during preparation, testimony, review, and comment for undergrounding of TRTP Addendum in Chino Hills. Environmental compliance support included technical consulting, mitigation monitoring and reporting, agency coordination support, variance support, mitigation plan preparation, environmental P6 scheduling, and photographic documentation. The team also provided review and comment support of TRTP draft and final EIR/EIS and supplemental draft and final EIR/EIS (FAA marker balls and lighting).

BRENDA EELLS (CONTINUED)

CEQA COORDINATOR

Western Placer Waste Management Authority, Renewable Placer, Waste Action Plan, Roseville, CA | CEQA Project Manager

Brenda managed development of comprehensive EIR for this over 30-year waste management plan, which includes traditional waste disposal, recycling and landfill diversion, opportunities for industrial innovation and economic growth, compliance with expanding regulations, and compatibility with current and future neighboring land uses. The EIR development requires active engagement with a wide range of stakeholders and interested parties.

Southern California Edison (SCE), Lake Success Transmission Project, Tulare County, CA | Project Manager and NEPA/CEQA Lead

Brenda supported preparation of the Proponents Environmental Assessment (PEA), to evaluate replacing transmission lines crossing Lake Success, under the jurisdiction of USACE. She was responsible for technical, quality, and project delivery aspects.

Los Angeles Department of Water and Power Silver Lake Reservoir Complex Storage Replacement Project, Los Angeles, CA | Deputy Project Manager

Brenda was the planner, visual resources specialist, and deputy project manager to prepare a draft and final EIR to construct and operate a 110-million-gallon underground water storage reservoir, 4-megawatt hydroelectric power-generating facility, and a 1-mile bypass pipeline. Specific environmental tasks included analyzing land use, public services and utilities, and visual resources impacts.

Los Angeles Department of Water and Power, Stone-Encino Water Quality Improvement Project, Los Angeles, CA | Deputy Project Manager

Brenda was the planner, visual resources assistant, and deputy project manager to prepare draft and final EIS for this completed project evaluating construction of water quality improvement facilities at two open reservoirs. She provided technical writing support on numerous sections of the EIR and helped manage the required environmental studies. Specific tasks included analysis of land use, public services and utilities, and visual resources impacts. The project involved significant agency coordination and meeting facilitation; she attended and facilitated intensive weekly meetings with community groups throughout the EIR process.

Los Angeles Department of Water and Power, Burbank Boulevard Trunk Line Project, Los Angeles, CA | Deputy Project Manager

Brenda led the land use task for this successful project's draft and final environmental assessment and mitigated negative declaration. The project evaluated the environmental impacts of constructing two water distribution pipelines and two pressure regulating stations, using streets and private property within the City of Los Angeles.

BOB HARDING, PE

LRP APPLICATION

Bob brings his 20 years of experience in leadership and management positions at MWD's Resource Planning and Development Section to your program to get LRP funding for our additional water reuse production. He has over 32 years of experience developing water resources solutions and an in-depth knowledge of hydraulics, hydrology, system and resource analysis, and water resource issues, along with setting up and running MWD's LRP program. He has a demonstrated knowledge of water resources strategic and financial planning, water supply and demand projections, and policy development and implementation. He was also the co-lead for MWD's Integrated Area Study, which defines how MWD will develop infrastructure to meet water supply needs for the next 50 years. Bob's experience includes working with California agricultural entities developing water-use inventories, facility plans, water optimization and measurement plans, transfer and exchange programs, analysis of third-party impacts, and U.S. Bureau of Reclamation water law and policies.

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
32+ years

EDUCATION
MBA, Pepperdine University, CA

BS, Civil Engineering, Brigham Young University, UT

LICENSES & CERTIFICATIONS
Professional Civil Engineer: No. C50185, CA Expires: 7/1/2021

WHY BOB?

- MWD insider knowledge and LRP program background insights to greatly help you get additional LRP funding for your new water reuse production
- Comprehensive financial expertise in developing water resources planning and dealing with water supply and demand projections

RELEVANT PROJECT EXPERIENCE

Central Utah Water Conservancy District (CUWCD), Juab County & South Utah County Water Supply and Infrastructure Plan Formulation Project, Orem, UT | Project Manager

Bob led this project to support the CUWCD's objectives, in collaboration with other agencies and municipalities in Juab and South Utah counties. The project was primarily a planning effort to formulate a CUWCD wholesale regional water supply and facility plan for the next 50 years by estimating reasonable projected water needs beyond current available sources and defining opportunities for supply augmentation. The project analyzes current water sources, demographics, current and future water needs, possible water supply alternatives, water development projects, phasing of recommended projects, and the feasibility and economic and financial considerations of the proposed plan.

MWD of Southern California, System of Resources Analysis Unit, Hemet, CA | Unit Manager V

With direct responsibility for an operations and maintenance budget of approximately $4 million, Bob led long-term facilities and resources planning and analysis for MWD's Integrated Water Resources Plan (IRP). Key accomplishments with direct relevance to MWD's continuing planning work include:

- Worked with MWD executive staff, member agency general managers, and Boards of Directors to develop projects and make policy recommendations for major desalination projects, groundwater programs, water conveyance and distribution infrastructure, water resource portfolios, and MWD's Regional Recycled Water Project.
- Managed MWD's 2010 and 2015 IRP. The IRP defines how MWD will integrate state, federal, and local resources into a water supply portfolio providing future water supply reliability. MWD's IRP strategy has enabled Southern California to maintain a reliable water supply during the recent extended drought in the Western U.S.

BOB HARDING, PE (CONTINUED)

LRP APPLICATION

- Led MWD's LRP update, West Basin Desal Integration Study, and 2010 and 2015 Regional Urban Water Management Plans, as well as an international review of desalination integration
- Negotiated MWD's agreement for the 150 mgd Regional Recycled Water Project.

MWD of Southern California, Planning and Resources Division, Hemet, CA | Senior Engineer/Section Manager

At MWD, Bob gained extensive experience working with agricultural entities. He had a wide variety of responsibilities and gained knowledge that is foundational to his consulting role on this team. His responsibilities and highlights of his experience are outlined below:

- Negotiated and implemented some of the first water transfers, exchanges, and storage programs in the State of California.
- Has extensive knowledge of California's State Water Project and the Colorado River agreements and operations
- Worked with federal, state, and local entities, including California DWR, U.S. Bureau of Reclamation, and numerous California agricultural water agencies, including Kern County Water Agency, Semitropic, and Arvin-Edison Water Storage District.
- Successfully completed first agriculture-to-urban and urban–to-urban conjunctive use programs including:
  - Semitropic/MWD Groundwater Storage Exchange program and the Calleguas/MWD Groundwater Storage Program
  - Prop 13 Storage programs with MWD's member agencies
  - Groundwater storage policy principles adopted by MWD's board of directors

MWD of Southern California, Engineering Division, Hemet, CA | Assistant Engineer

Bob was the project manager for the relocation of major pipelines within MWD's distribution system. Projects ranged from $2 million to $18 million.

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
8 years

EDUCATION
MS, Civil Engineering, Oregon State University

BS, Civil Engineering, Oregon State University

LICENSES & CERTIFICATIONS
Professional Engineer Civil Engineer: CA, No. 89304, Expires - 12/21/2020

Institute for Sustainable Infrastructure: Envision Sustainability Professional

WHY MONICA?
- Experienced in water and wastewater conveyance and storage design and condition assessment for conveyance systems
- Recently served as the conveyance design manager for the City of San Diego Pure Water's AWTP facility

MONICA MORALES, PE, ENV SP

GRANT APPLICATIONS SUPPORT

Monica brings her recent San Diego Pure Water Program experience to help you find viable water reuse and resilience related grants. San Diego's program was leading edge in water reuse concepts, opening several viable grant funding avenues that will be explored for your program. Monica is experienced in water and wastewater conveyance and storage design and condition assessment for conveyance systems, including water and wastewater pipelines, pump stations, and sanitary sewer systems. She has participated in projects for municipal clients, including pre-design, design, construction, and post-construction. She has recently served as the conveyance design manager for the San Diego Pure Water's facility, a 30-mgd AWTP with yard piping ranging from 1.5 inches to 54 inches in diameter.

RELEVANT PROJECT EXPERIENCE

City of San Diego Public Utilities, Pure Water Program, San Diego, CA | Task Manager /Reviewer

The Pure Water Program conveyance design by others is undergoing a constructability review to ensure scheduling is accurate and the design is adjusted according to a construction and traffic perspective to better ensure project completion. Monica assists management of constructability review comments for six different packages of the Pure Water Program Conveyance Design and also assists the Project Manager with organizing meetings, data, performing quantity take offs, and editing schedules.

City of San Diego Public Utilities, Pure Water Program, San Diego, CA | Conveyance Design Manager

The San Diego Pure Water Program includes expanding the North City Wastewater Reclamation Plant (NCWRP); effluent from NCWRP is to be treated at the new Pure Water Facility, and then conveyed to and stored in Miramar Reservoir. Monica's responsibilities include conveyance design of the 30-mgd Pure Water Facility yard piping, pump selections and hydraulic grade line calculations for the Metropolitan Biosolids Center Centrate Pump Station, and specifications for the NCWRP Expansion.

Water Replenishment District (WRD) of Southern California, Regional Brackish Water Reclamation Program Feasibility Study, Los Angeles, CA | Conveyance Engineer

Monica developed a pipe routing study and investigated available properties to convey and treat brackish water for groundwater remediation near Torrance, CA. She chose a preliminary pipe route to limit required permitting and tunneling costs. Her responsibilities included high-level design and a cost estimate for the conveyance pipelines, with capacities rated up to 58 mgd associated with each project option developed to achieve the master plan's goals.

WRD and Los Angeles Department of Water and Power (LADWP), Basin Master Plan, Los Angeles, CA | Conveyance Engineer

This project involved developing a master plan for WRD and LADWP to efficiently use potable reuse water for groundwater augmentation to reduce imported water and create more independent water resources in the greater Los Angeles area by providing project options and

MONICA MORALES, PE, ENV SP (CONTINUED)

GRANT APPLICATIONS

costs. Monica's responsibilities included high level design and cost estimation for the conveyance pipelines with capacities rated up to 58 mgd associated with each of the 17 project options developed to achieve the master plan's goals.

Confidential California Client, San Fernando Valley, CA | Assistant Engineer

Monica provides technical assistance and pipeline design for the evaluation of groundwater remediation and treatment in the San Fernando Valley.

Del-Co Water Company, Olentangy Water Treatment Plant Improvements, Delaware, OH | Assistant Engineer

Monica supported this treatment plant expansion, which planned to increase capacity by 33 percent. She assisted the process mechanical technical lead for the chemical feed and water treatment processes. Specific evaluations included sodium hypochlorite feed, zinc orthophosphate feed, and sludge discharge expansions, as well as alternatives development for lime residuals dewatering and lifecycle cost analyses for the alternatives.

City of Miamisburg, Water Reclamation Facility (WRF) Improvements, Sanitary Sewer Capital Improvement Plan, Miamisburg, OH | Assistant Engineer

Monica assisted office engineering services for improvements to a 4-mgd facility and expansion of its wet weather capacity to 15 mgd. Her primary roles included submittal review to ensure conformance with contract documents; civil, structural and mechanical portions of the WRF improvements, including the new pretreatment facility; new primary clarifier pumps and mechanisms; aeration basin diffusers and blowers; RAS holding tank; and associated yard piping.

City of Sidney, Wastewater Treatment Plant Improvements, Sidney, OH | Assistant Engineer

Monica performed field engineering and inspection services, including the oversight of onsite concrete testing and pouring, as well as field coordination with the general contractor. She also performed office engineering services, providing RFI responses, reviewing submittals, and ensuring conformance with the contract documents.

JAASON ENGLESMITH

TACT MODEL

Jaason designed and created the TACT strategic financial modeling platform, which improves a utility organization's ability to manage financial complexities. The model uses systems-thinking to arrive at optimal solutions to significant multi-variant challenges by developing an affordability cash flow curve and advisor insights. Jaason is often called upon as an owner's advisor to support clients through cross-functional operational and cultural financial assessments, business case evaluations, performance-based contracting, vendor evaluation, and full implementation management. He develops advanced economic modeling tools, performs data mining and analytics, and generates meaningful results aligned with specific organizational goals and objectives. Jaason helps water utilities improve operational efficiency and effectiveness throughout the meter-to-cash (M2C) cycle, affordability cash flow curves, and risk management registers.

CREDENTIALS

FIRM
Jacobs

EXPERIENCE
20+ years

EDUCATION
Graduate Certificate, Stanford University

BS, Mathematics, Economics, Occidental College, Los Angeles

WHY JAASON?

- Developed the TACT model that produced several affordability cash flow curves for California utilities, saving project delivery costs by innovative project sequencing and reducing program delivery periods
- Experienced financial advisor to assist public utilities as they look at rate setting, cash flows, and debt service needs.
- Works collaboratively with public financial departments to gather information and data needed for TACT model inputs and provide meaningful results for cost certainty and decision making

Relevant Project Experience

City of San Mateo, Program Management for Clean Water Program, San Mateo, CA | Strategy Financial Lead

Jaason was the strategy financial lead during the City of San Mateo's program initiation to design and implement this program. The initial cost estimate for the program was over $1 billion; however, with the support of the TACT modeling platform, Jaason and his team were able to demonstrate an overall savings of $250 million using an optimization algorithm for project sequencing and program duration, while achieving recycled water goals 10 years sooner and saving customers 30% overall. He then served in a senior financial advisor role where his team was responsible for developing applications for California SR) loans an application for a Water WIFIA loan to supplement traditional bond financing. This saved the city more than $400 million in total cost. He led quarterly economic summits with WWTP owners and the financial department, financial advisors, and rate consultant.

City of Fresno, Metropolitan Water Resources Program, Fresno, CA | Strategy Lead

Jaason helped design and implement this 10-year, $1.2 billion program, using the TACT modeling platform to explore various options and related affordability. The model incorporated user input for growth rates, customer demand, bonding scenarios, interest rates, cost loaded schedules, and program-specific binary and scale-defined options. Outputs were calculated in real-time and displayed on the dashboard, based on the specific scenario definition, and include target thresholds for metrics such as liquidity (days of cash) and debt coverage ratios. An unexpected benefit of TACT was the ability to understand the funding impact when rates were repealed, and then to support development of new rate alternatives based on various program sizes and structures. Continuing to leverage the tool, the water division customizes program delivery to provide affordability under a range of rate-setting realities.

JAASON ENGLESMITH (CONTINUED)

TACT MODEL

California Department of Water Resources, Central Valley and Statewide Flood Protection Programs, Sacramento, CA | Senior Financial Advisor

Jaason helped manage approximately $50 billion in infrastructure projects for both the Central Valley and statewide flood protection programs. He used TACT to help manage complexity and understand the impact of uncontrollable variables throughout this massive, multi-decade program.

Some of the benefits included a better understanding of the funding sources, amount of investment required, prioritization of those investments, benefits realization, and tracking. The model provided fully-integrated scenario analysis during the planning and implementation phases.

North Miami Beach (NMB) Water, CIP Water and Wastewater CIP Implementation Program, North Miami Beach, FL | Senior Financial Advisor

Jaason was a senior advisor for the $250 million water and wastewater CIP implementation program. As part of this program, the TACT model was used to explore tradeoffs between schedule, rate increases, funding sources, and other city obligations. The model was also used by utility and city management to develop feasible implementation strategies for a 15-year time horizon. Jaason and his team were responsible for crafting the financial plan and resulting rate increases necessary to effectively execute the CIP.

Anchorage Water and Wastewater Utility (AWWU), Anchorage, AK | Senior Financial Advisor

Jaason worked closely with AWWU to develop a decision analysis model in support of various treatment options for liquid waste (septage) in Anchorage. Having been stymied by thousands of potential outcomes and hundreds of unknowns, the utility was frustrated by continued issues they were having with septage treatment. Jaason derived a workshop setting with the client to focus the discussion on likely-outcomes and anticipated benefits of each alternative. The results of this approach helped to agree on a viable alternative and to build a strategy to move forward successfully.

TECHNICAL SUPPORT RESOURCES

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
Dhamal Aturaliye, PE	I&C/SCADA	MS, Environmental Engineering, Drexel University, Pennsylvania BS, Environmental Engineering, Dartmouth College BS, Physics, Colby College Professional Engineer: CA, No. 7312, Expires - 06/30/22 AZ, No. 5848 WY, No.13188 TX, No. 105693	• **City of Austin Water Utility, SCADA Rotation and SCADA and Telemetry Upgrades for the Water Distribution Control System and Lift Station Telemetry System, Austin, TX.** *Deputy Project Manager.* This project included developing a preliminary engineering report to install a new standard SCADA system and a common telemetry / communication network that would provide the adequate redundancy and bandwidth for the City's future needs which includes the installation of a data mart / historical data repository at each of the city's water and wastewater treatment plants and a data warehouse at the central offices of the City of Austin Water Utility. • **San Antonio Water System, San Production and Treatment SCADA Master Plan Antonio, TX.** *Project Manager.* Project's tasks included providing alternatives for improvement for the control systems and telemetry network and developing capital improvement projects (CIP) with cost estimates for future growth. • **Brushy Creek Regional Utility Authority (BCRUA), SCADA and Telemetry System Design and Implementation for Raw Water Intake, Pumps Stations and Distribution System, Round Rock, Cedar Park, and Leander, TX.** *Design Engineer.* Responsibilities included controlling and monitoring a primary flow meter and a bank of barge pumps, performing the radio path analysis and supervising the field testing of this radio network.
David Austin, PE	Reservoir Modeling	MS, Civil and Environmental Engineering, University of California, Davis MS, Water Resources Management, University of Wisconsin BA, Mathematics, University of Minnesota Professional Engineer: MN, No. 45274, Expires - 06/30/2020 Senior Ecologist, Ecological Society	• **St. Paul Regional Water Services, St. Paul, MN.** *Task Lead.* Replacement of two hypolimnetic aeration (HA) systems with ferric chloride augmentation were replaced. Detailed analysis of sediment oxygen demand, hypolimnion redox dynamics, and internal nutrient dynamics provided a design basis for hypolimnetic oxygenation (pure oxygen) system that were installed in both lakes. • **Anne Arundel County, Rock Creek Destratification Study, MD.** *Task Lead.* Designed a study that established baseline conditions, turned off destratification aeration, monitored the estuary during the time destratification was turned off, turn on destratification again and monitored recovery.

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
		of America Certified Ecological Designer, American Ecological Society	• **Riley Purgatory Bluff Creek Watershed Management District, Lake Rehabilitation Projects, Minneapolis, MN.** *Engineering and Ecological Task Lead.* Restoration of water clarity in lakes is a central District goal. Methods in development include in-lake engineering controls to limit internal phosphorus loading, reduction of external phosphorus loading via pond BMPs and low impact development criteria, biomanipulation of trophic status, aquatic invasive weed management, and carp management.
Jim Bays, MS, PWS	Natural Habitats	MS, Environmental Engineering Sciences, University of Florida BS, Environmental Biology, Ohio University Professional Wetland Scientist, No. 1011 Senior Ecologist, Ecological Society of America, 1993 Ecological Design, American Ecological Engineering Society, 2010	• **US Bureau of Reclamation, Wetlands Treatment and Restoration, City of Goodyear, AZ.** *Senior Consultant.* Worked with the US Bureau of Reclamation in the design and analysis of experiments and permitting for the use of reverse-osmosis membrane concentrate as a primary water source for the restoration of inland river marshes in central Arizona. Developed pilot system research plan and guided monthly water and salt balance for project feasibility assessment. • **Pacificorp, Water Quality Treatment by Wetlands in the Upper Klamath Basin, Pacificorp, Portland, OR.** *Senior Technical Consultant.* Provided technical direction, P-k-C* model guidance, technical review and presentation assistance as part of a detailed constructed treatment wetland evaluation for the improvement of total suspended solids, organic matter, nutrients and local water temperature improvements in the Klamath River. Led a technical advisory committee for site selection and technology demonstration. • **Tarrant Regional Water District, Phase II Value Engineering Study, Fort Worth, TX.** *Senior Technical Consultant.* Participated in the technical review and value assessment of a 1,600-acre wetland design for treating water from the Trinity River to supplement flow to the Richland-Chambers Reservoir, a public water supply for the Dallas-Fort Worth Metroplex. Contributed to the performance analysis and P-k-C* calibration of multi-platform wetland mesocosm data sets.
Kristian Benson, PMP	Hard-bid Cost Estimator	MS, Civil Engineering, University of California, Berkeley BS, Geology, Colorado College	• **CSRWA Regional Surface Water Supply, Stanislaus County, CA.** *Chief Estimator.* New water treatment facility using a Lump Sum Design-Build delivery model. Responsible for multiple teams estimating the engineering, construction, and commissioning work in parallel,

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
		PMP, Project Management Institute ICC Licensed General Contractor "A", Multiple Jurisdictions	reconciliation of those estimates, and preparation of final bid forms. • **San Francisco Public Utilities Commission (SFPUC), Biosolids Project, San Francisco, CA.** *Engineering Manager.* Responsible for overseeing design development and ensuring that the design was buildable and buyable in a challenging contracting and labor market. • **City of Goodyear, Goodyear Water Treatment Plant, Goodyear, AZ.** *Chief Estimator.* New water treatment facility delivered using a Progressive Design-Build delivery model. Responsible for multiple teams estimating the engineering, construction, instrumentation and controls, and commissioning work in parallel, and reconciliation of those estimates at each project design milestone through the progressive design build process.
Christopher Bessa, PMP, CCM	Construction Management	BS, Construction Management, California State University, Sacramento Certified Construction Manager (CCM), Construction Management Association of America. #A0799 Project Management Professional (PMP), Project Management Institute. #2098340	• **Recharge Fresno, Fresno, CA.** *Program Construction Manager.* Responsible for the overall delivery of construction management and quality assurance services for the program. Other responsibilities included construction contract management; change management; document controls including coordination of RFIs and submittals; progress payment review and approval; schedule review and analysis; shutdown coordination; monthly reporting; performing daily quality assurance field inspection to ensure contract compliance; special inspections, including pipe fabrication inspections; materials testing, including concrete, soils, and asphalt testing; overall project and program reporting; overseeing labor compliance activities. • **Water System Improvement Program, San Antonio Pump Station Upgrades Project, San Francisco Public Utilities Commission (SFPUC), CA.** *Construction Manager.* Responsibilities included the oversight management of Jacobs third-party construction management services (contract administration, field inspection, change management, and startup testing) • **Lopez Water Treatment Plant, San Luis Obispo, CA.** *Construction Manager.* Responsibilities included overseeing all daily field operations for the construction management staff, reviewing and negotiating contract change orders; critical path method (CPM) schedule review;

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
			overseeing field inspection, resident engineer, and office engineering staff; leading weekly construction meetings; preparation of monthly progress reports and executive summary reports used for reporting to the Board of Directors; and leading the preparation and execution of the Plant Startup and Commissioning Plan.
Howard Brewen	Operations	BS, Animal Science, University of California, Davis State of California, Wastewater Treatment Operator, Grade V State of California, Wastewater Collection Systems Operator, Grade II California Environmental Water Association (CWEA) CWEA Annual Conference 2016-18 Educational Program Team Water Environment Federation (WEF)	• **City of San Luis Obispo, Water Resource Recovery Facility, San Luis Obispo, CA.** *Superintendent.* Responsible for the daily operations and maintenance of the Water Resource Recovery Facility, including the administration of all wastewater treatment, reclamation and effluent disposal activities; • **Pacific Gas and Electric (PG&E), Water Resources Recovery Facility (WRRF), Energy Efficiency Project, CA.** *Principal Lead.* This project included design and replacement of equipment that was noncompliant or non-efficient from an energy or regulation perspective. The overall goal of the program was the integration of process technology, energy usage and instrumentation system optimization that would reduce overall energy usage at the facility. • **WRRF Upgrade Project.** *Core Management Team Member.* Responsible for the decision-making process for all aspects of the project. This project included the integration of new standard operations procedures, operation optimization, new treatment equipment and the collection of data to be able to predict trends, which would allow the facility to be proactive not reactive from an operational perspective.
Kevin Butcher	Cost Estimating		• See Resume
Julia Carroll, AIA, NCARB, BMP	Architecture	B of Architecture, University of California, Berkeley Licensed Architect: CA, No. C23829 WA, No. 13133 AZ, No. 70229 LA, No. 9186	• **Inland Empire Utilities Agency, Water Quality Laboratory, Chino, CA.** *Manager of Engineering and Design.* The permitting and construction administration of LEED Gold Water Quality Laboratory and Central Plant. The 17,000 sf Facility was awarded the Water/Wastewater Treatment Project of the Year from the American Society of Civil Engineers Los Angeles. The project showcased eco-friendly materials, state of the art water efficient laboratories, educational touring stations for school tours, and creative office design.

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
		AIA, No. 8751372 NCARB, No. 95246 HAACP Certified BMP	• **Los Angeles Department of Water and Power, Scattergood Repowering Project Control Center, El Segundo, CA.** *Project Architect.* The design, permitting and construction administration of design build LEED Silver Control Center for the Scattergood Repowering Project. The control center consisted of a four story 12,000 sf structure including complete battery backup facility and 100% redundancy on all support infrastructure. The building included structural enhancement and complete lockdown security enhancements for continuous emergency functionality. • **Orange County Sanitation District, OSHA & ADA Retrofit, Fountain Valley, CA.** *Project Architect.* The design, permitting and construction administration of OSHA Safety and ADA upgrades throughout the facility with responsibility for a multi-disciplinary team including geotech, civil, structural, MEP and architecture. Additional code upgrades included upgraded maintenance bays, structural retrofit due to water damage, fall protection, re-sloping of roof, transition to electric vehicles, storm drain retrofit, and parking lot re-sloping.
Quentin Clark, PE	Constructability (Conveyance)	MS, Soil and Water Science, University of Florida BS, Civil Engineering, University of Illinois Urbana-Champaign Professional Engineer: IL, No. 062056207, Expires – 11/30/21	• **Department of Water Management, CIP Delivery Program, Chicago, IL.** *Construction Manager.* Provided direct oversight for staff and Owner's representation for special projects such as those located in the Loop or in coordination with major infrastructure projects such as Wrigley Field renovations, CDOT, IDOT and CTA. • **City of Wilmington, Water Treatment Plant Upgrade and Intake Modifications, Wilmington, IL**. *Construction Project Manager.* Contractor-side project management of schedule and budget for $0.7M construction improvements 1 MGD surface water treatment plant. Developed and managed schedule, coordinated with jobsite superintendent, negotiated sub-contracts, managed payment applications, conducted EOC meetings. • **Green Bay Water Utility, 54-inch Steel Transmission Main, Green Bay, WI.** *Construction Manager.* Construction manager for the $35M construction of 76,500 feet of 54 inch steel pipe transmission main. Documented construction and produced daily, weekly and monthly progress reports for the Owner. Administered all aspects of construction

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
			including payment recommendations and certifications, submittal review, change orders, punch lists and drawings of record. Worked closely with the Contractor, the Owner, and associated regulatory agencies. Supervised three field inspectors on multiple construction crews. Specific aspects of construction included 76,500 feet 54 inch steel pipe installation, four 54 inch and 42 inch remotely operated motorized valves, seventeen 54 inch and 42 inch butterfly valves, sixteen 12 inch drain valves, sixty five air release valves, two 42 inch connections, corrosion monitoring (CP) systems, booster pump station interconnections, transience surge protection, installation of 360 feet of 66 inch and 72 inch casing pipe, wetland crossings, one river crossing, and associated paving and restoration.
Mike DiNapoli, PE	Constructability (Facilities)	MS, Civil Engineering, Missouri University of Science and Technology BS, Civil Engineering, Missouri University of Science and Technology Professional Engineer: CA, No. C50105, Expires - 6/30/21 AZ, No. 49525, Expires - 6/30/21 MO, No. E-020032, Expires - 12/31/2020 GA, No. 27142, Expires - 12/31/2020	• **City of San Mateo, San Mateo Clean Water Program, San Mateo, CA.** *Construction Manager.* Responsibilities included managing several conventional design-bid-build contracts, a construction management at risk contract, participating in a value engineering effort on the 60% design that resulted in a cost savings of more than $20 million; assisting with negotiation of the CMAR prime agreement terms and conditions and performing constructability reviews on several contracts. • **Visalia Water Conservation, Plant Upgrade, Visalia, CA.** *Project Director.* Responsibilities included leading a constructability review effort incorporating review comments into the final bid package; overseeing overall quality control and helping ensure success with contract administration, change orders, schedule and cost control, quality assurance, inspection, testing, document control, processing pay request, certified payroll compliance, system start-up, and closeout. • **Pima County Regional Wastewater Reclamation Department, Ina Road (Tres Rios) Water Reclamation Facility, Pima County, AZ.** *Project Manager.* Responsibilities included managing both a design engineering contract and a construction management-at-risk contract on behalf of the client; assisting with a value engineering study at the 30% design that reduced the project cost by more than $60 million.

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
Matt Elsner, PE	Alignment Analysis	MS, Civil Engineering, Drexel University, Pennsylvania MS, Environmental Engineering, Drexel University, Pennsylvania BS, Civil Engineering, Drexel University, Pennsylvania Professional Engineer: CA, No. 73432, Expires - 12/31/2020 AZ, No. 57683	• **Santa Clarita Valley Water Agency (SCVWA), South End (Phase 2C) Recycled Water Main Extension, Santa Clarita, CA**. *Senior Technical Manager.* Responsible for the data collection, utility research, hydraulic evaluation, corrosion evaluation, final design, and construction cost estimating • **Santa Clarita Valley Water Agency (SCVWA), West Ranch (Phase 2D) Recycled Water Main Extension, Santa Clarita, CA.** *Senior Technical Manager.* Responsible for the final design and engineering services during construction. **City of Paso Robles, Paso Robles Recycled Water Distribution System, Paso Robles, CA.** *Senior Technical Manager.* Responsible for data collection, utility research, alignment evaluation, construction cost estimating, and storage evaluation.
April Gorden	CAD/BIM	BA, Geography, California State University at Fullerton	• **Elsinore Valley Municipal Water District (EVMWD), Horsethief Canyon Water Reclamation Facility (HTCWRF) Upgrades and Expansion, Corona, CA.** *Project Automation Lead/Designer/Drafter.* Configured ProjectWise to use both Bentley Microstation 3D process piping and the rest of the project utilizing Autodesk's AutoCAD per the client's preferred software. Designed and drafted pond and site grading, as well as complex yard piping with minimal existing utility information provided. Prepared all grading, site and yard piping horizontal and vertical control. Oversaw markups when delegating work and assembling final document for production to meet client milestones. • **Eastern Municipal Water District (EMWD), Temecula Valley Regional Water Reclamation Facility Upgrade, Temecula, CA.** *Project Automation Lead/Designer/Drafter.* Set up ProjectWise for the Water Reclamation Facility Upgrade (23 MGD expansion). Created seeds, title block tags, etc with client border. Drafted general, electrical, and I&C drawings. Created civil/utility cut sheets. Assembled client deliverables throughout the life of the project and worked with engineers to address RFI's and change orders. Oversaw and delegated drawing markups as well as drawing production to meet schedule. Facilitated external production of civil and yard piping by subconsultant.

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
			• **Department of Public Works, Phase II, 6 MGD Expansion Four Mile Creek WQRF, Wichita, KS**. *Project Automation Lead/Designer/Drafter.* Assisted in all civil portions of the package. This included the placement of 3D models to create a master site plan, as well as prepare background masters to be used by other disciplines. Required preparing horizontal and vertical alignments of the road, as well as compiling control tables for the site plan and grading.
David Haug, PE	Permitting/Easements	MS, Civil Engineering, University of California, Davis BS, Civil Engineering, Loyola Marymount University Professional Engineer, CA No. 5199, Expires – 9/30/2021 Board Certified Environmental Engineer	• **City of Anaheim, Knollwood Circle Sewer Improvements Project, Anaheim, CA.** *Project Manager.* Included the design of a new sewer to divert flows which caused the existing system to exceed the available capacity. • **Santa Clarita Valley Water Agency, Clearwell CT Improvements, Santa Clarita, CA.** *Construction Manager.* Managed the construction of the 2.2 million- gallon chlorine contact basin at the Earl Schmidt Filtration Plant (ESFP) and acted as the owner's representative for the project. • **Sanitation Districts of Los Angeles County, Trunk Sewer Replacement, Los Angeles, CA.** *Construction Manager.* Managed two replacement trunk sewer projects totaling 2.5 miles of pipeline along the Los Angeles River.
Bob Hayden, PE	Chartering	MS, Civil Engineering, University of Arkansas BS, Civil Engineering, University of Arkansas Professional Engineer: TX, No. 48367 AK, No. 12864	• **Tyndall AFB, Tyndall Air Force Reconstruction Program, Panama City, FL.** *Program Consultant.* Program management services supporting the reconstruction of Tyndall AFB following damage from tropical storm. Provided program planning for risk management, logistical and delivery planning. • **Delta Conveyance, Sacramento, CA**. *Program Consultant.* Program and design management services supporting delivery of a $15 billion program to provide reliable, clean water to 27 state water utility contractors. Supported program with plan development and review and facilitation of partnering between four state agencies, water contractors, program and design consultants. • **MODON, Riyadh, Saudi Arabia.** *Program Consultant.* $135-billion program to develop infrastructure for 35 industrial cities across the Kingdom of Saudi Arabia. Led maturity review with integrated program

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
			management team which identified global best practices implementation plans. Led first ever program team chartering process meetings culminating in senior management and program team endorsement of detailed program understanding and delivery path forward.
Amanda Heise, PE	Steady State Strategy	BS, Civil Engineering, California State Polytechnic University Pomona Professional Engineer: CA, No. 84165, Expires - 09/30/21	• **Industrial Stormwater General Permit Compliance; U.S. Borax Wilmington.** *Lead Water Resource Engineer.* Currently providing mitigation recommendations for compliance with the Industrial General Permit (2014-0057-DWQ), including hydrology mapping, evaluation of existing water quality data, and conceptual layouts for alternatives to address high zinc and borax levels. • **Los Angeles County Metropolitan Transportation Authority, West Santa Ana Branch Transit Corridor Environmental Study, Santa Ana, CA.** *Water Resources Primary Author.* The study includes assessment of the existing federal, state, and local regulatory settings and impacts to existing hydrology, water quality, floodplains, and groundwater. • **City of Los Angeles Bureau of Sanitation, One Water LA Climate Change Vulnerability Study, Los Angeles, CA.** *Project Engineer.* Project engineer for the climate change vulnerability assessment of the city's wastewater and stormwater pump stations and water reclamation plants.
Tyler Huehmer	Performance Portal	Advanced Diploma Centre of Geographic Sciences (COGS), Remote Sensing/Geographic Information Systems, Lawrence Town, Nova Scotia BS, Natural Resource Management, University of Guelph, Ontario	• **City of San Mateo, San Mateo Clean Water Program, San Mateo, CA.** *Developer/Architect.* Responsible for but not limited to the database design, implementation, integration, and UI development. • **Miami OOL, Miami-Dade Water and Sewer, Miami, FL.** *Developer/Architect.* Responsible for but not limited to the database design, implementation, integration, and UI development. • **City of Houston, Houston Northeast Water Purification Plant Expansion, Houston, TX.** *Developer/Architect.* Responsible for but not limited to the database design, implementation, integration, and UI development.
Jagit Kaur, PhD	Flow Equalization	PhD, Civil Engineering, University at Buffalo, New York MS, Principles of Renewable Energy	• **HSPF Application to Banklick Creek, KY.** *Project Engineer.* Contributed to the development of an application of the HSPF model to evaluate the wet weather impacts on water quality of the system, conducted hydraulic calibration and provided assistance for water quality modeling.

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
		Use, Carl von Ossietzky, University of Oldenburg, Oldenburg, Germany MS, Physics, Punjab Agricultural University, Punjab, India BS, Mathematics, Punjab University, Chandigarh, India	• **HSPF Application, Black River, OH.** *Project Engineer.* Contributed to the development of the model and conducted hydraulic calibration to evaluate flow regimes in the Black River. The overall goal of the project was to evaluate the impact of water withdrawals on hydrology and water quality of the system. • **Confidential Client, HSPF Application to a Western Watershed, Semiarid western U.S.** *Project Engineer.* Assisted in the development of the model application for a watershed and conducted hydraulic calibration of the model. Also assisted with the water quality assessments of the system. The parameters simulated included flow, sediment, dissolved oxygen, phytoplankton, and benthic algae.
Chris van Lienden, PE	Hydraulic Modeling	MS, Civil & Environmental Engineering, University of California, Davis BS, Chemical Engineering, University of California, Berkeley Professional Engineer: CA, No. 75034, Expires - 12/31/21	• **Town of Windsor, Water Master Plan Update, Windsor, CA.** *Deputy Project Manager.* Updated the town's water master plan to reflect significant changes in the location and timing of future growth, and the available of additional water supplies. • **City of Anaheim, Water System Hydraulic Model Update, Anaheim, CA.** *QA/QC Lead.* The previous model, with more than 31,000 links and 19 pressure zones, served as the basis to update the model using the latest InfoWater modeling software. The model was updated to reflect significant changes in the GIS database, and to incorporate up-to-date well and valve structure data. • **Water Replenishment District of Southern California (WRD), Hydraulic Analysis, Operational Efficiencies, and Optimization Alternative Studies. Los Angeles, CA.** *Modeling Lead.* The analysis of WRD's Alamitos Barrier Pipeline system using five models developed for the project: a hydraulic model, a surge model, and a supply and demand water balance model of the barrier system, an updated hydraulic model of the connected LBWD recycled water system, and a model of the City of Cerritos recycled water system.
Mia Lindsey, PE	Risk Management	BS, Civil Engineering, University of California, Berkeley Master of Engineering, Civil and Environmental Engineering,	• **Bay Area Water and Wastewater Team, San Francisco, CA.** *Senior Project Manager and Group Leader.* Mia is responsible for day to day management of 25 assigned staff across the Bay Area, holding staff accountable for delivery, managing performance, and providing staff opportunities to grow

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
		Massachusetts Institute of Technology Professional Engineer: CA, No. 69602, Expires - 06/30/2020 Certified Project Management Professional, Project Management Institute	and develop. In addition to this role, Mia currently serves as a senior project manager in support of the San Mateo Clean Water Program, the San Jose Headworks Design-Build Project, and other projects. • **Environmental Consulting Team Lead Singapore.** *Deputy PMO Lead and Senior Project Manager, Project Technical Lead (Design Management).* Responsibilities included forming and leading diverse global and regional multidisciplinary teams to achieve project and business goals; conducting proactive monthly project reviews with each project manager covering scope, schedule, financial, risk, and quality management; providing training, guidance, and coaching to project managers; turning around underperforming projects; and achieving DSO reduction.
Susan Moisio, PE	Smart Systems		• See resume
Michael Molinari, PE	Electrical	BS, Electrical and Electronics Engineering, California Polytechnic University Pomona Professional Engineer: CA, No. 16550, Expires - 12/31/21 AZ, No. 36780, Expires - 09/30/22 NV, No. 05380, Expires - 12/31/21 OR, NO. 61282PE, Expires - 12/31/2020 TX, No. 89103, Expires - 09/30/2020 WA, No. 37305, Expires - 03/15/21	• **Eastern Municipal Water District, 23MGD Wastewater Treatment Plant Upgrade, Perris, CA.** *Senior Electrical Engineer.* Responsibilities included overseeing engineering and coordination with contractors to provide new electrical design for additional boilers systems while integrating controls and SCADA into existing plan operating and monitoring systems. • **City of Corpus Christi, OSO Wastewater Treatment Plant Upgrade, Corpus Christi, TX.** *Senior Electrical Engineer.* Responsibilities included overseeing engineering and coordination with multiple firms and contractors to design and build new water treatment facilities including new influent pump station, bio-reactive filter, upgrade transfer station, transfer two diesel generators and install into existing backup system, cable tray and underground systems, upgrade lighting and new receiving and screening facilities. • **Irvine Ranch Water District, Michelson Water Reclamation Plant, Phase II Improvements, Irvine, CA.** *Senior Electrical Engineer/Electrical Project Manager.* Responsibilities included overseeing engineering and coordination with multiple firms and contractors to design and build RO electrical distribution and treatment buildings. Provide distribution, control, and lighting design with Title 24 calculations for the State of California. Control budget to plan and authorize billing.

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
Monica Morales, PE	Flow Equalization Capacity Review		• See resume
Daniel Morse, PhD	Surge Analysis	PhD, Mechanical Engineering, Oregon State University MS, Mechanical Engineering, Oregon State University BS, Mechanical Engineering, Oregon State University BAS, George Fox University, Newberg, OR	• **Water Corporation, Beenyup Advanced Water Recycling Plant, Perth, Australia.** *Lead CFD Modeler/ Hydraulic Profile Modeler.* Provided ongoing analysis of the finished water pump station (FWPS) and supported design of the FWPS with CFD analysis of the entire structure. Provided CFD analysis for design of the reject return line (RRL). The CFD analysis was used to improve hydraulic conditions for the pumps, provide critical comparison for out of spec performing components, and anticipate multiphase (air/water) phenomena in the RRL. • **King County Water Treatment Division, Georgetown Wet Water Treatment Station (WWTS), Seattle WA.** *CFD Analyst.* Provided CFD analysis of the influent drop structure, basin, and pump station of the Georgetown WWTS. Included a CFD analysis of critical hydraulic characteristics related to pump performance including swirl angle, and intake velocity distribution. Analysis and hydraulic evaluation used to develop improved design for the influent drop structure to reduce potential issues related to aeration and hydraulic scour. • **Watercare, Mangere Wastewater Treatment Plant (WWTP) BNR Upgrade, Influent Pump Station 2, Auckland, NZ.** *Lead CFD Modeler.* Provided analysis of the Influent Pump Station 2 (IPS2) for the Mangere WWTP BNR upgrade project. CFD analysis was used to evaluate several different configurations of pumps and inlet geometry arrangements. Potential pump performance issues were identified and linked to specific design components such as baffle walls, inlet distribution wall, and opening sizing.
Tyler Nading	Source Control	BS, Civil Engineering, Washington University in St. Louis Engineer-in-Training: MO	• **Eastern New Mexico Rural Water Authority, Rural Water System Conveyance and Distribution Systems, NM**. *Project Engineer.* Responsibilities included the development of a Replica hydraulic model of both the conveyance and distribution pipelines. • **Aurora Water, Aurora Reservoir Water Purification Facility, Aurora, CO.** *Project Engineer.* Responsibilities included the coordination of the completion of record drawings for the water purification facilities.

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
			• **Colorado Springs Utilities, Southern Delivery System Juniper Pump Station, Colorado Springs, CO.** *Facility Lead.* Responsibilities included leading the design of the potassium permanganate storage and feed chemical building and developed a Replica hydraulic model of the Southern Delivery System Raw Water Conveyance System.
Gino Nguyen, PE	Civil	MBA, Information Systems, California State Polytechnic University, Pomona, California BS, Civil Engineering, California State Polytechnic University, Pomona, California Qualified SWPPP Developer/Practitioner (QSD/QSP) Caltrans SWPPP Developer Certification Professional Engineer: CA, No. 62140, Expires - 09/30/21 NV, No. 020082, Expires – 12/31/2021	• **Port of Long Beach, Interim Fireboat Station #20, Long Beach, CA.** *Task Lead Senior Civil Reviewer.* Responsible for reviewing site civil design of the interim fireboat station for grading and drainage with respect to local standards and design criteria and providing QC oversight of design calculations and methodology. • **US Navy, Naval Air Station North Island, P-704 Berth Lima Civil Eesign Upgrades. San Diego, CA.** *Task Lead/ Engineer of Record.* Responsible for the civil designs upgrades for Berth Lima to accommodate Nimitz class aircraft carriers and support vessels. Approximately 1,600 feet of wharf was repaved, and utilities were added and rerouted. A high security perimeter fence was designed and built, as wells as watch towers and a new security building. • **Southern California Edison, Stormwater Pollution Prevention Plan (SWPPP) On-Call, Rosemead, CA.** *Project Manager.* Managed active linear and traditional SWPPP projects with durations of several weeks to several years. Initiated SWPPP permitting and prepared documents; coordinated inspections, monitored projects for amendments, interacted with SWRCB on technical SWPPP issues, terminated SWPPP permits at the end of the project, and prepared annual reports
Tom Paige, PE	Structural	MS, Civil Engineering (Structures), University of Wisconsin-Madison BS, Civil Engineering, University of Wisconsin-Madison Professional Engineer: CA, No. 65724, Expires - 09/30/21 NM, No. 17930	• **Irvine Ranch Water District, Cienega Filtration Project, Irvine, CA.** *Lead Structural Engineer.* As part of the goal to address future selenium total maximum daily loads, this project was designed to remove nitrogen and selenium using a microbial reduction process via an underground gravel matrix cell. Structures included an oxygenation system facility, intake wet well, matrix cell, and process building. • **Lake Arrowhead Community Services District, Lake Arrowhead-Recycled Water System, Lake Arrowhead, CA.** *Lead Structural Engineer.* Wastewater structures, including circular clarifiers and trickling filters,

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
		AZ, No. 38336 WI, No. 25132 TX, No. 101432	retaining walls, rectangular tanks, filter structures, and masonry and pre-engineered metal buildings. • **Eastern Municipal Water District (EMWD), Perris Desalination Facility, Perris, CA.** *Lead Structural Engineer.* Project included several facilities, including feedwater flow control facility, reverse osmosis building, bulk chemical storage and pumping area, brine pump station, chlorine contact tank and administration building.
Tommy Salas	Scheduling/Cost Control	BAS, Western New Mexico University AA, Western New Mexico University US Army	• **City of San Mateo, San Mateo Clean Water Program, San Mateo, CA.** *Senior Project Controls Analyst / Interim Program Controls Manager.* Responsibilities included managing and developing an accelerated schedule for seven projects, developing and preparing the scope of work for bid proposals; building and managing the construction schedule, overseeing and managing the budget, change orders, generating reports commodity curves, training client staff. • **Multiple projects for bid proposals and self-perform projects**. *Project Controls / Scheduler.* Responsibilities included building new schedules for bid proposals, reviewing IFB drawings and other relevant documents to assure all detailed information was captured in the schedule for the bid proposal, updating current project schedules and quantifying installed quantities into the schedule for capturing progress. • **Citrus Solar Farm.** *Project Controls.* Responsibilities included earned value management for installed quantities, updating the construction tracker to measure progress and performance, managing the financial forecast to include manpower, equipment and construction indirect costs, change management, schedule updates, daily and weekly reports to the client, production factor reports based on earned value and populating the commodity curves on a weekly basis.
Daniel Speicher	Chartering	MBA, Organizational Development and Strategic Planning, School of Management, Yale University BS, Biology, Pennsylvania State University BS, Environmental Resource	• **DC Water, Washington, DC.** *Governance, Team and Organizational Development Lead.* Led team development, including defining team roles, responsibilities and facilitation of the lead governance team as the organization shifted its focus to improved project and program delivery. Assisted the DC Water project delivery organization to implement a plan to reach its goals of aligning project delivery and creating a learning culture.

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
		Management, Pennsylvania State University	• **St. Luke's Health System, Boise, ID.** *Program Development Lead.* Led and facilitated the senior management team through the creation of the client's program approach, including the development of investment decision and management processes. • **Cincinnati Metropolitan Sewer District Philadelphia Airport, Seattle Public Utilities, Devon Energy Corporation, Calgary, Canada.** *Chartering and Integration Facilitator.* Assisted these clients and more with facilitating workshops to bring together teams to set direction, integrate efforts, codify procedures, and reach high performance.
Ping Tian, PhD, PE, GE	Geotechnical	PhD, Geotechnical Engineering, University of Oklahoma MS, Coastal and Ocean Engineering, Hohai University, Nanjing, China BS, Engineering Mechanics, Hohai University, Nanjing, China Professional Civil Engineer: CA, No. C59873, Expires - 2021 Registered Geotechnical Engineer: CA No. 2660, Expires - 2021	• **San Luis Obispo Water Resource Recovery Facility, San Luis Obispo, CA.** *Geotechnical Task Lead.* Responsible for geotechnical field investigation, laboratory testing, building foundation design, pond liner and on-site pavement design. Subsurface soil conditions at the site consist of shallow groundwater, expansive fat clay, and moderately compressible soils. • **MCAGCC 29 Palms Potable Water Treatment and Blending Facility, Twentynine Palms, CA.** *Geotechnical Task Lead.* Responsible for geotechnical field investigation, laboratory testing, foundation design, and site grading improvements. Subsurface soil conditions at the project site consist of native dense sandy deposits, deep groundwater, and complicated mixing conditions of subgrade support. • **San Diego North City Water Reclamation Plant Expansion, San Diego, CA.** *Geotechnical Task Lead.* Responsible for geotechnical field investigation, laboratory testing, foundation design, and site grading improvements. Subsurface soil conditions at the project site consist of existing fills, shallow bedrocks, and complicated mixing conditions of subgrade support.
Das Topash, PhD	Resources	PhD., Hydrology, University of Stuttgart, Germany MS, Water Resources Development & Management, Indian Institute of Technology, India BS, Agricultural Engineering, Bidhan Chandra Agricultural	• **California Department of Water Resources, Central Valley Flood Protection Plan, Central Valley, CA.** *Technologist.* Supporting multiple projects to incorporate projected climate change in Basin Wide Feasibility Studies and CVFPP 2017 Plan Update. Developed unregulated flow frequency scaling factors for various climate change scenarios for using in risk analysis; Supported a pilot study to improve understanding of climate change risks to existing reservoir flood control

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
		University, India	operations and evaluate potential strategies for adapting to future change and develop reports documenting climate change results. • **California Water Commission, California's Water Storage Investment Program, Development of Climate Change and Hydrological Data Sets, CA.** *Technologist.* Developed data sets of projected precipitation, temperature, and runoff throughout the State of California for the two future reference points based on the most current methods consistent with the Climate Change Technical Advisory Group, which included global climate model simulations, spatially downscaled using the localized constructed analog method, quantile mapping to develop the future hydrology sequence and rainfall-runoff modeling using the Variable Infiltration Capacity model. • **U.S. Army Corps of Engineers, Water Supply Reliability Scenarios Water Feasibility Study, Tulsa District, OK.** *Technologist.* Developed and applied the climate change methodology for the climate-based water supply reliability assessment; utilized about one hundred CMIP5 climate model projections driven VIC hydrological model simulations to derive the future climate scenarios; produced simulations of water allocation in the Beaver Creek and Cache Creek stream systems under baseline and climate change scenarios.
Jeff Townsend, FASLA, RLA, FAIA, LEED AP	Landscape Architecture	BS, Landscape Architecture, Purdue University Landscape Architect, CA, No. 702 Landscape Architect, IN, No. 21400021 Landscape Architect, TX, No.1446 Society of Landscape Architects (ASLA), Fellow & Former Natl Vice President ASLA Sierra Chapter, Former	• **Reasons Farm Environmental Preserve, Roseville, CA**. *Project Director and Senior Land Planner.* This 1,700-acre environmental preserve includes income generating equestrian and camping facilities, a fishing pond, nature center, historical interpretation and environmental preservation. The park also provides wetlands and riparian habitat for native bird species with bird watching blinds for public use. The facility also provides stormwater retention for the surrounding community. • **Historic Elk Grove Boulevard Master Plan & Improvements, Elk Grove, CA.** *Project Director, Facilitator, Urban Designer.* This urban design master plan and subsequent improvement plans revitalizes the original main street in Old Town Elk Grove. The plan preserves historic buildings while redefining roadways and walkways in Old Town to make them more pedestrian friendly. The design guidelines provide architectural standards for materials, signage, parking and façade designs that ensure

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
		Trustee & President Urban Land Institute (ULI) Sacramento District Executive Committee Congress for New Urbanism (CNU) California Parks & Recreation Society	the historic character of the town will be preserved forever. The plan established a lighting and landscape district that creates a walkable historic district through enhanced paving, plazas, traffic calming portals, trees and street furnishings. • **San Joaquin County Facilities Master Plan, Stockton, CA.** *Project Manager Senior Planner.* Prepared a comprehensive facilities master plan update that expands county facilities on four sites. Improvements include a medical outpatient care clinic, public works offices, customer service centers, permitting center and corporation yard improvements. The plan includes programming and conceptual design services for 80,000 square feet of facilities
Samantha Wadsworth	Document Control	Lake County High School, Leadville	• **City of San Mateo, San Mateo Clean Water Program, San Mateo, CA.** *Document Control Lead.* Successfully implemented and trained team members on document management system (highly customized SharePoint-based portal); oversaw migration from existing portal to a newly created portal in the client's environment. Consolidate data to create program monthly reports, managed user accounts, updated metadata. • **Utility Privatization Program.** *Document Control Lead.* Created and managed work flows in SharePoint. Processed submittals and RFIs for multiple projects, liaising with suppliers and subcontractors to ensure deadlines are met. • **Cottonwood Water and Sanitation District, JWPP Renovation Project.** *Document Control Lead.* Responsibilities included processing submittals and RFIs in ProjectWise Construction Management, liaising with suppliers and subcontractors to ensure deadlines are met, manage submittals ensure all documents are reviewed and returned in a timely manner. Ran weekly and monthly reports.
Qingshan Wang, PE	Mechanical	MS, Mechanical Engineering, New Jersey Institute of Technology BS, Mechanical Engineering, Tianjin University of Science and Technology, China	• **City of Redding, Clear Creek Wastewater Treatment Plant Rehabilitation and Expansion, Package 6, Secondary Treatment, Disinfection and Other Improvements, Redding, CA.** *Lead Mechanical Engineer.* Responsibilities include high speed blower system design, blower and aeration piping system design, process equipment selection,

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
		Professional Engineer, CA, No. M32378, Expires - 06/30/21	system calculations and equipment specifications, construction support, and plant startup assistance. • **Lake Arrowhead Community Service District, Grass Valley Wastewater Treatment Plant Expansion, Phase I Design and SDC, Lake Arrowhead, CA.** *Design Manager and Lead Mechanical Engineer.* Included one 45-foot-diameter primary clarifier, one 42-foot-diameter secondary clarifier, one 42-foot-diameter trickling filter, denitrification filter expansion, 2-meter belt filter press system, a maximum of 3.6-mgd MF/UF membrane filtration and UV disinfection facility, and a recycled water pump station. • **King Abdullah University of Science and Technology (KAUST), Preliminary Design of Concentrated Photovoltaic (CPV) and SEA Water Reverse Osmosis (SWRO) System, Saudi Arabia.** *Design Manager.* Design including system sizing, equipment selection, P&ID development, cost estimate, project design management for the CPV system which is approximately 2 MW and SWRO Plant is about 1 mgd.
Ling Wang-Staley, PhD, PE	Water Quality/ Treatment	PhD, Environmental Engineering, University of California, Irvine MS, Environmental Engineering, University of Idaho BS, Environmental Engineering, Shenyang University of Technology Professional Engineer: CA, No. 86114, Expires - 09/30/2020	• **Pacific Gas & Electric Company, Complex Remediation Projects Bay Area, CA.** *Project Engineer.* Responsibilities included scheduling, coordination, and planning of project, prepared and reviewed proposals, work plan, and technical reports for clients, state agencies and other stakeholders; provided guidance and supervision to the subcontractors, and managed subcontractors' daily field activities, including O&M goals, monitoring and sampling frequency and protocols, review and approve lab analyses and analytical methods. • **Royal Adhesives & Sealants, Remediation Project, Contaminated Superfund Site, SC.** *Task Engineer.* Evaluation of four types of advanced oxidation processes for contaminant degradation and designed and tested bench-scale treatments. Identified suitable treatment technologies and detailed pilot-scale design criteria to enhance the site remediation process. • **Orange County Water District, Orange County, CA.** *Research Engineer.* Led teams of students, scientists, professors, engineers and UV equipment vendors in a National Science Foundation-funded project,

Proposed Staff (Alphabetical)	Role(s)	Education/Qualifications Registrations/Certifications	Relevant Experience
			developing fate and transport of emerging contaminants – pharmaceutical and personal care products, and facilitated water reuse through groundwater recharge.
Aaron Willis, PLS	Surveying	BA, Surveying, Michigan Technological University AAS, Civil Engineering, Michigan Technological University Professional Land Surveyor: CA, No. 8881, Expires - 12/31/21 CO, No. 37064, Expires - 10/31/21 NM, No. 19301 Expires - 12/31/21 WY, No. 12726, Expires - 12/31/21 UT, No. 8619005, Expires - 03/31/21 OR, No. 88798 Expires - 6/30/20 Treasurer, Professional Land Surveyors of Colorado (PLSC), Central Chapter (CCPS)	• **Federal Highway Administration (FHWA) Central Federal Lands Highway Division (CFLHD), Chester-Warner Valley Road (Forest Highway 169), Plumas County, CA.** *Surveyor.* Managed the preparation of right-of-way plans that included defining a new right-of-way in accordance with design improvements that was tied to existing land lines. Computed sections and townships from original Bureau of Land Management (BLM) notes and maps. Conducted research with local counties, BLM, and U.S. Forest Service. Conducted field surveys to recover Public Land Survey System (PLSS) monuments, including original corners. Prepared and filed in the public record legal descriptions for proposed right-of-way. Coordinated extensively with Plumas County personnel. Managed survey tasks. Performed field survey data reduction and adjustment. • **Federal Highway Administration (FHWA) Central Federal Lands Highway Division (CFLHD), Rock Creek Road Reconstruction, Bishop, CA.** *Surveyor.* Defined a new right-of-way in accordance with design improvements that had to be accurate, legally defensible, and tied to existing land lines. Computed sections and townships from original BLM notes and maps. Conducted research with local counties, BLM, and U.S. Forest Service. Conducted field surveys to recover PLSS monuments, including original corners. Prepared and filed in the public record legal descriptions for proposed right-of-way. Used detailed field surveys and terrain modeling to supplement existing photogrammetric mapping and provide higher accuracy planimetric information. Performed field survey data reduction and adjustment. Oversaw the preparation of right-of-way corridor description for new highway alignment.

APPENDIX B
Scope of Work

Las Virgenes -Triunfo Joint Powers Authority
Pure Water Project
Scope of Work

Purpose

This scope of work describes the services to be provided by the Jacobs team as Owner's Advisor/Program Manager (OA/PgM) for Phase 1 of the Las Virgenes-Triunfo Joint Powers Authority (JPA) Pure Water Project. Phase 1 is assumed to occur over a 24-month period.

Overview

JPA's service area receives imported water for its potable water supply. Within this service area, wastewater is collected and treated to Title 22 non-potable recycled water standards at the Tapia Water Reclamation Facility (WRF). During the dry, summer months, all of the recycled water is used thorughout the service area for irrigation of parks, golf courses, cemetaries and greenbelts and demand exceeds supply, requiring supplementation by potable water. During the winter, demand is low and Tapia WRF effluent is discharged to Malibu Creek. Due to new stringent limits for discharge to Malibu Creek that would require a higher level of treatment, the JPA has evaluated elimination of this discharge through redirection to an indirect potable reuse strategy as a surface water augmentation approach. The JPA is proactively addressing three major challenges – complying with more stringent regulatory requirements for discharge to Malibu Creek, balancing seasonal variation of recycled water demand, and creating a valuable resource to supplement the region's water supplies through California's reservoir augmentation program.

The fundamental plan is to build an advanced water treatment plant (AWTP) to treat tertiary effluent from the Tapia Water Reclamation Facility (WRF) for indirect potable reuse, and convey the product water to the Las VIrgenes Reservoir, where it will be blended with MWD supply by 2030. The water from the Las Virgenes Reservoir would then be treated at the Westlake Filtration Plant prior to distribution. Additionally, pipelines will be constructed to convey source water from the Tapia WRF to the AWTP; product water from the AWTP to the Las Virgenes Reservoir, and reverse osmosis (RO) concentration (brine) to a disposal site.

Primary Objectives

Services will be provided by the Jacobs team to achieve the following primary objectives:

1. Incorporate the JPA's Vision and target goal of having a new Advanced Water Treatment Plant operational by 2030 into delivery of the Program
2. Delivery of the Program within established budgets and schedules
3. Delivery of the Program to manage risk, changes, quality, and enhance earlier project delivery cost certainty.

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

Description of Services

The following sections further describe the scope of services to be provided by the Jacobs team to the JPA for Phase 1 of the Program. Please note that certain tasks listed in the RFP have been shifted to allow for clear delivery and responsibility of each Task.

The major tasks include:

- Task 1 – Program Management
- Task 2 – Mobilization/Program Priorities, Drivers, and Risks
- Task 3 – Project Delivery Methodology and Procurement Support
- Task 4 – Technical Studies, Drawings, and Specifications
- Task 5 – Environmental Studies and Regulatory Compliance

The following general assumptions apply to all tasks described below, while additional task-specific assumptions and deliverables are noted within each task description.

- Aerial mapping and existing site and utility plans will be provided by the JPA.
- JPA will make its facilities accessible to the Jacobs team, as required and appropriate for Jacobs to complete our project activities.
- The cost estimates developed will be consistent with Class 4 and 5 estimates as defined by the Estimate Classification system of the American Association for the Advancement of Cost Engineering International (AACE International).
- One draft and one final version of each deliverable described in this scope will be prepared. One consolidated set of comments on the draft deliverable will be provided by the JPA. Deliverables will be submitted electronically and uploaded to the web-based Program Delivery Portal. Each document will be submitted with appropriate file convention for clear retrieval.
- Jacobs has included hours and cost for each deliverable to have internal Quality Assurance and Quality Control (QA/QC) review.
- Development of Cost Loaded Master Schedule will be in Task 2 and maintained in Task 1, rather than a separate Task 6.
- The development of Program Management tools, models, and manuals will be conducted under Task 2 mobilization efforts. The maintenance and reporting from these Program Management tools is captured in Task 1 efforts.
- The program activities will be completed within the following approximate schedule, assuming we receive the Notice to Proceed in September 2020.
- The fee proposal is based on a two-year duration for Phase 1.
- The program will operate as a Virtual Program Management Office. Core leadership (Program Manager and Program Leaders) will primarily attend meetings in person, while the remaining team members will primarily attend meetings virtually as feasible. The team will meet with the JPA in person or visit sites as required.

Task 1 Program Management

The purpose of this task is to manage, coordinate, and lead the OA/PgM activities and perform administration of the program.

Task 1 includes the following key aspects:

- Program Administration
- Program Controls and Reporting
- Program Quality
- Independent Cost Estimates

Task 1A Program Administration

Our team will provide a streamlined, OA/PgM core leadership team, who will be the principal points of contact for JPA, and who will provide clear team direction, communications, and continuity for implementing inter-related tasks as the program advances from concept through completion. The Jacobs Team will maintain the integrated Virtual Program Management Office (VPMO) and Program Management Plan (PMP) in Task 1 for the duration of Phase 1, however the mobilization and set-up of the processes are defined and captured in Task 2.

Assumptions:

1. The VPMO, PMP, Master Program Schedule, Funding Model will be chartered and developed as part of Task 2 mobilization efforts. All systems will be maintained and updated in Task 1.
2. Jacobs will develop a web-based Program Delivery Portal (Portal) to serve as a website for team members to access delivery-oriented Program information. The Portal may be housed on the JPA server, or the Jacobs LAN and maintained by Jacobs IT Team.

Deliverables:

1. Attendance at on-site meetings by core program leadership.

Task 1B Program Controls and Reporting

The Jacobs team will implement a Program Controls System to deliver the Program, including cash flow projections, development and updates of a master schedule, budgets and expenditures, and a document management system.

- Complete critical path schedule analysis, float analysis, resource leveling, cash flow, and alternatives.
- Provide monthly cost and schedule updates by project managers and activity implementation leaders.
- Provide monthly performance reporting and real-time schedule and cost review.
- Conduct earned value analysis to enable early identification of potential delays and overruns.
- Conduct recovery planning to identify corrective approaches and actions.

Assumptions:

1. Program controls will be primarily found on the Portal.

Deliverables:

1. Monthly reports that provide a status update on all programmatic activities, including scheduling, permitting, environmental studies, funding, project delivery strategy, technical studies and engineering. Reports will include budget status at the programmatic level and for each project. Any significant variations from planned earned value (as exposed by the SPI and CPI parameters) will be reported, and recommendations for recovery will be identified. Reports will include a summary of the risk mitigation efforts, recommended adjustments to project budgets, or contingencies.
2. Updates of the Program Master schedule and costs monthly to track Program progress.
3. Program Control System Dashboard on the Portal.
4. Semiannually, the Jacobs team will produce graphical reports to communicate Program successes.
5. Change Control Procedure, Form, Log and Monthly Change Control Meetings.

Task 1C Program Quality

Jacobs will implement a quality management system to manage quality at the Program and individual project levels. This task will include the following:

- The Jacobs team will review the JPA's current tools for quality management of design and construction contracts and develop recommendations for modification. The Jacobs team will develop a detailed RACI (review/approve/consult/inform) diagram for QA/QC activities, and conduct a workshop with JPA staff to generally define roles and responsibility of the JPA, VPMO, Jacobs, subconsultants, design engineers, and other parties.
- Based on an agreement on the RACI diagram, quality management standards for all design and construction contracts will be developed. Typically, QA functions are the responsibility of the VPMO, and QC functions are the responsibility of the design engineers and construction contractors. Contract documents will be developed that clearly specify their responsibilities and the role of the VPMO.
- Jacobs will develop a Design Management Plan that describes required activities of the design engineers, including QC processes, independent reviews, and collecting, organizing, and responding to Jacobs and VPMO review comments.
- As part of Phase 2, Jacobs will develop a Construction Management Plan that clearly describes all construction management processes related to QA and oversight of the construction contractors.

Assumptions:

1. The VPMO Quality Assurance and Quality Control (QA/QC) Team will review deliverables developed in Task 1-5.

Deliverables:

1. Quality Management Plan that will be housed in the Project Management Plan, Section 9.

Task 1D – Independent Cost Estimates

The Jacobs Team will prepare independent construction cost estimates for projects at various stages of design. In addition, the Jacobs team will complete the following:

- Review project budgets to determine budgeting needs for all Program and project delivery elements. Cost estimates will be prepared using typical soft costs from similar programs and Jacobs' Parametric Cost Estimating System. This information will feed into the cost-loaded master schedule.
- Evaluate allocated contingencies for each project.

Assumptions:

1. Jacobs to provide an estimator for VPMO that will use Jacobs Parametric Cost Estimating Tool, processes, and procedures.
2. The cost estimates developed will be consistent with Class 4 estimates as defined by the Estimate Classification system of the American Association for the Advancement of Cost Engineering International (AACE International).

Deliverables:

1. Cost estimates for each project.

Task 2 Program Mobilization - Establishing Program Priorities, Drivers and Risks

The purpose of this task is to setup the foundation for implementation of the entire program and focuses on a Fast Start mobilization effort that will occur in the first six months. The key aspects include:

- Program Mobilization
- Readiness Assessment and Gap Evaluation
- Comprehensive Program Implementation Plan
- Financial Planning, Modeling, and Funding Strategies
- Cost Estimating, Schedule and Budget Management

Task 2A Program Mobilization

Mobilization is a critical first step that includes several principal activities that plan the entire program, including establishing program governance and structure, planning the Program Delivery Portal, and developing the Program Management Plan – a comprehensive document that becomes the OA/PgM team's Playbook used to manage the program effectively.

Task 2A.1 Program Definition, Governance, and Chartering

The Jacobs team will prepare for and conduct a series of interviews prior to one workshop with key Program team members to fully define the program, governance, and individual vision and goals for the program. The team will subsequently deliver the following:

- Conduct a series of workshops to clarify vision, mission, values, roles, and responsibilities and define the program.
- Produce an initial VPMO organization chart.
- Prepare a draft chartering agreement for signature by all team members.
- Develop an overview schedule with all tasks required to set up a VPMO that will serve as the baseline to develop the detailed Master schedule.

Assumptions:

1. 10 Workshops (7 with JPA staff, 3 with JPA Board):
    - JPA Staff – Kickoff, Chartering, Program Tools Development, TACT model, Project Delivery Approach, Draft PIP, and Final PIP (with project, schedule, and baseline cost).
    - JPA Board – Project Delivery Approach, Draft PIP, and Final PIP.
2. Chartering statement signed by Chartering team will be the guiding principles for running the Program.

Deliverables:

1. Workshop Agenda, Presentation materials, Meeting Minutes and Decisions.
2. Jointly developed Vision statement that reflects Clean Water Project values, mission and goals.

Task 2A.2 – Develop Program Management Plan (PMP)

The Jacobs team will develop a Program Management Plan (PMP) that provides overall guidance to implementation of the Program. The PMP will provide the Program team with the policies, processes, procedures, and standards necessary to effectively and consistently implement the Program. It will describe the roles and responsibilities of the integrated Program team, design consultants, contractors, and other stakeholders, decision making and documentation, delivery standardization and consistency, basis-of-design, project and future construction management, risk and change management, health and safety, and other key policies, procedures, and processes needed to deliver a successful Program. As the Program matures, the PMP will be updated yearly or as needed to reflect additional information or changes that occur.

The PMP will address the following topics:

- **Section 1**, *Program Management Plan Overview*.
- **Section 2**, *Program Vision, Mission, Goals, Objectives, and Charter*. Provides an overview of each of these fundamental foundations for Program delivery and success.
- **Section 3**, *Program Governance*. Establishes a framework for management of the Program, including the organizational structure, policies, and procedures with which projects will be executed, meetings, issue resolution and escalation, and 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 that are essential to efficient delivery.
- **Section 6**, *Program Controls Management*. Outlines tools, policies, and procedures that the PMT will use to monitor and update project progress to manage and deliver the Program.
- **Section 7**, *Performance Monitoring and Reporting*. Establishes performance criteria that will be monitored and reported throughout the Program life cycle and defines reports that will be prepared for use by the PMT, JPA staff, JPA Board, and external stakeholders.
- **Section 8**, *Project Management Information System*. Describes the electronic Program Delivery Portal and its components that will be used to store, manage, distribute, and display all 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.

- **Section 10**, *Risk Management*. Identifies the processes and tools to predict, quantify, identify, track, mitigate, and manage risk for all Program elements.
- **Section 11**, *Quality Management*. Outlines the processes and requirements to confirm 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, data capture for high-volume document digitization, storage, archiving, and sharing of files in a central site.
- **Section 13**, *PMT Communications Management*. Defines communication protocols internal to the PMT and among the PMT, 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, outlines key tools that will be used to manage stakeholder communication, key outreach challenges, and risks, and establishes the Program brand and core messages.
- **Section 15**, *Procurement and Contract Management*. Establishes Program-specific requirements and procedures for equipment, materials, and consultant and contractor procurement.
- **Section 16**, *Design Management and Value Engineering*. Provides a description of how the PMT will manage project design consultants and the Program value engineering (VE) process.
- **Section 17**, *Property 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 manager interfaces with designers, contractors, other utility agencies, permit and regulatory agencies, and the public.
- **Section 19**, *Permitting and Regulatory Compliance*. Establishes the roles, responsibilities, and procedures for PMT staff to identify the required permits for each Program project and apply for and remit payment for permits, and for timely permit acquisition and compliance. This section also defines the roles, responsibilities, and procedures for Program environmental and regulatory compliance.
- **Section 20**, *Utilities Coordination*. Defines the role of the PMT in coordination with JPA 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 health and safety of all PMT members throughout Program execution and presents the Health and Safety Policy Statement.

The finalized PMP will be published via a web-based Program Delivery Portal that will serve as a website for team members to access delivery-oriented Program information.

Assumptions:

1. PMP to be started under the Mobilization activities outlined in Task 2 and will be maintained by VPMO in Task 1 with updates throughout the life of the Program as new information becomes available.

2. If JPA is lacking a process, procedure, or standard then the Jacobs team will provide a viable process, procedure, and/or standard for PMO considerations and use within allowable budget authorizations.
3. The Portal will maintain the tools developed during mobilization in Task 2 for reporting and tracking schedule and costs, plus any agreed upon additions needed to PMO successes allowed with budget considerations.

Deliverables:

1. Draft PMP with periodic updates as needed.

Task 2A.3 Change Management

The Jacobs team will implement proven tools and processes to work with JPA staff to identify changes and out of scope items that impact cost and schedule for contract compliance or have the potential to impact design or construction cost in Phase 2. All changes will be identified, with estimated impact and receive approvals by VPMO and JPA prior to authorization.

Assumptions:

1. Change Management will be fully identified with appropriate forms in the PMP (Section 9) and maintained by the VPMO in Task 1.
2. The need for change is documented as early as possible; and the change recognizes WBS, scope, cost and schedule alignment for all affected Program areas and projects and will follow appropriate authorization protocols.

Deliverables:

1. Change Management Procedure, Form and Log.

Task 2A.4 Risk Management and Mitigation Planning

The Jacobs Team will develop a risk management program that includes the following characteristics:

- Active approach, with risk management activities occurring on regular intervals.
- Consistency and simplicity to allow consistent straightforward and uncomplicated application.
- Multi-level analysis, with roll-up of significant project risks for programmatic consideration.
- Placement of risk management as a high priority.
- Risk assessment at the Program and project levels.

Assumptions:

1. Risk Management will be fully identified in the PMP (Section 10) and maintained by the VPMO.

Deliverables:

1. Risk Management Process.
2. Establish and maintain a Program and project risk registers with JPA staff.
3. Conduct risk review as part of regular progress meetings on the Program and project risk impacts to determine mitigations and solutions.

Task 2A.5 Public Outreach

The Program will include an ongoing public outreach communications program for the JPA's customers and stakeholders about the Pure Water Project, needed capital improvement projects, and impacts on rates and fees. Acting as a subconsultant to Jacobs, Katz & Associates (Katz) will lead all public outreach activities. Katz will work with JPA staff to develop an acceptable Communications Plan that meets the needs of the Program and will then be tasked with administering this communication effort, design elements, and conducting support activities, within the established budgets. To address the specific needs and concerns of stakeholders, K&A will begin development of an overall database. The database will be created to facilitate information distribution by e-mail, the quickest and most cost-effective message delivery system, and will be organized by category (e.g., elected official, working group, residents, etc.).

Assumptions:

1. JPA has an existing branding of the Pure Water Project that will be continued.
2. JPA has public outreach staff and an existing public outreach consultant to develop on-going support.
3. JPA will purchase printing services, mailing list, mailings, advertising and rental space for community meetings to support public outreach activities.
4. Katz will prepare for and attend up to three meetings required for the CEQA process including a scoping meeting, draft review meeting and JPA Board meeting for certification of the Program EIR.

Deliverables:

1. Communications Plan to support ongoing JPA public outreach efforts that may include:
    - Designing and developing a "project update" newsletter template to be mailed annually to each customer; these could contain articles, rate breakdowns and rate projections, pilot study and project updates, construction status schedules, and photographs.
    - Updating templates for fact sheets, brochures, and other collateral materials.
    - Updates to project web pages.
    - Creating designs for annual bill inserts with information and graphics.
    - Developing public presentation materials, where appropriate.
    - Developing fact sheet and frequently asked questions.
2. Initial Audience and Stakeholder Database, with periodic updates as needed.
3. Providing public outreach efforts to support the overall stakeholder engagement of the CEQA processes as discussed in Task 5D.

Task 2A.6 Document Management

The Jacobs team will manage documents using a web-based contract management and document control tool to manage all contract- and project-related documentation. This tool will be used to collaborate on documents in progress and provide a repository for all project records.

The Jacobs team will develop and implement a document archiving plan for existing key documents identified and provided by JPA. The level of effort committed to document archiving will be limited to available resources and budget allocations to be agreed upon with JPA.

Assumptions:

1. JPA to provide their current document management processes, procedures, and systems;

2. The Jacobs Team and JPA to work around JPA data management requirements and legal guidance to gather PMO needed information for reporting and progress tracking, including costs and scheduling needs.

Deliverables and Accomplishments:

1. Document management system and guidelines for archiving that is acceptable to JPA.

Task 2B Readiness Assessment and Gap Evaluation

The Readiness Assessment will provide an objective perspective of the status of the program, including potential road-blocks that could impede progress, gaps in the program plan and structure; and an array of potential priorities for JPA's consideration. Our proposal and the RFP have identified studies and analyses that may be necessary to support the technical and engineering efforts in Task 4. The Jacobs team will approach this task in a workshop platform to prioritize which studies should be conducted immediately. These studies and evaluations will be fully scoped and budgeted as part of the readiness assessment.

The Jacobs team may complete engineering studies and evaluations of the following, depending on budget allocation constraints and authorization by the JPA:

- Tracer/Mixing Studies for regulatory compliance
- Water Augmentation Study
- Operational Strategies for Las Virgenes Reservoir and Westlake WFP
- Hydraulic Studies and Surge Analysis
- Utility Investigations
- Corrosion Studies
- Reservoir Management and Monitoring Plan
- Source Control Study
- Jacobs' Value-Added Ideas Presented in the Proposal

Detailed scopes of work will be developed for the studies before they are implemented.

Assumptions:

1. Specific needs for additional engineering studies will be defined as the Program progresses. Engineering studies will be completed according to Program needs and additional available budget authorizations.
2. The individual scope, budget, schedule, and workplan for each recommended study will be defined as part of Task 2C in the Program Implementation Plan.

Deliverables:

1. Conduct 2 workshops to summarize the current status of work and advise on recommended immediate studies or assessments to aid in the delivery of the program and develop risk assessment of the critical path activities.

Task 2C Comprehensive Program Implementation Plan

Finalize program scope, master schedule and baseline cost that defines studies and projects needed to complete Pure Water Program. The Program Implementation Plan will outline the Program priorities, drivers, and risks along with detailed work plan for each project. The anticipated start and end dates for each project will be identified and the Master Schedule and Budget will be updated.

Assumptions:

1. This plan will be the result of the readiness assessment and series of workshops to gain the JPA staff and board input and agreement.

Deliverables:

1. Program Implementation Plan.

Task 2D Financial Planning, Modeling, and Funding Strategies

The Jacobs team will support the JPA's financial advisor with proven programmatic processes, models, staffing, and tools to evaluate the most effective funding strategy for the Pure Water Project.

Task 2D.1– Financial Modeling (TACT)

The TACT Model will be used to evaluate the cost-benefits of different technology and project sequencing options; demonstrate the feasibility of a compressed or extended program delivery timeline (7 vs. 10-year delivery period); calculate revenue shortfalls and impacts; manage risk and change management and provide the justification for the decision to pursue bonds, grants, and low-interest loan programs.

The Jacobs team will develop cash flow projections and support the JPA's decisions using our TACT tool that allows variations in project scheduling to determine optimum timing for bond sales, drawdowns, contingency management, and any necessary changes in rates.

Assumptions:

1. TACT Model will be developed in conjunction with the Program Implementation Plan and Overall Program Schedule under Task 2, and will be maintained and updated as cost estimates are refined and additional information is obtained.

Deliverables:

1. TACT Model
2. Economic Summit will be conducted biannually for the JPA staff to provide updates on the financial standing of the program.

Task 2D.2 Funding Strategies

The Jacobs team will assist the JPA's funding advisor to determine the overall funding strategy for the Pure Water Project. The Jacobs team will develop an action plan to outline the process, approach, schedule, and information needed to apply and receive funds through Metropolitan Water District's Local Resources Program (LRP); State Revolving Funds (SRF); Water Infrastructure Finance and Innovation Act (WIFIA) loan program administered by the United States Environmental Protection Agency (EPA); Bureau of Reclamation (BOR); and other federal, state, or local funding sources that may be available to the JPA . The Jacobs team will accomplish this by:

- Identifying project eligibility for funding based on project type and schedules and funding program goals.
- Creating work plans to produce high-quality deliverables on schedule for loan application cycles.
- Evaluate whether creating a joint financing authority with the Las Virgenes-Triunfo Districts to provide a single source of responsibility for the loan programs is worthwhile for both parties. If not, separate approaches will be explored to maximize benefits for both parties.
- Coordinating with funding programs to align application materials with their goals and highlight relevant aspects of the program's projects overall regional, environmental, rate payers, and residences net positive benefits. A Resilience Triple-Bottom-Line approach is used that looks at net benefits for environmental, social and economic impacts by the Program.
- Produce successful, high-quality application packages or letters of interest, soliciting and unifying input from Las Virgenes-Triunfo Districts and external stakeholders, including: project managers, municipal advisors, Program strategic finance staff, environmental and permitting leads, JPA staff, JPA Board, and others
- Meeting with Metropolitan Water District to discuss strategy for LRP.

Assumptions:

1. All application fees will be paid by LVMWD.
2. Regulatory approvals and completed Environmental Studies precede funding applications.
3. The level of effort required to assist with Letters of Interest and Completed Application Packages for funding will not be known until recommendations regarding potential funding sources and strategies are completed and the list of projects and project sequencing are established. Actual level of effort applied to obtain funding will be determined once the grants or programs are identified and are outside of this scope and fee.

Deliverables:

1. Funding Strategy Action Plan.
2. Communication with funding programs.
3. Coordinate efforts and enter funding amounts and schedule into TACT model.

Task 2E Cost Estimating, Schedule and Budget Management

Task 2E.1 – Master Baseline Program Schedule

The Jacobs team will develop a master, cost-loaded schedule for the Program with P6 scheduling software. This task includes the following:

- Develop a common work breakdown structure (WBS) for all projects within the Program.
- Refined estimates of costs to develop a cost-loaded critical path schedule that will allow for analysis of project timing and resultant cash flow needs.
- Critical path schedule analysis, float analysis, resource leveling, cash flow, and alternatives.
- Earned value analysis to enable early identification of potential delays and overruns.
- In Phase 2, the designer and contractor baseline milestone activities will be integrated into the master schedule.

Assumptions:

1. The Jacobs team assumes that P6 scheduling software will be used, but understands the JPA would like to discuss selection of the software.
2. The Master Program Schedule will be maintained on a web-based Program Delivery Portal that provides access and visibility to the schedule, budget status, and earned value management parameters of schedule performance index (SPI) and cost performance index (CPI).

Deliverables:

1. Detailed work breakdown schedule (WBS) and WBS dictionary.
2. Detailed cost – loaded baseline Program Master Schedule.

Task 3 Project Delivery Methodology and Procurement Support

The purpose of this task is to evaluate and recommend design and construction delivery methods for each project within the Program and provide procurement support for the selected approach. The key aspects include:

- Delivery Strategy Selection
- Procurement Support

Task 3A Delivery Strategy Selection

The Jacobs team will provide an analysis of the advantages and disadvantages of various project delivery methods that can be applied to the design and construction of projects under the overall Program.

Assumptions:

1. Delivery Methods that will be evaluated include: traditional Design-Bid-Build (DBB), Construction Management At Risk (CMAR), Progressive Design-Build (PDB), and Fixed Price Design Build (FPDB).
2. Design Build Operate (DBO) and Public-Private Partnership will not be considered by the JPA.

Deliverables:

1. Develop a Procurement Strategy Technical Memorandum
2. One Workshop with JPA Staff
3. One Workshop with JPA Board to present alternative delivery options, advantages and disadvantages, and recommended strategy. An independent speaker from the Design Build Council could be invited to participate, if desired.

Task 3B Procurement Support

The Jacobs team will provide leadership to assist JPA in the development of procurement documents for the selected strategy and review of proposals by contractors and consultants for award of the projects.

- Developing bridging documents to a 10 percent, preliminary design level to provide project definition and requirements (fee carried in Task 4C for the AWTP and Task 4D for conveyance).
- Developing professional services contracts using JPA standards that appropriately assign responsibility and risk to the correct party.
- Developing clear project scopes of work.

- Developing standard bidding documents to create consistency and reduce individual project costs.
- Incorporating quality assurance (QA) requirements and adherence with other VPMO standardized workflows.

Assumptions:

1. The delivery method for certain components of the Program may be different if supported by the analysis.
2. Development of two procurement packages is assumed; one for the AWTP project and one for the Conveyance project.

Deliverables:

1. Prepare procurement packages based on procurement strategy for the AWTP and Conveyance projects.
2. Prepare project-specific contract documents (RFQs and/or RFPs) for consultants and contractors using approved JPA and PMO developed standard documents.
3. Review contractor and consultants supplied RFQs/RFPs and assist JPA and legal counsel in making award recommendations.
4. If an alternative delivery model is selected, assist JPA and their legal counsel with final contract coordination and negotiation of contract terms.

Task 4 Technical Studies, Designs and Specifications

The purpose of this task is to conduct technical studies to support environmental, funding and delivery activities for the identified projects. The key aspects include:

- 4A Tapia WRF Flow Equalization
- 4B Capacity Review of Discharge Point 005
- 4C AWTP Design Criteria Package (Bridging Documents)
- 4D Major Pipeline Alignment Study

Task 4A Tapia WRF Flow Equalization

The Tapia Water Reclamation Facility (WRF) produces tertiary recycled water that will be the main source water for the new AWTP. The Jacobs team will prepare a study evaluating options to equalize flows and blending strategies at the Tapia WRF. The following tasks will be conducted and summarized in a workshop with the JPA and a Tapia WRF Flow Equalization Memorandum.

- Use Digital Watershed to evaluate dynamic wastewater flows and confirm concept level EQ basin sizing.
- Evaluate Steady State Conditions and add the Water Augmentation study results.
- Estimate Peak storm Water Quantity: 5, 10, 50, 100-yr storms.
- Size and locate EQ basin for diurnal and wet weather flows.
- Develop a Blending Strategy based on up to 5 blending scenarios.
- Develop costs for options considered and prepare a present worth analysis for EQ options.
- Recommend the best option for flow equalization at the Tapia WRF.

Assumptions:

1. The value-added Water Augmentation Task will be approved and conducted as part of the rapid program readiness assessment. The results of the water augmentation study will be added to the steady state conditions at Tapia WRF to determine the recommended size of the EQ basin.

Deliverables:

1. Workshop Agenda, Powerpoint Presentation, and Meeting Minutes.
2. Tapia WRF Flow Equalization Memorandum (Draft and Final).

Task 4B Capacity Review of Discharge Point 005

The purpose of this task is to determine the capacity of the existing conveyance system from Discharge Point 005 to the Los Angeles River and identify potential improvements to the system to increase its capacity to accommodate the bypass flows from the AWTP. This task will be divided up into 5 subtasks detailed below.

Task 4B.1 - Review Existing Data for Los Angeles River

Woodard & Curran will research and obtain as-built drawings from LA County and Caltrans for the storm drain system between Discharge 005 and the LA River. The system will be split into reaches based on physical attributes and/or watersheds. Hydrologic information will also be obtained where available.

Based on preliminary storm drain research, the facilities have been identified:

1. 39" RCP along Parkway Calabasas and Calabasas Rd.
2. Open channel/swale running along the shoulder of the southbound 101 Freeway
3. Box culvert beneath 101 Freeway
4. Oakfield Drain
5. West Fork of Calabasas Creek
6. Calabasas Creek
7. LA River

Task 4B.2 – Assess capacity of system during high flow events

The design flow for the reaches will be obtained from the as-built documents where possible. It is likely that the upstream reaches were not designed for the 50-year storm, as such a hydraulic profile of the system for the 50 and 100-year events is not possible. The maximum capacity of each of the key reaches will be calculated using normal depth equations and compared to the maximum design flows obtained from the as-builts to determine the constraints in the system under various storm events.

A hydraulic constraints exhibit of the conveyance system from Discharge Point 005 to the Los Angeles River will be prepared based on the calculations described above. The hydraulic constraints exhibit will be used to evaluate the conveyance system's capacity and ability to handle additional flows during the 10, 25, and 50-year events. It is likely to be found that additional conveyance capacity during these events is not possible in the existing system.

Task 4B.3 – Determine Maximum Recycled Water Flow to Discharge Point

The maximum recycled water flow to Discharge Point 005 will be determined using the LWMWD's recycled water system hydraulic model. Discharge flow will be modeled using winter average, peak, and minimum demand scenarios for recycled water with the bypass flow caused by an AWTP shutdown added to those winter demand conditions. Maximum flow will be determined with the constraint of a minimum of 10 psi residual pressure in all portions of the distributions system.

Task 4B.4 – Determine Recycled Water and Storm Drain Improvements

As discussed above, it is likely the analysis in Subtask 4B.2 will indicate the existing storm drain system does not have the excess capacity for the necessary discharge at Discharge Point 005. As such, up to three storm water conveyance system improvement concepts will be evaluated to develop a delivery concept of the maximum expected volume of excess recycled water bypass flow without exceeding channel capacity during high flow events affecting the receiving tributary to the Los Angeles River.

If the analysis in Task 4B.3 indicates the existing recycled water system does not have the capacity to convey the excess recycled water to the Discharge Point 005, up to three potential recycled water conveyance system improvement concepts will be identified for improvement of the recycled water system. The capital costs for recycled water system and/or stormwater conveyance system improvements required will be estimated. Cost estimates will be Class 5 cost estimates in general conformance with AACE 18R-97.

Task 4C.5 – Discharge Point 005 Analysis Memorandum

The results of Tasks 4B.1 through 4B.4 will be summarized in a summary memorandum. The report will also include Environmental constraints associated with the recommended improvements, such as California Environmental Quality Act requirements, need for streambed alteration permits, and Regional Water Quality Control Board permitting limitations.

Assumptions

1. Hydraulic model for the recycled water distribution system is available, current, and calibrated and will be provided by Las Virgenes.
2. Maximum flows for stormwater reaches can be obtained from existing drawings or reports. If not, they can be calculated using Manning's equation and physical channel data.
3. No watershed modeling will be performed.
4. Hydrologic flows into the storm drain system along the path to the LA River are readily available.

Deliverables

1. Hydraulic constraints exhibit of the storm drain system from Discharge Point 005 to the LA River under various conditions.
2. Discharge Point 005 Analysis Memorandum.

Task 4C AWTP Design Criteria Package

The purpose of this task is to develop a Design Criteria Package to define the preferred design solution and project requirements to a 10% design level for use by a consultant or design build firm to progress the AWTP, starting at a 30% design definition.

Task 4C.1 Data and Information Collection

Information and data needed to formulate design criteria will be collected and reviewed by the team. This is expected to include:

- Review existing information, studies and data
- Develop and submit a data request
- Collect and review effluent data from the Tapia WRF
- Propose additional testing as required to establish the basis of design for the AWTP

Task 4C.2 AWTP Site Evaluation

JPA has identified two potential sites for the AWTP. One site is located on the eastern edge of Las Virgenes Reservoir in an open space area within the City of Westlake Village. The other site is located on an empty lot in a business park/office and retail zone off Agoura Road in the City of Agoura Hills (30800 Agoura Road.) The purpose of this task is to evaluate the specific considerations at each site and summarize the findings in a technical memorandum. This task will include the following activities:

- *Preliminary Hydraulic Profile:* Develop a preliminary hydraulic profile for each site.
- *Base Mapping Data:* Review available topographical and boundary mapping of each site and determine if additional survey data is needed for design efforts.
- *Geotechnical Summary:* Perform a desk-top evaluation of existing geotechnical investigations and reports, and published geologic, groundwater, and seismic data from each site. Jacobs will then prepare a geotechnical summary report to document the subsurface conditions and evaluate constructability for the 2-alternative AWTP sites. Additional geotechnical investigation needs will be identified in the report.
- *Zoning and Permitting Requirements:* The legal, City, permitting, and zoning constraints of each site will be evaluated and summarized. A list of relevant site permitting activities unique to each site will be developed and included in the Site Evaluation Technical Memorandum.

Task 4C.3 Preliminary Design

The purpose of this task is to develop the AWTP concepts to a 10% design level for the selected AWTP site. This will provide project definition for the preferred solution and define the facilities, process facility sizing, performance criteria, and potential obstacles to be addressed in design. The design criteria development information will be summarized in a series of technical memoranda in the following subtasks.

This task includes the following activities:

- Develop preliminary design and performance criteria for the AWTP
    - Flow and loading criteria
    - Treated effluent water quality requirements
    - Residual disposal requirements
    - Reliability and redundancy requirements
- Hydraulics
    - Hydraulic profile
    - Line size estimates for major process piping
    - Identification of special hydraulic analysis requirements
- Process Design:
    - Mass balance diagram
    - Plant-wide process flow diagram
    - Process flow diagrams for the individual unit processes
    - Summary of unit process design criteria and projected operating conditions
    - Process narrative for individual unit processes
- Site and Civil Design
    - Site plan showing new and existing structures
    - Preliminary grading and paving plan
    - Preliminary stormwater management plan
    - Preliminary yard piping plan (major piping systems)
    - Landscaping concept

- Architectural Design
    - Architectural theme
    - Architectural elevations and roof and floor plans
- Buildings and Structures
    - Footprints and sections of major structures showing major equipment
    - Structure dimensions
- Process Mechanical Design
    - Sizing of major equipment
    - Preliminary equipment lists and data sheets for major equipment
    - Layouts and elevations for equipment areas, including major piping and valves
    - Utility requirements
- Building Mechanical Design
    - HVAC, plumbing and fire protection concepts
- Electrical Design
    - Preliminary electrical load list
    - Electrical power one-line diagrams
    - Preliminary electrical site plan
- Instrumentation and Control
    - Control philosophy
    - Process control descriptions

Task 4C.4 Project Delivery

If the JPA elects to deliver the AWTP through an alternative delivery model, the purpose of this task is to develop supporting documentation to outline minimum requirements for the work to be executed by a design build firm. The purpose of this task is to develop the Design Criteria Package that will be included in the performance-based criteria for the design and construction of the new AWTP and will include the following specifications.

- Start-up and Testing Plan Requirements for the DB Firm
- Scheduling and Project Control Requirements for the DB Firm
- Safety Plan Requirements for the DB Firm

Task 4C.5 – Operational Review of Recycled Water Chlorination Practice

The RFP indicates this task as Task 5G, and we have shifted to be part of the AWTP design as it is a critical factor in designing the process. The Jacobs Team will evaluate the JPA's current recycled water chlorination practice at Tapia WRF and identify potential changes to improve efficiency, protect the future AWTP equipment, while maintain compliance with existing regulatory requirements.

Assumptions

1. The Readiness Assessments identified in Task 2 will be available for review and consideration in development of the Basis of Design Report.
2. The Jacobs team will summarize the AWTP design criteria in a series of Technical Memoranda.
3. Existing survey and geotechnical information will be reviewed. Additional survey and geotechnical investigations will be completed in Phase 2.

Deliverables

1. List of Additional Data Needs
2. AWTP Site Evaluation Technical Memorandum – including survey, geotechnical, permitting considerations
3. Preliminary Design Report
4. Alternative Project Delivery Specifications
5. Recycled Water Chlorination Evaluation Memorandum

Task 4D Major Pipeline Alignment Study

The purpose of this task is to prepare a Pipeline Alignment Study for the Program. The study will evaluate alignment alternatives for the following:

- AWTP Influent Pipeline – recycled water supply pipeline to the AWTP
- AWTP Product Water Pipeline - purified or product water pipeline from the AWTP to Las Virgenes Reservoir
- AWTP Off Spec Water Pipeline - for discharging off-spec water from the AWTP top appropriate location such as local storm drain or sanitary sewer system
- Brine Pipeline – discharge pipeline for RO concentrate

A step-wise process will be used to eliminate unnecessary alternatives analysis for each major pipeline system. Step 1 will consist of an initial screening (using coarse screening criteria selected jointly with the JPA) to identify the two or three alignment options for each pipeline system, for each of the two AWTP sites. Step 2 will be to conduct a detailed evaluation of the remaining alignment options to identify a recommended alignment for each AWTP site. The final step will be to define the recommended alignment for each pipeline system for both AWTP sites to a preliminary engineering (10% level of detail) to support project CEQA, regulatory permitting, funding pursuit, and program delivery. If needed, design development beyond 10% would be performed during Phase 2 of the Pure Water Project.

The following subtasks are applicable to all of the alignments indicated above unless otherwise noted.

Task 4D.1 – Review Existing Program Data

The team will prepare an initial data request list that builds on the previously received information during Woodard & Curran's development of the Regional Brine Management Study. The request will include, but not be limited to: available facilities and utilities as-builts documentation, utility mapping, engineering reports for facilities related to the Program, GIS data, recent pipeline bid tabulations and cost data, geotechnical data and report within the vicinity of the Program. The team will maintain and update the data request list as additional needs are identified and data are received. Data received will be reviewed and assumptions developed for key data gaps.

Task 4D.2 - Identify Other Cost-sharing Opportunities

As part of the Pipeline Alignment Study, cost-sharing opportunities with be evaluated to make the Project as cost effective as possible. The following are some examples of opportunities that will be considered:

- Discharging brine to the City of Thousand Oaks' Hill Canyon Treatment Plant with a dedicated pipeline or through the existing sewer system if there is sufficient capacity.
- Flush the brine pipeline using brackish groundwater from the Los Robles or Library wells, or effluent from the Hill Canyon WTP to help reduce scaling in the pipe.

- Identify alignments to the Los Virgenes Reservoir that could bring multiple benefits and potential alternative funding sources such as a recreational access (e.g. a pathway or maintenance roadway through the canyon to the north of the reservoir that would provide improve access to hiking trails and all-weather access to the Pure Water discharge facilities for the District and local emergency services through the open space.

Task 4D.3 - Evaluate Off-Spec Water Handling

The team will identify and recommend an option for disposal of AWTP off-spec water for the two AWTP sites. Up to four receiving infrastructures will be studied, including the JPA's sanitary sewer system, local storm drain system, an equalization tank, or the JPA's recycled water system). A desktop hydraulic analysis of the sanitary sewer as described in the tasks below will identify if the sewer system has available capacity for the Off-Spec water. Development of alignments and base maps associated with Off-Spec Water handling is covered under Task 4D.5.

Task 4D.4 – Conduct Hydraulic Analyses for Recycled Water and Sanitary Sewer Systems

To assist with ranking the influent pipeline alternatives, the team will use LAS VIRGENES's existing recycled water system hydraulic model to analyze the capability of the recycled water system to deliver Influent Water to the AWTP, identifying a preferred location for a turnout for each of the two alternative AWTP sites. To assist with the ranking of Off-Spec Water discharge options to the sanitary sewer (no hydraulic model exists), the team will conduct a hydraulic analysis to estimate the sanitary sewer system's capacity and potential receiving points for discharge of Off-Spec water. Infrastructure modifications that may be needed to accommodate these influent and off-spec flows will be identified as part of the conveyance system analysis covered under Task 4D.3.

Task 4D.5 - Develop Base Maps and Alignments for AWTP Influent, AWTP Product Water, AWTP Off-spec water, AWTP Residuals and Brine Pipelines

Base maps, using available GIS information, will be prepared for the pipelines indicated above. There are several potential alignment alternatives for each of the pipelines. Base maps for two alignments for each of the two AWTP sites will be prepared for each of the Influent water, Product Water, Brine, and Off-Spec Water pipelines will be prepared. Should the AWTP be located at the Las Virgenes Reservoir, the Product Water pipeline will be considered part of the AWTP facility design given the proximity of the two facilities to each other.

Task 4D.6 – Research Underground Utilities – Develop Utility Map

Team will contact Underground Service Alert (USA) to obtain a list of potential utility owners in the each of the major pipeline conveyance corridors. Using this information, a map of the potential alignments will be sent to the utility companies as a Preliminary Notification to request their utility mapping. A tracking log will be used to keep record of requests and responses. As data is received, it will be mapped in a GIS database and assigned a quality level following the American Society for Civil Engineers' (ASCE) publication *Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data (38-02).* Categorizing the utility information will also help identify any data gaps. The information will be utilized in ranking the various Pipeline alignments.

Task 4D.7 - Preliminary Geotechnical Investigations for Recommended Alignment

At the start of the Program, a desktop study of all available geotechnical information will be performed to help evaluate the various pipeline alignments. The information may include published geologic maps and literature, fault and seismic hazard maps, groundwater data, topographic maps, soils reports and site visits. When the recommended alignments for all the pipelines are selected, a Geotechnical Exploration Plan will be developed to obtain the maximum amount of data in the most cost-effective manner. The Geotechnical Exploration Plan may include, but not be limited to, the following: soils borings, rock borings, seismic reflection surveys, and Cone Penetrometer Tests (CPT).

Task 4D.8 – Identify Permit and Easement Requirements for Each Corridor

The team will identify agencies or entities that have jurisdiction over the installation of the pipelines within each corridor and will coordinate with those parties to determine contact information, permitting requirements including application requirements, fees, review/approval process, and schedule for reviews. The list of permits, contract persons, and requirements associated with each pipeline will be considered in the Alignment Alternatives Evaluation for each corridor.

Task 4D.9 - O&M Costs and Maintenance Recommendations for Brine Line

Minimizing long-term O&M costs are key considerations in choosing a pipeline alignment. For the Brine pipeline, choosing the correct alignment (shortest distance, maximum slope/velocity) to minimize brine residence time and water quality implications is critical. Maintenance requirements and probable O&M costs of the brine line will be captured as part of the evaluation criteria for recommending a preferred alignment.

Task 4D.10 - Construction Cost Estimates for Each Potential Pipeline Corridor

As part of the Pipeline Alignment Study Report, a comparative cost estimate will be performed to identify construction cost differentials that will aid in evaluation of alternative pipeline corridors for each major pipeline.

Task 4D.11 - Recommended Preferred Alignment for Each Pipeline

To recommend a preferred alignment for each pipeline corridor, evaluation criteria will be developed with the JPA staff. The following are examples of evaluation criteria that could be used in the evaluation:

- Pipeline length,
- Pumping needs,
- Property and/or right-of-way acquisition,
- Construction impacts
- Utility congestion,
- Impact to existing utilities at connection points,
- Proximity to supplemental source water (for Brine Pipeline alternatives),
- Required length of the Calleguas' Salinity Management Pipeline extension,
- Potential for multiple use/benefit and cost sharing opportunities
- Geotechnical considerations,
- Environmental and permitting requirements,
- Number of trenchless crossings,
- Constructability/Construction Risk,
- Operations and maintenance access,
- Construction and operating cost.

The information obtained from the Tasks above and the evaluation criteria will be summarized in the Pipeline Alignment Study Report which will include:

- Alignment evaluation criteria and methodology,
- Descriptions of alternatives and characterization using the evaluation criteria,
- Evaluation matrix and discussion,

- Recommended alignment for each pipeline corridor,
- A Class 5 cost estimate in general conformance with AACE 18R-97 for the recommended alignments.

Assumptions

1. Hydraulic model for the recycled water distribution system is available, current, and calibrated.
2. Geotechnical Exploration Plan scope and fee will be negotiated after the recommended alignment for all pipeline corridors are accepted.
3. The Hydraulic modeling will consist of the following for up to two flow conditions:
    a. Two Influent Pipeline connections will be modeled for each AWTP site (four model configurations total)
4. Desk-top hydraulic analysis of up to two connections to the sewer system for each site for the Product Water, Brine and Off-Spec water pipelines will be performed.
5. Base maps will be prepared for up to:
    b. Two Influent Pipeline water alignments
    c. Two Product Water Pipeline alignments from the Agoura Road site
    d. Four Brine Pipeline alignments
    e. Four Off-Spec Water (Wasting) Pipeline alignments (two from each AWTP site).
6. Topographic surveys and mapping for the recommended alternatives are not included.

Deliverables

1. Data Request List
2. Hydraulic Analysis Review Memorandum
3. Hydraulic calculation spreadsheets for conversion to EPANet model file format
4. Geotechnical desktop study
5. Pipeline Alignment Study Report

Task 5 Environmental Studies and Regulatory Compliance

The purpose of this task is to conduct environmental studies and develop the regulatory strategy to support funding, delivery and permitting activities for the identified projects. The key aspects include:

- 5A – Strategic Plan for CEQA
- 5B – Environmental Constraints Analysis
- 5C – Initial Study and Special Studies
- 5D – Environmental Process Management
- 5E – Support JPA Board Review of CEQA Document
- 5F – List of Permitting for Program
- 5G – Regulatory Strategy, Coordination, and Title 22 Engineering Report Preparation

Task 5A – Strategic Plan for CEQA

We propose a programmatic approach to CEQA. In this task, a CEQA Strategy Plan will be prepared to be used for team endorsement of the following topics: project elements ripe for project-level CEQA clearance, integration and timing of program elements into the CEQA document (primarily effluent discharges and water quality), and the in-depth studies needed for additional CEQA+ and/or NEPA compliance purposes.

This task should be developed concurrently with the Fast Start Team in Task 2. At this time, information should flow both ways: the environmental team needs to understand how the project is being designed, but the design team needs to know what project features need to be advanced to meet regulatory stakeholder needs.

Deliverable:

1. CEQA Strategy Plan

Task 5B – Environmental Constraints Analysis

This task includes a preliminary data collection effort and preparation of a memorandum summarizing environmental constraints. The task will proceed along with Task 5A, as our discovery of known constraints may help refine the project features (e.g., recorded biological or archaeological resources). For this project, the environmental constraints of greatest concern will be examined, including: (1) background traffic and noise levels in comparison to anticipated construction methods, (2) known biological and cultural resources, (3) air quality and odor emissions, and (4) changes in viewsheds. Throughout both Tasks 5A and 5B, the environmental team will continually engage with the engineering technical team to share constraints information about the critical environmental topics of discharge flows and water quality (Malibu Creek, Arroyo Calabasas, Las Virgenes Reservoir, and Oxnard Ocean Outfall).

Environmental constraints related to Discharge Point 005 will be evaluated in Subtask 4A and 4C.

Assumptions:

1. All field surveys can be performed from public right-of-way or from JPA (or other agency) owned property. The field survey team will not have to access private property, or access to private property will be secured by the JPA.
2. Jacobs will engage with a local traffic firm that manages data and modeling services for Westlake Village, Agoura Hills, and Calabasas.

Deliverables:

1. Environmental Constraints Analysis Memorandum

Task 5C - Initial Study and Special Studies

This task is the heart of the environmental work: preparation of the Program EIR, which will include many program elements at a site-specific, project level of detail. The structure of the document will be based on the strategy memo from Task 5A and the analysis will build on the constraints analysis from Task 5B. A brief discussion of the major chapters in the Program EIR follows:

- Purpose and Need. Although this is a NEPA term, we recommend that the introductory material describe why the project is necessary and how the project has been developed based on the need. This will be helpful for the reader to understand the project benefits, which are usually not discussed in a CEQA document.

- Project Description. For a simple project, this is usually written based on some level of design development. Given the numerous project elements and program/project approach, we recommend a tailored approach of simply describing the program and its project features in basic, reader-friendly terms and not reference or include any design drawings. Features that are expected to remain “finite and stable” – or at least mostly so – can be evaluated at the project level. Features that are in flux early in program development can be described generally for programmatic coverage.

- Impacts:
  - Aesthetics. Visible project features – primarily the AWTP – will be evaluated for impacts related to changes in visual character and visual quality from Key Observation Points (e.g., the adjacent Lexington apartments).
  - Air Quality. The potential for odors and other air pollutants is very low for this type of project, but some analysis will be required especially given anticipated [agency] permit reviews. In addition, construction emissions will be evaluated pursuant to [agency] thresholds and with attention to federal conformity rules.
  - Biological Resources. Impacts to special status plants and animals, oaks woodland, and other habitats along the construction corridor will be analyzed. Together with the engineering team, the analysis will include potential impacts to steelhead and tidewater goby in Malibu Creek and, potentially, similar impacts related to other discharge points. This part of the analysis is expected to heavily rely on prior work (e.g., Biological Opinion for Malibu Creek minimum discharges of 2.5 cfs).
  - Cultural Resources. Databases of known archaeological and historical resources will be researched and supplemented by field review, and all protocols will be followed so that the analysis is suitable for National Historic Preservation Act, Section 106 review.
  - Hydrology and Water Quality. The topics of hydrology and water quality are fundamentally related to Biological Resources, and so the two sections will be prepared at the same time to ensure consistency and the presentation of complementary information organized in a familiar, CEQA-based format. The basis for the information in this section will be the technical work performed for regulatory processes described in Task 5G.
  - Noise. The potential for construction-phase nuisance impacts will be evaluated by comparing ambient conditions to the types of noise impacts generated by construction activity with a focus on the AWTP given the expected long construction duration and nearby residences.
  - Traffic. The potential for construction-phase nuisance impacts will be evaluated by querying existing traffic data and analyzing the potential for short-term impacts from additional delays and detours.
- Cumulative Impacts. For the Pure Water program, the most important environmental resource topics already have been studied comprehensively and consider the effects of a range of impacts. The best example is Malibu Creek – development of the TMDL and project-specific WDRs are focused on the cumulative impacts that affect instream and Santa Monica Bay water quality, steelhead and tidewater goby habitat, and similar things. With that in mind, our recommended approach is to focus the discussion of cumulative impacts on local, nuisance concerns related to construction. For example, what other public and private construction activities are expected to occur at the same time? By working with the cities, our Program EIR should be able to explain how our project fits into a larger narrative about disruptive construction activities.
- Alternatives. A balancing act is required between program elements that have not been decided (e.g., brine line alignment) and the need to consider a broad range of alternatives per CEQA. Our recommended approach is to cover all options in the main analysis. This keeps the reader focused on the program as it is generally understood (e.g., the Title XVI Feasibility Study), even when decisions on specific features are yet to be made. The alternatives chapter can be limited to very high-level concepts for water reuse, which is appropriate for a programmatic evaluation.

Assumptions:

1. Project-level features requiring detailed evaluation are expected to include: new AWTP on Agoura Road, minor upgrades to the Tapia WRP, extension of existing recycled water pipelines along Agoura Road, and new finished water pipeline along Agoura Road, Lindero Canyon Road, and between Triunfo Road and Las Virgenes Reservoir. Program-level features will not require detailed, site-specific evaluation.
2. All field surveys can be performed from public right-of-way or from JPA (or other agency) owned property. The field survey team will not have to access private property, or access to private property will be secured by the JPA.
3. The level of effort assumes that a reasonable number of comments - up to 25 comment letters and/or 100 individual comments - will be submitted on the Draft PEIR.

Deliverables:

1. Administrative Draft Program EIR
2. Public Draft Program EIR
3. Administrative Final Program EIR
4. Final Program EIR

Task 5D – Environmental Process Management

The Jacobs team will prepare technical information for notices and advise on CEQA-mandated review methods and timeframes. As part of this process, the Jacobs team will support overall stakeholder engagement with our partner Katz & Associates by seamlessly integrating CEQA processes as part of the engagement strategy. This includes focusing one of the engagement meetings to serve as a general public meeting to solicit input on the Draft EIR.

Assumptions:

1. Work by Katz & Associates will be delivered under Task 2.A.5

Deliverables:

1. Notice of Preparation
2. Support of Stakeholder Engagement Meetings

Task 5E – Support JPA Board Review

The Jacobs team will support JPA staff in recommending adoption of the CEQA document by the JPA Board. This includes preparing CEQA Findings of Fact and a Statement of Overriding Considerations, and helping to prepare staff reports, presentations, and other supporting materials.

Deliverables:

1. CEQA Findings of Fact and Statement of Overriding Considerations
2. JPA Staff Report to the Board
3. JPA Board Powerpoint Presentation and other supporting materials

Task 5F – List of Permitting for Program

The Jacobs team will prepare a permitting matrix and summary memo documenting the required permits for all program elements, including agency contact information, required information and understanding of prerequisites, estimated permit acquisition timeframes, and anticipated permit application and any ongoing fees.

Task 5G – Regulatory Strategy, Coordination and Title 22 Engineering Report

This task includes preparation of required submittals and coordination with State Water Resources Control Board's (SWRCB) Division of Drinking Water (DDW) and the Los Angeles Regional Water Quality Control Board (RWQCB) in order to obtain regulatory concept approvals for the discharge of advanced treated water to Las Virgenes Reservoirs and modifications to the existing NPDES permits for Malibu Creek.

Task 5G.1 Regulatory Strategy and Coordination

Development of Regulatory Strategy

Objectives of this task include (1) defining specific regulatory requirements that will govern detailed project design and (2) initiating and proceeding with the process to obtain permits and approval from the SWRCB's DDW and the LA RWQCB. The following approvals will be required from these agencies:

- SWRCB - DDW
  - Conditional Approval Letter for Surface Water Augmentation Project
  - Amended Drinking Water Supply Permit for the Use of Augmented Las Virgenes Reservoir as a Source of Supply for Westlake Drinking Water Treatment Plant
- Los Angeles RWQCB
  - NPDES Permit for Modified Discharges to Malibu Creek and the New Discharge to Las Virgenes Reservoir

Each of these agencies features approval processes that are defined by differing sets of State of California statutes and regulations. While some tasks associated with these approvals will be specific to a given regulatory agency, other tasks will be dependent on actions from multiple agencies. As a result, significant coordination with these agencies will be required to (1) proceed through each agency's approval process and (2) maximize efficiency in addressing requirements from each agency, and (3) address and resolve any inconsistencies or conflicts between requirements of the agencies. Additionally, coordination will be required to ensure that CEQA/NEPA activities and findings are consistent with actions and findings required to proceed through the regulatory approval processes.

The CEQA/NEPA schedule will significantly influence the ability to proceed with the approval process of DDW, and RWQCB. Completion of CEQA/NEPA activities, for example, will be required in order to identify facilities, sites, and operations necessary to support completion of the Title 22 Engineering Report. Further, RWQCB action on the Las Virgenes Reservoir NPDES permit and the NPDES permits for Malibu Creek cannot occur until the CEQA/NEPA process is complete. Additionally, RWQCB cannot prepare draft version of the NPDES permits until DDW has approved the Title 22 Engineering Report and issued a Conditional Approval Letter for the Las Virgenes Reservoir potable reuse project.

As previously noted, the assumed duration of Pure Water Phase 1 is 24 months, with the bulk of that time needed to complete initial routing studies, preparation of preliminary engineering (10%), environmental assessments of sites and alignments, and to completion the environmental permitting process. Given this timeline, it will not be possible to complete the DDW, and RWQCB approval processes within the Phase I period. Within Phase 1, however, it will be possible to achieve a level of approval that (1) provides specifics necessary to proceed with detailed project design, (2) clearly defines the pathway for achieving final project approvals, and (3) through interim approval steps, provides a high degree of confidence in achieving final project approvals and permits. To this end, proposed work will target achieving the following within the 24-month Phase I period:

- Coordinating with DDW and preparing a draft version of the required Title 22 Engineering Report that defines project elements and proposed design parameters, presents methodology for ensuring compliance with DDW requirements, and addresses DDW issues and comments that arise as part of the Phase I regulatory coordination effort. While finalization of the Title 22 Engineering Report and DDW issuance of final project approval conditions will occur as part of Phase II, the Phase I work in completing the draft Title 22 Engineering Report will be sufficient to address all design-related issues and support final design.

- Coordinating with the RWQCB to define specific requirements that RWQCB staff will recommend to the RWQCB in the NPDES permit for the discharge of advanced treated water to Las Virgenes Reservoirs and the modified NPDES permits for Malibu Creek. RWQCB action on the Las Virgenes Reservoir NPDES permit and the NPDES permit for Malibu Creek cannot occur until the CEQA/NEPA process is complete. RWQCB action on these NPDES permits also cannot occur until DDW has approved the Title 22 Engineering Report and issued a Conditional Approval Letter for the Las Virgenes Reservoir potable reuse project. As a result, these tasks would be accomplished under Phase II. While it will not be possible to complete Reports of Waste Discharge to formally apply for the Las Virgenes Reservoir NPDES permit and to apply for modifications in the Malibu Creek and Arroyo Calabasas NPDES permits within the Phase 1 period, it will be possible to coordinate with the RWQCB to address all design-related issues and support final design.

The overarching goal of the regulatory element of the Phase I work is to (1) identify specific regulatory requirements that are pertinent to the final detailed design, (2) identify the approaches, facilities, and operations proposed to achieve compliance with these regulations, and (3) document why the proposed compliance approach represents the most efficient, cost-effective and reliable method of achieving compliance.

DDW and RWQCB Coordination

To address the above issues and facilitate interagency coordination, the team will coordinate and attend RWQCB-DDW meetings during the Phase I process where the draft Title 22 Engineering Report is developed and RWQCB permit requirements are clarified. Based on historic experience with DDW and the RWQCB, 90-minute meetings with DDW and RWQCB (proposed to be held at the Los Angeles RWQCB office or LVMWD office) should be sufficient to address regulatory questions, coordinate resolution of differences between DDW and RWQCB requirements, and support the step-by-step process under which the draft Title 22 Engineering Report is developed.

A total of six (6) meetings are proposed as part of the Phase I regulatory effort. In support of these meetings, this task includes preparation of a draft agenda and PowerPoint slide deck to be reviewed with JPA staff at a one-hour conference call approximately one week before each meeting. The team will finalize the agenda and slide deck based on (1) JPA input and priorities and (2) needs for identifying and resolving key regulatory issues. After the meetings, the team will prepare draft meeting notes which, after review and approval by the JPA, would be distributed to DDW and the RWQCB for their review and revision. After approval by DDW and the RWQCB, the meeting notes would represent a written record of the overall regulatory coordination, input, and feedback process. This written record would then form the basis for subsequent work in completing the Title 22 Engineering Report and presenting a concept proposal to the RWQCB.

Assumptions:

1. Six (6) joint meetings with DDW/RWQCB will be conducted.

Deliverables:

1. Regulatory Coordination Meeting draft/final Agendas (6).
2. Regulatory Coordination Meeting draft/final Minutes (6)

Task 5G.2 Title 22 Engineering Report

As part of Phase 1, the team will prepare initial draft and revised draft versions of the Title 22 Engineering Report pursuant to requirements established within Sections 60320.300 through 60320.330 and 64668.05 through 64668.30 in Title 22 of the California Code of Regulations.

A draft table of contents of the Title 22 Engineering Report will includes the following sections:

1. Project Overview
2. Project Proponents
    a. Agreement between Recycled Water Purveyor and Drinking Water Purveyor
3. Outreach
4. Regulatory Requirements
5. Source Wastewater
    a. Sewershed Description
    b. Raw Wastewater Characteristics
    c. Enhanced Source Control
6. Project Facilities
    a. Wastewater Collection system
    b. Tapia WRF
    c. Conveyance to AWPF
    d. AWPF
    e. Conveyance to Reservoir
    f. Las Virgenes Reservoir
    g. Westlake Drinking Water Treatment Plant
7. Tapia WRF Effluent – Quality and Quantity
8. Purified Water Quality
9. Pathogenic Microorganism Control
10. Chemical Control
11. Las Virgenes Reservoir
    a. Modeling Results
    b. Regulatory Limitations
    c. Proposed Operations
12. LVMWD Drinking Water Supply System
    a. Existing DDW Permits
    b. Sources of Supply
    c. Westlake Drinking Water Treatment Plant
        i. Existing Performance
        ii. Potential Impacts on Treatability
        iii. Modifications to DWTP and Operations
    d. Distribution System
        i. Description of Distribution System, including Interties with other Agencies
        ii. Existing System Quality and Monitoring Program
        iii. Corrosion Control and Microbial Stability after Project

13. Reliability – Failure Prevention and Response
14. Response and Notification Plan and Contingency Plan
15. Proposed Monitoring Program
    a. Sewershed
    b. Tapia WRF
    c. AWPF
    d. Reservoir
    e. Westlake DWTP
    f. Distribution System
16. Technical, Managerial and Financial Capacity of LVMWD and Project Partners
17. Operation Optimization Plan for AWPF and other Project Components
18. Appendices

The team will initially prepare an administrative draft of the Title 22 Engineering Report for JPA review. Following incorporation of JPA comments, the draft Engineering Report will be provided to DDW and RWQCB for review. Since the draft Engineering Report will be based on feedback received from DDW and the RWQCB as part of the regulatory coordination meetings, it is anticipated that the draft Engineering Report will address all significant DDW treatment and product water requirement. Upon receipt of additional DDW/RWQCB input after their review of the draft Title 22 Report, a revised draft Title 22 Report will be prepared that incorporates and addresses any feedback or subsequent input or comments from DDW and the RWQCB. By the time this revised Title 22 Report is submitted to DDW and the RWQCB at the completion of Phase I, all pertinent design issues will have been resolved and the project team (through Title 22 comments and coordination meeting feedback) will have resolved all significant issues that will affect project design. Completion of the Phase I effort will set the stage for Phase II, where DDW public hearings will be held, final revisions to the Title 22 Report will be prepared to address public comments and DDW responses, and DDW will be in a position to issue final project approval conditions.

Assumptions:

1. DDW Public hearings and finalization of the Title 22 Engineering Report will be completed as part of a separate Phase II contract.
2. The amended Drinking Water Supply Permit application will be completed as part of Phase II.
3. The Operations and Optimization Plan and detailed monitoring program will be completed as part of Phase II.

Deliverables:

1. Administrative Draft Title 22 Engineering Report
2. Draft Title 22 Engineering Report

Task 5G.3 Define RWQCB Requirements

As noted, RWQCB action on a NPDES permit for the Tapia WRF will be dependent on completion of CEQA/NEPA certification and finalization of project approval requirements recommended by DDW. Because it will not be possible to obtain a RWQCB NPDES permit within the Phase I period, Phase I tasks will be directed toward identifying permit requirements that will be recommended by RWQCB staff in Phase II when RWQCB staff develops draft permits for the consideration of their Board. Tasks proposed to achieve this goal include:

- Initial Coordination with RWQCB Staff. Initial coordination with RWQCB staff (which would be conducted independent of joint coordination meetings between the project team, DDW and the RWQCB) would target identifying key RWQCB issues and requirements, including (1) identifying key Basin narrative objectives and proposed means for ensuring compliance with the narrative objectives, (2) reviewing proposed approaches for ensuring compliance with numerical objectives, (3) reviewing key compliance issues associated with the California Toxic Rule (CTR) requirements established by EPA within 40 CFR 138, (4) discussing the potential for RWQCB designation of a CTR mixing zone and identifying information required for such RWQCB consideration, and (5) discussing reservoir monitoring and management needs to support the permit application process and ensure protection of beneficial uses. This initial RWQCB coordination would include up to three meetings or teleconferences with RWQCCB staff, and the development of draft and revised versions of meeting minutes for JPA and RWQCB review and comment.

- Development of Draft Concept Plan. Draft and final versions of a Concept Plan would be developed as part of the Regulatory Strategy and Coordination Task. The Concept Plan would present a brief summary of the proposed project and would outline the proposed basic approaches for achieving compliance with DDW requirements, Basin Plan narrative and numerical water quality objectives, and CTR water quality standards. As part of the Concept Plan task, an initial draft version of the Concept Plan would be developed and submitted to the JPA for comment and review. After inclusion of JPA comments, the revised Concept Plan would be presented to the RWQCB staff for review and comment. Development of the Concept Plan would involve an iterative coordination approach with the RWQCB and DDW. Goals of the draft Concept Plan include (1) fostering coordination among the District, RWQCB and DDW staff in planning the project, (2) soliciting RWQCB written feedback that clarifies the types of standards RWQCB staff would likely recommend to their Board as part of WDRs/NPDES permit, (3) providing a basis for incorporating RWQCB requirements into the draft Title 22 Engineering Report and (4) supporting future Phase II work which would include preparing and submitting a Report of Waste Discharge (RWD) in application for the Tapia WRF NPDES permit, along with associated Reservoir Monitoring and Management Plans. As part of summarizing how compliance with DDW and RWQCB requirements are to be achieved, the Concept Plan will also present the general approach and concepts that will comprise a proposed Reservoir Monitoring Plan and Reservoir Management Plan. The Reservoir Monitoring Plan (which would be developed and submitted to the RWQCB as part of the RWD submittal in Phase II) will present a coordinated approach for conducting reservoir monitoring that addresses how compliance with DDW requirements are to be achieved consistent with maintaining maximum flexibility in JPA operations and minimizing the potential for treatability-related issues. The Reservoir Management Plan would identify how reservoir monitoring data would be used to identify potential water quality issues or treatability problems. The Reservoir Management Plan would also identify operational or other corrective measures that would be available for implementation to address any such water quality or treatability issues. The Reservoir Management Plan would be developed and submitted to the RWQCB in Phase II either as part of the RWD or (at the discretion of the RWQCB) subsequent to adoption of the NPDES permit.
- Finalization of Concept Plan. After receipt of RWQCB comment on the Draft Concept Plan, a final version of the concept plan would be developed for JPA review and presentation to the RWQCB. The final Concept Plan would be submitted to the RWQCB along with correspondence that requests written RWQCB comment on the Concept Plan and the identification of probable NPDES requirements the RWQCB staff would recommend to their Board.

Assumptions:

1. In addition to overall regulatory coordination meetings conducted as noted above, three (3) meetings or teleconferences with RWQCB staff, including preparation of meeting support materials, and meeting minutes, will be conducted.
2. This proposal assumes that preparation of the Tapia WRF RWD will occur as part of Phase II work.

Deliverables:

1. Draft Concept Report
2. Final Concept Report

Value Added Services

The following ten Value Added Services were discussed in Section 2 of our proposal. We have provided a preliminary budgetary number for each of these items that the JPA may consider. During the Readiness Assessment of Task 2, we envision the JPA and Jacobs team will further define the requirements of each study, prioritize and set the schedule, and finalize the scope fee of additional studies.

- VA-1 Steady State Water Augmentation Study and Salinity Management Strategies using Digital Watershed
- VA-2 Improvements at Tapia WRF – MBR Feasibility
- VA-3 Natural Treatment System Feasibility for Brine Pretreatment
- VA-4 Reservoir Modeling and Recommendation for Air Curtain and Meeting >4 Month 100:1 Dilution
- VA-5 Integrated Operational Strategies for Westlake Filtration, Tapia WRF, and new AWTP
- VA-6 Develop Demonstration Testing Plan to Confirm NDMA Strategy/CTR Compliance
- VA-7 Evaluation of Raw and Treated Drinking Water Augmentation Options
- VA-8 Enhanced Source Control Plan
- VA-9 Dual Direction, Multi-Purpose Brine Pipeline Analysis
- VA-10 Investigate Alternative Emergency Discharge Options

Cost Proposal

The cost proposal is provided as a separate file and presents the cost to perform the services and a schedule of rates. Our labor rates will remain valid for the duration of the project, assuming a Fall 2020 start and a 2-year duration. Our project cost is based on the information contained in the RFP, the above scope of work, and our understanding of the JPA's needs. The scope of work is intended to serve as a starting point for discussions with the JPA, but we are also willing to use it as our contractual scope of work, if selected.

APPENDIX C
Quality Management

APPENDIX C

QUALITY MANAGEMENT

INTRODUCTION AND PURPOSE

The purpose of quality management is to establish a quality delivery system, monitor adherence of Program delivery by designers, construction managers, and contractors to established processes and procedures, and provide a framework for continuous improvement. We will develop a detailed Quality Management Plan to establish an approach for achieving work products and constructed facilities that comply with JPA expectations for quality.

We approach quality planning from two perspectives. First, we focus on delivering services that meet your expectations. We approach this by conducting a client expectation survey and periodic follow-up surveys, so we understand your expectations. We prepare an internal QA/QC plan that defines the level of checking and review for the deliverables associated with our OA/PgM contract. We also conduct internal quality audits to verify that we are following our QA/QC procedures. Second, we establish a quality assurance program to monitor and inspect the work being done by others to make sure it is meeting the requirements.

Program consultants and contractors are responsible for the quality of the work they perform. Therefore, the OA/PgM will perform quality assurance (QA) to confirm that appropriate quality control (QC) processes have been established by consultants and contractors, and that QC is completed in compliance with Program quality standards. The Program quality management plan (QMP) provides QA policy and guidance for work to be managed by the OA/PgM, including contracts with designers, construction managers, and construction contractors.

EXHIBIT C-1 Delivery Assurance Processes

QUALITY ASSURANCE AND CONTROL

Our comprehensive quality assurance program integrates all disciplines through planning checks to prevent rework delays by comprehensive oversight of work in progress and real-time activity tracking.

Our QA/QC team is comprised of our best and most seasoned discipline leads and industry experts. They support our discipline leads to provide consistency through thorough reviews with each design. Working in conjunction with our leads for conveyance, advanced water treatment, environmental, and brine management, our team encompasses all areas of our quality assurance program.

Included herein is an example quality management plan used in the San Mateo Clean Water Program where we are in a similar OA/PgM role.

Our quality objectives are:

- To achieve monthly targets for conducting robust reviews across our suite of projects;
- To deliver an effective internal audit program which meets quarterly and annual targets;
- To meet challenging targets for conducting Client Surveys, responding honestly to feedback received;
- To meet and exceed targets for delivering added value and financial savings to our Clients; and
- To meet and exceed targets for delivering efficient and sustainable solutions to our Clients.

QUALITY POLICY

It is our intent to provide QA for all contracts so that designs and constructed infrastructure accomplish the following:

- Comply with the quality and performance standards established for the Program;
- Comply with all federal, state, and local regulatory requirements; and
- Require the OA/PgM to perform its duties in accordance with the established procedures.

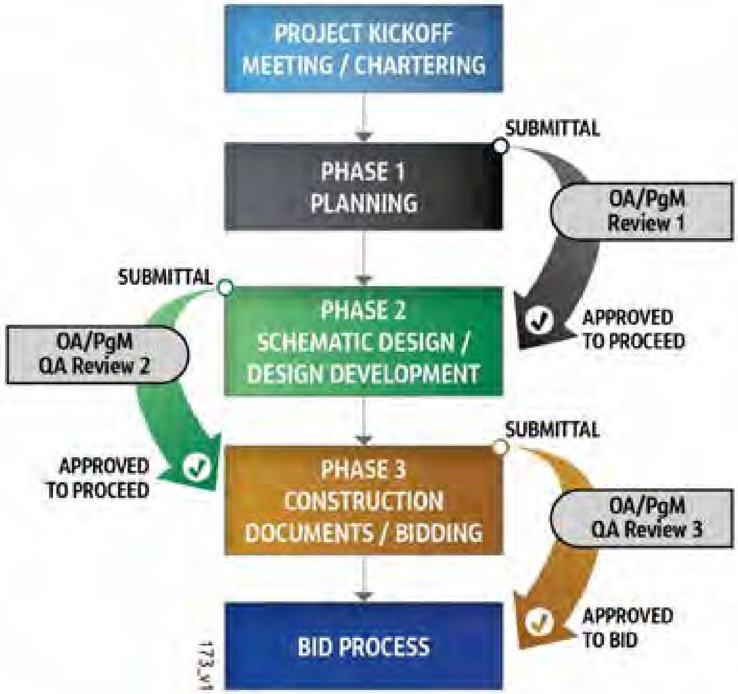
All Program activities will have QA processes and procedures performed and documented by individuals filling specific functional positions to comply with this Program QMP. An independent review should be completed for all Program deliverables. Lessons learned throughout the course of the Program will be documented and compiled in a database. This will help continually improve quality management procedures and quality throughout the Program.

QUALITY MANAGEMENT PROCESS

Quality is an integral part of the deliverable review processes. Quality of deliverables will be planned, executed, and monitored through the controlled document review cycle. The following are essential components of the deliverables review process:

- Deliverables list;
- Establishing distribution matrix (defining personnel responsible for the documents and support /review personnel);
- Document tracking sheet (set review date and track outstanding submittals);
- Periodic review of outstanding documents;
- Confirm project schedule has built-in review time for each submittal; and
- Identification of changes and the current revision status of documents.

EXHIBIT C-2 Deliverable Review Process



SAMPLE QUALITY MANAGEMENT PLAN

San Mateo Clean Water Program

Section 11
Quality Assurance Management

Contents

Section Page

Acronyms and Abbreviations

CAD	computer-aided drafting
CDPH	California Department of Public Health
CIP	Capital Improvement Plan
City	City of San Mateo
CRF	Comment Review Form
CQMP	Construction Quality Management Plan
O&M	operation and maintenance
PMP	Program Management Plan
PMT	Program Management Team
Program	Clean Water Program
QA	quality assurance
QC	quality control
QMP	Quality Management Plan
QRF	Quality Review Form
RFP	request for proposals

SECTION 11

Quality Management

11.1 Introduction and Purpose

This section presents the Program Quality Management Plan (QMP) and establishes quality assurance (QA) and processes for work on the City of San Mateo (City) Clean Water Program (Program or CWP). This Program QMP will allow the Program Management Team (PMT) to manage the Design Consultant, Construction Management Consultants, and contractor construction contracts to achieve work products and constructed facilities that comply with City and Program expectations for quality.

The purpose of quality management is to establish a quality delivery system, monitor adherence of Program delivery by designers, construction managers, and contractors to established processes and procedures, and provide a framework for continuous improvement.

Program consultants and contractors are responsible for the quality of the work they perform. Therefore, the PMT will perform QA to confirm that appropriate quality control (QC) processes have been established by consultants and contractors, and that QC is completed in compliance with Program quality standards. This Program QMP provides QA policy and guidance for work to be managed by the PMT, including contracts with designers, construction managers, and construction contractors.

11.1.1 Quality Policy

It is the PMT's intent to provide QA for all contracts so that designs and constructed infrastructure accomplish the following:

- Comply with the quality and performance standards established for the Program;
- Comply with all federal, state, and local regulatory requirements; and
- Require the entire PMT to perform its duties in accordance with the established procedures.

All Program activities will have QA processes and procedures performed and documented by individuals filling specific functional positions to comply with this Program QMP. An independent review should be completed for all Program deliverables. Lessons learned throughout the course of the Program will be documented and compiled in a database. This will help continually improve quality management procedures and quality throughout the Program.

11.1.2 Definitions

Audit: Systematic, independent, and documented process for obtaining supporting evidence and evaluating it objectively to determine the extent to which applicable criteria have been fulfilled.

Project: Unique process consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including the constraints of time, cost, and resources.

Quality: Degree to which a set of inherent characteristics fulfils requirements.

Quality control (QC): The set of procedures defined in the project QMP to ensure that the final product or service meets or exceeds the requirements of the client.

Quality assurance (QA): The act of confirming that QC was completed. A set of procedures intended to ensure that the product or service under development (before work is complete, as opposed to afterwards) meets the specified requirements.

11.2 Quality Management Organization

The PMT maintains overall responsibility for quality of the Program deliverables. Quality management roles and responsibilities are embedded within the PMT organization and are intended to achieve the following objectives:

- Establish and maintain the QA policy and objectives of the project QMP;
- Promote the quality policy and QA objectives throughout the project and increase awareness, motivation, and involvement;
- Empower members of the PMT to identify and report areas where opportunities to improve quality exist;
- Make certain that appropriate processes are implemented to enable requirements of the City and other agencies to be fulfilled and quality objectives to be achieved;
- Make sure that an effective and efficient quality management system is established, implemented, and maintained to achieve these quality objectives;
- Ensure the availability of necessary resources;
- Review the quality management system periodically;
- Decide on actions regarding quality policy and objectives; and
- Decide on actions for improvement of the quality management system.

11.2.1 PMT QMP Responsibilities

It is important that through leadership and actions the PMT create an environment that enables the QMP to be implemented effectively. In delivering the overall Program and individual projects, Program Managers and the PMT Quality Manager have responsibility for ensuring that all QA/QC activities are performed in accordance with this QMP. However, QC is the responsibility of the individual consultants under contract to the City to provide engineering, construction, and construction management services. The roles and responsibilities of these PMT members along with several other key staff are summarized in Table 11-1 below.

Table 11-1: PMT Quality Management Roles and Responsibilities
City of San Mateo Clean Water Program Management Plan

Role	Program Delivery Responsibilities	QMP Responsibilities
Program Manager (City)	Confirm successful Program delivery through routine communication with the City's leadership team.	Conduct periodic reviews to confirm that the QMP is being enforced.
Program Management Advisor	Overall responsibility for successful Program completion.	Establishes adequate budget for completing the plan; primary responsibility for implementation of the plan; primary interface with Program Manager.
Program Quality Assurance Manager	Ensure that auditing, feedback, and recommendations for improvement for quality management are systematically performed.	Supports QA process and provides as needed support to the Project Manager who has primary responsibility for ensuring that QC activities are performed in accordance with the consultant's QMP. Meets periodically as needed with the Program Management Advisor to discuss and assess the overall status of Program quality.

Table 11-1: PMT Quality Management Roles and Responsibilities
City of San Mateo Clean Water Program Management Plan

Role	Program Delivery Responsibilities	QMP Responsibilities
WWTP/CS Functional Lead	Supervises functional teams for successful delivery of Program projects in their function area.	Responsible for implementing the QMP in function area; endorsing staffing, monitoring, and supporting implementation of the plan, and documenting results. Works in partnership with the Program Management Advisor in resolving quality issues.
Project Manager/Project Quality Assurance Manager/City Engineering Staff	Supervises Consultant Project Manager regarding design scope, schedule, and budget.	Monitors design tasks to ensure Design Consultants are practicing continuous QC in accordance with the QMP. Reviews design deliverables for completeness and format prior to transmission to City. Assure adherence to QMP throughout construction of projects managed.
Construction Management Lead	Supervises Construction Managers and construction consultants regarding construction scope, schedule, change orders, and claims	Monitors construction key indicators of each project to ensure construction-related QC policies and procedures are being observed, and monitors the effectiveness of the project Construction Management team.
Permitting Lead	Manages environmental and permitting activities for the CWP.	Provides QA of all Program-related environmental documentation and permitting.

Requirements for the Design Consultant and contractor QMPs are described in more detail below.

11.2.2 Project Quality Management Plans

The best way to control Program risks and potential liability is to deliver high-quality projects. Successful completion of consultant and contractor work is central to overall project quality. It is essential that all consultants and contractors on the Program can successfully perform their work and that the planned level of management and review is sufficient to ensure the project is successful.

Minimum requirements and standards established for consultants and contractors for the Program include the following:

- Employs appropriate engineering staff;
- Ensures construction management professionals are properly certified and trained for their roles;
- Makes certain staff is experienced in the type of work to be performed;
- Utilizes appropriate design and construction management tools or other software required for project;
- Can perform work in accordance with specified standards, including those adopted by the City of San Mateo and state and federal agencies, e.g., standards for surveying;
- Has adequate staff to complete the work within the schedule; and
- Develops QC procedures for which the consultant or contractor is ultimately responsible.

The consultant and contractor capabilities will be evaluated based on the minimum requirements and standards established for the project. This evaluation of the consultant or contractor capabilities also should be part of the project risk assessment.

Each consultant and/or contractor will be required to develop a project-specific QMP that will address the processes, procedures, and personnel engaged in QC. The project QMPs will identify the following roles and responsibilities.

11.2.2.1 Consultant Roles and Responsibilities

All individuals working on the project will contribute to the overall quality of the final deliverables. As such, each individual is responsible for the quality of his or her work products, whether for internal or external use. Individuals should not rely on others to discover mistakes or omissions. Before a work product is assigned to someone else for review or use as part of the design or construction process, make sure it is complete and the quality is acceptable.

Overall project quality requirements will be met if each team member takes responsibility for the quality of his/her portion of the work.

Each project Design Consultant will be required to prepare and establish a working Project QMP that establishes roles, responsibilities, and procedures for QC. A sample Project QMP is included as Appendix A to this section. If desired, the PMT can provide separate requirements for consultant QMPs as part of request for proposals (RFPs) for design services. The Project QMP will identify personnel and responsibilities for quality for the project, including the Consultant Project Manager, Quality Manager, QC Reviewers, Senior Technology Consultants, and Discipline Leads.

11.2.2.2 Design Consultant Project Manager

The Consultant Project Manager will establish and monitor effective implementation of the quality requirements for the project. The PMT Project Manager will also track compliance with the Program requirements to a level appropriate for the risk and significance of the activity to the project. Following preparation of the Project QMP by the Design Consultant, the Project Manager will review and approve the document.

At each project milestone or deliverable, the Consultant Project Manager will be responsible for forwarding the QMP Process Certification that covers all applicable disciplines to the PMT PM. QMP Process Certification forms for each phase of the design will be reviewed and filed by the PMT Project Manager prior to approval to advance to the next phase of the contract. The PMT Project Manager will review the Comment Review Form (CRF) responses from the consultant for the given phase and if satisfactory, send to City reviewers so they know how their review comments were addressed. A sample QMP Process Certification form and sample CRF are included in Appendix A to this section.

11.2.2.3 Design Consultant Project Quality Manager

Each Project Consultant will identify a Project Quality Manager. For smaller projects, the Consultant Project Manager may also serve as the Quality Manager. The Quality Manager will have the following minimum responsibilities:

- Prepare the Project QMP.
- Assist the Project Manager by monitoring the activities of the QC Reviewers and Senior Technology Consultants to ensure that both continuous QC review and scheduled reviews occur in accordance with the Project QMP.
- Assist in the resolution of quality-related issues and inform the Project Manager of any unresolved issues. The Project Quality Manager will ensure that all QC review comments are adjudicated and complete the QMP Process Certification form.
- Approve updates to the Project QMP as necessary.
- Confirm that comments from City are addressed and responses are documented in the CRF.

11.2.2.4 Design Consultant Project QC Reviewers

Each Design Consultant will identify project QC Reviewers for all applicable design disciplines. The QC Reviewers will have the following minimum responsibilities:

- Be familiar with the project scope and staff by reviewing the project instructions and/or execution plan.
- Provide continual input to the project by assisting the Discipline Leads with developing concepts, evaluating/selecting alternatives, and making decisions, especially early in the project.
- Be proactive – meet and talk to the Consultant's Project Manager, Quality Control Manager, and Discipline Leads on a continual basis.
- Perform thorough, timely reviews in accordance with the project schedule. Present review comments clearly.
- Verify with the Discipline Lead that all required calculations and analysis have been prepared and checked.
- Meet with the Discipline Lead to discuss major review comments. Make sure that the Discipline Lead understands the comments and knows how to address them. Ensure that all major review comments are adjudicated and their resolution is documented and implemented.
- Lead and participate in the completion and adjudication of consultant Quality Review Form (QRF) comments.

11.2.2.5 Design Consultant Project Senior Technology Consultants

Senior Technology Consultants will be required and identified by each Design Consultant for each discipline to assist in developing and approving the project approach. Senior Technology Consultants will have the following minimum responsibilities:

- Review and approve the project approach. This should be completed before submittal of the schematic (30 percent) design.
- Review and approve any proposed changes to the project approach, e.g., changes due to City requests.
- Act as a resource to the Discipline Leads related to the project approach and its proper implementation during project execution.
- In conjunction with the Design Consultant Project QC Reviewer, ensure that adequate reviews are performed.

11.2.2.6 Design Consultant Discipline Leads

Design Consultant Discipline Leads are responsible for the design of a specific portion of the project. They have the primary responsibility for producing high-quality deliverables on schedule and within budget. Specific quality-related responsibilities include:

- Prepare documentation including calculations and analysis made that clearly define the basis for the recommended design.
- Ensure that all calculations are prepared and checked.
- Involve the Design Consultant Project QC Reviewer (and DC Senior Technology Consultant if applicable) in the analytical process on a continual basis. Solicit QC Reviewer input when developing concepts, evaluating/selecting alternatives, and making decisions, especially early in the project.
- Obtain Senior Technology Consultant input and approval for any proposed change to the project approach.
- Be proactive – meet or talk with the QC Reviewer on continual basis.
- After each formal QC review, meet with the Design Consultant QC Reviewer to review major comments and define how they will be addressed.

- Coordinate with the other Discipline Leads – communicate directly to make sure that each lead has the information he or she needs to perform their work.
- Assist Consultant Project Manager in addressing City comments and documenting the response in the CRF.

11.3 Quality Management Process

Quality is an integral part of the deliverable review processes. Quality of deliverables will be planned, executed, and monitored through the controlled document review cycle. The following are essential components of the deliverables review process:

- Deliverables list;
- Establishing distribution matrix (defining personnel responsible for the documents and support/ review personnel);
- Document tracking sheet (set review date and track outstanding submittals);
- Periodic review of outstanding documents;
- Confirm project schedule has built-in review time for each submittal; and
- Identification of changes and the current revision status of documents.

Figure 11-1 presents the design review process and Table 11-2 below provides a summary of the deliverable review process for the Program.

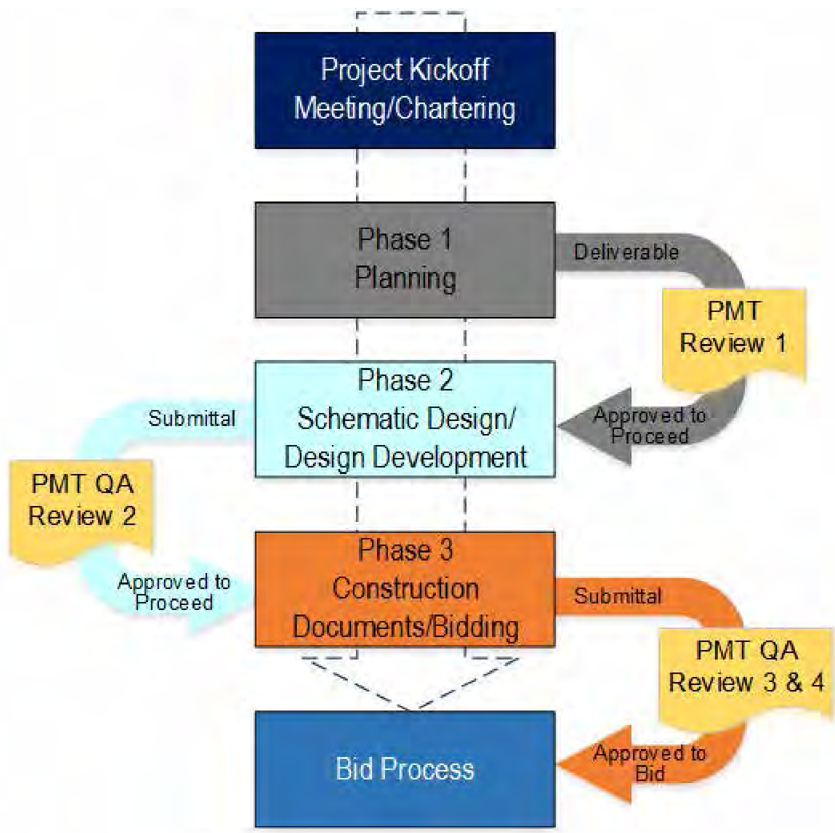


Figure 11-1: Design Review Process

Table 11-2: Deliverable Review Process
City of San Mateo Clean Water Program Management Plan

Type of Review	PMT/City Reviewer(s)	Consultant Reviewer(s)	Final Documentation of Review	Phase 1	Phase 2	Phase 3
Project Scope of Work	PMT Project Manager		Signed Contract	X		
Project Schedules	PMT Project Manager		Signed Contract	X		
Basis of Design Report	PMT Project Manager	DC PM/Senior Technical Consultant	PMT CRF	X	X	X
Calculations		DC PM/Senior Technical Consultant	Consultant QMP Process Certification	X	X	X
Design Discipline Reviews	PMT Project Manager	DC PM/Senior Technical Consultant	Engineering Standard Checklist; Consultant CRF	X	X	X
Design Documents (Plans & Specifications)	PMT Project Manager	DC PM/Senior Technical Consultant	Consultant QMP Process Certification; Consultant CRF		X	X
Permitting	PMT Project Manager/PMT Permitting Lead		Permit Review	X	X	X
Environmental Health & Safety	PMT Project Manager/City Operations & Maintenance (O&M) Staff		EH&S Checklist/FSI	X	X	X
Operability	City O&M Staff		PMT CRF		X	X
Cost Estimate	PMT Project Manager	DC PM	Consultant QMP Process Certification	X	X	X

After the Consultant QC process has been completed, all deliverables subject to review by the PMT will follow the QMP Review process:

1. The Consultant Project Manager will confirm that the all comments from the Consultant QC Reviewers and Senior Technology Consultants have been adjudicated. If so, the deliverable will be sent to the PMT Project Manager. If not, the deliverable will be redistributed to the Consultant Discipline Leads to address comments.
2. The PMT Project Manager will review the deliverable for conformance with the PMT QMP.
3. If the deliverable is in conformance with the PMT QMP, the PMT Project Manager will identify the appropriate members of the PMT to review the deliverable.
4. If the deliverable is not in conformance with the PMT QMP, the deliverable will be sent back to the Consultant Project Manager with the deficiencies identified.
5. PMT Review Team reviews the deliverable and sends the PMT CRF to the PMT Project Manager.
6. The PMT Project Manager will send the deliverable back with the PMT CRF to the Consultant Project Manager to address review comments.
7. If necessary, the PMT Project Manager and Consultant Project Manager will conduct a Project Review Meeting between the PMT Review Team and the Consultant's design team to discuss and adjudicate comments.
8. Consultant Project Manager sends deliverable with responses in PMT CRF to PMT Project Manager.

9. PMT Project Manager determines acceptability of the responses to CRF comments and whether PMT CRF comments have been adequately adjudicated/answered.
10. If the process is deemed acceptable, the deliverable will be approved for current phase. If not, the deliverable will be sent back to the Consultant Project Manager with deficiencies identified for additional revisions.

11.3.1 QMP Certifications

No deliverables will be considered complete until the Consultant QMP Process Certification has been completed and the PMT CRF has been accepted. Samples of these documents have been included in Appendix A at the end of the section.

11.3.1.1 Consultant QMP Process Certification

A signed Consultant QMP Process Certification must accompany each deliverable to the PMT. This form will be documentation that the deliverable has successfully passed the quality management process established by the Design Consultant prior to submission to the PMT. Deliverables not accompanied by the signed and adjudicated Consultant QRF will be returned to the consultant and not be considered by the PMT until the completed certification is provided.

At minimum, the QMP Process certification must have the name of the project, the phase the project is under, the date, and the names of the QC Reviewers and Senior Technical Consultants with their signatures.

11.3.1.2 PMT CRF

The PMT will also review the deliverables using the PMT CRF. The PMT CRF will be completed by each PMT reviewer as required by the PMT Project Manager with input from the PMT Quality Manager. The PMT will consolidate the individual PMT QRFs from each reviewer into a single PMT CRF for distribution back to the Consultant Project Manager. All PMT CRF review comments must be adjudicated for all deliverables required for each phase of the project.

11.3.2 Establishing Milestones for Design QA/QC

QA/QC is an ongoing process that should be occurring constantly by the Design Consultant's Discipline Lead and QC Reviewer staff. At significant milestones as identified in the project scope of work and Consultant's Contract, the QA/QC process must be formalized. This will be documented by the PMT Project Manager using the certifications, checklists, or other approved methods.

Minimum milestones for QA/QC are at the end of each phase of the project.

11.3.3 Acceptance of Project Design QA/QC

Design Consultant QC will not be considered acceptable by the PMT until Consultant and PMT CRFs have been deemed complete by the PMT Project Manager. All applicable checklists and deliverables must be considered complete by the PMT Project Manager.

If there are a significant number of review comments on either the PMT CRF, the project QC process will be further evaluated by the PMT Project Manager and Quality Manager. If the PMT Project Manager is not satisfied with the level of QA/QC occurring on a project, work may be halted and an audit conducted of the Consultant's QMP. The work stoppage may continue until the PMT Project Manager and Quality Manager are satisfied that project QA/QC deficiencies have been corrected.

11.3.4 Audit Process

To ensure that the QMP is being successfully implemented, and to provide a systematic means of identifying needs and opportunities for improvements to the QMP, internal QA audit activities will be performed monthly, or on an as-needed basis.

The PMT Quality Manager has the responsibility to ensure that auditing, feedback and recommendations for improvement are systematically performed. The PMT Quality Manager will support and report to the PMT Project Manager who has primary responsibility for ensuring that QC activities are performed in accordance with the Consultant QMP. The PMT Quality Manager will periodically meet with the PMT Program Management Advisor and other project team members, to discuss and assess the overall status of the Program and specifically the status of QMP implementation. As a routine part of each quality audit, the PMT Quality Manager will make spot checks on the degree to which QMP processes and procedures have been completed and documented. He/she will also make spot checks on the completeness and quality of the execution of individual quality review activities.

Following initial audit activities, the PMT Quality Manager will meet with the Program Manager and discuss the results and preliminary conclusions of the audit activity. This review will include consideration of the degree to which the PMT is accomplishing quality management relative to the goals established for the Program. The Program Manager and PMT Quality Manager will agree on any additional audit activity to be performed. This may include discussions with other PMT staff, and may involve focused audits by technical specialists if needed to determine the sufficiency of QMP results in certain technical areas.

The results of each audit will be reported in writing and discussed with the Program Manager. Included will be recommendations for action to be taken to correct for deficiencies or otherwise improve the QMP and the achievement of its objectives. The Program Manager is responsible for sharing the report with the Project Team, and for implementing appropriate recommendations. The report will be subsequently reviewed with the Program Director during the next periodic audit, and an assessment made of the extent to which recommendations were completed.

Project audits may include the following:

- Audit plan or checklist;
- Pre- and post-audit meetings;
- Defined criteria used as measurement of compliance;
- Audit observations with corrective or preventative actions; and
- Suggestions for improvements.

Experienced and qualified personnel trained in the auditing process will perform project audits. Auditors will be selected for their impartiality and will not be allowed to audit their own work.

The PMT Quality Manager and PMT Project Manager will establish the frequency of the QA audit at the beginning of each project. In addition to these periodic audits, Surveillance Audits will be performed when deviations are noted or suspected. The purpose of these Surveillance Audits will be to determine compliance with stated objectives, defined procedures, and project requirements. Surveillance Audits will also determine adequacy of procedures, competency, and knowledge of personnel as well as compliance with appropriate defined procedures.

11.3.5 Process for Inter-Project Coordination

To ensure that projects are well coordinated with each other, the Program Manager, PMT Quality Manager, PMT Construction Management Lead, and PMT Project Managers will meet monthly to review all active and planned projects. Overlaps, conflicts, and connections between projects will be identified and discussed by the entire team. Resolution of overlaps, conflicts, and connections between projects will follow the process described below:

1. The PMT Project Managers will initiate the resolution process by discussing proposed solutions with the appropriate team of the PMT Chief of Engineering, Engineering Manager, Consultant Senior Technical Consultants, Consultant Project Managers, and others as necessary.
2. A recommended solution from the PMT Project Managers will be forwarded to the Project Management Lead and Program Manager.
3. In conjunction with the Program Manager, the Project Delivery Manager will either approve the proposed solution or request that other solutions be considered.

11.3.6 Document Control

Documents created as part of the QMP will be properly stored and managed through SharePoint. Additional information regarding document management can be found in Section 12, *Document Management*, of the Program Management Plan (PMP). Quality management document control ensures the following:

- The pertinent information of appropriate documents is available to personnel where activities are essential to the effective functioning of the QMP.
- Invalid and/or obsolete documents are promptly removed from all points of issue or use, or otherwise assured against unintended use.
- Obsolete documents retained for historical reference are suitably identified and archived.
- A document history file will be maintained for the retention of project records generated during the document development process.

Document control includes defining the types of documents that must be controlled and the manner in which they will be controlled.

11.3.6.1 Quality Control (QC) Documents

The following types of documents are used in executing the QMP:

- Documents that provide consistent information, both internally and externally, about the QMP;
- Documents that describe how the QMP is applied to a specific product, or overall project;
- Documents stating requirements;
- Documents stating recommendations or suggestions;
- Documents that provide information about how to perform activities and processes consistently; and
- Documents that provide objective evidence of activities.

The QMP includes requirements for formal documentation of the quality processes. Specifically, the following forms and checklists are included by reference:

- CRF summarizing review comments and responses, and summarizing the issues that were addressed, the date they were resolved, and the action taken;
- Project checklists, e.g., design checklists or milestone checklists that are signed by the reviewer(s) and the appropriate project staff;
- Consultants QMP certification forms − pertinent quality records from subconsultants are an element of these data;

- Lessons learned; and
- Document master list.

All quality-related documents and records will be saved in a defined location within the PMT Document Management file management system as noted below:

- Project QMP and any updates;
- QC review documentation;
- Results of audits, including documentation of steps taken to address any deficiencies; and
- Other quality-related documents and records.

11.3.6.2 Control of Quality Records

The key procedures that will be used to manage the control of quality records are described below. This procedure is applicable to all documents and data pertinent to the implementation and effective operation of the QMP.

- **Maintenance of up-to-date documents at point of use.** A document master list will be maintained and stored in the document control system to ensure that the most current versions of documents are being used by the project team.
- **Control of documents of external origin.** The document master list will be reviewed quarterly by the PMT Project Delivery Manager and PMT Quality Manager to ensure that the most current version of applicable documents is being used by project team members**.**
- **Prevention of unintended use and identification of obsolete documents.** Invalid and/ or obsolete documents will be promptly removed from all points of issue or use, or otherwise assured against unintended use. Obsolete documents retained for historical reference will be suitably identified and archived.
- **PMT-suggested revisions to QMP documents.**
  - Any PMT member may suggest the need for a new document or a revision to an existing document. All such requests will be directed to the PMT Quality Manager.
  - The PMT Quality Manager will consider the request and, if deemed valid, coordinate the draft/review of the document.
  - Upon drafting/ reviewing the document by the PMT Quality Manager, it will be forwarded to the Program Manager for comment. The PMT Quality Manager will ensure the document's description, issue status, type, and control status are identified.
  - The document master will be kept by the PMT Quality Manager and filed in the appropriate location in the document control system.
  - The issue status of a document will be determined by comparing it to the appropriate list or Document Master List filed in the appropriate location in the document control system.

Quality records will be maintained to demonstrate conformance to specified requirements and the effective operation of the quality system. Quality records will be legible, stored electronically on in the document control Records Library, and consistent with the policy for scanning and electronic storage of all relevant project files.

11.4 Permit Quality Assurance (QA)

Quality for projects delivered under this Program include meeting and maintaining all federal, state, and local standards, and by obtaining the appropriate permits from all agencies. Meeting federal standards and obtaining required permits will be established for each project. Each project will adhere to the established Program Permitting Guideline found in the Program Delivery Portal (Portal).

11.5 Program Standards

The quality of all projects must also conform to established Program Standards, which cover the following:

- **PMT Standards and practices for design.** All projects conducted within the Program will follow established PMT standards for design. An *Engineering Design Guideline* will be provided to Design Consultants and these standards will be incorporated into all design work products, services, and processes, including specifications, computer-aided drafting (CAD) standards, forms, reports, etc.
- **Project Cost Estimates.** All project cost estimates will be performed in accordance with the Program's established Cost Estimating Guidelines. Each cost estimate will be subject to review by the PMT along with all other deliverables required for each project.

11.6 Construction Quality Management

A Construction Quality Management Plan (CQMP) will be prepared once PMT construction-phase roles and responsibilities are confirmed. A conceptual outline for the CQMP is as follows:

1. Roles and Responsibilities
    a. Program Construction Manager
    b. Construction Quality Manager
    c. Designer
    d. Project Manager
    e. Construction Manager
    f. Contractor
2. Quality Metrics
    a. Applicable Codes
        i. IBC, UPC, NEC, etc.
    b. Utility Company Standards
    c. Program-Specific Quality Standards and Guidelines
        i. Cost Estimating
        ii. Scope Changes
    d. QC Plan Outline Requirements
        i. Contractor Contract Language Requirements
    e. QA Plan for Construction Management
    f. QA Plan for Subcontract Work
    g. Operations and Maintenance (O&M) Capital Improvement Plan (CIP) Projects
3. Inspection
    a. Utility Company Inspections
        i. Who, What, When
    b. Specialty Inspections

4. Permit Compliance
    a. Permit Compliance Monitoring
        i. Who, What, When
    b. Permit Compliance Checklist
5. Commissioning
    a. Vendor and Manufacturer Services
    b. Installation
    c. Performance Testing
    d. Operations
6. Owner Training
    a. Equipment O&M
    b. Control System
7. Audits and Feedback
    a. Audit Protocol

11.7 Project Closeout

11.7.1 Continuous Improvement and Lessons Learned

Continuous improvement is an essential management and quality strategy in addressing client satisfaction, service and product delivery, compliance, and cost savings. The PMT plans and manages the processes necessary for the QMP's continuous improvement. The PMT facilitates the QMP continuous improvement by using the Quality Policy, objectives, audit results, analysis of data, and Client/Stakeholder Quality Management review.

The PMT will undertake the implementation of the quality process with continuous improvement by utilizing the specialists within each phase of the project. This approach ensures that a product is at its highest quality at the point of delivery, that any changes require minor amendments before delivery to the City, and that the specialists at each stage undertake the product QC at that time.

In addition to this ongoing assurance by the specialists delivering the products (deliverables), the Program will engage in the open solicitation of recommendations for improvement of all Program and project processes through employee referrals, recognition, and reward.

PMT members will engage in continuous improvement during all stages of QA, including the following:

- Requirements definition – this is the technical requirements and specifications for any deliverable that is supplied to the team.
- Acceptance criteria – this is the minimum standard for which any deliverable is required to achieve before it can be used in developing the project. These can be internal, external, statutory, or regulatory.
- Client/Stakeholder requirements – this is the requirement from the City and California Department of Public Health (CDPH) of the expected standards for acceptance.
- Deliverable processes – these are the processes and other procedures that are undertaken by the team during the development of each project.

- Phase checks – these are sets of checks that the deliverable undergoes when it moves through the PMT in its development, such as peer reviews, measurement inspections, product approvals, and QC checks.
- Process review and improvement – during the delivery, the work activity will undergo internal reviews of all processes.
- Communications and training – it is imperative that all improvements are communicated and training, as needed, made available to all parties both within and external to the project.
- Quality control – this is normally the final check that a deliverable undergoes before it is issued.

Continuous improvement at the project level is executed through audits, trend analysis best practices review, lessons learned, orientation, and training. These elements comprise the continuous improvement process. Management promotes a "no-fault" attitude and "no-blame" culture toward identifying deficiencies and necessary actions to effectively implement the continuous improvement process.

Risk management and mitigation activities are carried out to identify potential areas of concern before issues develop, and before they have a significant impact on the project or quality. Measures are established and documented to identify conditions adverse to quality and initiate corrective action. Programmatic and technical elements of projects are assessed and mitigation or preventative actions are taken so that the risk to achieving objectives is known and acceptable.

The PMT Quality Manager examines data obtained from audits, lessons learned, and continuous improvement actions periodically to detect trends. When several deficiencies of the same type are observed within a given time interval, or the number of deficiencies per time interval increases significantly, an adverse trend is reported. When an adverse trend is detected, the PMT Quality Manager analyzes it by examining the observed deficiencies and influencing factors, and then notifies the Responsible Manager so that appropriate continuous improvement feedback can be initiated. Continuous improvement may include changes or additions in processes, procedures, policies, or work practices. Following the rollout of the Continuous Improvement Feedback initiative, orientation and training are provided to the applicable personnel to ensure that the processes are understood and consistently implemented.

Appendix A
Samples

Sample Project QMP

San Mateo Clean Water Program

Project Quality Management Plan (QMP)

Overall San Mateo Clean Water Program Quality Objective: It is the Program's policy to deliver high quality products and services for the City of San Mateo by meeting and exceeding their expectations, and (b) satisfy Program policies, professional standards, and regulatory requirements. This commitment to quality applies to all program-related work, whether it is a service or design project activity.

San Mateo Clean Water Program Guiding Quality Principles:

1. All Quality Control will be done in accordance with Program Quality procedures.
2. The Project Manager is responsible for the quality of the project.
3. All projects have a quality management plan (QMP) that defines responsibilities, roles, tools, budget and schedule.
4. Quality is built-in from the beginning of the project through input and involvement of the appropriate senior technology consultants (STCs).
5. Each project team member is responsible for the quality of their own work - completeness, accuracy and applicability to project goals and needs.
6. All client deliverables must be reviewed by a qualified reviewer

PROJECT INFORMATION

PROJECT NO.: ________ CLIENT: City of San Mateo PROJECT TYPE: ________

PROJECT NAME: ________ PREPARED BY: ________ DATE: 12/16/2014

REVISED BY: ________ DATE: ________ REVISION NO. ________

OWNING OFFICE: ____ Subconsultant/Subcontractors: ____ OPERATIONS LEADER/PROJECT DELIVERY LEADER: ________

PROJECT FEE: $ ________ PROJECT QC NO.: ________ PROJECT QA/QC BUDGET: $ ________

KEY PROJECT TEAM MEMBERS			DELIVERABLE RESPONSIBILITIES		
TEAM ROLE	TEAM MEMBER	OFFICE/ FIRM	DELIVERABLES	INDIVIDUAL	OFFICE/ FIRM

PROJECT & SERVICES DESCRIPTION

CLIENT QUALITY PERCEPTION

RISK ASSESSMENT

Category	SubCategory	Risk Description	Risk Level	Mitigation Strategy	Comments

Separate Risk Assessment already completed; see attached.					

PROJECT QMP INFORMATION

PROJECT SENIOR TECHNICAL CONSULTANTS (STCs)

CORE TECHNOLOGY	SENIOR TECHNICAL CONSULTANT	BUDGET

PROJECT CORE TECHNOLOGIES

☐	Agricultural Services	☐	Program Controls
☐	Air Quality/Odor Control and Safety Management	☐	Program Management
☐	Biosolids	☐	Raw Water Collection and Transmission
☐	Desalination	☐	Wastewater and Wet Weather Collection
☐	Env Planning and Restoration	☐	Wastewater Treatment
☐	Facility Automation	☐	Water Distribution
☐	Financial Services	☐	Water Reuse
☐	Knowledge Management	☐	Water Supply
☐	Management Consulting	☐	Water Treatment
☐	Membrane Technologies	☐	Watershed Services
☐	Natural Treatment		

PROJECT QUALITY MANAGER (PQM):

Name: Doug Berschauer

OFFICE: PHX **50k in**

CH2M HILL DELIVERABLE QC REVIEWERS **SUPPLEMENTAL FORM PAGE**

DELIVERABLE DESCRIPTION & RESPONSIBILITY	QC REVIEWER	SCHEDULED DATE	QC PROJECT NUMBER	QC HOURS/ BUDGET	REVIEWER/PQM CERT.
Separate List of Deliverables prepared and attached.					

SUBCONSULTANT/SUBCONTRACTOR DELIVERABLE QC REVIEWERS **SUPPLEMENTAL FORM PAGE**

NAME	DELIVERABLE	QC REVIEWER	SCHEDULED DATE	QC PROJECT NUMBER	QC HOURS/ BUDGET	REVIEWER/PQM CERT.

Sample QMP Process Certification Form

CIP Program

QA/QC Process Certification

Project Number and Name

Deliverable Information:	
Project Phase/Task:	
Work Product:	
Document Name:	
Author(s):	
Document Version:	
Document Date:	

The following certifies that the aforementioned deliverable has been prepared and reviewed in accordance with Jacobs Quality Management Plan.

Scope of the Review/ Discipline	Reviewer	Signoff & Date
Deputy Public Works Director (City)		
Program Manager (City)		
Program Manager Advisor		
Deputy Program Manager Advisor		
Quality Manager/PDL		
Deputy PDL(s)		
Functional Lead		
Project Manager		
Technical Quality Control Reviewer(s)		

Sample Comment Review Form

Quality Review Form (QRF)

Client/Project:

Project No.:

Phase:

Work Product:

Date:

Category 1: Comment intended to identify significant system deficiencies for phase of review or major design flaws. Reviewers shall only use this category to include comments that truly are considered serious flaws or life safety issues. If continuous QC review is performed correctly there should be little or no need for this category.

Category 2: Comment to identify incorrect information found in the review. Comment may also be focused on lowering risk, or improving the quality of the work product and/or the ultimate application of the work product consistent with the contracted scope and quality management plan.

Category 3: Comment is editorial or otherwise minor in nature with little effort to implement. Intent of this category is not to spend time discussing these comments during final review discussions. Comment is non-controversial in nature and easily incorporated or may be discretionary with the Task Lead and/or PM.

Reviewers:

Return to:

File Name:

Review Comment Due Date:

Response Due Date:

Final Adjudication Due Date:

Comment Number	Reference Page or Sheet No.	Reviewer (QR)	Review Comment	CAT NO.	Responsible Responder	Response	Final Adjudication: "Done" if resolved, "ITF" if passed to Issue Tracking Form
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							

APPENDIX D
Insurance Certificate

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 06/02/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER LIC #0437153 1-212-948-1306
Marsh Risk & Insurance Services
CIRTS_Support@jacobs.com
633 W. Fifth Street

Los Angeles, CA 90071

CONTACT NAME:
PHONE (A/C, No, Ext): FAX (A/C, No): 1-212-948-1306
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : ACE AMER INS CO	22667
INSURER B :	
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
Jacobs Engineering Group Inc.

C/O Global Risk Management
1000 Wilshire Blvd., Suite 2100
Los Angeles, CA 90017

COVERAGES CERTIFICATE NUMBER: 59393958 REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE [X] OCCUR X CONTRACTUAL LIABILITY GEN'L AGGREGATE LIMIT APPLIES PER: [X] POLICY [ ] PRO-JECT [ ] LOC OTHER:			HDO G71565129	07/01/19	07/01/20	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 2,000,000 $ 500,000 $ 5,000 $ 2,000,000 $ 4,000,000 $ 2,000,000 $
A	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY / SCHEDULED AUTOS HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY			ISA H25295511	07/01/19	07/01/20	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $ $
	UMBRELLA LIAB [ ] OCCUR EXCESS LIAB [ ] CLAIMS-MADE DED RETENTION $						EACH OCCURRENCE AGGREGATE	$ $ $
A A A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) N If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		SCF C65892327 (WI) WCUC65892285 (AK,LA,OH,TX) WLR C65892248 (AOS)	07/01/19 07/01/19 07/01/19	07/01/20 07/01/20 07/01/20	X PER STATUTE / OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 1,000,000 $ 1,000,000 $ 1,000,000
A	PROFESSIONAL LIABILITY "CLAIMS MADE"			EON G21655065 010	07/01/19	07/01/20	PER CLAIM/PER AGG AGGREGATE DEFENSE INCLUDED	2,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CONTRACT MGR: Brian Skeith. RE: Pure Water Project. CONTRACT END DATE: 9/21/2021. SECTOR: Public. *$2,250,000 SIR FOR STATES OF: OHIO. Las Virgenes - Triunfo Joint Powers Authority, its directors, officials, officers, employees, agents, and volunteers are added as an additional insured for general liability & auto liability as respects the negligence of the insured in the performance of insured's services to cert holder under contract for captioned work. Coverage is primary and certificate holder's insurance is excess and non-contributory. Waiver of subrogation is hereby granted in favor of Las Virgenes - Triunfo Joint Powers Authority, its board members, officers, employees, agents, and volunteers for GL, AL and WC. *THIS IS A SAMPLE CERTIFICATE ONLY*. THE ACTUAL CERTIFICATE FOR THE PROPOSED PROJECT WILL

CERTIFICATE HOLDER

Las Virgenes - Triunfo Joint Powers Authority

4232 Las Virgenes Road

Calabasas, CA 91302

USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

SUPPLEMENT TO CERTIFICATE OF INSURANCE

DATE	06/02/2020

NAME OF INSURED: Jacobs Engineering Group Inc.

COMPLY WITH THE TERMS AND CONDITIONS NEGOTIATED IN THE FINAL CONTRACT, CONSISTENT WITH POLICY TERMS AND CONDITIONS

SUPP (10/00)

APPENDIX E
Consulting Agreement Response

APPENDIX E

STANDARD CONSULTANT AGREEMENT REVIEW

RFP Item IV: Minimum Qualifications

Jacobs recently signed agreements with Las Virgenes Municipal Water District including the Phase 2 White Paper Study Evaluating the Opportunity to Leverage Existing Infrastructure to Maximizes Stormwater and Water Resiliency Goals effective February 1, 2019. We have reviewed the Sample Agreement that was included with The Pure Water Project RFP issued by Las Virgenes-Triunfo JPA May 8, 2020 and find it to be generally acceptable and request that the indemnity, insurance and payment terms provisions be consistent with the prior referenced Contract with Las Virgenes MWD.

APPENDIX F

Example Project Management Plan (PMP)

APPENDIX F

PROGRAM MANAGEMENT PLAN

EXAMPLE FROM SAN MATEO

For your reference, we included a sample table of contents below of our web-based Program Management Plan for the San Mateo Clean Water Program and overview document.

Table of Contents – PMP Working Files

Table of Contents	Functional View	Forms and Templates
1. Overview 2. Program Mission-Vision-Goals-Chartering 3. Program Governance 4. Program Scope of Work 5. Business Process Mapping 6. Program Controls Management 7. Performance Monitoring and Reporting 8. Project Management Information System 9. Change Management 10. Risk Management 11. Quality Management 12. Document and Record Management 13. PMT Communications Management 14. Outreach 15. Procurement and Contract Management 16. Design Management and Value Engineering 17. Property Acquisition Management 18. Construction Management 19. Permitting and Regulatory Compliance 20. Utilities Coordination 21. Cost Estimating 22. Health and Safety Management Version 1: Complete PMP File	1. Program Administration 2. Project Management 3. Program Controls 4. Environmental and Permitting 5. Procurement 6. Construction Management 7. Public Outreach	1. Forms and Templates 2. Business Workflows 3. PMP Working Files

PMP

Section 1
Program Management Plan Overview

Contents

Section Page

Figure

Acronyms and Abbreviations

CDO	Cease and Desist Order
CIP	Capital Improvement Plan
City	City of San Mateo
CWP	Clean Water Program
EMID	Estero Municipal Improvement District
H&S	Health and Safety
NPDES	National Pollutant Discharge Elimination System
PMP	Program Management Plan
PMT	Program Management Team
Portal	Program Delivery Portal
Program	Clean Water Program
PXP	Project Execution Plan
ROW	right-of-way
RWQCB	Regional Water Quality Control Board
SSO	sanitary sewer overflow
WWTP	wastewater treatment plant

Program Management Plan Overview

1.1 Purpose

The purpose of the Program Management Plan (PMP) is to provide overall guidance to the Program Management Team (PMT) to successfully implement the City of San Mateo (City) Clean Water Program (Program or CWP). The PMT is comprised of the City and CH2M Team staff who will manage and deliver the Program using design consultants and construction contractors contracted directly by the City.

Programmatic delivery will utilize a broad and encompassing management approach to achieve benefits through delivery of identified projects. Projects include those defined in the City's ongoing Capital Improvement Plan (CIP), and projects to be defined by City Public Works. The PMP is intended to accomplish the following objectives:

- Establish the PMT organization and define the roles and responsibilities used in managing the Program.
- Identify approaches, develop strategies, and define requirements for all aspects of Program management, and flow down key aspects into execution-level documents (such as Project Execution Plans [PXPs] for individual Program projects).
- Define the Program implementation processes, including communication, management approaches, project execution, and overall Program controls and reporting.
- Generally define Program functions, including engineering, technology, design, schedule management, budget, risk management, change management, reporting, procurement, construction, land acquisition, permitting, resource management, health and safety, security, environmental compliance, legal, purchasing, contracting, and other management requirements.
- Provide specific sequential steps and tasks to be undertaken to ensure best practices are used in executing 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 projects, including Project Definition; Schematic Design; Design Development, Construction Document, and Bidding; Construction and Commissioning; and Closeout.

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

1.2 Program Background

The City collects and treats wastewater for San Mateo residents and businesses as well as surrounding communities, including the Foster City/Estero Municipal Improvement District (EMID), a portion of the County of San Mateo, the Town of Hillsborough, and Crystal Springs County Sanitation District. The wastewater treatment plant (WWTP), which is jointly owned by the City and Foster City/EMID, serves the City's collection system (approximately 230 miles of sanitary sewer and 26 lift stations) and the Foster City/EMID collection system (approximately 66 miles of sanitary sewer and 49 lift stations).

In March 2009, the Regional Water Quality Control Board (RWQCB) issued a Cease and Desist Order (CDO) to eliminate sanitary sewer overflows (SSOs) as well as corrective action to increase sewer capacity. In 2013, the WWTP was issued a new National Pollutant Discharge Elimination System (NPDES) permit that required a more holistic look at the WWTP and collection system. This requirement resulted in the development of an Integrated Wastewater Master Plan, including a Capital Improvement Program, addressing the necessary improvement to the City's collection system and the WWTP to replace aging infrastructure and increase capacity.

The City's Integrated Wastewater Master Plan is still in draft form, and has been used to initiate the Clean Water Program to implement the CIP as laid out in the plan. The objectives of the Program are more thoroughly discussed in Section 4, *Program Scope of Work*.

In 2015, the Master Plan was validated to develop an alternative at the WWTP to provide higher quality effluent to meet future regulatory requirements and provide recycled water. The collection system validation involved bundling projects to be implemented as five design and construction basins.

In June 2016, the Programmatic Environmental Impact Report was adopted by City Council and the in-system storage alternative was selected.

1.3 Development of Program Delivery Approaches

The Program is a complex set of bundled projects that must be delivered in a coordinated fashion to achieve the vision, mission, goals, and intended benefits for the City of San Mateo. A key to successful Program management is to translate the City's vision for the CWP and its corporate governance into a series of Program governance approaches, which are the foundation for Program execution and delivery approaches as shown on Figure 1-1.

Figure 1-1: Translating Vision and Governance to Delivery

1.4 PMP Structure

The PMP is intended to provide the PMT with the overall strategies and approaches used to execute the Program. The PMP is divided into sections that provide the overall strategy, responsibilities, and processes to execute the overall Program and its individual projects. The PMP was developed in recognition of the full range of Program stakeholders, including City management, departments, and partner agencies, the PMT, design consultants, contractors, and stakeholders involved in the overall delivery and execution of the Program such as regulatory and permit agencies, and citizens and outside stakeholder interest groups. The PMP sections are described below, including the general purpose and content of each:

Section 2, *Program Chartering*. Provides an overview of each of these fundamental foundations for Program delivery and success.

Section 3, *Program Governance*. Establishes a framework for management of the Program, including the organizational structure, policies, and procedures with which projects will be executed, meetings, issue resolution and escalation, and 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 that are essential to efficient delivery.

Section 6, *Program Controls Management*. Outlines tools, policies, and procedures the PMT will use to monitor and update project progress in order to manage and deliver the Program on time and on budget.

Section 7, *Performance Monitoring and Reporting*. Establishes performance criteria that will be monitored and reported throughout the Program life cycle, and defines reports that will be prepared for use by the PMT, City management, City Council, and external stakeholders.

Section 8, *Project Management Information System*. Describes the electronic Program Delivery Portal (Portal) and its components that will be used to store, manage, distribute, and display all 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.

Section 10, *Risk Management*. Identifies the processes and tools to predict, quantify, identify, track, mitigate, and manage risk for all Program elements.

Section 11, *Quality Management*. Outlines the processes and requirements to ensure 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, data capture for high-volume document digitization, storage, archiving, and sharing of files in a central site.

Section 13, PMT *Communications Management*. Defines communication protocols internal to the PMT and among the PMT, City departments, and outside agencies as necessary to implement Program projects.

Section 14, *Outreach*. Establishes the Program's approach to working with the external Program stakeholders, outlines key tools that will be used to manage stakeholder communication, key outreach challenges, and risks, and establishes the Program brand and core messages.

Section 15, *Procurement and Contract Management*. Establishes Program-specific requirements and procedures for equipment, materials, and consultant and contractor procurement.

Section 16, *Design Management and Value Engineering*. Provides a description of how the PMT will manage project design consultants and the Program value engineering process.

Section 17, *Property 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 taking 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, permit and regulatory agencies, and the public.

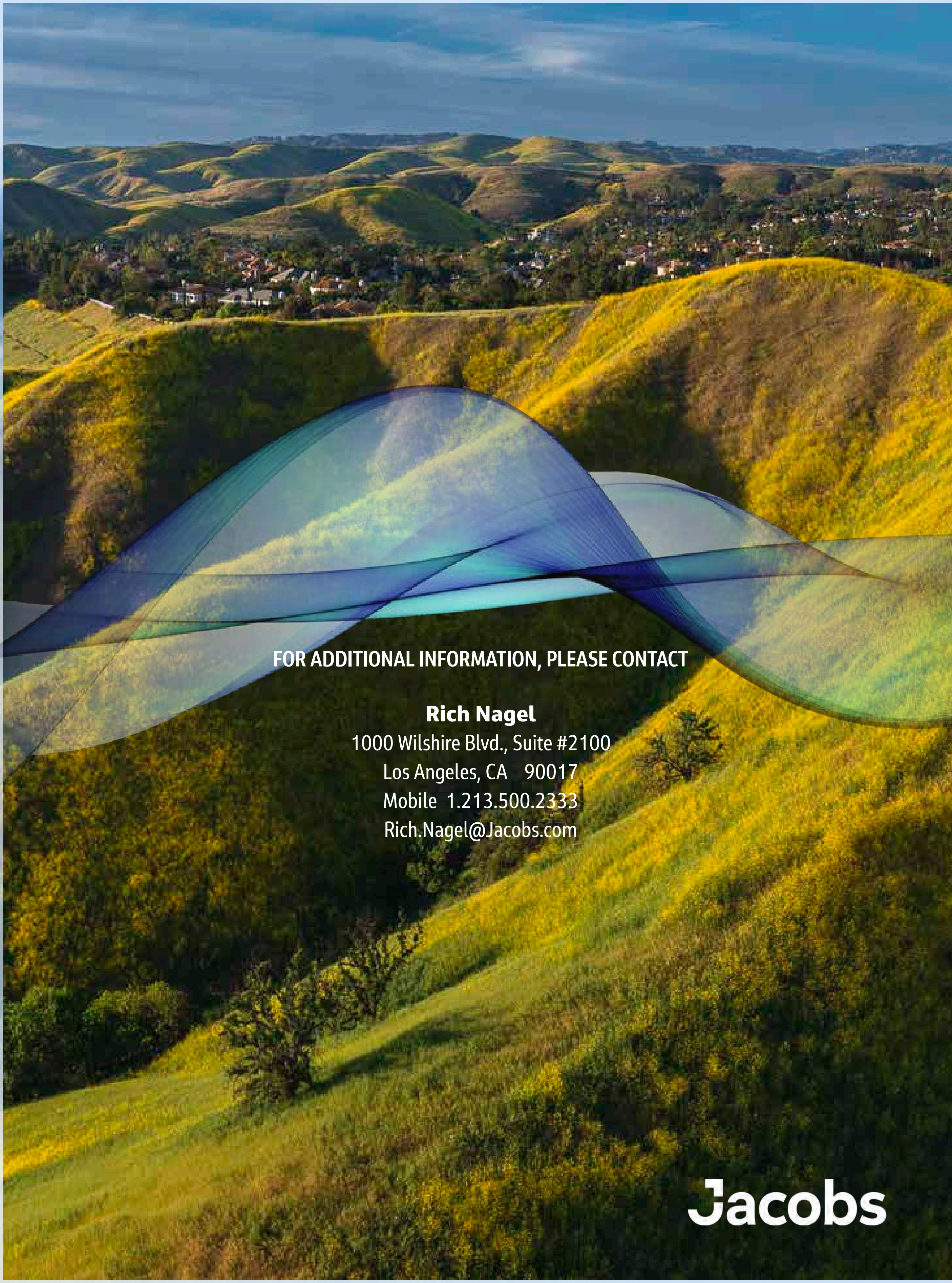
Section 19, *Permitting and Regulatory Compliance*. Establishes the roles, responsibilities, and procedures for PMT staff to identify the required permits for each Program project and apply for and remit payment for permits, and for timely permit acquisition and compliance. Also defines roles, responsibilities, and procedures for Program environmental and regulatory compliance.

Section 20, *Utilities Coordination*. Defines the role of the PMT in coordination with other City departments 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 health and safety of all PMT members throughout Program execution, and presents the Program Health and Safety (H&S) Policy Statement.

Chapters will be updated as necessary to ensure they remain current and address changes in Program implementation strategies, processes, and tools.



FOR ADDITIONAL INFORMATION, PLEASE CONTACT

Rich Nagel
1000 Wilshire Blvd., Suite #2100
Los Angeles, CA 90017
Mobile 1.213.500.2333
Rich.Nagel@Jacobs.com

Jacobs

An Integrated Partnership Committed to JPA's Pure Water Project

BRINGING YOUR WATER FULL CIRCLE

COST PROPOSAL FOR

PURE WATER PROJECT LAS VIRGENES-TRIUNFO

Owner's Advisor/Program Manager

PREPARED FOR

Las Virgenes-Triunfo Joint Powers Authority

JUNE 25, 2020

Jacobs

Jacobs

Challenging today.
Reinventing tomorrow.

FIRM
Jacobs
1000 Wilshire Blvd
Suite 2100
Los Angeles, CA 90017
213.538.1388

JACOBS PRINCIPAL
Rich Nagel
Rich.Nagel@jacobs.com
(213) 500-2333

June 25, 2020

Attn: Eric Schlageter, P.E.
Las Virgenes Municipal Water District
4232 Las Virgenes Road
Calabasas, CA 91302
ESchlageter@lvmwd.com

Subject: Cost Proposal for Owner's Advisor/Program Manager for Las Virgenes-Triunfo Pure Water Project

Dear Eric:

Jacobs Engineering Group Inc. is pleased to submit our fee proposal for the Las Virgenes-Triunfo JPA Pure Water Project. This fee proposal is associated with the detailed scope of work presented in Appendix B of our proposal.

The cost proposal table provides a summary of our proposed total hours, expenses and budget for the Jacobs Team. Please note that we have moved Task 6, Cost Estimating and Scheduling, in the RFP to Tasks 1 and 2. The value added options table identifies those additional studies we have introduced in our proposal to enhance the Pure Water Project, for the JPA's consideration.

We have attached standard billing rate tables that include workforce categories for our team and our subconsultants. These rates are in effect from 2020-2022.

We are excited about working with the Las Virgenes-Triunfo JPA on this important project and look forward to the opportunity to discuss our cost proposal with you in detail.

Should you have any questions regarding the costs, please contact either of us directly. Our contact information is below.

Regards,

Rich Nagel, PE
Vice President and Principal-in-Charge
213.500.2333
rich.nagel@jacobs.com

Jennifer Phillips, PE
Program Manager
480.377.6281
Jennifer.Phillips@jacobs.com

Jacobs Team Cost Proposal - Las Virgenes-Triunfo JPA - Owner's Advisor/Program Manager for the Pure Water Project

Task	Jacobs Labor Hours	Jacobs Labor Cost	Jacobs Expenses	Woodard & Curran Labor Hours	Woodard & Curran Labor Cost	Woodard & Curran Expenses	Other Subconsultant Hours	Other Subconsultant Labor Cost	Other Subconsultant Expense	Markup on All Subconsultants	Total Labor Hours	Total Labor Cost	Total Expenses	Total Cost
Task 1 - Program Management														
1A Program Administration	2,820	$ 734,100	$ 30,920	806	$ 197,200	$ 1,320	72	$ 13,320	$ 1,500	$ 10,667	3,698	$ 944,620	$ 44,407	$ 989,027
1B Program Controls and Reporting	2,424	$ 502,144	$ 21,090								2,424	$ 502,144	$ 21,090	$ 523,234
1C Program Quality	940	$ 260,420	$ 10,938				80	$ 16,000		$ 800	1,020	$ 276,420	$ 11,738	$ 288,158
1D Independent Cost Estimates	560	$ 112,240	$ 4,714								560	$ 112,240	$ 4,714	$ 116,954
Total - Task 1	**6,744**	**$ 1,608,904**	**$ 67,662**	**806**	**$ 197,200**	**$ 1,320**	**152**	**$ 29,320**	**$ 1,500**	**$ 11,467**	**7,702**	**$ 1,835,424**	**$ 81,949**	**$ 1,917,373**
Task 2 - Mobilization/Program Priorities, Drivers, and Risks														
2A Program Mobilization	1,606	$ 253,346	$ 10,641				600	$ 132,000		$ 6,600	2,206	$ 385,346	$ 17,241	$ 402,587
2B Readiness Assessment and Gap Evaluation	372	$ 90,768	$ 3,812	144	$ 38,976	$ 440	24	$ 4,440	$ 500	$ 2,218	540	$ 134,184	$ 6,970	$ 141,154
2C Comprehensive Program Implementation Plan	344	$ 78,528	$ 3,298								344	$ 78,528	$ 3,298	$ 81,826
2D Financial Planning, Modeling, and Funding	1,120	$ 264,160	$ 11,095								1,120	$ 264,160	$ 11,095	$ 275,255
2E Master Cost Loaded Schedule Development	240	$ 54,560	$ 2,292								240	$ 54,560	$ 2,292	$ 56,852
Total - Task 2	**3,682**	**$ 741,362**	**$ 31,137**	**144**	**$ 38,976**	**$ 440**	**624**	**$ 136,440**	**$ 500**	**$ 8,818**	**4,450**	**$ 916,778**	**$ 40,895**	**$ 957,673**
Task 3 - Project Delivery Methodology and Procurement Support														
3A Delivery Strategy Selection	284	$ 64,948	$ 2,728								284	$ 64,948	$ 2,728	$ 67,676
3B Procurement Support	1,396	$ 295,284	$ 12,402				40	$ 8,000		$ 400	1,436	$ 303,284	$ 12,802	$ 316,086
Total - Task 3	**1,680**	**$ 360,232**	**$ 15,130**				**40**	**$ 8,000**		**$ 400**	**1,720**	**$ 368,232**	**$ 15,530**	**$ 383,762**
Task 4 - Technical Studies, Drawings, and Specifications														
4A Tapia WRF Flow Equalization	1,036	$ 177,188	$ 7,442								1,036	$ 177,188	$ 7,442	$ 184,630
4B Capacity Review of Discharge Point 005	64	$ 13,320	$ 559	298	$ 59,910	$ 220				$ 3,007	362	$ 73,230	$ 3,786	$ 77,016
4C AWTP Design Criteria Package and Bridging Docs	4,316	$ 809,680	$ 34,007								4,316	$ 809,680	$ 34,007	$ 843,687
4D Major Pipeline Alignment Study	350	$ 72,458	$ 3,043	3,102	$ 598,480	$ 1,540				$ 30,001	3,452	$ 670,938	$ 34,584	$ 705,522
Total - Task 4	**5,766**	**$ 1,072,646**	**$ 45,051**	**3,400**	**$ 658,390**	**$ 1,760**				**$ 33,008**	**9,166**	**$ 1,731,036**	**$ 79,819**	**$ 1,810,855**
Task 5 - Environmental Studies and Regulatory Compliance														
5A-F Environmental Studies and CEQA	4,886	$ 950,548	$ 39,923								4,886	$ 950,548	$ 39,923	$ 990,471
5G Regulatory Coordination and Title 22 Report				1,342	$ 297,290	$ 1,540	440	$ 81,400	$ 2,500	$ 19,137	1,782	$ 378,690	$ 23,177	$ 401,867
Total - Task 5	**4,886**	**$ 950,548**	**$ 39,923**	**1,342**	**$ 297,290**	**$ 1,540**	**440**	**$ 81,400**	**$ 2,500**	**$ 19,137**	**6,668**	**$ 1,329,238**	**$ 63,100**	**$ 1,392,338**
TOTALS	**22,758**	**$ 4,733,692**	**$ 198,903**	**5,692**	**$ 1,191,856**	**$ 5,060**	**1,256**	**$ 255,160**	**$ 4,500**	**$ 72,829**	**29,706**	**$ 6,180,708**	**$ 281,292**	**$ 6,462,000**

Note: The task numbers listed in the cost proposal correspond to the tasks and work detailed in Appendix B, Scope of Work.

Jacobs

Jacobs Team Value Added Options - Las Virgenes-Triunfo JPA - Owner's Advisor/Program Manager for the Pure Water Project

Value Added Options	Total Estimate
VA1 - Steady State Water Augmentation Study & Salinity Management Strategies using Digital Watershed	$ 170,000
VA2 - Improvements at Tapia WRF- MBR Feasibility	$ 50,000
VA3 - Natural Treatment System Feasibility for Brine Pretreatment	$ 50,000
VA4 - Reservoir Modeling and Recommendation for Air Curtain and Meeting >4 mo 100:1 dilution	$ 75,000
VA5 - Integrated Operational Strategies for Westlake Filtration, Tapia, and new AWTP	$ 50,000
VA6- Develop Demonstration Plan Testing Plan to Confirm NDMA Strategy/CTR Compliance	$ 100,000
VA7 - Evaluation of Raw and Treated Drinking Water Augmentation Options	$ 50,000
VA8 - Enhanced Source Control Plan	$ 30,000
VA9 - Dual Direction, Multi-Purpose Brine Pipeline Analysis	$ 48,000
VA10 - Investigate Alternative Emergency Discharge Options	$ 32,000

Note: The Value Added Options are budgetary estimates that will be scoped and refined, if selected by the JPA during the Readiness Assessment.

Jacobs Engineering Group Inc.
Professionals and Technicians
2020-2022 Hourly Bill Rates

CLASSIFICATION	RATE
Principal Professional 2	$295
Program Manager	$285
Sr. Professional 2	$263
Sr. Professional 1	$225
Project Professional 2	$203
Project Professional 1	$191
Staff Professional 3	$177
Staff Professional 2	$156
Graphics	$140
Staff Professional 1	$127
CAD Technician	$128
Admin/Clerical	$110

EXPENSES

EXPENSE TYPE	Estimating Method	RATE
Auto Mileage	Travel	GSA Rate
Auto Rental	Travel	Actual
Other Travel	Travel	Actual
Equipment Rental	Operating Expense	Actual
Postage/Freight	Operating Expense	Actual
Reprographics	Outside Service	Actual
Subcontractors	Outside Service	Actual + 5%

2020 Standard Rates	
Labor Category	**2020 Rate**
Engineer 1 (E1) Scientist 1 (S1) Geologist 1 (G1) Planner 1 (P1) Technical Specialist 1 (TS1)	166
Engineer 2 (E2) Scientist 2 (S2) Geologist 2 (G2) Planner 2 (P2) Technical Specialist 2 (TS2)	192
Engineer 3 (E3) Scientist 3 (S3) Geologist 3 (G3) Planner 3 (P3) Technical Specialist 3 (TS3)	217
Project Engineer 1 (PE1) Project Specialist 1 (PS1) Project Geologist 1 (PG1) Project Planner 1 (PP1) Project Technical Specialist 1 (PTS1)	227
Project Engineer 2 (PE2) Project Specialist 2 (PS2) Project Geologist 2 (PG2) Project Planner 2 (PP2) Project Technical Specialist 2 (TS2)	242
Project Manager 1 (PM1) Technical Manager 1 (TM1)	257
Project Manager 2 (PM2) Technical Manager 2 (TM2)	273
Senior Project Manager (SPM) Senior Technical Manager (STM)	289
Senior Technical Practice Leader (STPL)	315
National Practice Leader (NPL) Strategic Business Unit Leader (SBUL)	320
Software Engineer 1 (SE1)	151
Software Engineer 2 (SE2)	170
Designer 1 (D1)	128
Designer 2 (D2)	159
Designer 3 (D3) Senior Software Developer (SSD)	164
Senior Designer (SD)	169
Project Assistant (PA)	113
Marketing Assistant (MA) Graphic Artist (GA)	121
Senior Accountant (SA) Senior Project Assistant Billing Manager (BM)	132
Marketing Manager (MM) Graphics Manager (GM)	153

Note: The individual hourly rates include salary, overhead and profit. Other direct costs (ODCs) such as reproduction, delivery, mileage (as allowed by IRS guidelines), and travel expenses will be billed at actual cost plus 10%. Subconsultants will be billed as actual cost plus 10%. Woodard & Curran, Inc., reserves the right to adjust its hourly rate structure at the beginning of each year for all ongoing contracts.

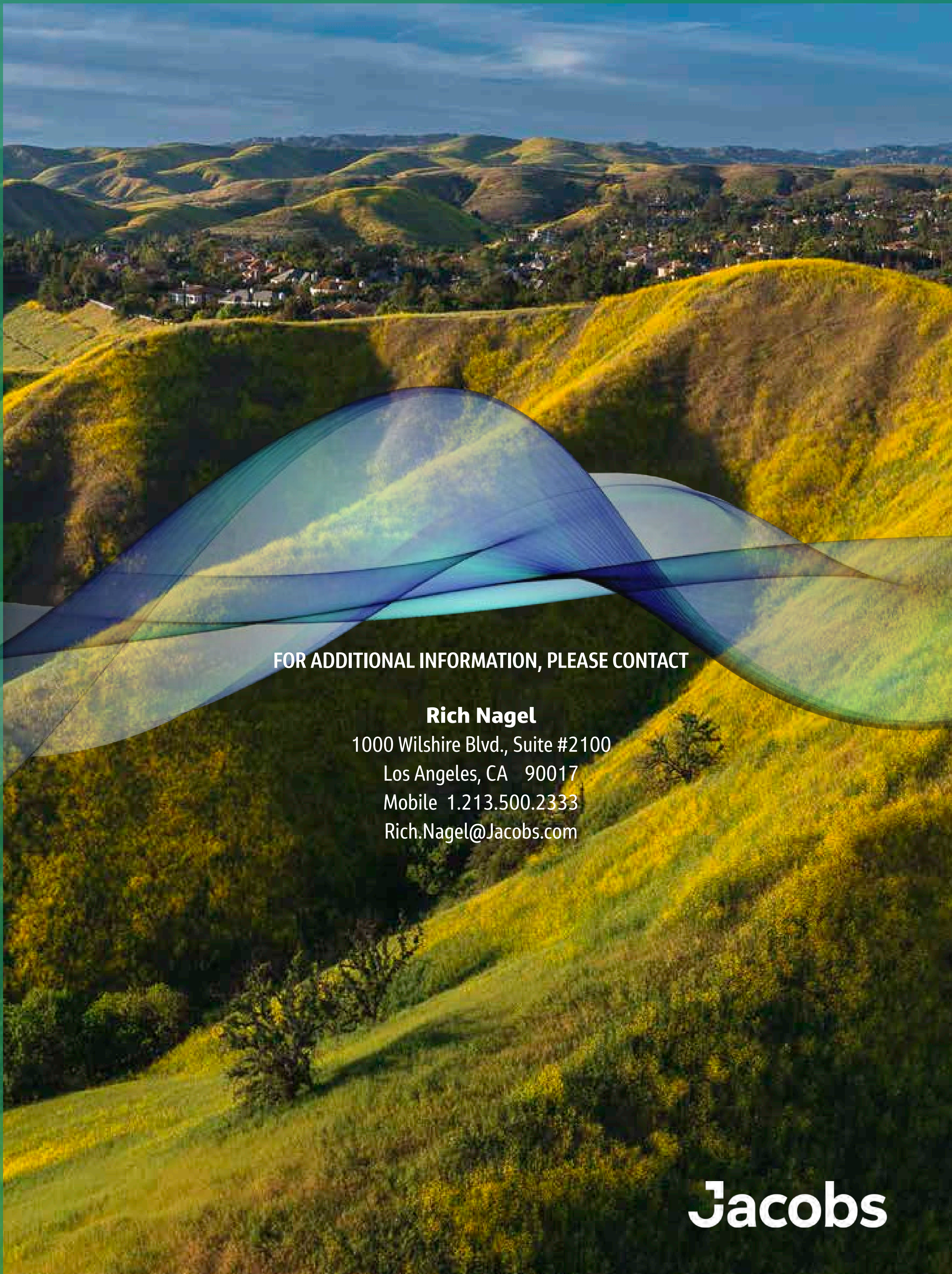
KATZ & ASSOCIATES, INC.

2020 HOURLY RATES

Labor Classification	2020 Hourly Rate*
Project Support	$ 80
Account Coordinator	$ 95
Account Assistant	$ 105
Graphic Design	$ 130
Account Executive I	$ 140
Account Executive II	$ 150
Art Director	$ 160
Senior Account Executive	$ 170
Account Supervisor	$ 185
Senior Account Supervisor	$ 200
Director	$ 220
Senior Director	$ 230
Vice President	$ 245
Executive Vice President / Senior Facilitator	$ 270
President	$ 285
CEO	$ 310

#####

**Rates are subject to a 5% annual escalation, beginning January 1, 2021.*



FOR ADDITIONAL INFORMATION, PLEASE CONTACT

Rich Nagel
1000 Wilshire Blvd., Suite #2100
Los Angeles, CA 90017
Mobile 1.213.500.2333
Rich.Nagel@Jacobs.com

Jacobs

September 8, 2020 JPA Board Meeting

TO: JPA Board of Directors

FROM: Engineering and External Affairs

Subject : Pure Water Project Las Virgenes-Triunfo: Regional Brine Management Study

SUMMARY:

On August 5, 2019, the JPA Board awarded a Regional Brine Management Study to Woodard & Curran and authorized the Administering Agent/General Manager to execute a multi-agency cooperative funding agreement for the work between the JPA, City of Thousand Oaks, Camrosa Water District and Calleguas Municipal Water District. The Regional Brine Management Study is a cooperative effort by the partnering agencies to jointly investigate regional solutions for the conveyance, treatment and disposal of brine discharges in the Malibu and Calleguas Creek Watersheds. Collectively, the partnering agencies recognize the potential mutual benefits of a regional brine management approach for discharges that will be generated by the Pure Water Project Las Virgenes-Triunfo and proposed local groundwater supply projects in the City of Thousand Oaks.

Woodard & Curran has completed the Regional Brine Management Study and incorporated input from each of the participating agencies. A summary of the study and its findings will be presented at the Board meeting. Staff recommends that the Board receive and file the Regional Brine Management Study.

RECOMMENDATION(S):

Receive and file the Regional Brine Management Study.

FISCAL IMPACT:

No

ITEM BUDGETED:

Yes

FINANCIAL IMPACT:

There is no financial impact associated with this action.

DISCUSSION:

The JPA desires a sustainable and cost-effective brine disposal option for the Pure Water Project Las Virgenes-Triunfo. Similarly, the City of Thousand Oaks seeks a sustainable and cost-effective brine disposal solution for its proposed groundwater supply projects and assurances that discharges from its Hill Canyon Treatment Plant (HCTP) would continue to meet regulatory requirements if it were to accept brine discharges into its sewer collection system. Camrosa Water District desires to maintain and possibly improve the quality of HCTP effluent that it diverts downstream at its Conejo Creek Diversion Project for agricultural purposes or potential future direct delivery. Calleguas Municipal Water District wishes to support local water supply reliability projects by leveraging the investment in its Salinity Management Pipeline (SMP), while ensuring that discharges do not negatively affect the operation of the facility or its on-going compliance with regulatory requirements.

The objective of the Regional Brine Management Study was to evaluate alternatives to the original Pure Water Project Las Virgenes-Triunfo Advanced Water Treatment Facility's reverse osmosis concentrate (brine) pipeline alignment to the Calleguas Salinity Management Pipeline (SMP). In addition, the study included exploring a variety of alternative brine management strategies using existing infrastructure for conveyance and disposal, including Thousand Oaks' sewer collection system and its Hill Canyon Treatment Plant (HCTP) for discharge to Conejo Creek.

The following evaluations were conducted as part of the study:

1. Assessment of the City of Thousand Oaks' sewer collection system and HCTP to verify adequate capacity.
2. Evaluation of potential treatment performance impacts to HCTP as a result of additional brine loading.
3. Assessment of water quality impacts associated with discharging blended HCTP effluent and Pure Water Project Las Virgenes-Triunfo concentrate to Conejo Creek.
4. Capability and impacts to Camrosa Water District's non-potable water system from receiving a combination of blended HCTP effluent and Pure Water Project Las Virgenes-Triunfo concentrate.

The study evaluated many alternatives for brine conveyance through the City of Thousand Oaks' existing sewer collection system. These alternatives involved the discharge of HCTP and Pure Water Project Las Virgenes-Triunfo brine blends to Conejo Creek to achieve NPDES compliance, as well as meet agriculture irrigation water quality targets. The solutions consisted of a combination of process and equipment modifications at HCTP, as well as constructing desalters of various capacities to meet water quality requirements.

Alternatively, the study evaluated brine disposal options through a proposed pipeline along the original alignment identified in the approved Title XVI Feasibility Study and along new alignments that provide a more direct path towards the HCTP, avoiding the Norwegian Grade that poses many constructability challenges.

The results of the study have concluded that only the options involving brine conveyance to Calleguas' Salinity Management Pipeline (SMP) through a new brine pipeline are cost-competitive. The alternative brine conveyance pipeline alignment to the SMP through the City of Thousand Oaks is slightly longer, and potentially more costly than the original Title XVI alignment, but provides the added regional benefit of brine disposal for the City of Thousands Oaks' brackish well desalters.

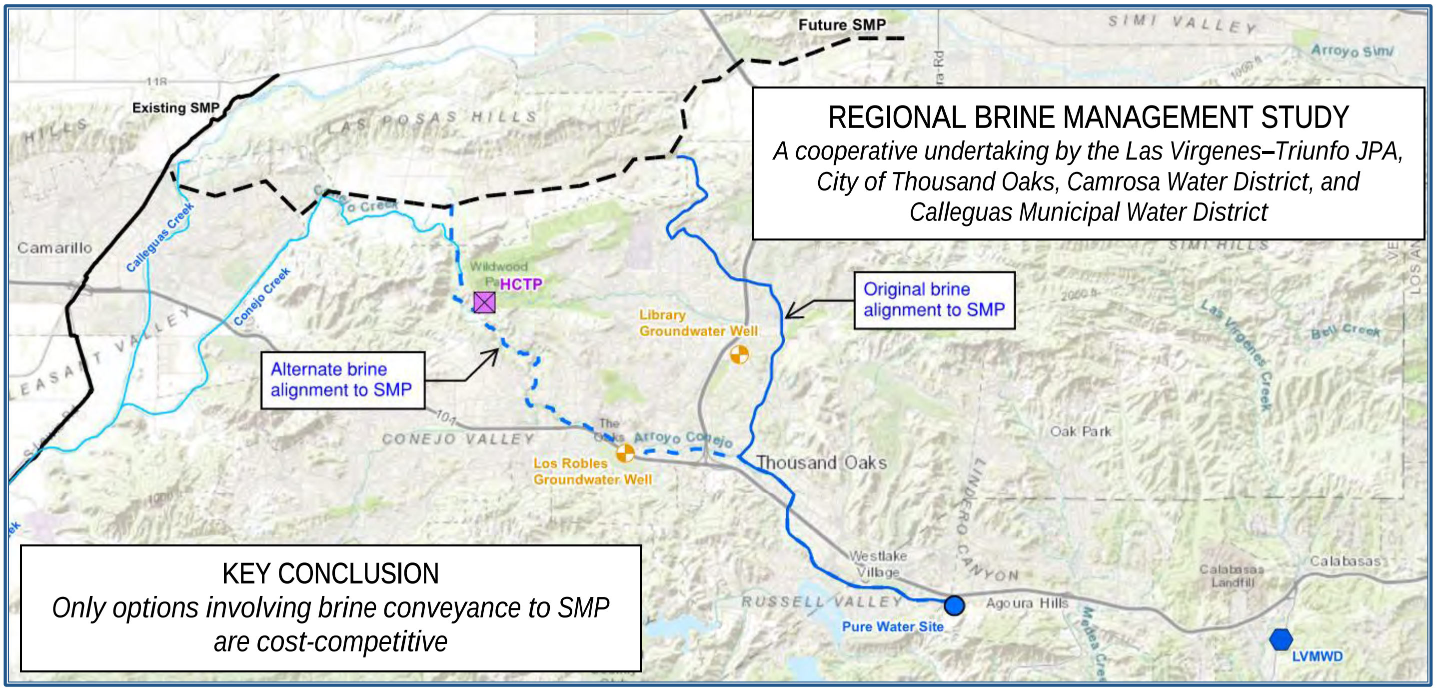
The results of the study will be further evaluated by the JPA's Pure Water Project Las Virgenes-Triunfo Program Manager/Owner's Advisor and additional discussions among the partnering agencies to identify cost-sharing opportunities and achieve common regional goals and solutions.

Prepared by: Eric Schlageter, P.E., Principal Engineer

ATTACHMENTS:

Regional Brine Management Study - Synopsis

Regional Brine Management Study - Complete



Regional Brine Management Study Objective: Evaluate alternatives to the original Pure Water AWPF RO concentrate (brine) conveyance alignment to the Salinity Management Pipeline (SMP). Evaluate alternative brine management strategies using existing infrastructure for conveyance including Thousand Oaks' sewer collection system and Hill Canyon Treatment Plant (HCTP) for NPDES discharge to Conejo Creek.

Evaluations Conducted:

- High-level capacity assessment of the Thousand Oaks sewer collection system and HCTP to verify adequate capacity
- Evaluation of HCTP treatment performance implications due to the addition of Pure Water brine into collections system
- Water quality assessment of discharging HCTP effluent/Pure Water brine blend into Conejo Creek
- Capability of and implications to Camrosa WD non-potable water system using HCTP effluent/Pure Water brine blend

Alternatives Evaluated:

- Alternatives involving discharge of HCTP/Pure Water brine blend to Conejo Creek:
  - Modify HCTP disinfection to UV to reduce chloride levels and achieve NPDES compliance
  - Construct HCTP desalter (MF/RO) to achieve NPDES compliance
  - Construct larger desalter to achieve NPDES compliance and agricultural irrigation water quality targets
  - Construct desalter to achieve NPDES compliance and convey lower TDS effluent to Camrosa non-potable system
  - Modify HCTP disinfection to UV and construct desalter to achieve NPDES compliance
  - Modify HCTP disinfection to UV and construct larger desalter to achieve agricultural irrigation water quality targets
- Alternatives involving direct Pure Water brine conveyance to SMP
  - Original Title XVI Feasibility Study Alignment
  - New alignment through Thousand Oaks, running adjacent to HCTP, connecting to SMP at Hill Canyon Drive

Preliminary Findings:

- Collection system would not surcharge with additional brine flows (additional modeling recommended if project proceeds)
- Brine addition would not hinder nitrification performance or settling in the HCTP activated sludge treatment process (additional process modeling recommended if project proceeds)
- Applying safety factors appropriate for this level of analysis, no alternatives incorporating Thousand Oaks infrastructure would be cost competitive to the original concept of direct conveyance of Pure Water brine to the SMP.
- Alternatives involving discharge of HCTP/Pure Water brine blend to Conejo Creek with desalter capacity at HCTP were not cost competitive with the original concept.
- Alternate brine conveyance alignment to SMP through Thousand Oaks would be slightly longer, and potentially more costly, than original Title XVI alignment, but with added regional benefits of brine disposal for Thousand Oaks brackish wells desalter.

Study Status:

- Conducting additional "sensitivity analysis" of alternatives
- Draft report due end of June 2020

Las Virgenes – Triunfo JPA

Calleguas Municipal Water District

Camrosa Water District

City of Thousand Oaks

Regional Brine Management Study

August 2020

PURE WATER PROJECT
LAS VIRGENES-TRIUNFO
Bringing Our Water Full Circle

CALLEGUAS MUNICIPAL WATER DISTRICT

CAMROSA WATER DISTRICT

City of Thousand Oaks

WOODARD & CURRAN

888 South Figueroa #1700
Los Angeles, California 90017
213.223.9460

woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

0011407.00

TABLE OF CONTENTS

SECTION PAGE NO.

TABLES

FIGURES

APPENDICES

1. INTRODUCTION

1.1 Study Background and Objectives

The Las Virgenes – Triunfo Joint Powers Authority (JPA), the City of Thousand Oaks, Camrosa Water District (CWD), and Calleguas Municipal Water District (CMWD) have formed a partnership to jointly address regional water supply resiliency and environmental stewardship while minimizing costs for their customers. This study was launched by the partnership to evaluate alternative regional reverse osmosis (RO) concentrate (brine) management strategies incorporating existing and new partner agency infrastructure that could minimize brine management costs and possibly augment local water supply while adhering to Malibu and Conejo Creek[1] Total Maximum Daily Load (TMDL) limits. Each of the partners has both shared and specific objectives.

The JPA is pursuing the Pure Water Project and desires to identify the most cost-effective strategy to manage brine from the planned AWTP (assumed for this study to be located at the Agoura Road site). Previous studies identified a preliminary alignment for the brine pipeline to the SMP. The JPA is interested in partnering with the City to either jointly convey brine flows to the SMP, or use City wastewater infrastructure to either discharge brine flows to Conejo Creek (via Hill Canyon Treatment Plant [HCTP] NPDES-permitted discharge) or, via an additional HCTP effluent desalter and associated brine pipeline, to the SMP.

The City wants to increase their use of local groundwater supplies and, to this end, completed a study in 2016 to identify existing and new wells that could be brought online. Two of these project concepts (Los Robles Golf Course Well [existing] and a brackish groundwater treatment facility [4 new wells]) involve RO treatment for salinity reduction, creating a potential partnership opportunity with the JPA. The City has investigated alternative groundwater treatment processes and the viability of discharging resultant brine discharges to its sanitary sewer system.

CWD is interested in maintaining, and potentially improving, the water quality they provide to agricultural users on their Non-Potable System (NPS). Currently, CWD diverts Conejo Creek flows just south of U.S. Route 101 to the NPS and supplements with treated imported water (delivered by CMWD) to reduce salinity for some agricultural customers. Since the HCTP discharges to Conejo Creek, any plant effluent salinity increase is a concern to CWD. CWD is, at a minimum, interested in maintaining the water quality that is drawn from Conejo Creek and in exploring ways to improve that water quality (i.e., potentially maintaining chloride concentrations below 110 mg/L), including evaluating a direct connection between an HCTP effluent desalter and the NPS. In addition, CWD has been diversifying their water supply portfolio and would like to explore the possibility of a groundwater augmentation (GWA) project.

CMWD is interested in supporting regional solutions that increase local water supplies. CMWD has built and operates the Salinity Management Pipeline (SMP) to support this goal.

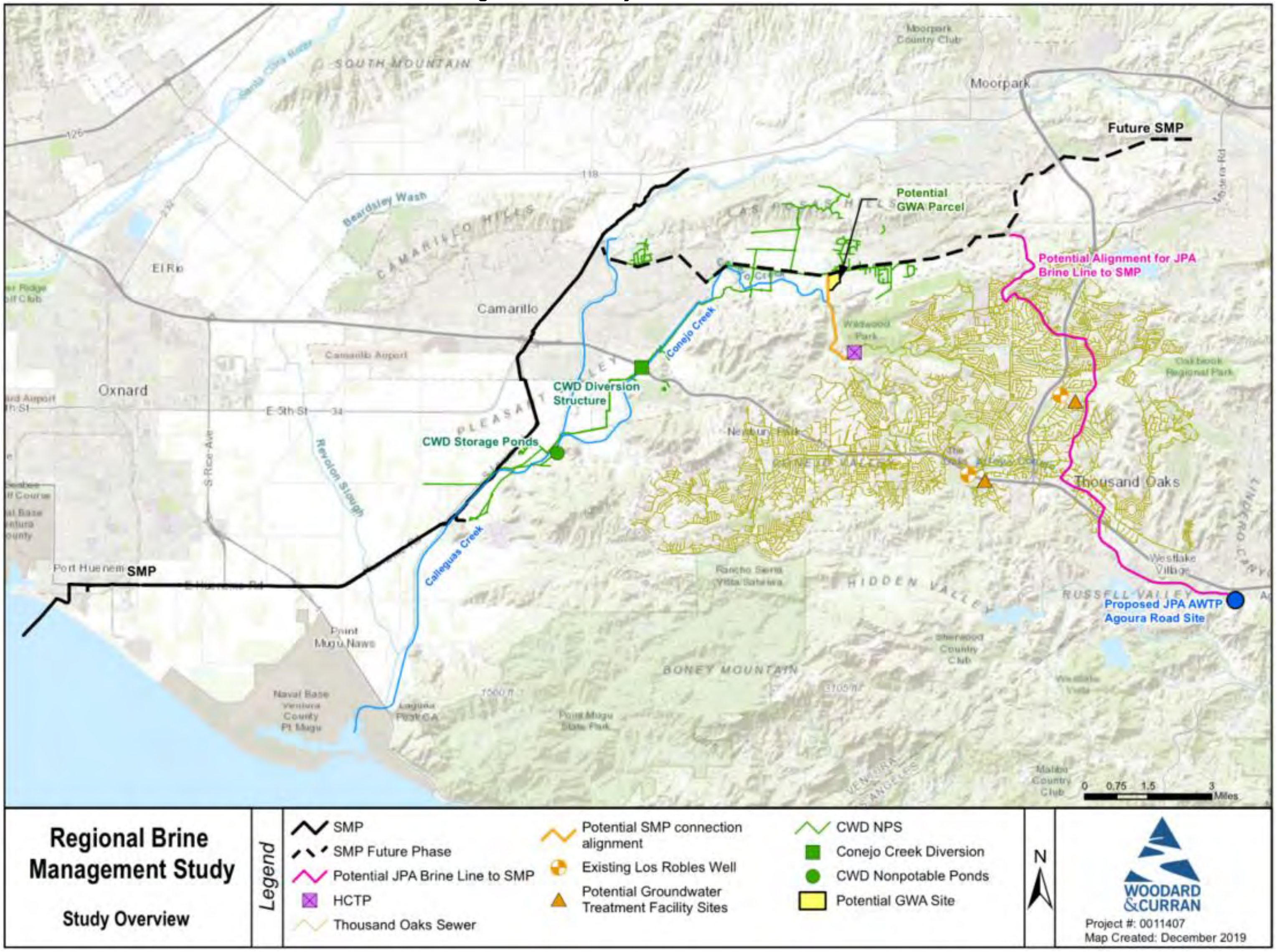
This study seeks to answer a key question: Given the current plan to convey Las Virgenes-Triunfo Pure Water Advanced Water Treatment Plant (AWTP) and City of Thousand Oaks impaired groundwater well treatment facility brines directly (using common pipelines where practical) to the SMP, is there an alternative regional brine management strategy incorporating existing partner agency infrastructure that could reduce overall brine management costs and potentially provide local water supply benefits?

Figure 1-1 illustrates an overview of the Study's facilities.

---

[1] The Malibu TMDL applies to LVMWD's Tapia Water Reclamation Facility effluent discharge and the Conejo Creek TMDL applies to the City's Hill Canyon Treatment Plant effluent discharge.

Figure 1-1: Study Overview



1.2 Study Approach

A key aspect of the approach to this study was the facilitated engagement of the partnering agencies throughout the study. Multiple workshops and web-based meetings were conducted to keep the partnering agencies informed and to draw on their institutional knowledge and experience.

Given the multiple brine sources and the myriad of facilities and systems that would be involved in a regional brine management strategy, it was decided at the outset to develop an Excel-based Water Quality Model to evaluate a wide range of strategies using City wastewater infrastructure to manage the brine flows.

The Water Quality Model was demonstrated to partnering agencies at the first workshop, and the group jointly identified alternatives to be investigated focusing on the following variables.

- Potential for assimilative capacity in the Conejo Creek (existing creek water quality as compared with TMDL limits) to accommodate added brine loading at HCTP
- Size of HCTP effluent desalter needed to meet HCTP NPDES requirements with added brine loading
- Size of HCTP effluent desalter needed to meet CWD NPS water quality requirements with added brine loading
- Amount of excess HCTP effluent (summer months) that could be used by CWD for groundwater augmentation (GWA).

A second workshop was held with partner agencies to review outcomes of the initial analysis. It was noted that streamflow records indicated insufficient flow in Conejo Creek to support a GWA project, and that a substantial chloride and sulfate loading was occurring at HCTP due to the sodium hypochlorite disinfection process and the associated dechlorination process that uses sodium bisulfite. Based on the initial findings, additional alternatives were investigated focusing on the following variables.

- Potential benefits of HCTP disinfection conversion from sodium hypochlorite to UV
- Direct delivery of HCTP effluent desalter product water to CWD NPS

In addition, the partner agencies requested consideration of the following additional scenarios during subsequent discussions.

- Early start scenarios (prior to Pure Water start-up)
  - Convey Los Robles Well untreated groundwater to City sanitary sewer (to assess impact on HCTP ability to meet NPDES and CWD NPS water quality requirements)
  - Convey Los Robles Well untreated groundwater to City sanitary sewer and transition HCTP to UV disinfection (to assess impact on HCTP ability to meet NPDES and CWD NPS water quality requirements)
  - Convey Los Robles groundwater treatment brine to the City sanitary sewer and transition HCTP to UV disinfection
- Convey City untreated groundwater to an expanded Pure Water AWTP, with conveyance of the combined brine flows directly to the SMP

It was determined during the scoping phase for this project that, in addition to the basic evaluation of alternatives, two supplemental studies were needed to fully vet the conceptual feasibility of alternatives using City wastewater infrastructure.

- Thousand Oaks Sanitary Sewer Capacity Assessment to model the effects of discharging brine flows from Pure Water and City groundwater treatment facilities to existing City backbone sewer interceptors and identify improvements required to accommodate a combination of all brine flows (Appendix A).
- HCTP Treatment Process Analysis to evaluate the effects on the HCTP activated sludge treatment and settling processes from the addition of all brine flows to HCTP influent (Appendix B).

After reviewing the evaluation results of the full array of alternatives, the partners determined that some NPDES permit mass loading capacity should be reserved for potential future development (20% of NPDES permit mass loadings Limits). The model was used to reevaluate all alternatives given these new mass loading Limits, referred to herein as "Target Loading Limits".

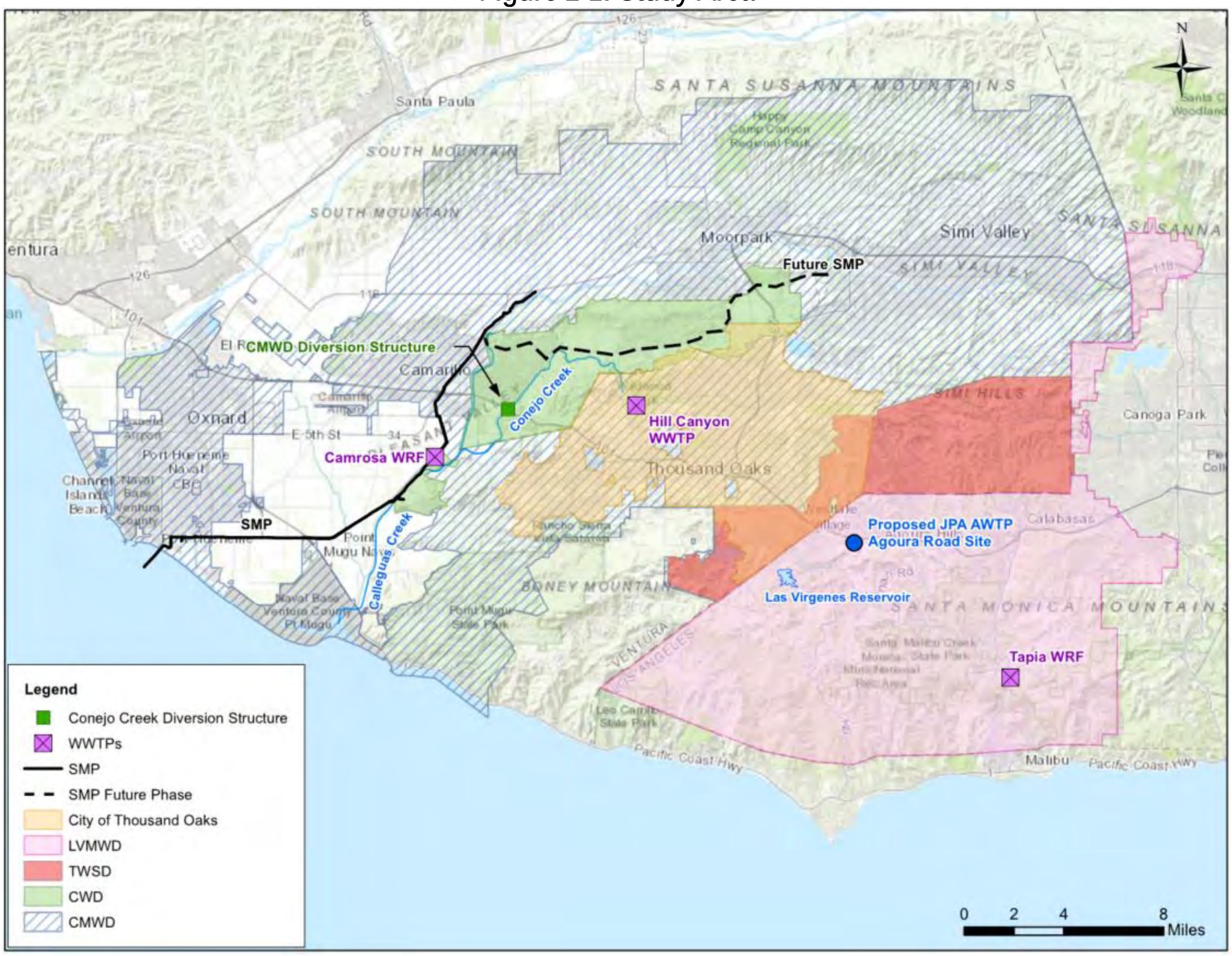
At a third workshop, it was determined that the HCTP desalter capacities required to meet NPDES permit limits or CWD NPS water quality requirements were excessive, and that a Desalter Facilities Assessment originally scoped would not be required. Instead, a sensitivity analysis was added to the scope of work to test the robustness of the original study assumptions and to investigate other strategies to make use of regional partner infrastructure.

2. STUDY SETTING

2.1 Study Area

The Study is led by the Las Virgenes-Triunfo JPA which includes the Las Virgenes Municipal Water District (LVMWD) and the Triunfo Water and Sanitation District (TWSD). The Study partners include the City, CMWD, and CWD. Figure 2-1 shows the service areas of all five study participants as described in the following sections.

Figure 2-1: Study Area



2.1.1 Las Virgenes - Triunfo JPA

The LVMWD and the TWSD established a JPA to construct, operate, and maintain a regional sewage collection and treatment system for the agencies' respective service areas, primarily within the Malibu Creek Watershed. The Las Virgenes-Triunfo JPA owns and operates the Tapia Water Reclamation Facility (WRF) and provides wastewater services for more than 30,000 people within western Los Angeles County and eastern Ventura County. The Tapia WRF has a NPDES surface discharge to Malibu Creek; however, discharge into Malibu Creek is strictly regulated and generally prohibited from April 15 to November 15. Malibu Creek TMDL's have prompted the Regional Water Quality Control Board (RWQCB) to issue a compliance schedule for Tapia WRF to meet strict nutrient limits year-round starting in 2030, prompting the JPA to pursue Pure Water.

LVMWD is in the Santa Monica Mountains and relies primarily on imported water purchased from the Metropolitan Water District of Southern California (MWD), but also has limited local water resources including surface runoff into the Las Virgenes Reservoir and groundwater supplies from the Thousand Oaks Area Basin which is only used to supplement the recycled water system (LVMWD, 2016). LVMWD provides extensive recycled water to its service area from the Tapia WRF.

The TWSD wastewater and recycled water service area is in eastern Ventura County including Oak Park, Lake Sherwood, Bell Canyon, Westlake Village, and the North Ranch portions of Thousand Oaks. TWSD provides potable water to more than 14,000 people in the community of Oak Park by purchasing imported water through CMWD (see Section 2.1.2).

The Las Virgenes-Triunfo JPA is interested in improving water supply reliability, drought resilience, and eliminating discharges to Malibu Creek through its Pure Water Project. This Pure Water project is discussed in Section 3.5.

2.1.2 Calleguas Municipal Water District

CMWD, a member agency of MWD, imports nearly all its water supply from the SWP that originates in northern California and is transported south via the California Aqueduct. Lying at the northwest tip of MWD's service area, CMWD receives treated water from the Jensen Treatment Plant in Granada Hills and uses its transmission facilities to deliver treated water to its customers. Should MWD's Jensen supply be interrupted, CMWD can also deliver water stored in Lake Bard and treated at the Lake Bard Water Filtration Plant located in the hills between Thousand Oaks and Simi Valley. Lake Bard can store 10,500 AF. Water can also be stored and subsequently extracted at the Las Posas Aquifer Storage and Recovery Wellfield.

CMWD is active in regional water planning, conservation, watershed protection and development of recycled water. CMWD participates in regional efforts to advance groundwater desalter and nitrate removal projects through the development of the SMP. CMWD has completed construction of the first 16.7 miles of the 35-mile SMP to manage increasing salt levels in the region's groundwater and surface water. Existing facilities that discharge to the SMP are the Port Hueneme Brackish Water Reclamation Facility and the Camrosa Round Mountain Desalter near California State University Channel Islands. Additional desalters are planned along the existing SMP in Camarillo and along the planned extensions to Moorpark and Simi Valley.

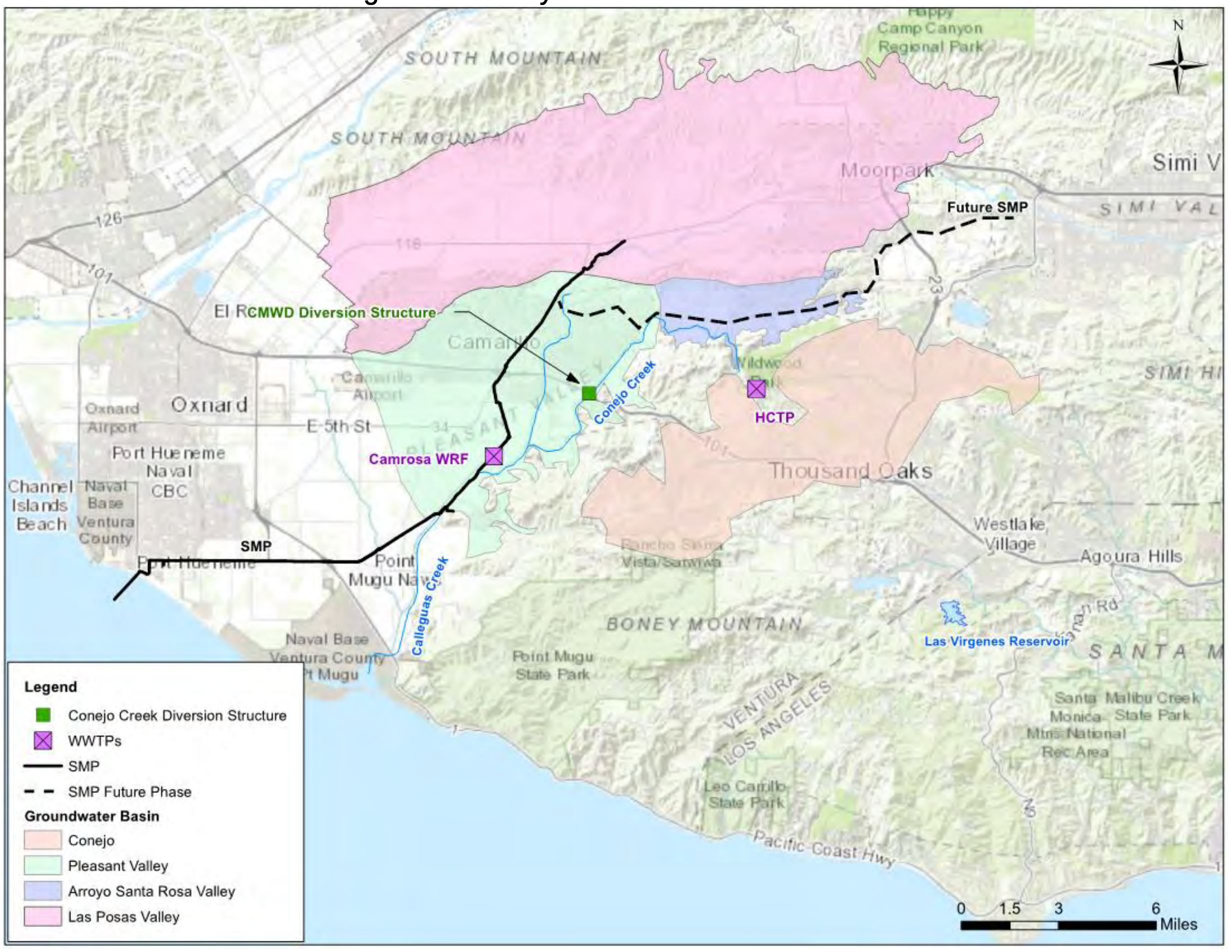
CMWD currently operates the SMP under an outfall discharge permit (NPDES No. CA0064521), Waste Discharge Requirements (R4-2019-0075), and requirements of the California Ocean Plan. Discharge to the Pacific Ocean through the ocean outfall at Port Hueneme Beach is limited to a maximum of 19.1 mgd. Under certain conditions, testing of SMP effluent for chronic toxicity to marine organisms is required. Due to the prevalence of copper in domestic water supplies and its toxicity to marine organisms, it is important to evaluate the effects that brine addition would have on SMP effluent quality, specifically relating to increased copper concentration.

2.1.3 City of Thousand Oaks

The City of Thousand Oaks (City) is a planned community located in eastern Ventura County that was incorporated in 1964. It encompasses 56 square miles and has a population of approximately 132,000. The City is nearly built-out and is focusing on infill development, redevelopment, and maintenance of aging infrastructure. The City provides both water and wastewater services. The City's domestic water demands are met solely by purchasing imported MWD water from CMWD (see Section 2.1.2).

Prior to the 1960's, local groundwater from the Conejo Valley Groundwater Basin was the City's sole source of water. The groundwater basin was over-drafted in the early 1960s but has since rebounded, presenting a viable and sustainable supplemental local water supply (see Figure 2-2). The groundwater supply presents a valuable resource that has been largely untapped after imported water became available; however, the groundwater quality is brackish and is unusable as a potable water supply without treatment.

Figure 2-2: Study Area: Groundwater Basins



To evaluate the viability of groundwater as a supplemental supply, a Groundwater and Reclaimed Water Study was conducted in 2016 to evaluate the safe yield for groundwater production from the Conejo Valley Groundwater Basin, determine potential uses as a reclaimed water supply, and develop local supply projects (CDM Smith, 2016). Another groundwater study was conducted in 2018 (Kennedy/Jenks Consultants, 2018). The studies resulted in two brackish groundwater treatment projects: 1) the Los Robles Treatment Facility, and 2) the Library Treatment Facility. These proposed brackish groundwater desalination projects would extract and treat groundwater from the existing Los Robles Golf Course well and one new well at the Library site, respectively. These brackish groundwater treatment projects are discussed further in Section 3.2.

Wastewater treatment for the City is provided by the Hill Canyon Treatment Plant (HCTP). Wastewater treatment processes at the HCTP include flow equalization, primary clarification, activated sludge process with nitrogen removal using the Modified Ludzak-Ettinger process, and secondary and tertiary filtration. The effluent meets advanced secondary/tertiary recycled water standards, rendering the water suitable for unrestricted reuse (Kennedy/Jenks, 2016).

Treated effluent from HCTP is discharged to Conejo Creek and is made available to other agencies for beneficial uses downstream. A project known as the Conejo Creek Diversion project provides a regional benefit of reduced groundwater pumping through in-lieu use of non-potable water. As part of this project, CWD diverts water from Conejo Creek for its non-potable water supply (see Section 2.1.4).

2.1.4 Camrosa Water District

CWD is in southern Ventura County in the vicinity of the cities of Camarillo, Simi Valley, Moorpark, and Thousand Oaks. CWD encompasses an area of about 31 miles and serves more than 30,000 people by providing wastewater, potable water, non-potable water, and recycled water services. Wastewater collection and recycled water services are provided in the central portion of CWD at the Camrosa WRF located near California State University Channel Islands. CWD's potable water supply is a blend of about half imported water, delivered by CMWD (see Section 2.1.2), and half groundwater from the perched aquifer and the Tierra Rejada, Arroyo Santa Rosa Valley, and Pleasant Valley groundwater basins.

CWD is guided by the principle of building self-reliance by increasing local resources while reducing dependence on imported water. CWD has two distinct non-potable water distribution systems; one that distributes tertiary-treated, Title-22 recycled water produced at the Camrosa Water Reclamation Facility. The other non-potable system delivers a blend of surface water from Conejo Creek and supplemental imported water. Due to significant differences in health code regulations and legal definitions between diverted surface water and Title-22 recycled water, the two systems are hydraulically separate; each has its own distribution system and storage facilities.

The diversion of surface water from Conejo Creek is shown on Figure 2-2. The diversion is located about 300 feet south of U.S. Route 101, two miles upstream of the confluence of Conejo Creek and Calleguas Creek, and about 10 miles from the Pacific Ocean. The diverted water is pumped to Camrosa's storage ponds and eventually distributed to CWD customers and the Pleasant Valley County Water District (PVCWD) for irrigation purposes. In the Santa Rosa Valley, the non-potable surface water system was augmented with groundwater from the Arroyo Santa Rosa Valley Groundwater Basin (Santa Rosa Basin), Figure 2-2. Based on recent conversations with CWD, the blend of groundwater from the Santa Rosa Basin has fluctuated over the years and since 2016 the non-potable agriculture water has been provided as a blend of Conejo Creek and imported water.

Areas that receive non-potable surface water include the County-owned property near California State University Channel Islands, farmland surrounding the Adolfo Industrial Park, farmland near the diversion structure and adjacent to the non-potable irrigation system into Santa Rosa Valley and the large agricultural area within the Santa Rosa Valley Greenbelt area.

CWD utilizes non-potable water whenever possible; but when the non-potable supply exceeds demand, excess water is sold to the neighboring PVCWD, a purely agricultural water district just to the west. For each acre-foot of non-potable surface water CWD sends to PVCWD, CWD receives one acre-foot of pumping allocation in the Pleasant Valley Basin. This exchange between CWD and PVCWD maximizes local resources to reduce dependence on imported water

3. FACILITIES

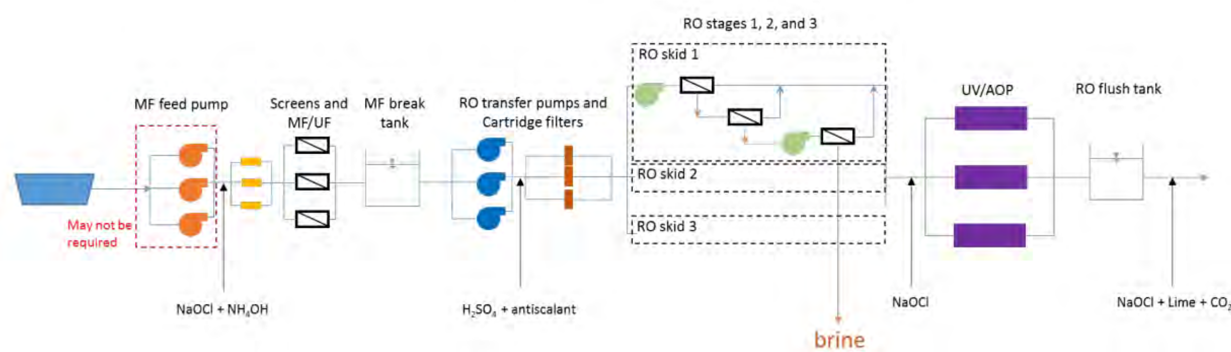
3.1 Las Virgenes - Triunfo JPA Pure Water Project

For many years, the Las Virgenes-Triunfo JPA has been working to resolve critical water resource management issues related to the seasonal imbalance of supply and demand for recycled water, constraints to discharging from the Tapia WRF, and the region's dependence on imported water supplies. The Tapia WRF is subject to stringent regulatory requirements that govern its operation (National Pollutant Discharge Elimination System Order No. R4-2017-0124). One of the key drivers for the Las Virgenes-Triunfo Pure Water Project is to achieve compliance with the Malibu Creek and Lagoon Sedimentation and Nutrients TMDL to Address Benthic and Community Impairments. This TMDL was a source of litigation for the JPA with the USEPA, which was settled through development of the Pure Water Project as a means of compliance (Las Virgenes-Triunfo JPA, 2020). Construction is planned to begin in 2025 with start-up in 2030.

Based on the terms of the NPDES Permit, the JPA is prohibited from discharging Tapia WRF treated effluent from April 15th to November 15th. Recognizing that recycled water is a valuable resource as a potable water supply source, the Pure Water Project implements potable reuse through surface water augmentation (SWA). Recycled water from Tapia WRF would be delivered to an AWTP, proposed to be located on Agoura Road (Figure 2-1). At the AWTP, advanced water treatment processes would purify the recycled water to augment imported water supplies stored in the Las Virgenes Reservoir (MWH, 2016). Water from the Las Virgenes Reservoir is treated and disinfected at Westlake Filtration Plant prior to entering the drinking water system. The Pure Water AWTP would produce 4,130 acre-feet per year (AFY) at buildout.

The Pure Water AWTP, currently planned for 6 mgd production capacity, would include microfiltration/ultrafiltration (MF/UF), 3-stage reverse osmosis (RO) and ultraviolet disinfection with an advanced oxidation process (AOP) with stabilization and chlorination (as-needed) prior to pumping to the Las Virgenes Reservoir, as shown in Figure 3-1 (MWH, 2016).

Figure 3-1: Pure Water AWTP Process Flow Diagram



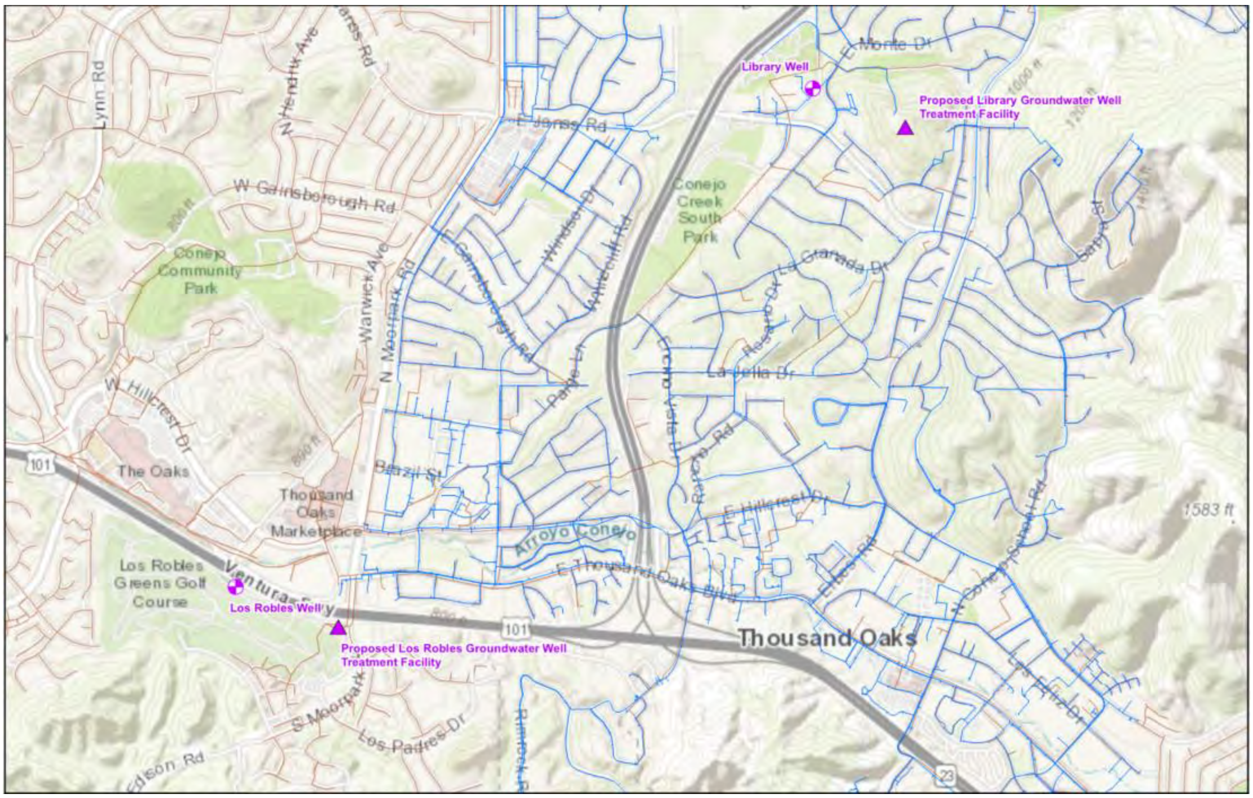
Source: *Recycled Water Seasonal Storage Basis of Design Report,* 2016

As originally planned, the AWTP operation would be seasonal, treating excess recycled water after existing non-potable demands are met. Based on historical recycled water demand the Pure Water Project would be operational between October and May during irrigation off-peak season (MWH, 2016). As a basis for this study, it is assumed that the AWTP would operate at full capacity. For a design capacity of 6 mgd, 1.1 mgd of brine would be produced assuming an 85 percent RO recovery factor (Kennedy/Jenks, 2018).

3.2 Thousand Oaks Brackish Groundwater

The City of Thousand Oaks is planning to develop a supply of irrigation and potable water from a local brackish groundwater supply in the Conejo Valley Groundwater Basin. The poor groundwater quality is attributed to elevated levels of salts, sulfates, and trace metals associated with the geology in the area (CDM Smith, 2016). The City is planning on treating the brackish groundwater supply from two existing wells using reverse osmosis (RO), which would require a disposal method for the brine. The two groundwater treatment facility locations are depicted in Figure 3-2.

Figure 3-2: Proposed Brackish Groundwater Treatment Facility Locations



The only current option for brine disposal is to the City of Thousand Oaks sewer system, where it would combine with raw sewage and be treated at the HCTP.

3.2.1 Los Robles Well

The planned Los Robles Treatment Facility would treat groundwater from a well located at the Los Robles Golf Course (Figure 3-2) and provide an irrigation supply for the Los Robles Golf Course and a new potable water source for the City (Kennedy/Jenks, 2018). The Los Robles Treatment Facility would treat brackish groundwater from the Los Robles Well using media filtration, RO, decarbonation, and disinfection.

For this Study, 30 years of groundwater quality data from the Los Robles Well and pilot study results for the Los Robles Well were reviewed and summarized in Table 3-1. The 90th percentile pilot study results were used in this Study to estimate brine quality.

Table 3-1: Los Robles Well Water Quality and Pilot Study Results

Constituent	Units	Design Raw Water Quality[1]	Pilot Lab Results 90th Percentile[2]
TDS	mg/L	1530	1516
Boron	mg/L	0.2	0.2
Sulfate	mg/L	569	603
Chloride	mg/L	190	195
Copper	ug/L	<0.01	0.00

Sources:

1. *Los Robles Golf Course Groundwater Utilization Project Final Initial Study*, 2018
2. Los Robles groundwater well pilot study data provided by Thousand Oaks January 16, 2020.

Table 3-2 provides a summary of the Los Robles Treatment Facility design flows, assuming a RO system recovery of 80 percent. Based on a well supply of 1000 AFY (0.89 mgd), a product water flow of 500 gpm (0.71 mgd) could be produced by the proposed treatment facility.

Table 3-2: Los Robles Treatment Facility Design Flows

Constituent	Flow (AFY)	Flow (mgd)
Supply from Well/ RO Feed [1]	1000	0.89
RO Permeate (Product Water)	800	0.71
Brine	200	0.18

Sources:

1. Personal communication with Thousand Oaks staff, LVMWD Regional Brine Management Study, Workshop #2, February 3, 2020.

3.2.2 Library Well

Library Well Treatment Facility is planned to be located near the existing Library Well at a City-owned open space as shown in Figure 3-2. The proposed Library Well Treatment Facility would treat brackish groundwater from the Library Well using media filtration, RO, and disinfection.

The design criteria for the Library Well Treatment Facility are summarized in Table 3-3. For the purposes of this Study, the pilot lab water quality from the Los Robles groundwater well was assumed for the Library Well.

Table 3-3: Library Groundwater Well Treatment Facility Design Flows

Constituent	Units	Flow
Supply from Well/ RO Feed [1]	AFY	500
RO Permeate (Product Water)	mgd	0.31
Brine	mgd	0.09

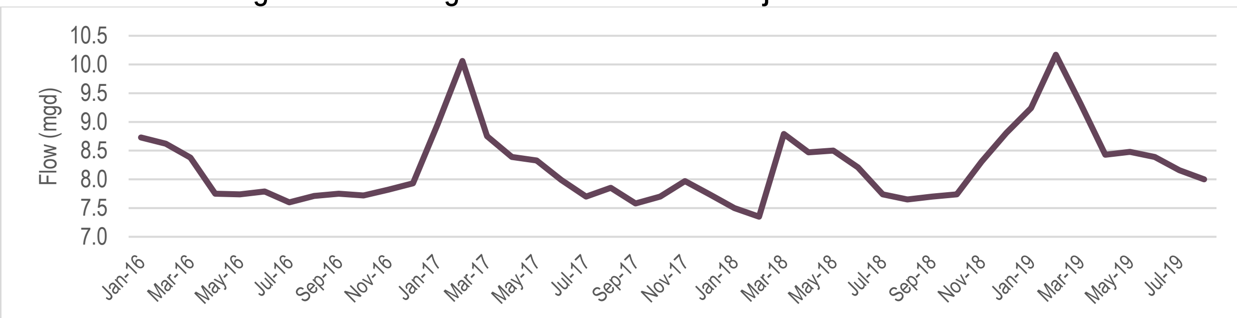
Sources:

1. Personal communication with Thousand Oaks staff, LVMWD Regional Brine Management Study, Workshop #2, February 3, 2020.

3.3 Hill Canyon Treatment Plant

Data for HCTP influent and effluent flow and water quality were provided by the City of Thousand Oaks and downloaded from the California Integrated Water Quality System (CIWQS) public reports on the SWRCB website. HCTP data from January 2016 to September 2019 were downloaded from the electronic self-monitoring reports which includes analytical and calculated data provided by NPDES permit holders. Monthly HCTP effluent flow is illustrated in **Figure 3-3**. Higher flows in winter months could be attributed to wet weather events and potential infiltration into the City's collection system. The City has begun to reline its collection system, which is expected to decrease flow into the HCTP once completed.

Figure 3-3: Average HCTP Effluent to Conejo Creek 2016 – 2019

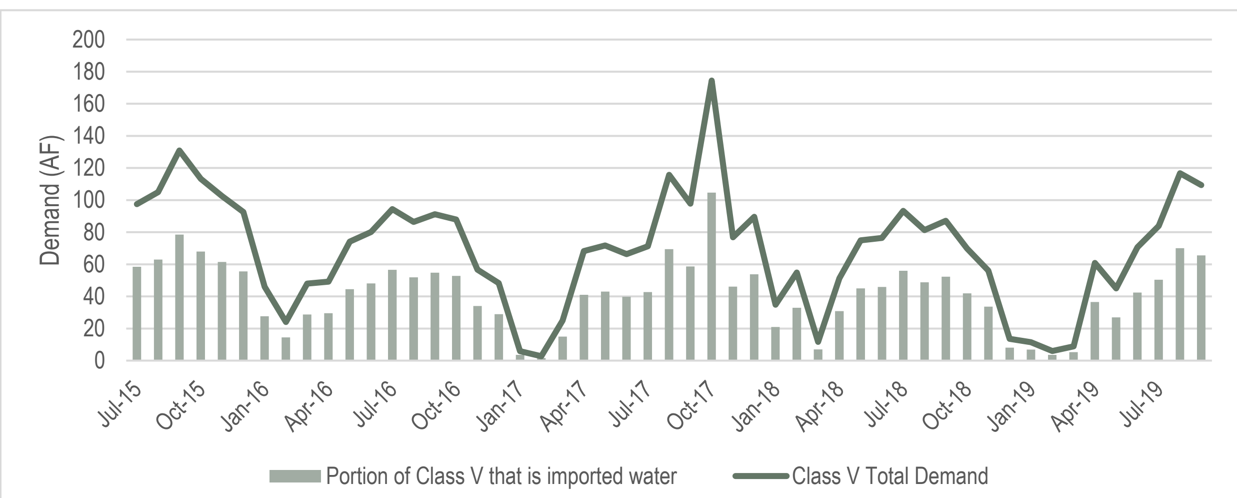


3.4 Camrosa Water District Non-Potable Water System (NPS)

CWD diverts water from Conejo Creek for its non-potable water system (NPS). CWD's NPS serves six different non-potable customer classes with Class V, the blended agriculture class, being the primary concern for this study. CWD has a chloride target of 110 mg/L (although CWD would like to provide 90 mg/L) for Class V service.

The average CWD NPS Class V customer demand from July 2015 to September 2019 was approximately 69 AF per month, with maximum demands occurring in summer and fall as shown in **Figure 3-4**. For service to Class V customers, the CWD imported water to diversion water blend ratio is currently 60/40. The maximum imported water used for blending with creek water is approximately 104 AF per month or 1.11 mgd.

Figure 3-4: Historical CWD NPS Class V – Blended Agriculture Demands

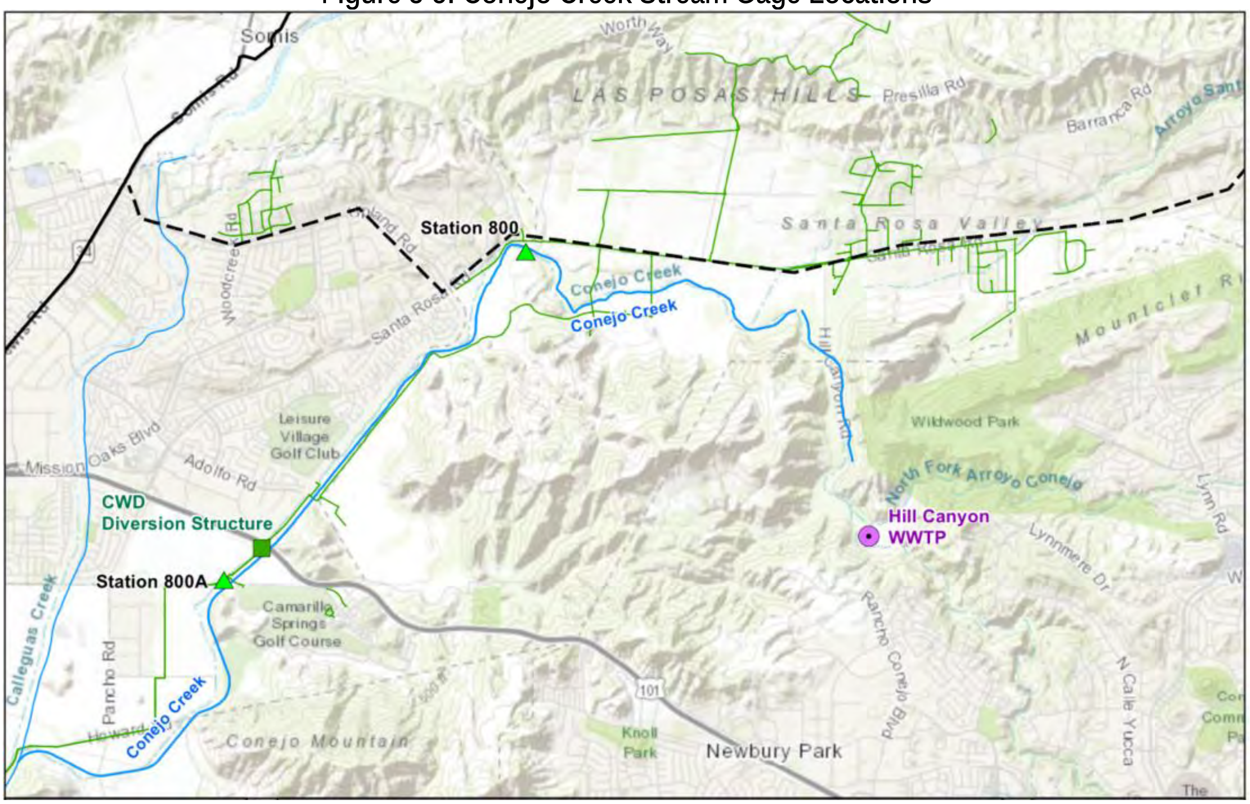


3.5 Conejo Creek Streamflow

The Ventura County Watershed Protection District established a streamflow gage named "Station 800" in 1968 and recorded flows since October 1972. The Station 800 gage was moved and renamed in 2010, now located south of the CWD diversion structure, known as "Station 800A". Additionally, CWD provided daily gage streamflow data from January 2013 to December 2018 recorded from the Baron Gage, previously known as Station 800. The locations of the stream gages are shown in Figure 3-5.

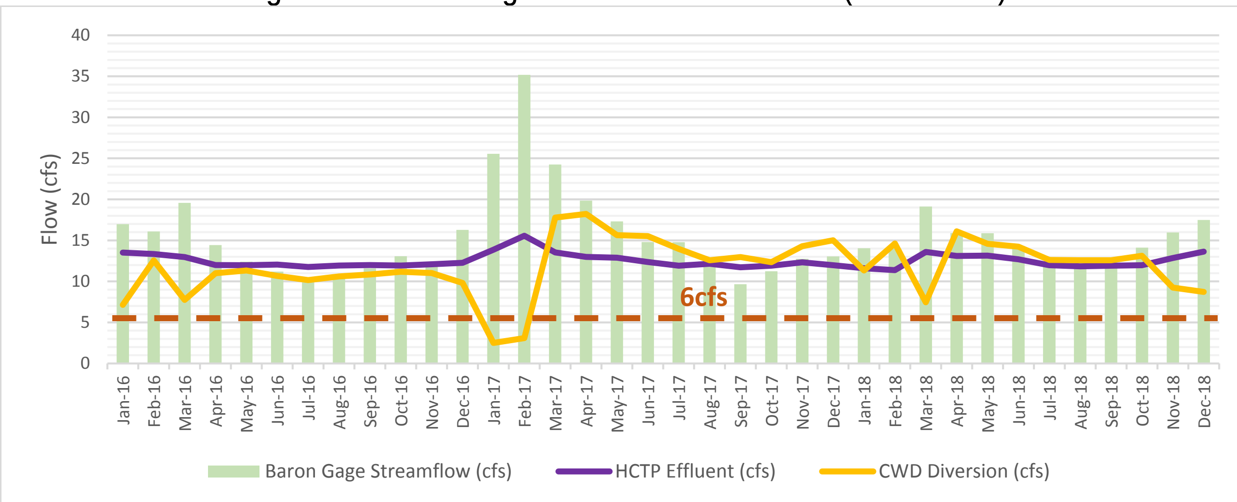
The CWD Diversion Structure, located approximately 7 miles downstream from the HCTP discharge point between Stations 800 and 800A, diverts stream flow as allowed by the 1997 Arroyo Conejo, Conejo Creek, and Calleguas Creek Water Rights Application. The allowed diversion amount is equal to HCTP's effluent minus 4 cubic feet per second (cfs) for in-stream uses and channel losses. An additional amount of water equal to the flow contributed by use of imported water in the region (estimated at 4 cfs) may be diverted when at least 6 cfs of water will remain in the stream downstream of the diversion point (SWRCB, 1997). Natural flows due to precipitation are not allowed to be diverted.

Figure 3-5: Conejo Creek Stream Gage Locations



The majority of the flow in Conejo Creek is diverted, as indicated in Figure 3-6. After reviewing these data, it was agreed by the partner agencies that a GWA project (which would rely on excess Conejo Creek flows during the summer) would not be feasible due to stream flow restrictions.

Figure 3-6: Baron Gage Stream Flow Evaluation (2016 – 2018)



4. WATER QUALITY MODEL DEVELOPMENT

A water quality modeling tool was developed to evaluate an array of alternative regional brine management strategies to model water quality impacts caused by regional brine discharges. This section describes the model methodology, data inputs, and results summaries. Detailed model results are presented in Appendix C.

4.1 Methodology

The spreadsheet-based water quality and mass balance model calculates the estimated water quality implications to key regional brine management system components, presented as nodes. The key regional brine management components (nodes) are presented in Figure 4-1. Each number on the map represents an input and output node in the model, incorporating the water quality and flow data gathered for the Study. The water quality model nodes and inputs are described in Table 4-1.

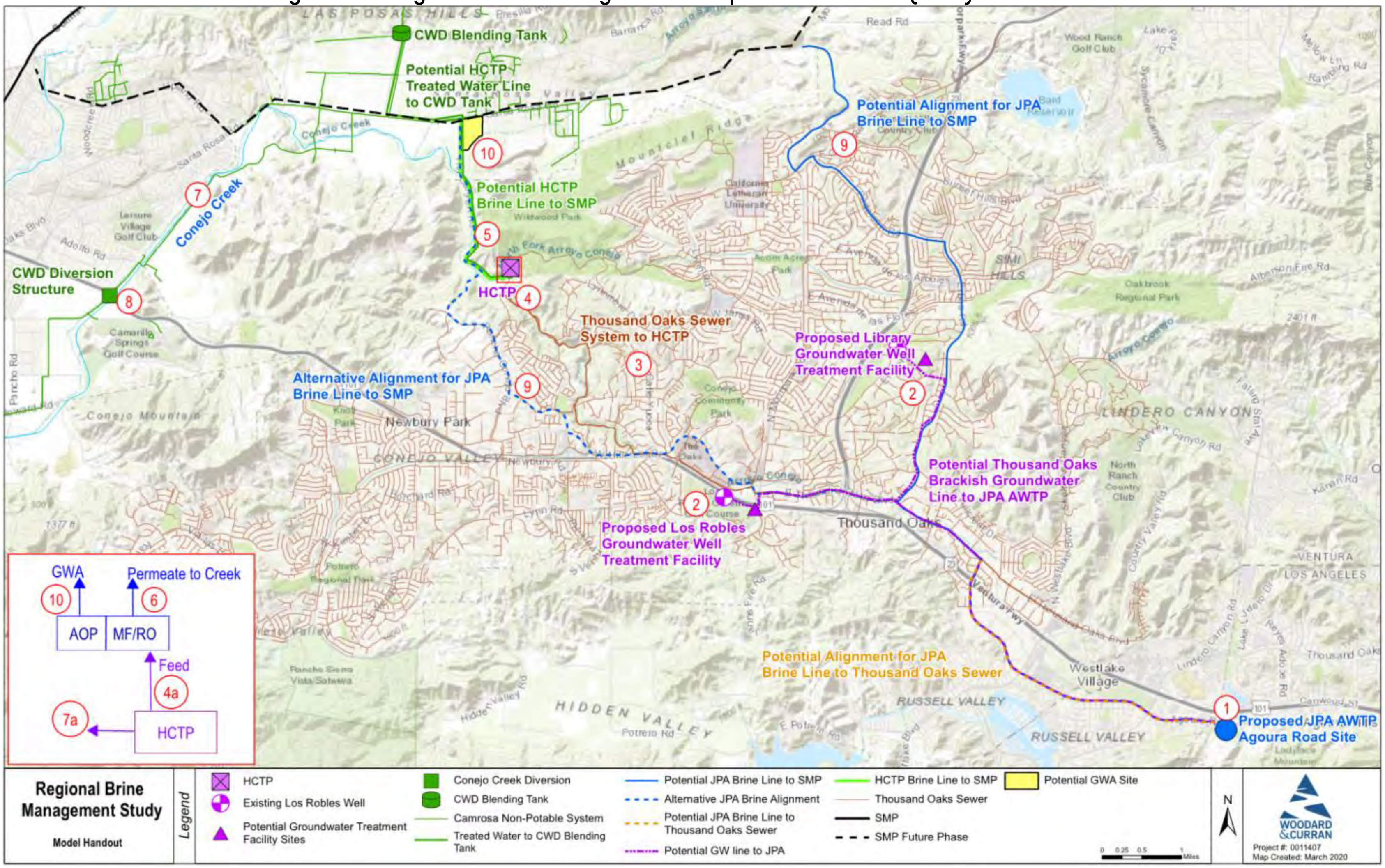
Table 4-1: Water Quality Model Nodes

Node	Description and Purpose	Inputs
1	JPA Pure Water AWTP – calculate the anticipated monthly Pure Water brine flow and water quality	• Tapia WRF Effluent Water Quality • Pure Water AWTP Design Flows
2	Thousand Oaks Groundwater Treatment Facilities – calculate the anticipated monthly combined Thousand Oaks brine flows and water quality	• LRGC Well Raw Design Water Quality • Los Robles and Library Well Treatment Facilities Design Flows
3	Thousand Oaks Raw Sewage – document the influent raw water quality for HCTP and calculate the HCTP treatment process influence on water quality	• HCTP Influent and Effluent Water Quality and Flow
4	HCTP Conventional – calculate the HCTP influent water quality influenced by JPA and City brine discharges	• Nodes 1 & 2 – brine water quality • Node 3 – influent water quality
4a	Desalter Feed – calculate the new desalter feed water quality influenced by brine discharges and HCTP treatment processes	• Node 3 – HCTP treatment process influence • Node 4 – influent water quality + brine
5	Desalter Brine – calculate the new desalter brine flow and water quality	• Node 4a – desalter feed
6	Desalter Permeate – calculate the new desalter permeate flow and water quality	• Node 4a – desalter feed
7a	HCTP Conventional Effluent to Conejo Creek – calculate the HCTP effluent bypassing the desalter	• Node 3 – effluent water quality
7	HCTP Combined Effluent to Conejo Creek – calculate the HCTP effluent water quality combined with the new desalter permeate	• Node 4a – influent water quality + brine + HCTP effluent • Node 6 – desalter permeate
8	Conejo Creek Diversion Structure – calculate the water quality at the diversion point for CWD NPS[1]	• Node 7 – combined effluent water quality[1]
9	Single Brine Line to SMP – calculate the JPA and City brine water quality in single brine line	• Nodes 1 & 2 – brine water quality
10	AWTP – calculate the water quality of the HCTP AWTP product water for groundwater augmentation	• Node 6 – desalter permeate

Notes:

1. Includes the assumption that an estimated 40 mg/L of chlorides are added to the creek naturally in the winter months. Based on reviewing CWD's Diversion Structure chloride concentrations from 2016-2019, the average chloride concentrations ranged from 140-207 mg/L, while the average HCTP effluent chloride concentrations from 2016-2019 ranged from 143-163 mg/L.
2. The original groundwater augmentation task was not investigated further as discussed in Section 3.5.4.

Figure 4-1: Regional Brine Management Components – Water Quality Model Nodes



4.2 Water Quality Model Inputs

4.2.1 Base HCTP Effluent Water Quality

The 3-year average influent and effluent flow and water quality data for total dissolved solids (TDS), boron, sulfate, chloride, and copper are summarized in Table 4-2. These five constituents are key to the water quality and mass balance model for the Study as described in Section 4.3 below.

Table 4-2: Average HCTP Effluent Data 2016 – 2019

Constituent	Units	2016-2019 Average Effluent
Flow	mgd	8.19
Total Dissolved Solids (TDS)	lb/day	41,525
	mg/L	608
Boron, Total	lb/day	31.6
	mg/L	0.46
Sulfate, Total (as SO4)	lb/day	7,729
	mg/L	113
Chloride	lb/day	10,266
	mg/L	150
Copper	lb/day	0.19
	ug/L	2.83

The average change between the HCTP influent and effluent water quality was evaluated to determine the influence of the HCTP treatment processes for the five key constituents. Sulfate and chloride loadings increase by 1,530 and 1,680 lbs/day, respectively, within the HCTP due to chemical addition during the chlorination and de-chlorination processes, namely the use of sodium hypochlorite for chlorination and sodium bisulfite for de-chlorination. Boron does not change throughout the HCTP treatment process, while copper is significantly removed through the biosolids process.

4.2.2 Brine Source Estimated Water Quality

The brine flows and concentration factors for Pure Water and the City groundwater treatment facilities are summarized in Table 4-3. Water quality parameters for the City groundwater treatment brines were estimated using either the average or 90th percentile concentration data from 2019 pilot testing results as discussed in Section 3.2. The same concentrations from the Los Robles well pilot testing were assumed for the Library well for which no data are available. Brine flow rates were assumed to be about the same month to month and were estimated based on existing reclaimed and groundwater treatment feasibility studies performed for the City of Thousand Oaks, the Los Robles Golf Course, and LVMWD.

Table 4-3: Brine Sources

Source	Flow (mgd)	Concentration Factor[1]	Discharge Period
Los Robles Groundwater Well Treatment Facility Brine	0.18	5.00	Year-round

Source	Flow (mgd)	Concentration Factor[1]	Discharge Period
Library Groundwater Well Treatment Facility Brine	0.09	5.00	Year-round
Pure Water Brine	1.1	6.67	October through March (6 months/year)

Note:

1. Dependent on RO recovery factor, 80% recovery yields a concentration factor of 5.00; 85% recovery yields a concentration factor of 6.67.

Based on the anticipated design flows and water quality data, Table 4-4 presents expected loadings to be evaluated in the water quality model.

Table 4-4: Pure Water AWTP and Thousand Oaks Groundwater Treatment Brine Loadings

Parameter	Pure Water AWTP Brine	Los Robles Treatment Facility Brine	Library Treatment Facility Brine
Flow (mgd)	1.1 (Oct – Mar)	0.18 (year-round)	0.09 (year-round)
TDS (lbs/day)	48,200	11,290	5,650
Boron (lbs/day)	24	1.5	0.8
Sulfate (lbs/day)	13,000	4,490	2,250
Chloride (lbs/day)	9,850	1,460	730
Copper (lbs/day)	0.19	0	0

4.2.3 Conejo Creek Water Quality

Conejo Creek average water quality (chlorides, sulfates, total dissolved solids [TDS], and nitrates) is presented in Table 4-5. The relatively high chloride levels (compared to CWD Class V target level) is the rationale for blending of imported water into that portion of the NPS.

Table 4-5: Conejo Creek Water Quality (July 2015 – September 2019)

Constituent	Average Concentration (mg/L)
Chloride	168.9
Sulfate	178.6
TDS	823.7
Nitrate	28.9

Note:

1. Monthly NPS demand data and production data from July 2015 to September 2019 were reviewed for this Study. Monthly data indicate that approximately 40 mg/L of chlorides are added within the creek naturally in the winter months.

4.3 HCTP Discharge Water Quality Targets

The water quality model for the regional brine system focuses on five water quality parameters (boron, TDS, sulfate, chloride, and copper) based on Calleguas Creek TMDLs, the City's HCTP National Pollutant Discharge Elimination System (NPDES) discharge Limits to Conejo Creek and CWD's NPS water quality target (chloride) for agricultural users. The following sections describe these discharge requirements.

4.3.1 Calleguas Creek TMDL

Effluent discharges from HCTP to Arroyo Conejo that are not diverted will continue downstream to Calleguas Creek. Eleven of the fourteen reaches in the Calleguas Creek Watershed were identified as impaired due to elevated levels of boron, chloride, sulfate, or TDS (salts) under the 2002 Clean Water Act Section 303(d). By mandate of the US EPA, the Los Angeles Regional Water Quality Control Board adopted in 2007 the Calleguas Creek Watershed Salts TMDL with the purpose of protecting and restoring the water quality in the watershed from the accumulation of salts. The primary beneficial uses serving as drivers for this TMDL were protecting water quality for agriculture irrigation and groundwater recharge. The Calleguas Creek Watershed Salts TMDL established wasteload allocations for chloride, boron, sulfate, and TDS for treatment plant dischargers into the watershed (including HCTP). Per the TMDL Compliance Monitoring Program annual reports to date, HCTP has complied with the interim salts wasteload allocations as set in the TMDL.

4.3.2 HCTP Effluent Discharge Limits

The City of Thousand Oaks currently operates the HCTP under Tentative Waste Discharge Requirements (Order No. R4-2014-0064-AXX) an NPDES Permit No. CA0056294 adopted on November 14, 2019 (Los Angeles Regional Water Quality Control Board, 2019). HCTP discharges tertiary treated wastewater into the North Fork Arroyo Conejo under the effluent discharge limits summarized in Table 4-6. The green highlighted constituents signify the five parameters the water quality model focuses on tracking.

Some HCTP effluent discharged to Arroyo Conejo is diverted for irrigation; the remaining flow continues to the receiving waters of Calleguas Creek. During wet weather, stormwater runoff changes the assimilative capacity of the receiving waters. These differences are reflected in differing effluent limits for TDS, sulfate, chloride, and boron during wet and dry weather. Dry weather discharge limits are in units of pounds per day (lbs/day) and wet weather discharges are in units of milligrams per liter (mg/L). "Dry weather" is defined in the receiving waters of Calleguas Creek as the condition when the flows are below the 86th percentile flow measured at California State University Channel Islands. "Wet weather" is when the flows are greater than or equal to the 86th percentile flow. Calleguas Creek 86th percentile flow at California State University Channel Islands is 31 cfs.

For this Study, the dry weather mass loading discharge limits (lbs/day) were reduced by 20 percent to accommodate future buildout in the City, estimated to be an additional 8,000 units constructed over the next 10 to 20 years. These Target Loading Limits are used in the model as the effluent limits for the various scenarios described in Section 5.

Table 4-6: Hill Canyon Treatment Plant Discharge Limits

Parameter	Units	Effluent Limits					Target Loading Limits[3] (NPDES Permit Limits reduced 20%)				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum	Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Biochemical Oxygen Demand (BOD5)	mg/L	20	30	45	--	--	--	--	--	--	--
	lbs/day[1]	2,300	3,500	5,200	--	--	1,840	2,800	4,160	--	--
Total Suspended Solids (TSS)	mg/L	15	40	45	--	--	--	--	--	--	--
	lbs/day[1]	1,750	4,600	5,200	--	--	1,400	3,680	4,160	--	--
pH	standard units	--	--	--	6.5	8.5	--	--	--	--	--
Removal Efficiency for BOD and TSS	%	85	--	--	--	--	--	--	--	--	--
Oil and Grease	mg/L	10	--	15	--	--	--	--	--	--	--
	lbs/day[1]	1,200	--	1,750	--	--	960	--	1,400	--	--
Settleable Solids	ml/L	0.1	--	0.3	--	--	--	--	--	--	--
Total Residual Chlorine	mg/L	--	--	0.1	--	--	--	--	--	--	--
MBAS	mg/L	0.5	--	--	--	--	--	--	--	--	--
	lbs/day[1]	60	--	--	--	--	48	--	--	--	--
Boron	mg/L	1	--	--	--	--	--	--	--	--	--
	lbs/day[1]	120	--	--	--	--	96	--	--	--	--
Total dissolved solids (TDS) (dry weather)	lbs/day	99,250	--	--	--	--	79,400	--	--	--	--
TDS (wet weather)	mg/L	850	--	--	--	--	--	--	--	--	--
Sulfate (dry weather)	lbs/day	29,200	--	--	--	--	23,360	--	--	--	--

Parameter	Units	Effluent Limits					Target Loading Limits[3] (NPDES Permit Limits reduced 20%)				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum	Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Sulfate (wet weather)	mg/L	250	--	--	--	--	--	--	--	--	--
Chloride (dry weather)	lbs/day	17,500	--	--	--	--	14,000	--	--	--	--
Chloride (wet weather)	mg/L	150	--	--	--	--	--	--	--	--	--
Ammonia Nitrogen	mg/L	3.1	--	5.6	--	--	--	--	--	--	--
	lbs/day[1]	--	--	5.1 x Q[6]	--	--	--	--	--	--	--
[Nitrate + Nitrite] (as N)	mg/L	9	--	--	--	--	--	--	--	--	--
Nitrate (as N)	mg/L	9	--	--	--	--	--	--	--	--	--
Nitrite (as N)	mg/L	0.9	--	--	--	--	--	--	--	--	--
Beryllium	ug/L	4	--	--	--	--	--	--	--	--	--
	lbs/day	0.46	--	--	--	--	0.37	--	--	--	--
Copper	ug/L	6	--	8.8	--	--	--	--	--	--	--
	lbs/day	--	--	0.7	--	--	--	--	0.56	--	--
Nickel	ug/L	153	--	231	--	--	--	--	--	--	--
	lbs/day	--	--	0.3	--	--	--	--	0.24	--	--
Cyanide	ug/L	4.2	--	8.5	--	--	--	--	--	--	--
	lbs/day	0.49	--	0.99	--	--	0.3920	--	0.79	--	--
Mercury	lbs/month	0.022	--	--	--	--	0.0176	--	--	--	--
Bis(2-ethylhexyl) phthalate	ug/L	4	--	--	--	--	--	--	--	--	--
	lbs/day	0.46	--	--	--	--	0.3680	--	--	--	--
Chlordane	ug/L	0.00059	--	0.0012	--	--	--	--	--	--	--
4,4-DDD	ug/L	0.00084	--	0.0017	--	--	--	--	--	--	--

Parameter	Units	Effluent Limits					Target Loading Limits[3] (NPDES Permit Limits reduced 20%)				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum	Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
4,4-DDE	ug/L	0.00059	--	0.0012	--	--	--	--	--	--	--
4,4-DDT	ug/L	0.00059	--	0.0012	--	--	--	--	--	--	--
Dieldrin	ug/L	0.00014	--	0.00028	--	--	--	--	--	--	--
PCBs	ug/L	0.00017	--	0.00034	--	--	--	--	--	--	--
Toxaphene	ug/L	0.00016	--	0.00033	--	--	--	--	--	--	--
Chlorpyrifos	ug/L	0.0133	--	0.024	--	--	--	--	--	--	--
Diazinon	ug/L	0.1	--	0.1	--	--	--	--	--	--	--

Notes:

1. The mass-based effluent limits are based on the plant design flow rate of 14 MGD and are calculated as follows: Flow (MGD) x Concentration (mg/L) x 8.34 (conversion factor) = lbs/day. During wet-weather storm events in which the flow exceeds the design capacity, the mass discharge rate limits shall not apply, and concentration limits shall be the only applicable effluent limits.
2. For TDS, sulfate, chloride, and boron discharges during wet- and dry- weather; dry-weather is defined in the Calleguas Creek Watershed Salts TMDL as the condition when the flows in the receiving water are below the 86th percentile flow. Wet weather is defined in the Salts TMDL as the condition when the flows in the receiving water are greater than or equal to the 86th percentile flow.
3. For this Study, the HCTP NPDES discharge limits were reduced by 20 percent to accommodate the City's future buildout, approximately 8,000 more units in the next 10 to 20 years.

4.3.3 CWD NPS Water Quality Target

As noted in the previous section, CWD diverts water from Conejo Creek to serve its NPS. For service to its agricultural Class V customers, its chloride target range is 90 - 110 mg/L. CWD purchases and blends imported water with Conejo Creek water to meet the current target of 110 mg/L, but would like to supply its Class V customers with a supply not exceeding 90 mg/L. For alternative scenarios structured to meet the Class V chloride target, the water quality model used 90 mg/L as the target effluent concentration.

4.3.4 CMWD SMP NPDES Limits

CMWD currently operates the SMP under an outfall discharge permit Waste Discharge Requirements (R4-2019-0075), NPDES No. CA0064521 (Los Angeles Regional Water Quality Control Board, 2019), and requirements of the California Ocean Plan. Discharge to the Pacific Ocean is limited to a maximum of 19.1 mgd through the ocean outfall at Port Hueneme Beach. Under certain conditions, testing of SMP effluent for chronic toxicity to marine organisms is required. Due to the prevalence of copper in domestic water supplies and its toxicity to marine organisms, it is it is important to evaluate the effects that brine addition would have on increasing copper concentrations. The five key constituents in the water quality model do not have discharge limits. Thus, the constituent of concern is the 730 ug/L maximum daily effluent limit for total recoverable copper and the 6-month median limit of 75 ug/L.

4.4 Brine Influence on HCTP Effluent

Table 4-7 summarizes the average brine influence on the HCTP effluent and how the combined effluent compares to effluent limits and NPDES Target Loading Limitation as discussed Section 4.3.2.

Table 4-7: Regional Brine Influence on HCTP Conejo Creek Effluent Limits and Target Loading

		HCTP Effluent	Las Virgenes Pure Water (Oct-Mar)	Combined Thousand Oaks Well Brines	Total (Oct-Mar)	Effluent Limits	Target Loading (Dry Weather)
Flow	mgd	8.2	1.1	0.27	9.57	14.0	11.2
TDS	lbs/day	41,530	48,600	16,940	*107,100*	99,250	79,400
Boron	lbs/day	31.7	24	2.2	58.1	120	96
Sulfate	lbs/day	7,730	13,100	6,730	*27,546*	29,200	23,360
Chloride	lbs/day	10,270	9,925	2,180	*22,400*	17,500	14,000
Copper[1]	ug/L	2.8	21.5	0.0	2.6	6	--

Note:

1. Assumes 94% removal of copper in HCTP secondary treatment process

The HCTP would exceed its NPDES limits for TDS, sulfate and chloride in the winter months with the addition of brine from Pure Water without additional treatment or mitigation at HCTP, as illustrated below in Figure 4-2, Figure 4-3 and Figure 4-4.

Figure 4-2: Average HCTP Discharge – Brine Impacts on HCTP Effluent TDS Loading

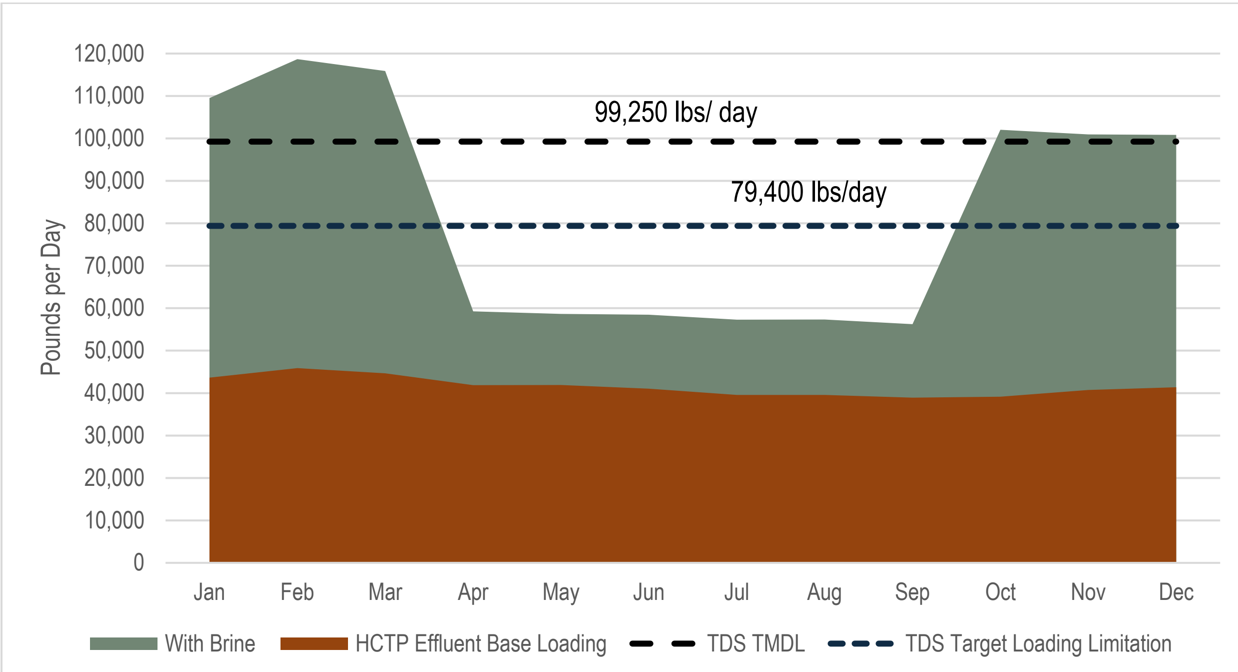


Figure 4-3: Average HCTP Discharge – Brine Impacts on Sulfate Loading

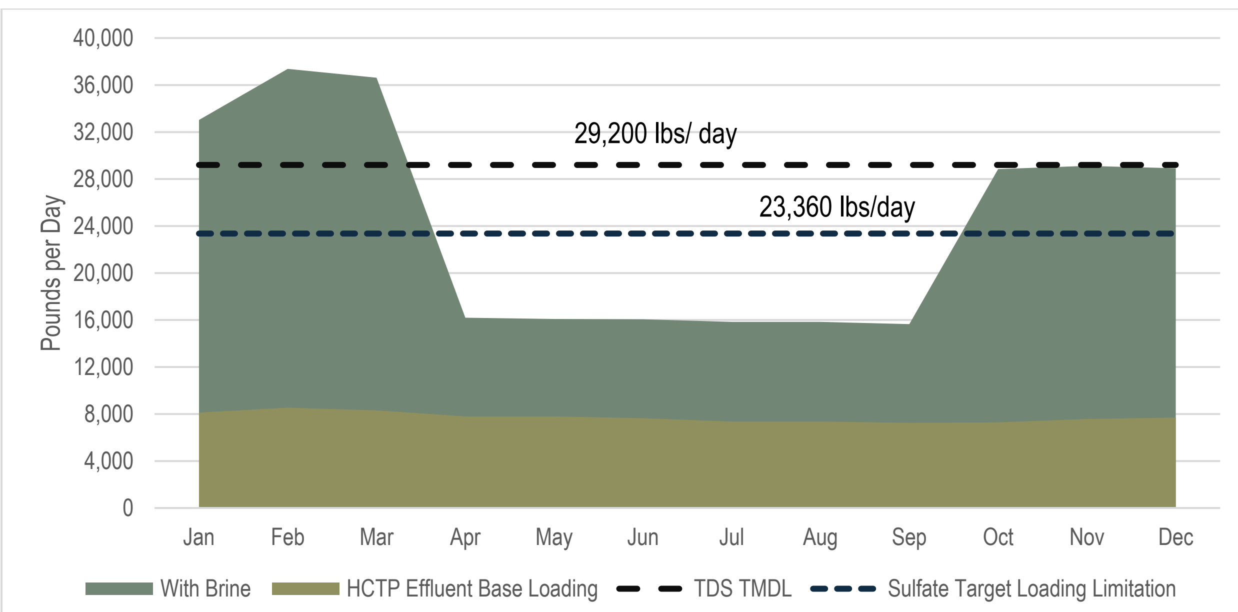
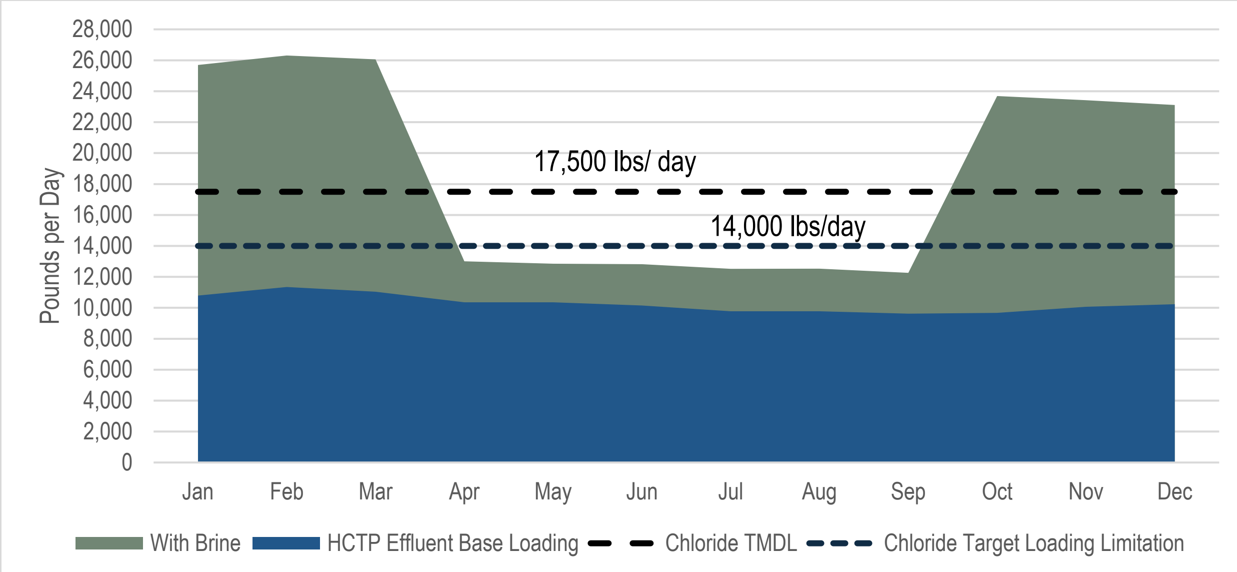


Figure 4-4: Average HCTP Discharge – Brine Impacts on Chloride Loading



The HCTP effluent combined with the brine sources would exceed HCTP's NPDES dry weather discharge limit for chloride. TDS and sulfate concentrations would be more than 80% of the NPDES dry weather discharge limits. Copper could exceed discharge limits based on this preliminary evaluation which assumed that the copper load added by Pure Water brine would not be substantially removed by HCTP since that copper loading had already bypassed Tapia WRF treatment. Boron does not exceed mass loading limit to Conejo Creek; however, the average boron concentration of the combined effluent and regional brines is estimated to be 0.6 mg/L, which could be toxic to certain sensitive crops. Plant toxicity can occur when boron is above the range of 0.3 to 0.5 mg/L.

4.5 Proposed HCTP Desalter and UV Disinfection Assumptions

The proposed desalter to treat HCTP effluent (with the added brine flows) as discussed in the previous section assumes MF/UF and RO as the baseline treatment processes. Noting that the chlorine disinfection and associated dechlorination process (required for discharge to Conejo Creek) add substantial chloride and sulfate loadings to the HCTP effluent, an alternative or supplemental chloride and sulfate reduction strategy of transitioning HCTP to UV disinfection was evaluated. Table 4-8 summarizes the treatment process assumptions that were included in the water quality model for evaluation.

Table 4-8: Water Quality Model – Treatment Assumptions

Treatment Process	Assumed Product Recovery	Assumptions
UV Disinfection[1]	100%	Replacing the existing chlorine disinfection process at HCTP would lower the salts added to the HCTP effluent during the chlorination process and potentially lower chemical costs at the plant. A UV disinfection system was added to some alternatives for evaluation as discussed in Section 5.
MF/UF	93%	Backwash would be re-routed to the headworks of the HCTP (no net RO feed reduction).
RO	85%	RO concentrate (brine) would be sent to a future SMP extension via Hill Canyon Road for disposal.

Note:

1. Potential treatment alternative to existing chlorine disinfection system at HCTP.

5. ALTERNATIVES DEVELOPMENT

Over the course of this study, the partner agencies identified eleven alternative scenarios to be evaluated using the water quality model. Generally, the partner agencies identified three categories of alternative scenarios:

- Early Phase Concepts
- Alternatives Leveraging City Wastewater Infrastructure
- Alternatives with Common Brine Pipeline to SMP

The “early phase concepts” enable the City to address groundwater treatment issues prior to Pure Water construction and start-up. “Concepts leveraging City wastewater infrastructure” incorporate the original concept of adding a desalter (MF/RO) to treat a portion of the HCTP effluent prior to discharge if Conejo Creek water quality objectives were exceeded or to meet water quality targets for the CWD NPS. As mentioned in Section 4, an additional treatment strategy of transitioning HCTP disinfection from sodium hypochlorite to UV was added. As concept alternatives were being evaluated and refined, stakeholders identified additional brine load staging and alternative plumbing strategies to the mix. The final category, “concepts with common brine pipeline to the SMP”, evaluated various strategies to merge the Pure Water and City groundwater brine pipelines in alternative alignments and configurations. Table 5-1 summarizes the various concept alternatives evaluated in this study. For full model results of each scenario, see Appendix C. Descriptions of the alternatives scenarios are presented in this section.

Table 5-1: Alternatives Summary

Concept Alts.	Brine Sources		Brine Discharge Locations		HCTP Treatment Strategy		Water Quality Objective	
	Pure Water	Thousand Oaks Wells	Thousand Oaks Sewer	SMP	UV	Desalter	Chloride Loading (20% Buffer)	CWD Chloride Target
Early Phase Concepts								
A		✓					✓	
B		✓			✓		✓	
C		✓	✓		✓		✓	
Alternatives Leveraging City Wastewater Infrastructure								
1	✓	✓	✓	✓		✓	✓	
2	✓	✓	✓	✓		✓	✓	✓
3	✓	✓	✓	✓		✓	✓	
4	✓	✓	✓	✓	✓	✓	✓	
5	✓	✓	✓	✓	✓	✓	✓	✓
Alternatives with Common Brine Pipeline to SMP								
6 (Original Alignment)	✓	✓		✓			n/a	n/a
7 (HCTP Alignment)	✓	✓		✓			n/a	n/a
8	✓	✓		✓	This concept conveys 1,500 AFY Thousand Oaks Brackish Groundwater to the JPA Pure Water AWTP, with combined brine flow conveyed to SMP using HCTP Alignment.			

5.1 Early Phase Projects

The Early Phase Projects provide the City phased opportunities to implement before the Pure Water AWTP is constructed and operational, currently scheduled for 2030.

5.1.1 Early Phase Project A – Los Robles Groundwater to HCTP

Early Phase Project A would involve the conveyance of 1000 AFY of raw groundwater from the existing Los Robles well into the City's sewer system to evaluate how it influences the HCTP NPDES effluent limits and CWD's NPS water quality requirements. This alternative includes approximately 1,900 linear feet (LF) of a 10-inch groundwater conveyance pipe to connect to the nearest Thousand Oaks sewer manhole as shown in Figure 5-1.

5.1.2 Early Phase Project B - Los Robles Groundwater to HCTP with UV Disinfection

Like Project A, this early phase project involve the conveyance of 1000 AFY of raw groundwater from the existing Los Robles well into the City's sewer system, but includes the replacement of the chlorine disinfection system with a new 10 mgd UV disinfection system to lower the chloride and sulfate loadings in the plant's effluent. This alternative includes the same conveyance infrastructure and discharge location as Early Phase Project A.

5.1.3 Early Phase Project C – Groundwater Treatment Brines to HCTP with UV Disinfection

Early Phase Project C would enable the City to evaluate Los Robles and Library Well Treatment Facilities' brine discharges to the City sewer system, with a mitigating step of replacing the existing HCTP chlorine disinfection system with a new 10 mgd UV disinfection system to lower the chloride and sulfate loading in the plant's effluent. Two individual brine lines from each of the Thousand Oaks Groundwater Treatment Facilities would convey the well brines to the City's sewer system as shown in Figure 5-2; a 4-inch 2,500 LF brine line from the Library Well Treatment Facility and a 6-inch 500 LF brine line from the Los Robles Treatment Facility.

Figure 5-1: Early Phase Projects A & B – Groundwater Conveyance to Sewer Manhole

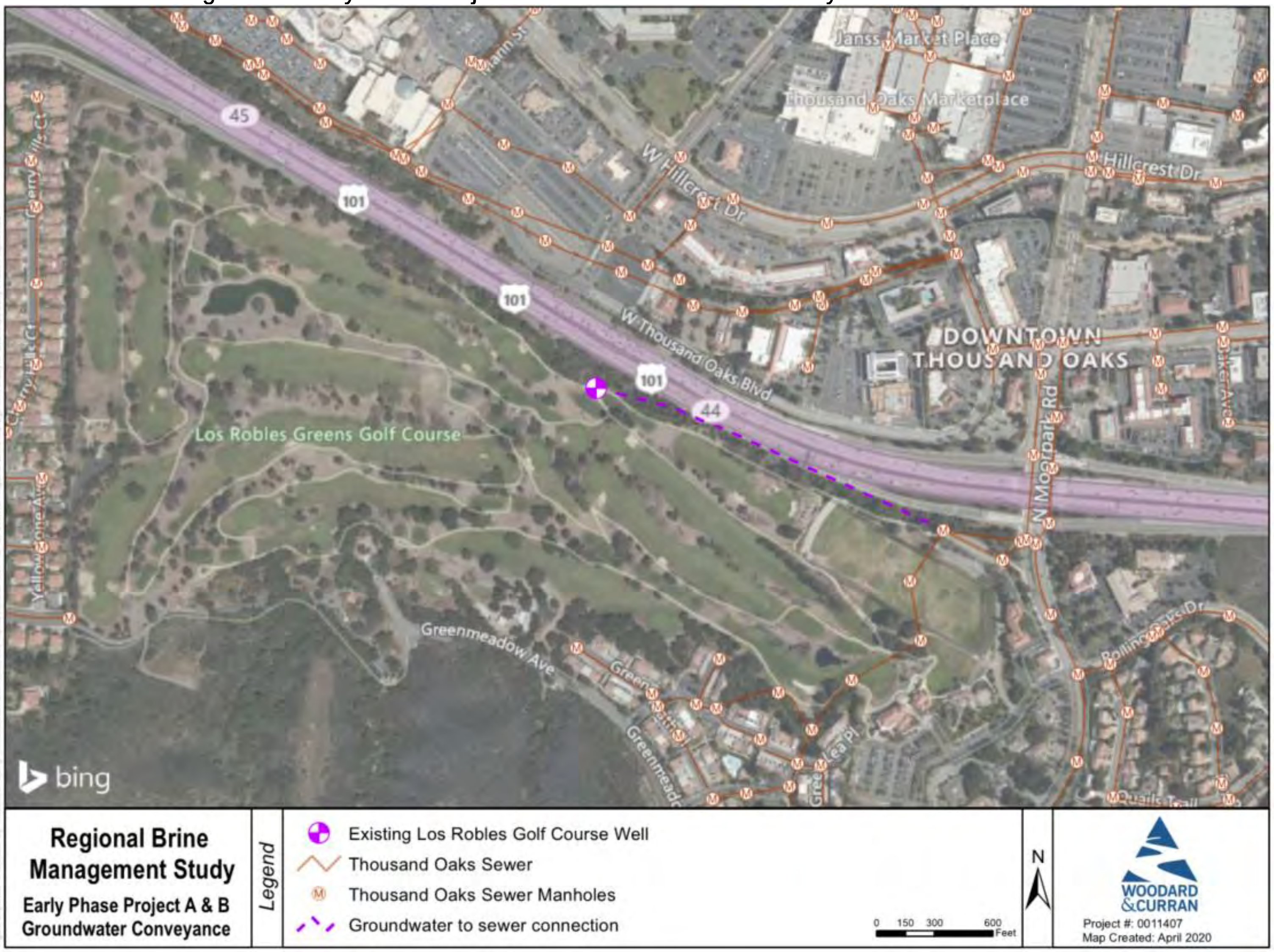
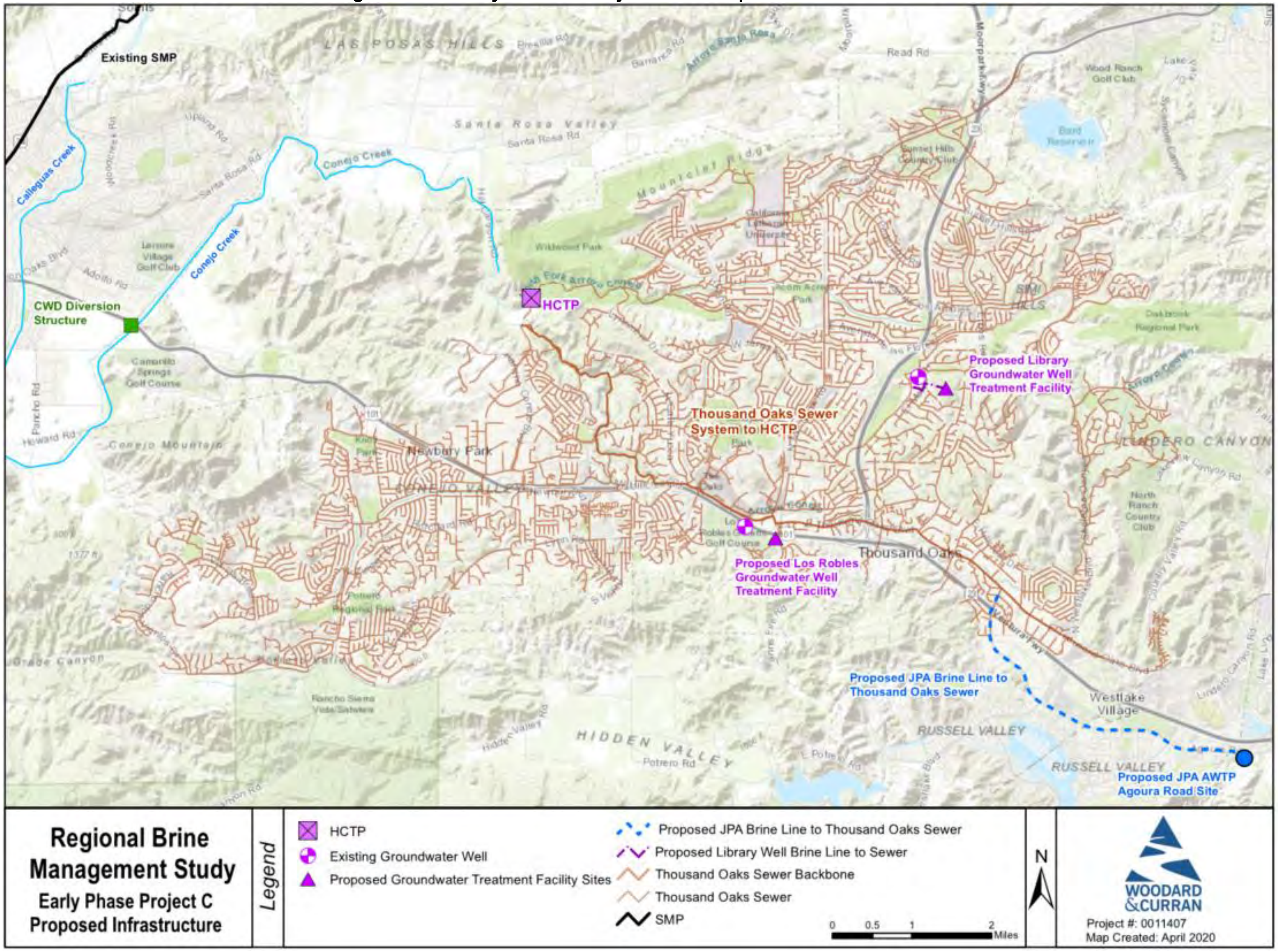


Figure 5-2: Early Phase Project C – Proposed Infrastructure



5.2 Alternatives Leveraging City Wastewater Infrastructure

The Projects that Leverage City Wastewater Infrastructure allow the use of existing collection infrastructure to convey brine flows to HCTP by providing additional treatment capability to reduce chlorides. The reduction is needed for compliance with water quality requirements.

5.2.1 Scenario 1 – Desalter at HCTP for NPDES Compliance

Scenario 1 evaluates the LVMWD Pure Water and combined Thousand Oaks Groundwater Treatment brine flow influences on the HCTP NPDES effluent limits with the addition of a new 4.1 mgd desalter following the conventional HCTP treatment processes to meet NPDES limits.

A proposed 12-inch diameter brine line, approximately 17,800 LF, would discharge the Pure Water brine into the City's sewer system. Two individual brine lines from each of the Thousand Oaks Groundwater Treatment Facilities would convey the well brines to the City's sewer system as shown in Figure 5-3; a 4-inch 2,500 LF brine line from the Library Well Treatment Facility and a 6-inch 500 LF brine line from the Los Robles Treatment Facility would connect to the City's collection system. The brines would travel through the City's sewer system to the HCTP for conventional and desalter treatment. A proposed 11,400 LF 8-inch brine line from the HCTP would discharge the HCTP desalter brine flow to the future SMP extension to Hill Canyon Road.

5.2.2 Scenario 2 – Desalter at HCTP for CWD NPS Water Quality Improvement

This scenario evaluates the LVMWD Pure Water and Thousand Oaks Groundwater Treatment brine influences on the CWD NPS water quality. It includes the addition of a new 4.7 mgd desalter following the conventional HCTP processes to meet CWD non-potable water quality for chlorides (90 - 110 mg/L) during the summer months while Pure Water is not operational and when irrigation demands are highest. CWD would still need to blend during the winter months.

The conveyance infrastructure and brine discharge locations associated with this alternative are the same as for Scenario 1, as shown in Figure 5-3.

5.2.3 Scenario 3 – Desalter at HCTP for NPDES Compliance and Direct Delivery to CWD

This scenario evaluates the LVMWD Pure Water and Thousand Oaks Groundwater Treatment brine influences on the HCTP NPDES effluent limits and CWD NPS water quality. It includes the addition of a new 5.1 mgd desalter following the conventional HCTP processes, sized to meet NPDES limits and to produce an additional 1.0 mgd for direct delivery of desalter product water to CWD's NPS blending tank, offsetting imported water used by CWD to blend with creek water to improve water quality for their NPS Class V customers. Additional conditioning on the RO permeate would be required to convey the RO water to the CWD blending tank.

This alternative would require the same conveyance infrastructure as Scenario 3, with the addition of a 10-inch 20,200 LF RO product water pipeline to the CWD NPS blending tank, as shown in Figure 5-4.

5.2.4 Scenario 4 – UV Disinfection and Desalter at HCTP for NPDES Compliance

This scenario evaluates the LVMWD Pure Water and Thousand Oaks Groundwater Treatment brine influences on the HCTP NPDES effluent limits. It includes the addition of a new 3.2 mgd desalter following the conventional HCTP processes, sized to meet NPDES limits while replacing the current chlorine disinfection system with UV disinfection to lower the chloride and sulfate loading into the effluent.

The conveyance infrastructure and brine discharge locations associated with this alternative are the same as for Scenario 1, as shown in Figure 5-3.

5.2.5 Scenario 5 – UV Disinfection and Desalter at HCTP for CWD NPS Water Quality Improvement

This scenario evaluates the LVMWD Pure Water and Thousand Oaks Groundwater Treatment brine influences on the CWD NPS water quality. It includes the addition of a new 4.0 mgd desalter and replaces the chlorine disinfection system with a 10 mgd UV system to lower the chloride and sulfate loading in the plant's effluent. The 4.0 mgd desalter was sized to meet CWD non-potable water quality for chlorides (90 -110 mg/L) during the summer months while Pure Water is not operational and when irrigation demands are highest. CWD would still need to blend during the winter months.

The conveyance infrastructure and brine discharge locations associated with this alternative are the same as for Scenario 2, as shown in Figure 5-3.

5.2.6 Copper Implications

Copper levels in both the HCTP effluent and HCTP desalter brine were evaluated. The HCTP effluent NPDES copper limit is 6 ug/L as an average monthly concentration, while the Scenario 4 (i.e., the smallest desalter capacity, therefore "worst case scenario") maximum monthly (December) concentration is 3.6 ug/L. The corresponding desalter brine copper concentration is 36 ug/L, well below the SMP 6-month median copper limit of 75 ug/L.

Figure 5-3: Scenarios 1, 2, 4 & 5 – Proposed Conveyance Infrastructure

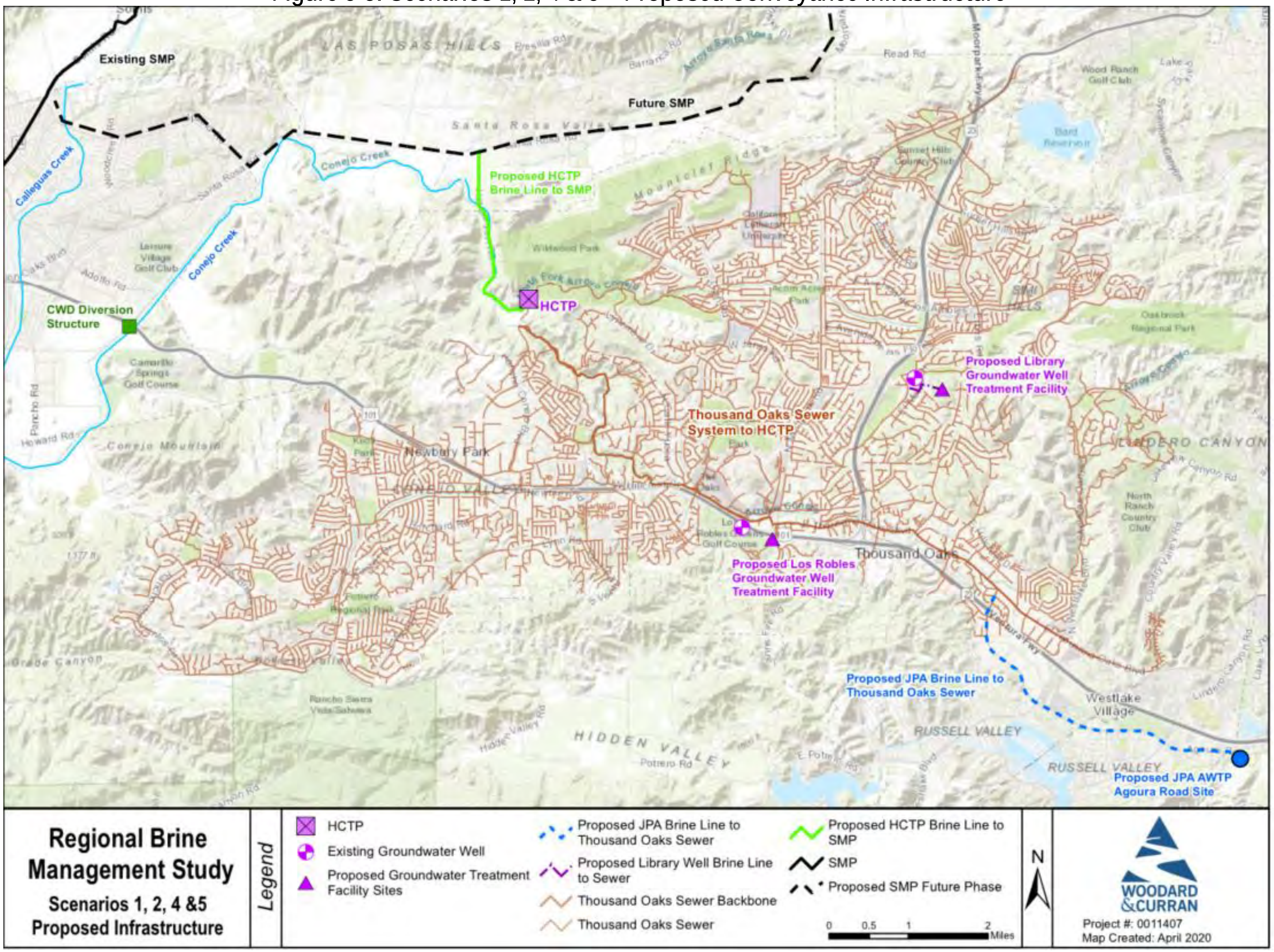
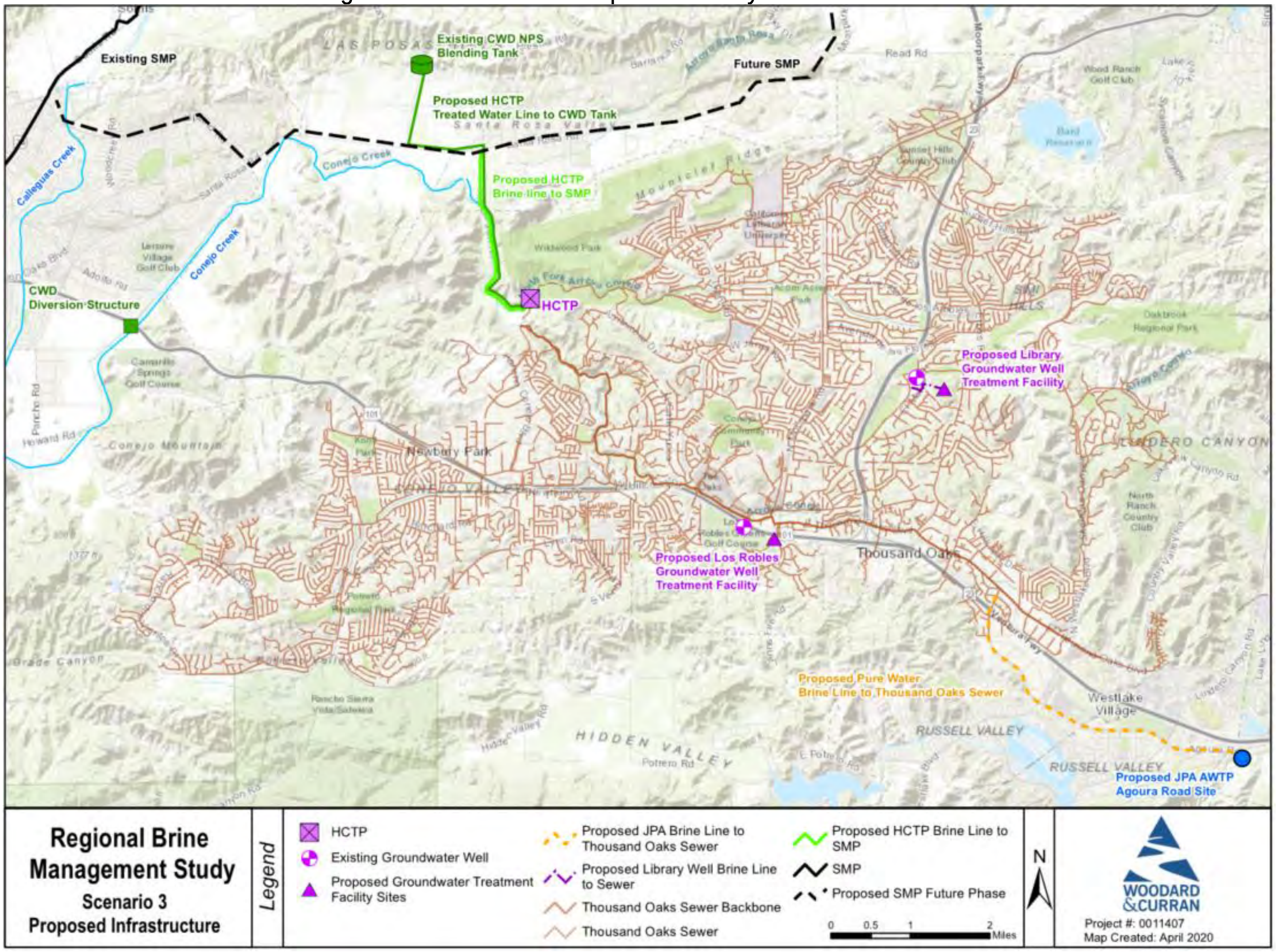


Figure 5-4: Scenario 3 – Proposed Conveyance Infrastructure



5.3 Common Brine Pipeline to SMP Alternatives

In addition to brine management alternatives that leverage City wastewater infrastructure, three alternatives were evaluated that use a common pipeline to convey Pure Water and City groundwater treatment brines to the SMP.

5.3.1 Scenario 6 – JPA Pure Water Brine Line to SMP Extension to Moorpark Road to HCTP

Scenario 6 evaluates conveying the JPA and City's brine discharges to the CMWD SMP, with an alignment corridor consistent with JPA preliminary planning and as documented in the Pure Water Title XVI Report. The brine pipeline alignment assumes that the proposed point of connection to the SMP would be at the intersection of Santa Rosa Road and Moorpark Road, as shown in Figure 5-5. The SMP may potentially extend to Simi Valley, and the proposed connection at Moorpark Road may impact the timing and or diameter of the SMP extension.

A proposed 12-inch diameter brine line, approximately 62,800 LF in length, would discharge the Pure Water brine into the SMP. Two individual brine lines from each of the Thousand Oaks Groundwater Treatment Facilities would convey the well brines to the JPA brine line as shown in Figure 5-5; a 4-inch 4,000 LF brine line from the Library Well Treatment Facility and a 6-inch 11,200 LF brine line from the Los Robles Treatment Facility.

5.3.2 Scenario 7 – JPA Pure Water Brine Line to CMWD SMP Extension to Hill Canyon Road

Scenario 7 evaluates conveying the JPA and City's brine discharges to the CMWD SMP along an alternative alignment that passes near HCTP. This alternative brine line alignment assumes that the SMP would be extended to the proposed point of connection at the intersection of Santa Rosa Road and Hill Canyon Road as shown in Figure 5-6.

A proposed 12-inch diameter brine line, approximately 69,900 LF, would discharge the Pure Water brine into the SMP. This alignment is approximately 7,100 LF longer than the proposed alignment in Scenario 6 but would connect to the SMP at Hill Canyon Road instead of Moorpark Road. The SMP may potentially extend to Simi Valley, and the proposed connection at Hill Canyon Road may impact the timing and or diameter of the SMP extension. Two individual brine lines from each of the Thousand Oaks Groundwater Treatment Facilities would convey the well brines to the JPA brine line as shown in Figure 5-6; a 4-inch 10,700 LF brine line from the Library Well Treatment Facility and a 6-inch 3,400 LF brine line from the Los Robles Treatment Facility.

Environmental Considerations

Constructing a pipeline to the SMP along Hill Canyon Road between SR 101 and Santa Rosa Road has the potential to impact numerous state and federal threatened and endangered species and migratory birds (U.S. Fish & Wildlife Service, 2020). The report of species and environmental resources generated for the alignment past HCTP is included in Appendix F. The alignment would cross critical habitat for the endangered plant, Lyon's Pentachaeta (Pentachaeta lyonii). A California Environmental Quality Act (CEQA) Initial Study would likely identify potential significant biological resource impacts and would require preparation of an Environmental Impact Report (EIR).

Additionally, the project would cross the Arroyo Conejo and other drainages and riparian and wetland areas. Open cut trenching across any drainages, riparian and wetland areas would require permits from the US Army Corps of Engineers (Clean Water Act Section 404 permit), Los Angeles Regional Water Quality Control Board (CWA Section 401 Water Quality Certification) and California Department of Fish and Wildlife (CDFG Code Section 1602 Streambed Alteration Agreement). Applications for these permits would require preparation of a Jurisdictional Delineation and biological field surveys. Although the project impacts would be temporary, the agencies could still require compensatory mitigation for temporary impacts to waters and wetlands. As part of the Section 404 permit process, the Corps of Engineers would conduct a formal Section 7 consultation with the US Fish and Wildlife Service on the potential of jeopardizing the continued existence of any listed species or adverse impacts to designated critical habitat.

To avoid impacts, protocol level surveys for special status species would have to be performed and construction-related activities would have to be conducted outside of bird nesting season. Reasonable and prudent alternatives to avoid jeopardy or adverse impacts would be developed and discussed with the Corps prior to the US Fish and Wildlife Service release of a formal Biological Opinion which would contain a lengthy discussion and set of mitigation criteria to proceed with the project.

Although less of an issue than biological resources, construction of a pipeline across this area has the potential to encounter cultural resources (the area has not been previously disturbed), and would require consultation with Native American tribes who are traditionally and culturally affiliated with the area. In addition to cultural resources monitoring conducted by an archaeologist, the project would likely require monitoring for tribal cultural resources by local Native American tribal monitor(s).

The Scenario 7 alignment was selected as a representative comparison to the original alignment presented in Scenario 6, which has potential construction issues within the Norwegian grade. There are other alignment options that could be considered to minimize potential environmental impacts of constructing the brine line. A more detailed alignment study would need to be performed to address these impacts.

5.3.3 Scenario 8 – City Brackish Groundwater to JPA Pure AWTP

This scenario evaluates delivering 1,500 AFY of raw groundwater from Thousand Oaks to the Pure Water AWTP as an alternative to the City building two groundwater desalters for the Los Robles and Library wells. Scenario 8 assumes that the groundwater conveyance pipeline from the City would share the same trench as the Scenario 7 Pure Water brine line to the SMP.

Conveyance of City groundwater to the Pure Water AWTP would provide an additional water supply and an operational benefit to the advanced water treatment facility. If the 7.4 mgd feed to Pure Water is not consistently available, brackish groundwater from Thousand Oaks may also serve as a feed water augmentation during winter months. If groundwater is supplied during summer and shoulder months, the Pure Water AWTP would not require a capacity expansion and could operate year-round. The strategy of treating brackish groundwater in the summer months would provide the benefit of augmenting Las Virgenes MWD's water supply with an additional 1.1 mgd during the period of highest water demand. This strategy would offset constructing new groundwater treatment (avoided capital cost for the City) but would require increased pumping costs to convey groundwater to the Pure Water facility. Table 5-2 summarizes the flows for the Pure Water Project expected during summer operation when fed by brackish City groundwater.

Table 5-2: Pure Water AWTP Summer Design Flows

Constituent	Units	Flow
Brackish City Groundwater Supply	AFY	1,500
Summer AWTP Feed	mgd	1.3
Summer RO Permeate (Product Water)	mgd	1.1
Summer Brine Production	mgd	0.2

Two individual brackish groundwater pipes from each of the Thousand Oaks wells would convey the groundwater to the JPA Pure Water AWTP as shown in Figure 5-7; an 8-inch 10,700 LF groundwater pipe from the Library Well and a 10-inch 3,400 LF groundwater line from the Los Robles Well would then combine into a 12-inch pipeline for approximately 32,400 LF to the Pure Water AWTP.

5.3.4 Copper Implications

The copper concentration in a common pipeline scenario delivering Pure Water and City groundwater treatment brines would be 24 ug/L, well below the SMP 6-month median copper limit of 75 ug/L.

Figure 5-5: Scenario 6 – Proposed Infrastructure

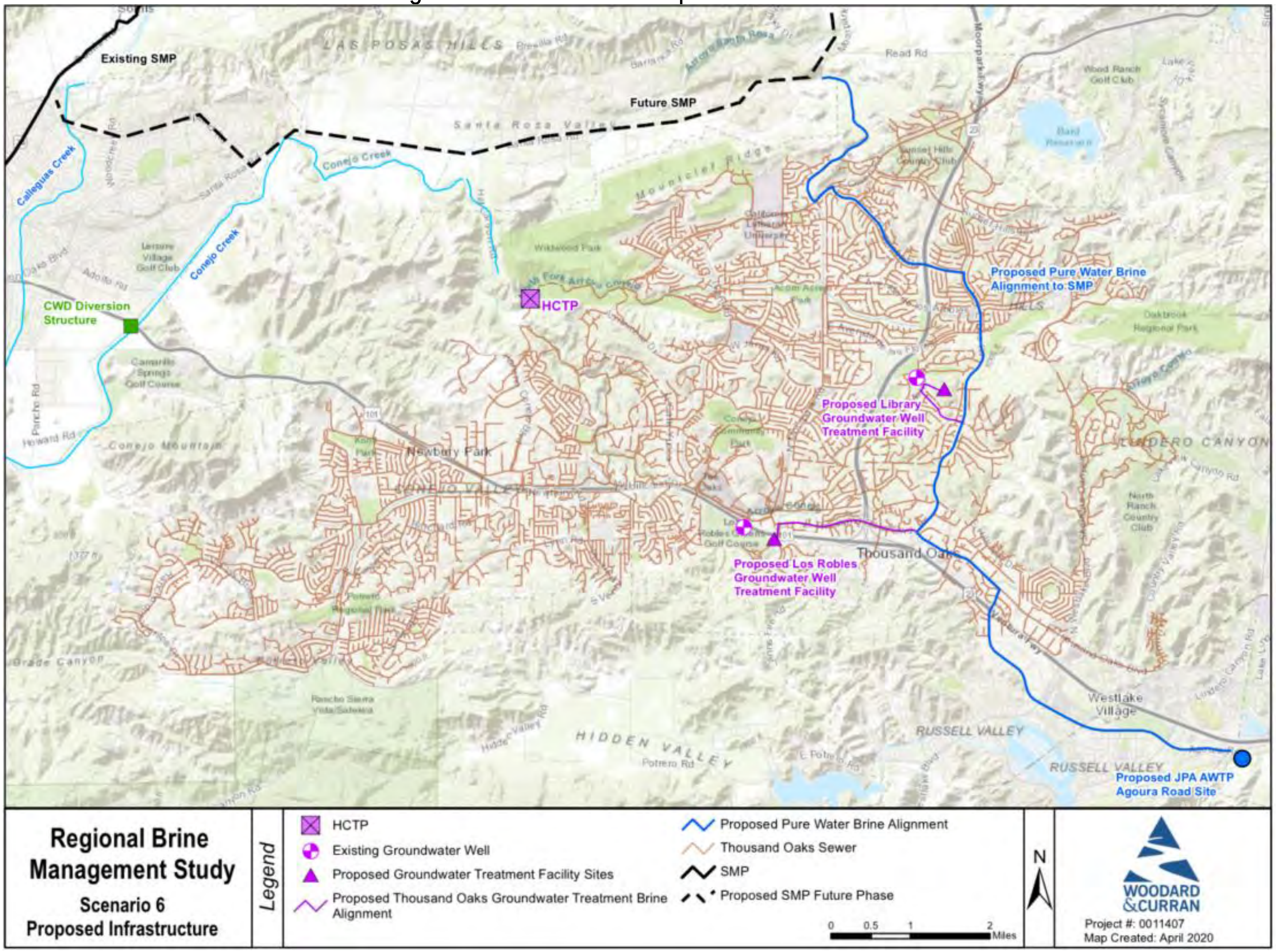


Figure 5-6: Scenario 7 – Proposed Infrastructure

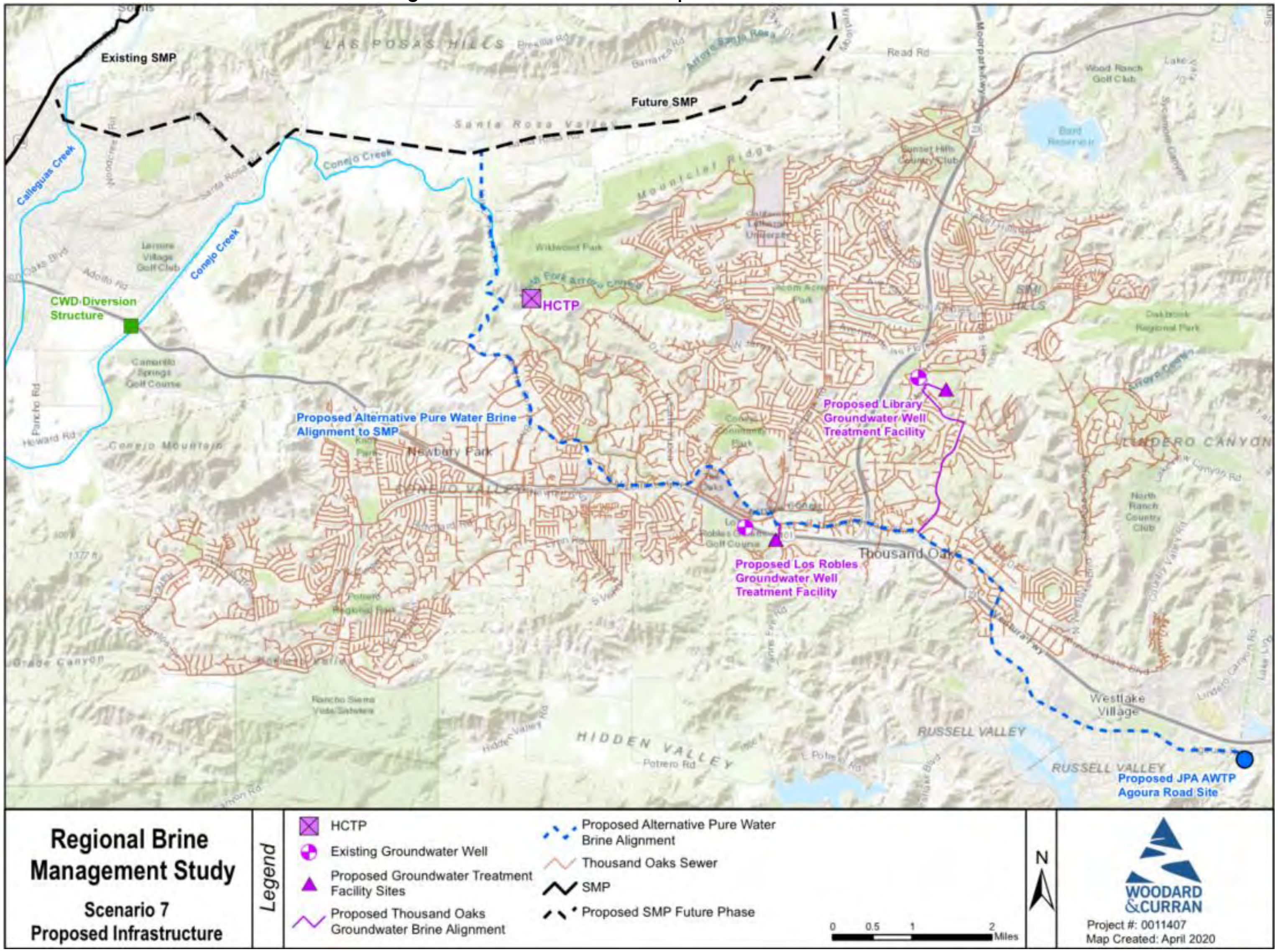
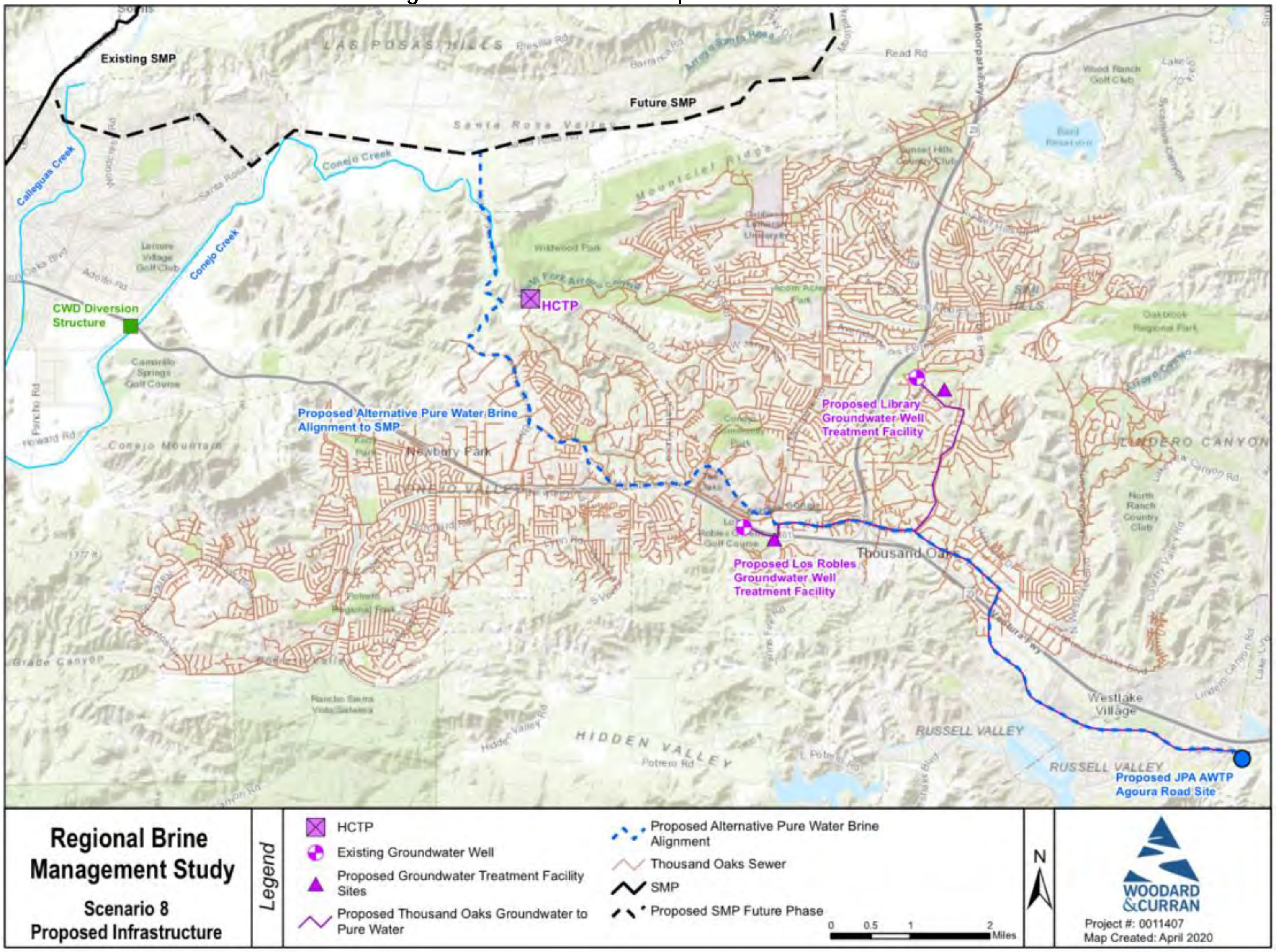


Figure 5-7: Scenario 8 – Proposed Infrastructure



6. ALTERNATIVES EVALUATION

The array of alternatives identified in Section 5 were evaluated based on constituent loading removal, potential water supply augmentation, and cost. Appendix C includes the Water Quality Model results in both tabular and graphic form. Table 6-1 summarizes the various components included in each alternative.

Table 6-1: Alternative Components Summary

Alt.	City GW Treatment	Brine Conveyance	HCTP Conversion to UV	HCTP Effluent Desalter Capacity (mgd)	HCTP Desalter Brine Conveyance to SMP	Direct Pipeline HCTP to CWD	JPA Brine Conveyance to SMP
A	Groundwater conveyance						None
B	Groundwater conveyance		✓				None
C		✓	✓				None
1	✓	✓		4.1	✓		Hill Canyon Rd
2	✓	✓		4.7	✓		Hill Canyon Rd
3	✓	✓		5.1	✓	✓	Hill Canyon Rd
4	✓	✓	✓	3.2	✓		Hill Canyon Rd
5	✓	✓	✓	4.0	✓		Hill Canyon Rd
6	✓	✓					Moorpark Rd
7	✓	✓					Hill Canyon Rd
8	Groundwater conveyance	✓					Hill Canyon Rd

6.1 Thousand Oaks Sanitary Sewer Capacity Assessment

In addition to the alternatives evaluation, two companion studies were conducted to address potential issues that might arise from significant brine addition to the City's sanitary sewer. The first study was an assessment of the hydraulic capacity of the City's sewer system to quantify the effects of the regional brine addition. Combined brines were introduced into the sewer system in two different locations. Based on the model results, surcharging of the backbone sewer interceptors is not anticipated. Modeled capacity exceeded the 75% depth to diameter ratio (d/D) in some locations; however, if the brines were introduced into the upstream location, there were no exceedances of the 75% d/D value. As flow travels downstream, peak flows are attenuated (dampened) which reduces the impact on downstream hydraulic deficiencies. Details of the sewer system hydraulic evaluation are presented in a Technical Memo attached to this Study as Appendix A.

6.2 HCTP Treatment Process Analysis

The second companion study was an evaluation of the impacts to performance in the HCTP secondary treatment processes. The study evaluated the following potential impacts of the regional brine addition for potential:

- Biomass toxicity due to the increase in TDS
- Loss of nitrification and exceedance of ammonia limits, and
- Deterioration of biomass settleability.

The mass balance results indicated that the increase in TDS would not have a major impact on the biological treatment performance, including nitrification. Further, the monovalent to divalent cation ratio is expected to drop with the brine addition, which would not result in negative impacts to settling performance. Settling may even improve due to the change in cation ratio due to the brine addition. Details of the HCTP process evaluation are presented in a Technical Memo attached to this Study as Appendix B.

6.3 Preliminary Cost Estimate

Preliminary cost estimates were prepared for new facilities associated with each alternative brine management strategy. These cost estimates, representing an Association for Advancement of Cost Estimating International's (AACE) Class 5 cost estimate, are focused on comparative cost implications and are not intended to depict the full cost of all aspects of the Pure Water, City groundwater treatment or SMP initiatives.

Reference Unit Costs

Various unit cost data and estimating methods have been used to develop the Class 5 conceptual level construction cost estimate. A summary of these unit costs is contained in Table 6-2.

It should be noted that sewer charges are based on the Thousand Oaks Waste Discharge Ordinance, the value presented is an approximation only. It is recommended that the JPA consult with the City to determine the actual charges related to discharge of brine to the City's sewer system.

Table 6-2: Unit Cost Assumptions

Item	Construction Cost (1)	Annual O&M Cost
Treatment Facilities		
UV Disinfection	$140,000 per mgd of product water	1% of capital cost
MF/UF	$1.5 million per mgd of product water	1% of capital cost
RO	$1.8 million per mgd of product water	1% of capital cost
Chemicals (Storage and Feed Systems)	$150,000 per mgd of product water	$82,000 per mgd
Sitework/ Piping/ Structures for Desalter	$2,940,000 per mgd of product water	n/a
Sitework Allowance for UV Process	10% of equipment costs	n/a
Inter-process Tank	$1.25 / gal	0.5% of capital cost
Distribution System Facilities		
Pipelines	6" ($150 per LF) 8" – 10" ($200 per LF) 12" ($250 per LF) 12" in Dual Trench ($340 per LF)	0.5% of capital cost
Pump Stations	$6,500 / hp	3% of capital cost
Brine Discharge Station	$350,000 per station	$45,000 per station
Operations & Maintenance		
Electricity	--	$0.18/kWh
Labor	--	$60/hour
Chemicals	--	$82,000 per mgd/year
Sewer Charges		$439,000 per 6 months

Notes:

1. Contingencies and implementation factors presented above the table are added to the unit construction costs.
2. Treatment cost estimates developed using SCVWD Ford AWTF costs (RMC Water & Environment., 2017).
3. Pump station size based on peak flow and 75% pump / motor efficiency.

Total Capital Cost Factors

Construction contingencies are defined as unknown or unforeseen costs. In general, higher contingencies should be applied to projects of high risk or with significant unknown or uncertain conditions. Unknowns and risk conditions for construction cost estimates could include project scope, level of project definition, occurrence of groundwater and associated dewatering uncertainties, unknown soil conditions, unknown utility conflicts, etc. A 30% contingency will be applied to construction cost estimates based on the methodology for Class 5 estimates.

Implementation factors are included to try to capture the capital costs associated with the implementation of the project in addition to construction costs. While these costs can vary greatly from project to project and from component to component, it is most common to assume a standard factor applied to the estimated construction costs across all projects and project types when analyzing alternatives and project options. Implementation factors are used to account for the following activities:

- Planning, environmental documentation, and permits
- Engineering services (pre-construction)
- Property acquisition (excluding cost of property)
- Engineering services during construction
- Construction management and inspection
- Legal and administrative services

For this study, 25% or 15% of the estimated project construction costs are used to account for these additional services.

Equivalent Annual Cost

To support alternative comparison and the development to unit costs, capital and O&M costs are rendered into an equivalent annual cost, using an interest rate of 3% and payback period of 30 years.

6.4 Alternatives Cost Evaluation

Planning level cost estimates for the various capital and O&M components of the eleven alternatives are presented in Table 6-3. These costs are based on the project components presented in Table 6-1, with the exception of City groundwater treatment costs, which are assumed to be the same for this analysis. Conceptual cost estimate details can be found in Appendix D.

Table 6-3: Alternatives Cost Summary

Conceptual Alternatives	Total Capital Cost	Annualized Capital Cost[1]	Annual O&M Cost	Total Annualized Cost
Early Phase Project A – Thousand Oaks Groundwater to HCTP	$640,000	$33,000	$2,000	$35,000
Early Phase Project B - Thousand Oaks Groundwater to HCTP with UV Disinfection	$3,140,000	$160,000	$(458,000)	$(298,000)
Early Phase Project C - Thousand Oaks Brine Lines and HCTP UV Disinfection	$3,260,000	$166,000	$(458,000)	$(292,000)
Scenario 1: LVMWD and Thousand Oaks Brine and 4.1 mgd HCTP Desalter/ Brine Line	$65,900,000	$3,362,000	$2,366,000	$5,728,000
Scenario 2: LVMWD and Thousand Oaks Brine and 4.7 mgd HCTP Desalter/ Brine Line	$73,790,000	$3,765,000	$2,610,000	$6,375,000
Scenario 3: LVMWD and Thousand Oaks Brine and 5.1 mgd HCTP Desalter/ Brine Line, 1.0 mgd to CWD NPS Tank	$86,090,000	$4,392,000	$2,883,000	$7,275,000
Scenario 4: LVMWD and Thousand Oaks Brine and HCTP UV Disinfection, 3.2 mgd HCTP Desalter/ Brine Line	$58,010,000	$2,960,000	$1,545,000	$4,505,000
Scenario 5: LVMWD and Thousand Oaks Brine with UV and 4.0 mgd Desalter at HCTP	$66,200,000	$3,377,000	$1,857,000	$5,234,000
Scenario 6: LVMWD Pure Water Brine Line to SMP - Moorpark Road[2]	$31,680,000	$1,616,000	$583,000	$2,199,000
Scenario 7: LVMWD Pure Water Brine Line to SMP - Hill Canyon Road[2]	$34,620,000	$1,766,000	$529,000	$2,295,000
Scenario 8: Thousand Oaks Groundwater to LVMWD Pure Water and Brine Line to SMP - Hill Canyon Road[2]	$43,590,000	$2,224,000	$1,007,000	$3,231,000

Note:

1. Annualized cost based on 3% interest rate over 30-year period
2. Pumping from the Los Robles and Library Wells included for cost comparison purposes, will most likely be covered by City.

6.5 Alternatives Evaluation Summary

As noted previously, the array of brine management alternatives was evaluated based on cost implications, salt load reduction, and water supply benefit. Table 6-4 presents a summary of this evaluation, using chloride export as the metric for salt load reduction.

Table 6-4: Alternatives Evaluation

Conceptual Alternatives	Chloride Export (lbs/day)	Total Annualized Cost ($/yr)	Chloride Export Unit Cost ($/lbs/day)	Water Quality Implications		
				Meets Conejo Creek TMDL	Meets CWD NPS Class V Summer Chloride Target	
					110 mg/L	90 mg/L
Early Phase Project A	--	$35,000	--		✓	
Early Phase Project B	1,680	$(298,000)	$(177)	✓	✓	✓
Early Phase Project C	1,680	$(292,000)	$(174)	✓	✓	
Scenario 1	12,110	$5,728,000	$473	✓	✓	
Scenario 2	14,090	$6,375,000	$452	✓	✓	✓
Scenario 3[1]	15,075	$7,275,000	$483	✓	✓	✓[2]
Scenario 4	9,665	$4,505,000	$466	✓	✓	
Scenario 5	11,430	$5,234,000	$458	✓	✓	✓
Scenario 6[3]	12,015	$2,199,000	$183			
Scenario 7[3]	12,015	$2,295,000	$191			
Scenario 8[3]	11,700	$3,231,000	$276			

Note:
1. CWD NPS becomes recycled water system (Operational and regulatory requirements) (CWD).
2. Achieved by conveying 1 mgd of expanded desalter product water directly to NPS blend tank.
3. No implication on HCTP discharge, so no water quality benefits provided to CWD.

It should be noted that alternative scenarios involving use of city wastewater infrastructure and discharge to Conejo Creek (Scenarios 1-5) provide a water quality benefit to CWD, with some options meeting minimum chloride target of 110 mg/L and other scenarios with supplemented treatment achieving a lower 90 mg/L chloride target.

7. SENSITIVITY ANALYSIS

A sensitivity analysis was conducted to test preliminary study assumptions. Table 7-1 summarizes the sensitivity analyses performed; see Appendix E for sensitivity analysis model results.

Table 7-1: Sensitivity Analysis Summary

Sensitivity Analysis	Preliminary Assumption to be Revised	Revised Assumption/Test
No. 1	20% HCTP NPDES mass loading capacity is reserved for City build-out	10% HCTP NPDES mass loading capacity is reserved for City build-out.
No. 2	City infrastructure would receive Pure Water AWTP brine flow as currently projected.	City infrastructure would receive reduced Pure Water AWTP brine flow.

7.1 Sensitivity Analysis No. 1 – NPDES Mass Loading Capacity Reserve is Reduced to 10%

For this Study, the HCTP NPDES discharge limits were reduced by 20 percent to accommodate the City's future buildout, approximately 8,000 more units in the next 10 to 20 years. The water quality model uses the Target Loading Limits, summarized in Table 4-6, as the effluent limits for the model. A sensitivity analysis on the 20 percent Target Loading Limitation was performed to determine the impact of a reduced loading limitation on desalter sizing and project costs.

For this sensitivity analysis, a 10 percent reduction of the HCTP NPDES discharge limits is modeled. Table 7-2 summarizes the five parameters the water quality model focuses on with 20% and 10% Target Loading Limits. The analysis was performed on Scenario 4 for desalter size and cost comparisons are discussed below.

Table 7-2: Hill Canyon Treatment Plant Discharge Limits – Target Loading Limits

Parameter	Units	Target Loading Limits (10% of NPDES Limits)			Target Loading Limits (20% of NPDES Limits)		
		Average Monthly	Average Weekly	Maximum Daily	Average Monthly	Average Weekly	Maximum Daily
Boron	mg/L	--	--	--	--	--	--
	lbs/day[1]	108	--	--	96	--	--
Total dissolved solids (TDS) (dry weather[2])	lbs/day	89,325	--	--	79,400	--	--
Sulfate (dry weather[2])	lbs/day	26,280	--	--	23,360	--	--
Chloride (dry weather[2])	lbs/day	15,750	--	--	14,000	--	--
Copper	ug/L	--	--	--	--	--	--
	lbs/day	--	--	0.63	--	--	0.56

Notes:

1. The mass-based effluent limits are based on the plant design flow rate of 14 MGD and are calculated as follows: Flow (MGD) x Concentration (mg/L) x 8.34 (conversion factor) = lbs/day. During wet-weather storm events in which the flow exceeds the design capacity, the mass discharge rate limits shall not apply, and concentration limits shall be the only applicable effluent limits.
2. For TDS, sulfate, chloride, and boron discharges during wet- and dry- weather; dry-weather is defined in the Calleguas Creek Watershed Salts Total Maximum Daily Load (Salts TMDL) as the condition when the flows in the receiving water are below the 86th percentile flow. Wet weather is defined in the Salts TMDL as the condition when the flows in the receiving water are greater than or equal to the 86th percentile flow.

Revisiting Scenario 4 with the LVMWD Pure Water and Thousand Oaks Groundwater Treatment brine influences on the HCTP NPDES effluent loading limitation with a 10 percent reduction decreases the desalter size to 2.5 mgd in comparison to a 3.2 mgd desalter required for the larger 20% loading limitation.

The Scenario 4 project costs for each of the two loading limits (20% and 10%) are presented in Table 7-3. The capital cost for Scenario 4 with a 2.5 mgd desalter is approximately $47,940,000. Table 7-3 compares Scenario 4 with a 20% reserved capacity and a 10% reserved capacity.

Table 7-3: Cost Comparison – No. 1

Conceptual Alternatives	Desalter Size	Total Capital Cost	Annualized Capital Cost[1]	Annual O&M Cost	Total Annualized Cost
Scenario 4 – 20% Reserved Capacity	3.2 mgd	$58,010,000	$2,960,000	$1,545,000	$4,505,000
Scenario 4 – 10% Reserved Capacity	2.5 mgd	$47,940,000	$2,446,000	$1,260,000	$3,706,000

Overall, the analysis shows an estimated annual savings of $800,000. Revising the Target Loading Limits from 20% to 10% does not change the Study's primary outcome that alternatives involving building the brine line from Pure Water directly to the SMP appears to be the most cost-effective regional brine management strategy.

7.2 Sensitivity Analysis No. 2 – Reduced Brine Flow to City Wastewater Infrastructure

The evaluation of alternatives considered the ultimate Pure Water AWTP capacity (6 mgd) and brine production (1.1 mgd). Should Pure Water be implemented in phases, or if the project does not achieve the planned capacity early in its operational life, lower amounts of brine flows could be generated. This sensitivity analysis was conducted to determine the amount of Pure Water AWTP brine that the City infrastructure could accommodate without exceeding the HCTP's NPDES mass loading limits (10% target loading limits). The model evaluated the HCTP effluent water quality influenced by the City brines and Pure Water brine to meet the NPDES Target Loading Limits for 10 percent (assuming this operation would not coincide with City build-out conditions) without additional treatment at HCTP. The model determined the following reduced flows from Pure Water AWTP brine were allowable to meet NPDES limits.

Table 7-4: Reduced Brine Flows from Pure Water AWTP to HCTP

Conceptual Alternatives	Pure Water Brine Flow to City sewer
10% Reserved Capacity – with UV	0.4 mgd
10% Reserved Capacity – no UV	0.15 mgd

Table 7-5: Cost Comparison – No. 2

Conceptual Alternatives	Pure Water Brine Flow	Total Capital Cost	Annualized Capital Cost[1]	Annual O&M Cost	Total Annualized Cost
10% Reserved Capacity – with UV	0.4 mgd	$8,650,000	$441,000	$55,000	$496,000
10% Reserved Capacity – no UV	0.15 mgd	$6,030,000	$308,000	$510,000	$818,000

Based on this analysis, there is not substantial capacity to accommodate an interim limited capacity Pure Water project. Even with the addition of UV at HCTP, only a 2 mgd Pure Water project could be accommodated.

8. FINDINGS

This study was conducted to identify potential regional brine management strategies that address the partner agency goals of water supply reliability, watershed protection, and cost-savings to their customers. Based on the baseline analysis, sensitivity analyses, and supplemental City sanitary sewer and HCTP studies, the following are key findings of this study.

8.1 Early Phase Concepts

Early project concepts were evaluated that could enable the City to move forward with brackish groundwater development prior to Pure Water coming on-line.

- Early Phase Project A, discharging of Los Robles Groundwater well test water into the sewer system, would not cause a violation of the HCTP NPDES Target Limits; but it would slightly degrade Conejo Creek water quality and, hence, CWD's NPS system water quality.
- With the HCTP transition from chlorine disinfection to UV, Early Phase Project B would enable the Los Robles Groundwater well test water to be discharged into their sewer system without violating the HCTP NPDES Target Limits, lowering HCTP chemical costs in the process and improving the CWD NPS water quality.
- Early Phase Project C, with the transition to UV disinfection, would allow the City to discharge groundwater treatment brines into their sewer system while meeting their NPDES Target Loading Limits permit limits. However, it slightly degrades the water quality for CWD's NPS system. It was noted that even without UV, an Early Phase Project discharging City groundwater treatment brines into the sanitary sewer generally would meet modified NPDES Target Loading Limits.

8.2 Alternatives Leveraging City Wastewater Infrastructure and Discharge to Conejo Creek

Alternatives that leverage City wastewater infrastructure were evaluated based on two water quality targets, HCTP discharge Target Loading Limits (year-round) and CWD's NPS Class V customer chloride target (summer irrigation season only).

- Constituents of Concern: Chloride, sulfate, and TDS were the primary water quality parameters of concern in this analysis, with chloride loading generally the controlling factor. Chloride concentrations and loadings were the water quality metrics used in the evaluation of alternatives.
- Seasonal Implications: Based on collected data, the "worst case" month for meeting HCTP discharge Target Loading Limits is February, with chloride, sulfate and TDS all exceeding modified NPDES permit limits. This is due primarily to the Pure Water winter-only operation. The summer irrigation season was selected as the basis for alternative scenarios focusing on meeting CWD's NPS Class V customer chloride target of 90 mg/L.
- Transitioning HCTP to UV Disinfection:
    - The disinfection process at HCTP (chlorination via sodium hypochlorite addition), and the associated dechlorination step (sodium bisulfite addition) add substantial amounts of chloride and sulfate to the effluent, exacerbating the already high loadings of those two constituents. Due to this, transitioning HCTP to UV disinfection was included in some alternative scenarios as a potential salt loadings reduction strategy.

- Based on the cost analysis, conversion of HCTP disinfection from chlorine to UV provides an operational cost saving regardless of water quality implications. Accordingly, transitioning HCTP disinfection to UV appears to be a more cost-effective means of achieving chloride loading reduction than an effluent desalter.
- Even with transitioning to UV, some desalter capacity would be required to meet NPDES and, when applicable, CWD NPS Class V customer water quality targets for all alternative scenarios.

- Alternative Scenarios focusing on HCTP discharge Target Loading Limits (Scenarios 1 and 4):
  - Without transitioning to UV, an HCTP effluent desalter with a capacity of 4.1 mgd would be required.
  - Assuming HCTP disinfection transition to UV, the required desalter capacity would be reduced to 3.2 mgd, with a net equivalent annual cost (annualized capital cost plus O&M cost) savings of roughly $1M/yr.
  - Assuming the HCTP effluent desalter would be operated year-round, these alternative scenarios would meet the minimum CWD NPS Class V chloride target of 110 mg/L during the summer.
- Alternative Scenarios focusing on CWD NPS Class V Chloride Concentration of 90 mg/L (Scenarios 2 and 5):
  - An increased desalter capacity of 0.6 to 0.8 mgd would be required to meet the lower chloride target of 90 mg/L (vs 110 mg/L achieved by other scenarios).
  - This increased desalter capacity has an associated equivalent annual cost increase of roughly $500,000 per year.
  - For all scenarios that had implications on CWD NPS Class V customers, boron levels were reviewed due to its potential toxicity to certain sensitive crops. Although boron does not exceed the mass loading limit to Conejo Creek, boron concentrations (as high as 0.6 mg/L in some scenarios) exceed the range of 0.3 to 0.5 mg/L where toxicity to certain sensitive crops could occur. Should planning proceed on one of these alternative scenarios, this issue would warrant further consideration.

Alternatives with Common Brine Pipeline to SMP

- Concepts involving the JPA and City partnering on the construction of a brine line directly to the SMP, not involving use of City wastewater infrastructure, appears to be the most cost-effective regional brine management strategy, given the assumptions and constraints used in this study.
- Conveyance of City groundwater to the Pure Water AWTP provides an operational benefit to the advanced treatment facility through an alternative influent supply. If groundwater is supplied only during summer and shoulder months, the Pure Water AWTP would not require a capacity expansion. The strategy of treating brackish groundwater in the summer months would provide the benefit of augmenting Las Virgenes MWD's water supply during the period of highest water demand. This strategy would offset constructing new groundwater treatment (avoided capital cost for the City) but would require increased pumping costs to convey groundwater to the Pure Water facility.
- An alternative alignment passing near HCTP appears to have a higher capital cost but potentially lower pumping costs. It is noted that choosing a common brine pipeline alignment proximate to HCTP could support a future effluent desalter at that facility; however, there are environmental impacts and other alignment options that should be considered to minimize potential environmental and cultural impacts of constructing a brine

line in the vicinity of HCTP. A more detailed alignment study would need to be performed to address these impacts.

Copper Implications

Copper levels in both the HCTP effluent and HCTP desalter brine were evaluated. The HCTP effluent NPDES copper limit is 6 ug/L as an average monthly concentration, while the Scenario 4 (i.e., the smallest desalter capacity, therefore "worst case scenario") maximum monthly (December) concentration is 3.6 ug/L. The corresponding desalter brine copper concentration is 36 ug/L, well below the SMP 6-month median copper limit of 75 ug/L. The copper concentration in a common pipeline scenario delivering Pure Water and City groundwater treatment brines would be 24 ug/L, well below the SMP 6-month median copper limit of 75 ug/L.

8.3 Sensitivity Analyses

Sensitivity Analysis No. 1 - NPDES Mass Target Loading Limitation Reduced to 10%

Using Alternative Scenario 4 (UV Disinfection and Desalter at HCTP for NPDES Compliance) as a test case, revising the Target Loading Limitation from 20% to 10% reduced the annual cost by roughly $800,000 but did not change the Study's primary outcome that alternatives involving building the brine line from Pure Water directly to the SMP appear to be the most cost-effective regional brine management strategy.

Sensitivity Analysis No. 2 - Reduced Brine Flow to City Wastewater Infrastructure

This sensitivity analysis was designed to identify the largest capacity Pure Water AWTP that could discharge brine to the City sanitary sewer system without exceeding HCTP NPDES permit limits, assuming no HCTP effluent desalter. Based on this analysis, and assuming HCTP transition to UV, a 2 mgd Pure Water project could be implemented and still meet NPDES permit limits, offering a potential interim strategy should the JPA desire to implement Pure Water in phases.

8.4 Supplemental Study Results

Results from the two supplemental studies conducted for the City facilities are as follows.

City of Thousand Oaks Sanitary Sewer Capacity Assessment

A simplified hydraulic model of the City's sanitary sewer system was developed to identify potential hydraulic limitations to brine discharges. Based on the model results, surcharging of the backbone sewer interceptors is not anticipated due to any of the alternative scenarios evaluated. It is noted that the City will be performing a Sanitary Sewer System Master Plan; preliminary results from this analysis can then be validated with a more expansive, calibrated hydraulic model.

HCTP Brine Impacts Assessment

Based on an assessment of HCTP operations with increased brine loading from Pure Water and City groundwater treatment, it was determined that neither the nitrification process and nor settling would be impacted, and that settling actually may improve due to the change in anion-cation ratios from the brine addition.

8.5 Potential Additional Areas of Study

As planning for Pure Water and City groundwater development moves forward, and additional information is gathered regarding Conejo Creek flows and trending water quality parameters, the Water Quality Model developed as part of this study can be a useful tool to periodically explore new partnership opportunities that may arise.

9. REFERENCES

AECOM. (2020). City of Thousand Oaks Wastewater Interceptor Capital Improvement Program Unit W – Technical Evaluation of Unit W - Phase 1.

Bachman, S. (2013). Conejo Creek Project.

Calleguas Municipal Water District. (2018). Annual Water Quality Report.

Camrosa Water District. (2013). Santa Rosa Basin Groundwater Management Plan.

Camrosa Water District. (2018). 2015 Urban Water Management Plan, Revised 11/15/18.

CDM Smith. (2016). City of Thousand Oaks Groundwater and Reclaimed Water Study.

Kennedy/Jenks Consultants. (2018). Los Robles Golf Course Groundwater Utilization Project.

Kennedy/Jenks Consultants. (2018). Pure Water Project Las Virgenes - Triunfo Joint Powers Authority Title XVI Feasibility Study.

Las Virgenes-Triunfo JPA. (2020, May 8). Bringing Our Water Full Circle.

Los Angeles Regional Water Quality Control Board. (2019, June). Waste Discharge Requirements for the Calleguas Municipal Water District Regional Salinity Pipeline Discharge to the Pacific Ocean, Order No. R4-2019-0075; NPDES No. CA0064521.

Los Angeles Regional Water Quality Control Board. (2019, November). Waste Discharge Requirements for the Hill Canyon Treatment Plant Discharge to the North Fork Arroyo Conejo Outfall 005, Order R4-2019-00XX; NPDES No. CA0056294.

MWH. (2002). City of Thousand Oaks Wastewater Interceptor Master Plan .

MWH. (2016). Recycled Water Seasonal Storage Basis of Design Report.

State Water Resources Control Board (SWRCB). (1997). Water Right Application 29408 and Wastewater Change Petition WW-6 of the CIty of Thousand Oaks.

U.S. Fish & Wildlife Service. (2020, August 6). IPaC Resource List generated for Scenario 8 Alignment past HCTP. Retrieved from https://ecos.fws.gov/ipac/location/EE7BU4JPA5G5HLHN2EDPJL2KQI/resources

Ventura County Watershed Protection District. (2016). 2015 Annual Report for Groundwater Conditions.

APPENDIX A: THOUSAND OAKS SEWER HYDRAULIC ANALYSIS TECHNICAL MEMORANDUM

TECHNICAL MEMORANDUM

TO: Eric Schlageter, Las Virgenes Municipal Water District

CC: Nader Heydari, City of Thousand Oaks

PREPARED BY: Andrew Baldwin, Woodard & Curran

REVIEWED BY: Brian Dietrick, Woodard & Curran, Janet Fordunski, Woodard & Curran

DATE: August 11, 2020

RE: Regional Brine Management Study - Task 8
Hydraulic Analysis of Thousand Oaks Wastewater Collections System

1. BACKGROUND AND OBJECTIVES

The focus of this analysis is evaluate the hydraulic capacity of the Thousand Oaks wastewater collections system with the addition of up to 1.3 million gallons per day (mgd) of reverse osmosis concentrate (brine) from proposed brackish groundwater desalters in Thousand Oaks and from the proposed Las Virgenes-Triunfo JPA Pure Water Advanced Water Treatment Plant (AWTP) in Agoura Hills. The proposed brine flows would be piped to existing manholes and pipes in the eastern part of the City.

The Thousand Oaks sewer collection system is divided into 11 tributary areas called "units", which have letter designations (A, B, C, E, F, G, U, V, W, X and Y). The largest sewers serving these areas are called "interceptors." The interceptors and relevant sewers draining units E, F, G, U, V and W conveying the resulting flow to the Hill Canyon Treatment Plant (HCTP) are the subject of this study. In particular, the study is focused on evaluating the hydraulic impact on the Unit V and W interceptors, indicated on **Figure 2.1**. The analysis begins with an evaluation of pipe materials in the relevant reaches.

2. PIPE MATERIALS EVALUATION

The City's sewer GIS data were used to identify and evaluate the pipe material and sizes impacted by the brine discharge, as conveyed in the Unit W and V interceptors, terminating at HCTP. The alignment is approximately 9 miles in length, consisting of pipes ranging between 12- and 42-inches in diameter. The eastern end of the alignment begins near the intersection of Thousand Oaks and Westlake Boulevards and the western end terminates at the HCTP.

Table 2.1 shows the pipe materials for the Unit W and V interceptors. The pipe materials for the Unit W Interceptor are asbestos-cement (ACP), ductile iron (DIP), fiber-reinforced polymer mortar (FPM), high-density polyethylene (HDPE), mixed, reinforced concrete (RCP), and vitrified clay (VCP). The pipe materials for the Unit V Interceptor are ACP, polyvinyl chloride (PVC), unlined reinforced concrete pipe (URCP), VCP, and VCP/ACP.

The Unit V interceptor is mostly ACP, VCP, and URCP while the Unit W interceptor is mostly DIP, FPM, and RCP. **Figure 2.1** shows the pipe materials along the Unit W and V interceptors.

Material	Unit	Length (ft)	% Unit V Pipe Length	% Unit W Pipe Length
ACP	V	10,443	50%	-
ACP	W	3,305	-	11%
DIP	W	9,930	-	34%
FPM	W	6,130	-	21%
HDPE	W	1,947	-	7%
Mixed	W	205	-	1%
PVC	V	998	5%	-
RCP	W	4,936	-	17%
URCP	V	2,853	14%	-
VCP	W	2,769	-	9%
VCP	V	6,245	30%	-
VCP/ACP	V	400	2%	-
Unit V Pipe Length (ft):			**20,939**	
Unit W Pipe Length (ft):				**29,222**
Total Pipe Length (ft):		**50,162**		

Table 2.1 Summary of Pipe Material and Diameters

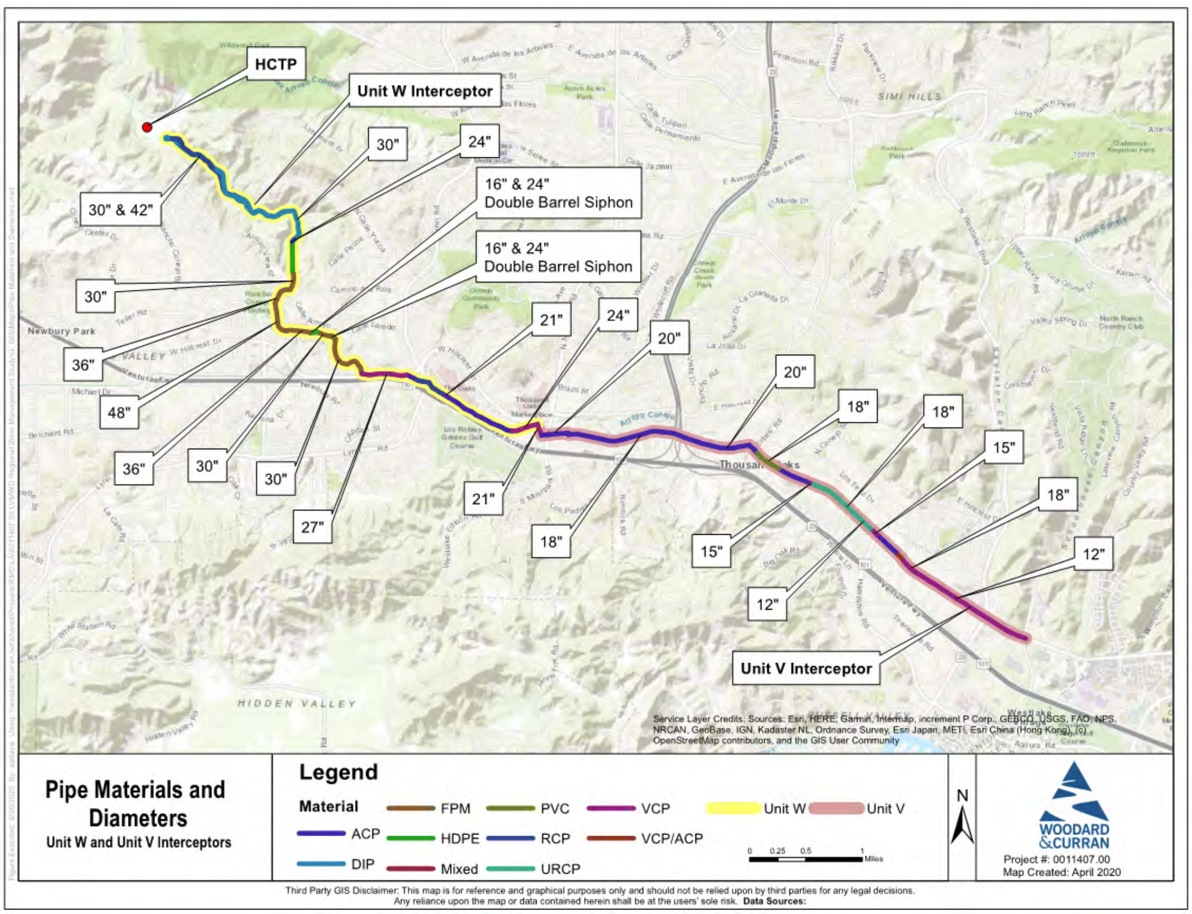


Figure 2.1: Plan View of the Core Model Network

3. APPROACH

The hydraulic model used for the previous City of Thousand Oaks Wastewater Interceptor Master Plan (2002 Master Plan) was not available for this study. As a result, a new hydraulic model of the interceptor and associated units was built using the Innovyze InfoWorks ICM software. This software package is an updated (and renamed) version of the HydroWorks software used in the 2002 Master Plan.

As this study is focused on the hydraulic analysis of the Unit V and W interceptors, the new model only included pipe segments and manholes along this alignment. Dry weather flows, along with estimated inflow and infiltration flows drained by units E, F, G, U, V and W, were modeled as drainage basins, represented as polygon shapes, and connected to the alignment at drainage manholes.

The following industry modeling practices and key steps were used in the modeling process:

1. Develop hydraulic model network
2. Model dry weather flows and ground water infiltration
3. Model inflow and infiltration flows
4. Calibrate model to existing flow conditions
5. Establish design rainfall and future flow criteria
6. Conduct hydraulic analysis, identifying system deficiencies

4. HYDRAULIC MODEL DEVELOPMENT

The hydraulic model utilized the InfoWorks ICM software to build a model of the interceptor pipe alignment along with respective inflows. The model consists of a series of pipe segments and associated manholes extracted from the City's latest GIS data. Key model attributes were obtained from the GIS provided by the City and imported into the software. Key model attributes include:

- Manhole ID's
- Manhole rim elevation (ft)
- Pipe size (inches)
- Upstream and downstream connecting manhole ID's
- Pipe length (ft)
- Pipe inverts (ft, upstream and downstream).

Although the City's GIS provided most of the above attributes, data validation revealed a series of missing values including inverts and pipe sizes specifically in the parallel pipe section upstream of the HCTP interceptor. Our team obtained as-built drawings and profiles for this section and extracted and entered the relevant data into the new model. **Figure 4.1** shows the core model network of the Unit W interceptor.

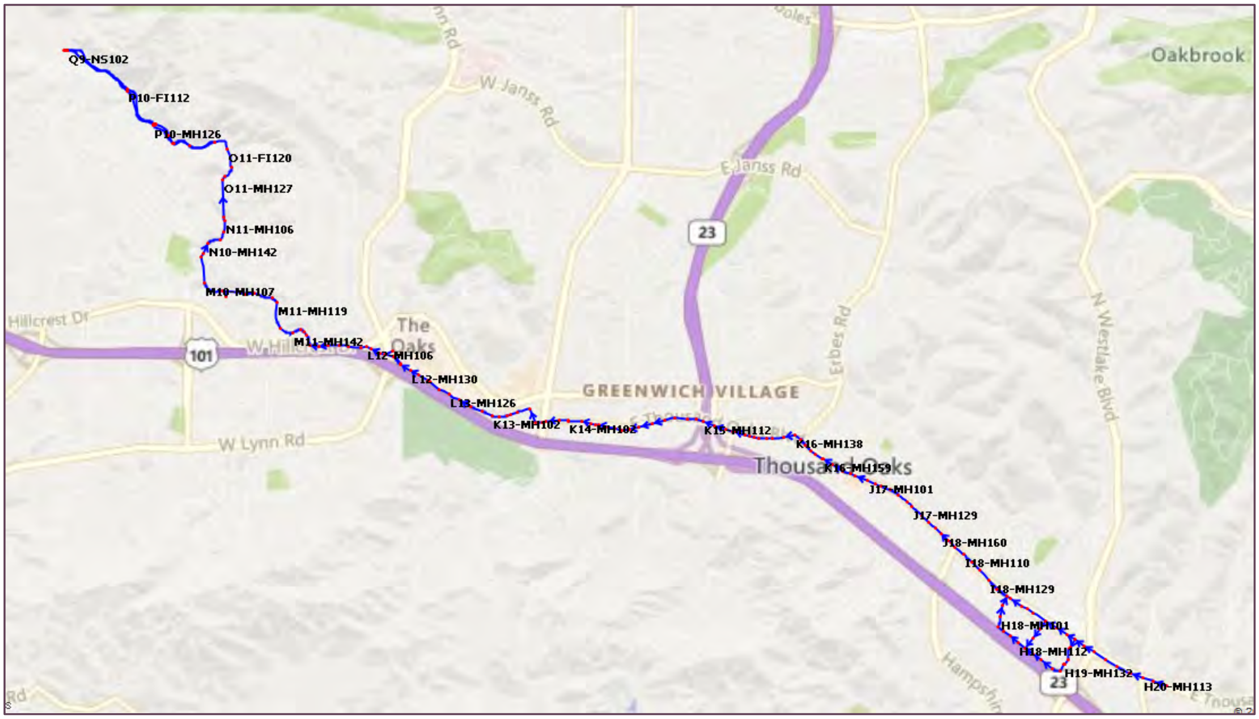


Figure 4.1: Plan View of the Core Model Network

Close inspection of the as-built drawings of the parallel interceptor alignment revealed some cross-connection pipes that allow flows to be split and conveyed along the respective parallel sections. **Figure 4.2** shows details of the Unit W parallel interceptor.

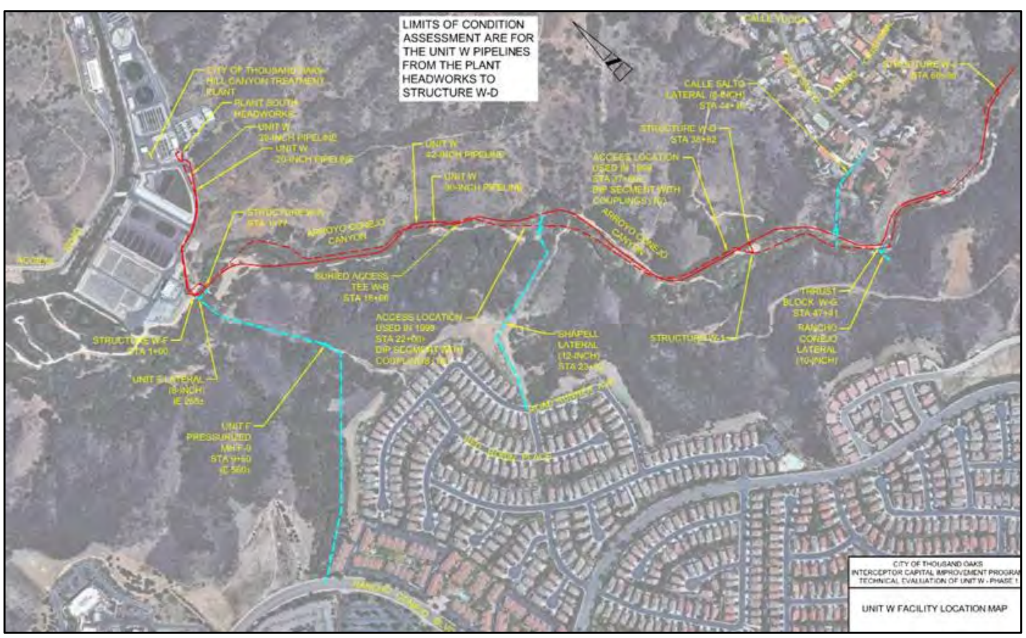


Figure 4.2: Unit W Interceptor – Parallel Section

These cross connections along with the respective manholes were modeled. In addition, siphon pipes were also modeled, enabling the model to accurately represent the hydraulic head losses specifically under surcharge conditions along the Unit W interceptor. **Figure 4.3** shows the modeled hydraulic profile of the Unit W interceptor.

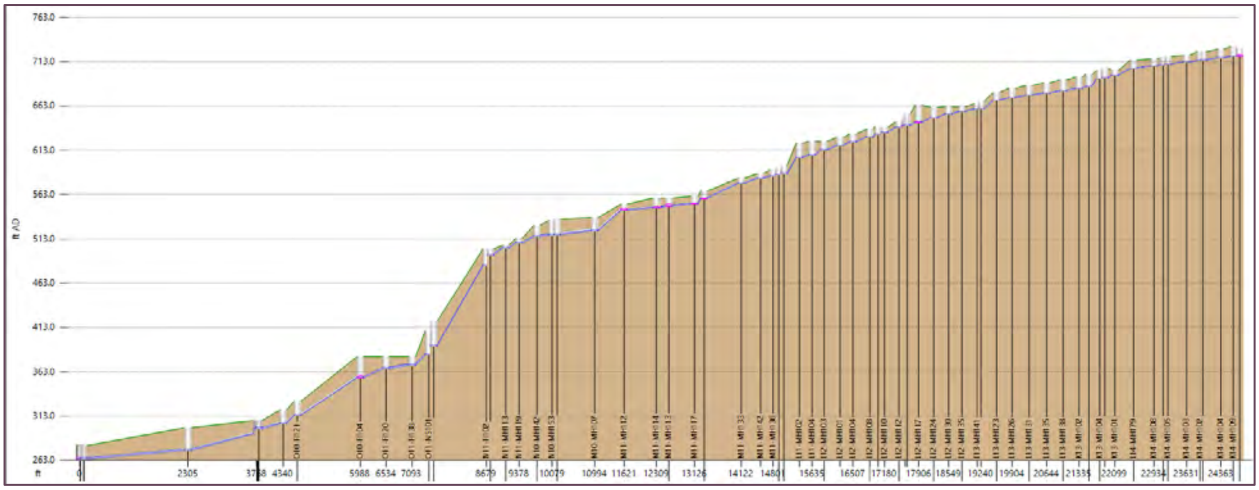


Figure 4.3: Profile of the Unit W Interceptor

5. EXISTING AND FUTURE FLOW PROJECTIONS

Wastewater flows typically include three components: population-based wastewater flow (BWF), groundwater infiltration (GWI), and rainfall-dependent infiltration/inflow (RDI/I). BWF represents the sanitary and process flow contributions from residential, commercial, institutional, and industrial users of the system. GWI is groundwater that infiltrates into the sewer through defects in pipes and manholes. GWI varies based on groundwater conditions and is typically seasonal in nature and remains relatively constant during specific periods of the year. RDI/I is storm water inflow and infiltration that enters the system in direct response to rainfall events. RDI/I can occur through direct connections (such as holes in manhole covers or illegally connected roof leaders or area drains), or through defects in sewer pipes, manholes, and service laterals. RDI/I typically causes short term peak flows that recede quickly after the rainfall ends. These three flow components are illustrated conceptually in **Figure 5.1,** which depicts dry weather flow (DWF) consisting of BWF plus GWI and wet weather flow shown as the RDI/I component.

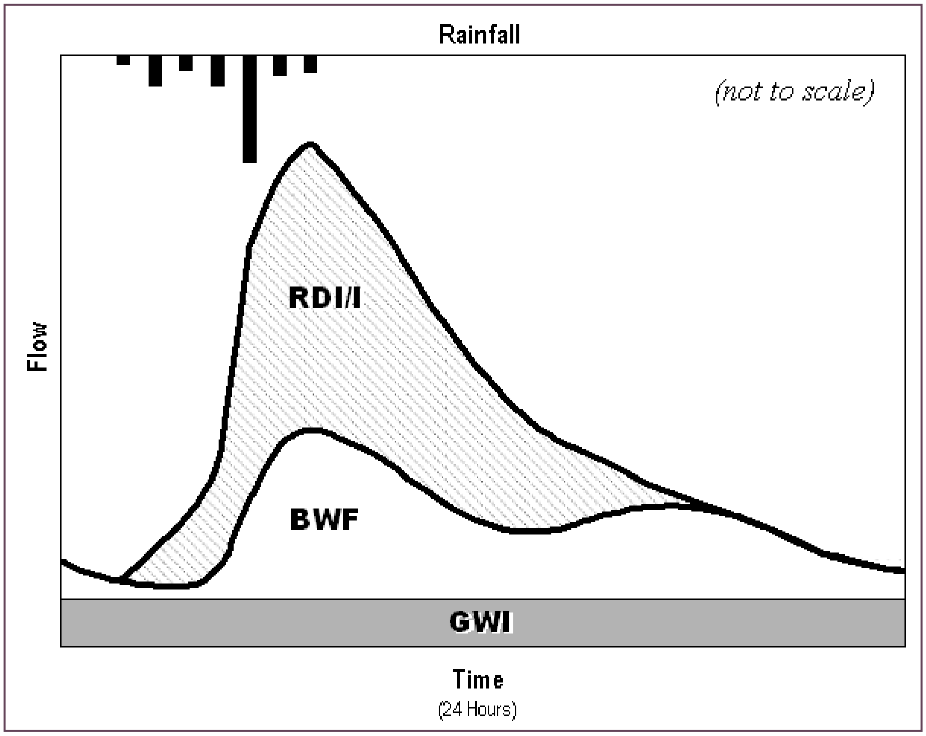


Figure 5.1: Wastewater Flow Components

Dry weather flows entering the Unit W interceptor from the connecting unit areas are modeled using a combination of unit flow factors and equivalent populations initially derived from the 2002 Master Plan. Equivalent populations represent the estimate residential and employment populations distributed over the relevant unit areas. The unit flow factors, often referred to as "per capita flows", represent the average amount of wastewater discharged per person. The average dry weather flow (ADWF) is calculated as follows:

Average Dry Weather Flow (ADWF) = Equivalent Population x Unit Flow (gallons per day)

5.1 Existing Population Flows

Population-based flow estimates obtained from the 2002 Master Plan are not suitable for calculating existing dry weather flows in the current model due to outdated population data. Therefore, population data obtained from Southern California Association of Governments (SCAG) were obtained for the latest period (2018) and distributed over the City's unit areas based on total pipe length. This population distribution provided the basis for estimating current dry weather flows. The estimated SCAG population (for 2018) is 130,196 for the entire City of Thousand Oaks. As the City boundary differs slightly from the sewer service area, this population was adjusted (reduced by 8%) to determine the population served by the service area. The adjustment was based on the population used in the 2002 Master Plan and the 2000 population estimate, also obtained from SCAG. The City are planning to update the wastewater collection system master plan in 2022 which will refine the SCAG-based flow projections used for this study by incorporating future developments and land-use changes.

Unit flow factors are used to quantify sewer flows per capita for multiple land-use categories such as residential, commercial and industrial. For typical master planning studies, accurate flows are required to identify hydraulic deficiencies for the entire collection system. They require granular unit flows obtained from analysis of land-use and measured flow data. As this study is focused on cumulative flow entering the Unit W interceptor, 'consolidated' unit flow factors representing combined flows from multiple land-uses were used to develop the dry weather flow estimates. A single unit flow factor was derived for the entire study area by comparing calculated flow estimates with observed flow measurements at HCTP, and where necessary adjusting distributed populations (per unit), to align with the with observed flows at HCTP. **Table 5.1** summarizes the population and unit flow estimates. As described later in the model calibration section, minor adjustments were further made to the unit flow factors.

Based on the calibration process, unit flows were adjusted to match the model predictions with observed flow data resulting in a final system-wide unit flow factor of 64-gallons per day per capita. The calculated unit flow was compared with results from recent master planning and sewer flow studies and showed a close correlation with these values. In addition, the updated unit flow is lower than historical unit flows as used in the 2002 Master Plan resulting from changes in water demand and water conversation.

Description	2000	2018	BUILD-OUT
HCTP Influent ADWF, *gallons per day*	11,330,000	7,689,790	13,470,000
GWI (Assume 10%), *gallons per day*	1,133,000	768,979	1,347,000
Population DWF, *gallons per day*	10,197,000	6,920,811	12,123,000
Unit Flow Factor, *g/d/p*	**94.42**	**57.59**	**64.20**
SCAG Population	117,005	130,196	N/A
Sewer Service Area Population	**108,000**	**120,176**	**186,240**

Table 5.1 Population and Unit Flow Summary

Dry weather flow is also comprised of a base infiltration inflow, typically referred to as 'ground water infiltration' (GWI). This flow component varies seasonally with the highest values occurring during the winter months following periods of rainfall which in turn raise the local groundwater levels. The model calibration results described in the 2002 Master Plan provided the basis for estimating the GWI supported by typical GWI values gathered from recent sewer master planning studies. As a result, typical GWI ranges from 5 to 20-percent of the average base flow. For this study, the GWI was assumed to be 10-percent of the base dry weather flow and was included in the unit flow calculations shown in **Table 5.1**.

5.2 Diurnal Profiles

Diurnal profiles are applied to average dry weather flows to represent time-varying flows during a typical 24-hour period. As these flows travel downstream, peak flows are attenuated (dampened) which potentially reduces the impact on downstream hydraulic deficiencies. Therefore, it is important to model these profiles accurately and apply them appropriately to the inflows entering the Unit W interceptor to enhance the accuracy of the hydraulic analysis.

The diurnal profiles developed for this study are shown in **Figure 5.2**. The curve shows the flow multiplier (ratio of hourly flow to average daily flow) for each hour of the day. Weekday and weekend profiles were developed based on flow data captured at selected flow meters along the Unit W interceptor. These profiles differ in magnitude and timing of the peak flow, ranging from a high peak occurring in the morning, a somewhat lower peak occurring in the morning, and a higher peak occurring in the evening.

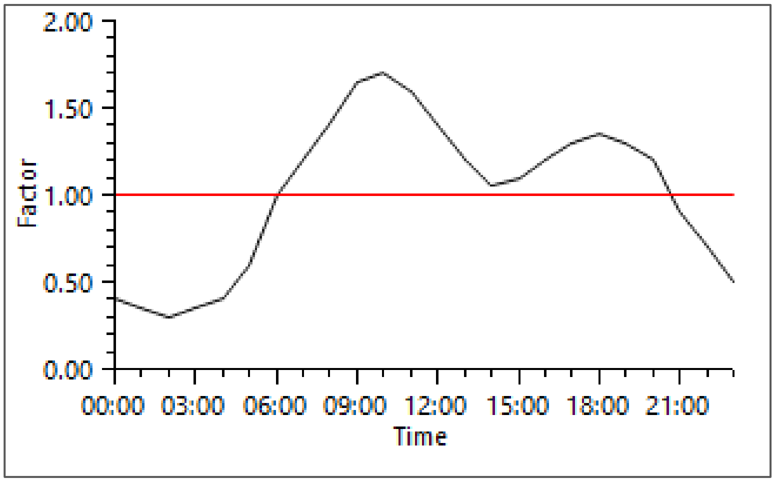


Figure 5.2 Weekday Diurnal Profile

5.3 Future Population Flows

The capacity improvement projects identified from the 2002 Master Plan were based on 'build-out' flow projections derived from planned developments and land-use changes. Although changes in development projects and updates to land-use designations have likely occurred since the 2002 Master Plan, the resulting future 'build-out' flow projections were assumed to be suitable for predicting future flows for this study. For this study, future build-out flows were derived as follows:

- Used build-out flow projections defined in the 2002 Master Plan to estimate future dry weather flows.
- Build-out flow projections were extracted from the 2002 Master Plan (per unit area) and converted into adjustment factors (percent). These percentage increases were applied to the existing dry weather flows to estimate future build-out flows per unit areas.
- The estimated future build-out flows as summarized in **Table 5.1** were entered into the current model at selected manholes along the core trunk in-line with the pipes draining the unit areas.
- Peak dry weather flows are modeled using a diurnal profile calibrated against current flow data collected at 4 flow meters local to the core trunk system.
- Additional brine flows (from the sources listed below) are combined with the future build-out flows. These flows were modeled under a 24-hr constant discharge scenario.

- Peak wet weather flows (PWWF) are derived from a simulated rainfall storm approximating the storm event used in the 2002 Master Plan. PWWF's are combined with the build-out dry weather flows to evaluate capacity impacts along the core trunk system.

Discussions with City staff revealed the City's plans to build up to 8,000 housing units within the next 10 to 20-years. For the purposes of this study, future flow projections obtained from the 2002 Master Plan were assumed to include these planned housing units. However, as the City's development projections may have changed since 2002, it is understood that the City will be updating their sewer master plan in 2022 upon the completion of the City's general plan. This planned study will capture future development plans and consequently revise the sewer capacity and treatment needs. Results from the updated sewer master plan may change the conclusions drawn from this study.

6. INFLOW AND INFILTRATION

RDI/I flows result from rainfall events that produce infiltration and inflow of stormwater runoff into the sewer system. RDI/I sewer flows are defined by the magnitude, shape, and timing of the RDI/I response. RDI/I varies depending on many factors, including the magnitude and intensity of the storm event, area topography, type of soil, and the condition of the sewers, manholes, and sewer service laterals. RDI/I can be expressed as a volume or a percentage of rainfall volume, or a peak flow or peaking factor. For a dynamic model, RDI/I is typically computed as a percentage of the rainfall falling on the contributing area of a sub-catchment. In the model, RDI/I is estimated in terms of "fast", "medium", and "slow" runoff components as illustrated in **Figure 6.1***Figur*. Summing all the component hydrographs for the entire duration of the rainfall event results in the total RDI/I hydrograph for the event for that sub-catchment. Note that although the "slow" RDI/I component, as represented by a delayed, flatter I&I curve, can contribute significantly to the total RDI/I volume, the "fast" component, shown as a peaky I&I response, has the biggest impact on the magnitude of the peak wet weather flow.

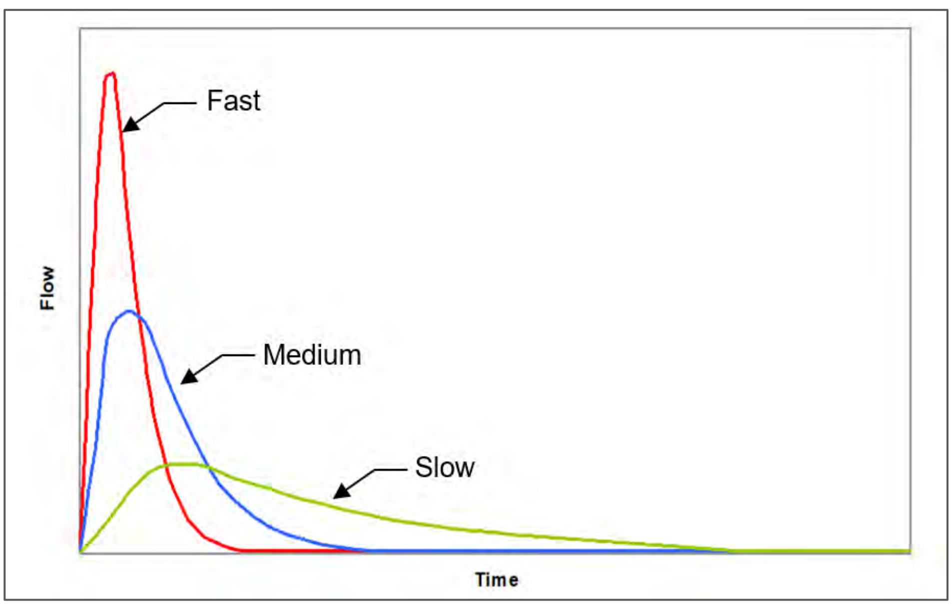


Figure 6.1 RDI/I Hydrograph Components

One way of expressing the magnitude of RDI/I is by the “R-value”, which represents the volume of RDI/I entering the sewer system as a percentage of the rainfall volume falling over a specified area. R-values are typically derived by comparing observed wet-weather flow data against measured rainfall data (for the same period) which is the approach deployed for master planning studies. However, observed wet-weather flow data and corresponding rainfall data were not available for this study, therefore ‘calibrated’ R-values derived from the 2002 Master Plan were applied to the new hydraulic model to estimate RDI/I.

The total R-value is a good measure of RDI/I volume, but it does not necessarily reflect the magnitude of the peak RDI/I. R-values under 2 percent are typically observed in newer sewers or sewers in very good condition. Areas with R-values over 4 percent may be considered candidates for RDI/I reduction measures. R-values obtained from the 2002 Master Plan range from 0.3 to 4.9-percent, with the highest R-value (4.9-percent) occurring in unit W.

For the future (2040) scenario, the RDI/I parameters developed during the calibration process were applied without change. The assumption is that sewer maintenance, rehabilitation, and replacement projects in the future will be sufficient to offset any increases in RDI/I resulting from general deterioration of the system. Currently vacant parcels, however, were assumed to contribute RDI/I as they develop, at the same per-acre rates as the adjacent developed areas within the same sub-catchment.

7. DESIGN RAINFALL

The design storm return period conceptualizes the degree of risk an agency takes on under a large wet weather event. However, the return period is not the only consideration; the storm duration and temporal and spatial rainfall distribution also influence the storm’s impact on the system. While regulators generally will not specify a required design storm (since all overflows are prohibited), many agencies in California use 5 or 10-year design storms with durations ranging from 4 to 24 hours. Oftentimes, the choice of a return period is a balance between the risk of overflows and the potential cost of improvements, considering that sizing the system for a very infrequent event could also mean the system does not function well under typical (lower) flow conditions.

The recommended design storm criteria used for this study to evaluate the hydraulic capacity and identify necessary capacity improvement projects was based on the design storm used in the 2002 Master Plan as follows:

- Observed storm event on March 4 to– 6, 2001 (referred to as ‘Event 5’ in the 2002 Master Plan)
- Storm ‘time-shifted’ to align the peak flow with the mid-afternoon dry weather flow
- Depth range: 2.5 – 3.4 inches
- Storm duration: 60 hours
- Comprised of 2 events separated by a 2-hr dry weather period

The design storm profile was recreated from the 2002 Master Plan PDF document by manually ‘digitizing’ the rainfall intensity values into the rainfall data record within the InfoWorks ICM modeling software. The resulting rainfall profile is shown in **Figure 7.1**. Although this approach is consistent with the 2002 Master Plan and will provide similar hydraulic predictions (and hence capacity improvement recommendations), the design storm is less than a 5-yr event when compared to the NOAA statistical rainfall dataset. Typically, design storms range from 5 to 10-year return periods and therefore this difference should be addressed during the next sewer master plan update. In addition, the next master plan update, planned for 2022, will account for reduced I&I flows as seen by the City over the past 10-years resulting from on-going sewer lining projects.

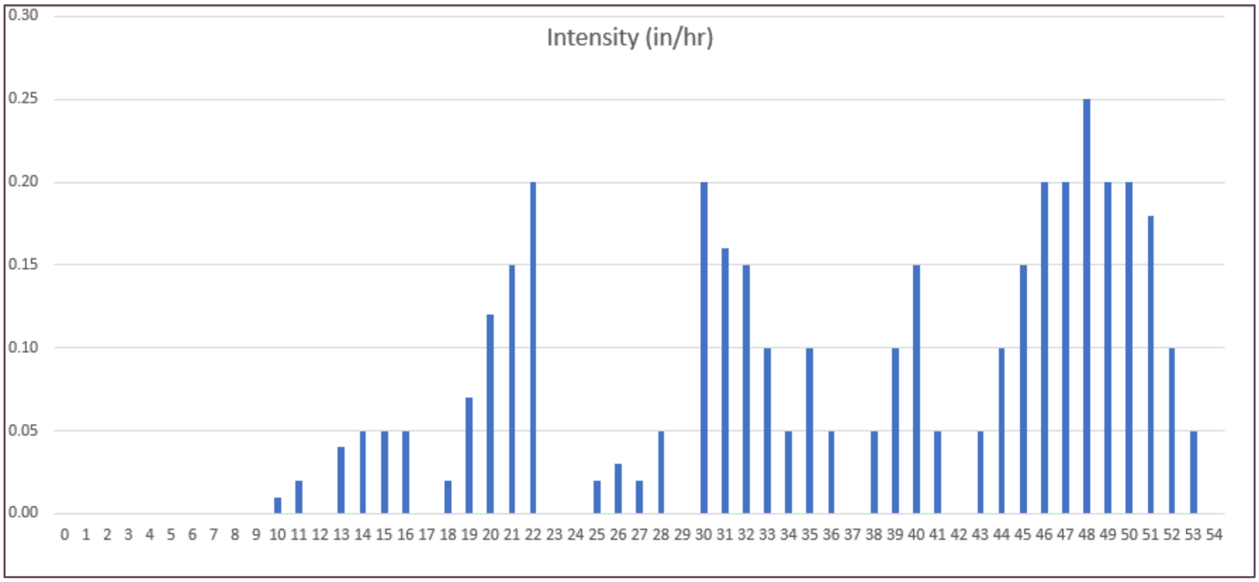


Figure 7.1 Design Rainfall Profile

8. MODEL CALIBRATION

Model calibration is the process of comparing model-computed flows to observed (monitored) flows, adjusting model parameters, and verifying that the model accurately simulates flows in the sewer system. The model is calibrated for only dry weather flow conditions. The following sub-sections describe the calibration process and overall results.

8.1 Dry Weather Flow Calibration

Dry weather flow (DWF) calibration involves determining per-capita flow rates, 24-hour diurnal flow profiles, and GWI rates in the model that result in the best match of modeled flows to monitored flows for a typical dry period. A major part of DWF calibration also involves verifying and adjusting the equivalent population distribution across the relevant unit areas which determine the routing of flow through the model system. DWF calibration also involves adjustment of the system-wide unit flow rate based on a comparison of modeled versus observed flow meter flows.

The dry weather calibration process was also used to quantify GWI (as indicated by monitored flows that were higher than estimated BWF). GWI was added when the observed (metered) dry weather hydrographs were greater than the model-simulated hydrographs by a relatively constant value throughout the day.

Observed flow data were obtained from four permanent flow meters located within the study area. The meters are managed by the Hach Company and are accessed through an online web application (https://fsdata.hach.com/). FloDar meters are used to collect water elevation and velocity profiles from a 'top-down' sensor which uses the reflectivity of the water surface to determine water depths and velocities. While this technology has the advantage of avoiding sensors located in the flow, hence avoiding potential debris and ragging, the technology can result in data inconsistencies especially during changing flow conditions. However, for the purpose of this study, the data were considered usable for verifying the flow conditions and supporting the model calibration phase. **Table 8.1** summarizes the flow meters used for the model calibration. **Figure 8.1** shows an example screenshot of the Hach flow meter online application.

HACH Flow Meter ID	Location	Model Reference	Notes
U3-5	Mall Parking Lot	L12-MH111.1	Poor flow data – low velocities cause inaccurate flow calculations
V-59-3	Thousand Oaks Chuck E Cheese	L14-MH179.1	Good consistent flow data
W-24-2	Citation Way & Hillcrest	M11-MH115.1	Good consistent flow data
W-50-13B	Hillcrest Dr. PETCO	L12-MH123.1	Good consistent flow data

Table 8.1 Permanent Flow Meter Summary

A 5-day dry period from September 9 to 14, 2019 was selected as the dry weather calibration period. This period had minimal antecedent rainfall, and the weekday and weekend flow patterns appeared typical for most of the flow meters. Flow meter data from this period were compared to the model flow data and where necessary, the initial equivalent population distribution was updated to reflect the flow meter observations. Additional comparisons were made against data used in the 2002 Master Plan to validate the current model flows and general flow distribution over the unit areas. **Figure 8.2** shows the comparison between model (green) and observed (red) flow for Meter W-24-2, located downstream of Unit E. The peak flow and average flow match well with values within an acceptable 5-percent accuracy tolerance. The timing of the flow peaks is not aligned exactly (approx. 90-min difference), however this minor difference will not impact the hydraulic analysis.

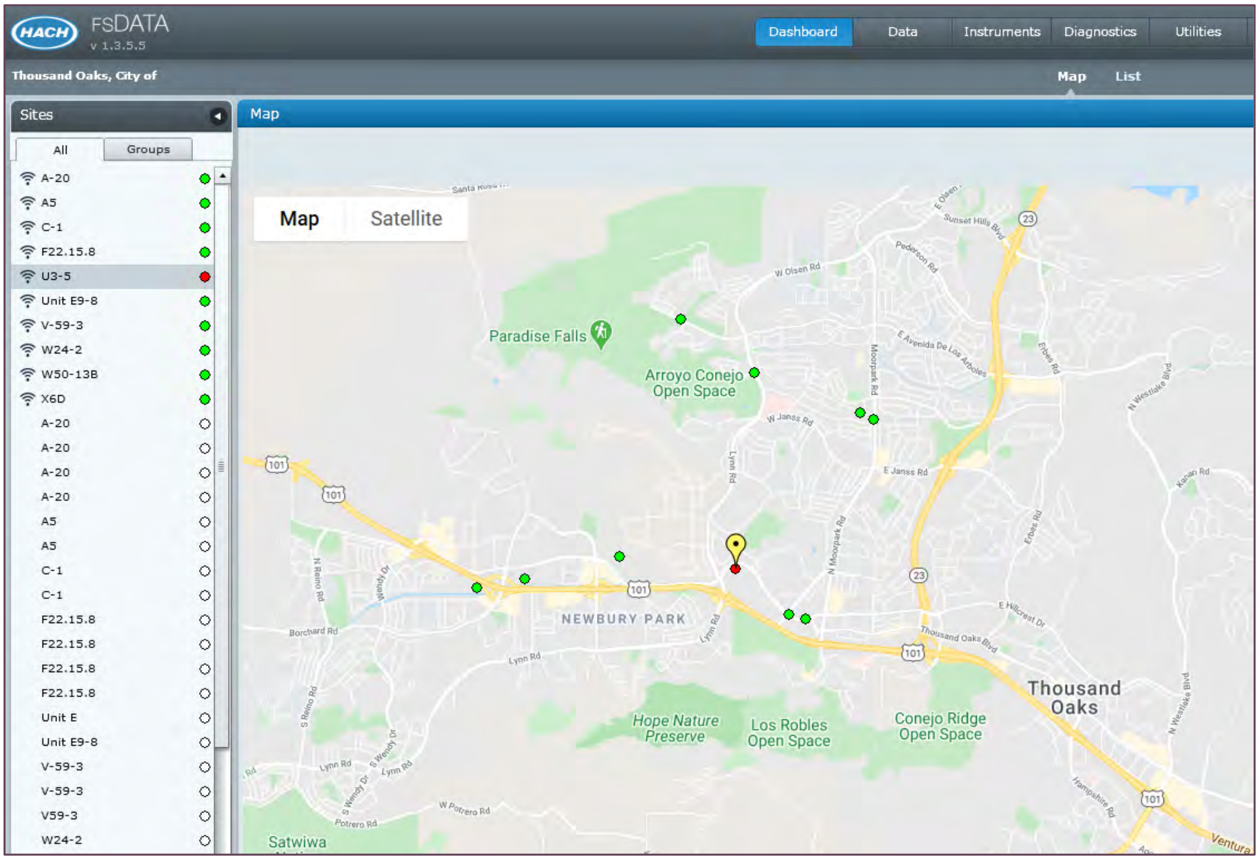


Figure 8.1 Example Screenshot of the Hach Flow Meter Application

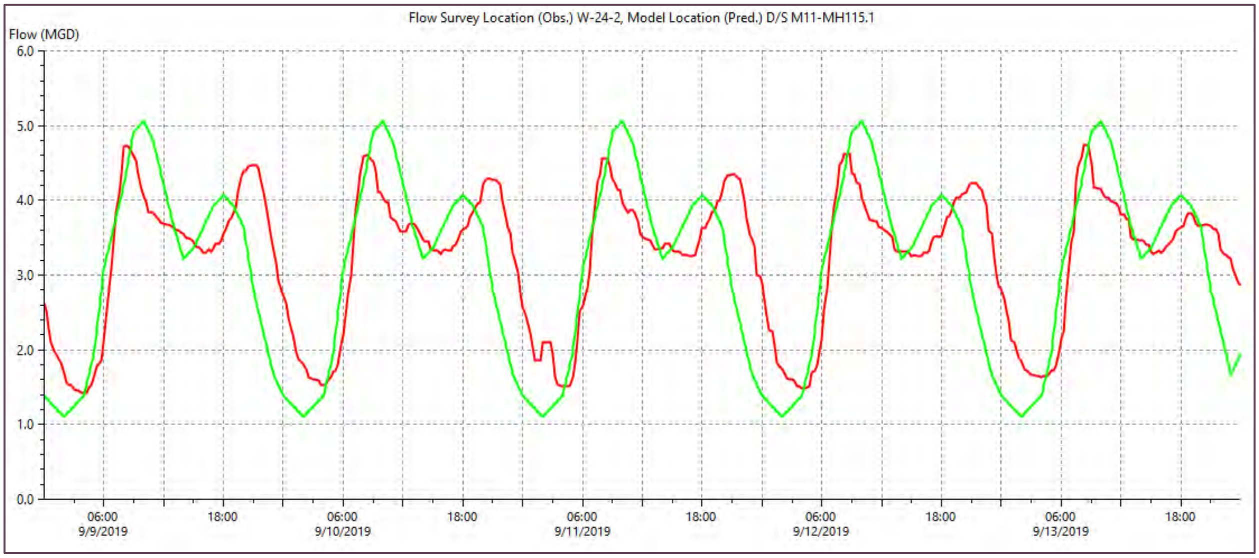


Figure 8.2 Example Dry Weather Flow Comparison Plot (Green – Model; Red – Flow Meter)

8.2 Wet Weather Flow Calibration

Typically, wet weather calibration is conducted to verify peak flow estimates based on the RDI/I model inputs. However, no wet weather flow data and corresponding rainfall data were available for this limited study, therefore the RDI/I parameters originally calibrated in the 2002 Master Plan were applied to the current model. Assuming the City's collection system has not significantly deteriorated since 2002 (causing an increase in inflow and infiltration), using these original RDI/I parameters is considered acceptable for this study. Wet weather calibration is recommended for the City's next sewer master plan update.

9. HYDRAULIC ANALYSIS

Sewer system capacity is typically evaluated for specific flow conditions in combination with system performance (capacity deficiency) criteria. Design flow and system performance criteria based on the 2002 Master Plan were used to evaluate system capacity deficiencies for both dry and wet weather conditions. Section 6 discussed the design storm. This section summarizes the hydraulic assumptions, performance criteria, and the results of the capacity evaluation for dry weather and design wet weather flows for both existing and future scenarios.

9.1 Hydraulic Assumptions

Design flows provide the basis for evaluating system capacity, in combination with system performance criteria discussed later in this section. Section 4 discussed the various flow components and the development of existing and future wastewater flows and model parameters for each component. These parameters were used in conjunction with a design storm (presented in Section 6) to generate design wastewater flows. The basic assumptions associated with the model, including the physical network, design dry weather flows, and design wet weather flows, are described in the following paragraphs.

Physical Network

- A Manning's "n" of 0.013 was assumed for all pipes in the model, including lined pipes. Lined pipes can initially reduce the friction factor. However, over time, with sedimentation and fouling, the friction factor may increase. A friction factor of 0.013 for lined pipes therefore represents a conservative assumption.
- Downstream parallel pipe alignments operating under surcharge conditions to drive flow over a 20-foot head discharging into the HCTP headworks. The surcharging varies under dry and wet-weather conditions.

Dry Weather Flows

- As discussed in Section 5, existing per-capita unit flow rates were assumed constant across the service area and were calculated based on observed flow measurements at HCTP, (collected during 2019) and population estimates. Future population growth was added to existing flows, assuming the same per-capita unit flow rates. Therefore, the design flow criteria assume no increase or decrease in per capita rates. This means that there will be no significant reductions (e.g., from water conservation) or increases (e.g., from more intensive water use or densification) in the future.

Wet Weather Flows

- The same calibrated wet weather flow parameters were applied to generate flows throughout the system under existing and future conditions. This assumes that in existing developed areas, there will be no net change in RDI/I in the future (i.e., any increases in RDI/I due to future sewer deterioration will be offset by reductions from rehabilitation or replacement of older sewers).
- RDI/I rates for currently vacant land (typically infill) developed in the future were assumed to be the same as for surrounding areas. This approach is reasonable for the master planning level; but for future analyses of specific development requests, the City may choose a more site-specific approach (particularly for development of large areas).

- As described in **Section 6**, the design storm from the 2002 Master Plan was applied to the model to determine design peak wet weather flows.
- The design storm was timed to cause peak RDI/I at approximately the same time as the average base wastewater flow occurring between 2pm and 4pm in most areas of the system ("peak-on-average"). Timing the storm to produce peak-on-average is consistent with the approach applied in the 2002 Master Plan and is considered less extreme than assuming the storm peak occurs during the peak base flows which often result in very conservative and excessive peak flow predictions.

9.2 Planned Brine Inflows

The purpose of the hydraulic analysis is to evaluate the impact of brine flows from two brackish groundwater treatment facilities (desalters) in the City of Thousand Oaks and the Las Virgenes-Triunfo JPA Pure Water AWTP in Agoura Hills when discharged into the **Unit W interceptor** in the City's sewer collection system. Locations of the three proposed brine sources are shown on **Figure 9.1**. The red circle indicates one proposed location for adding brines to the sewer system (Alternative 1).

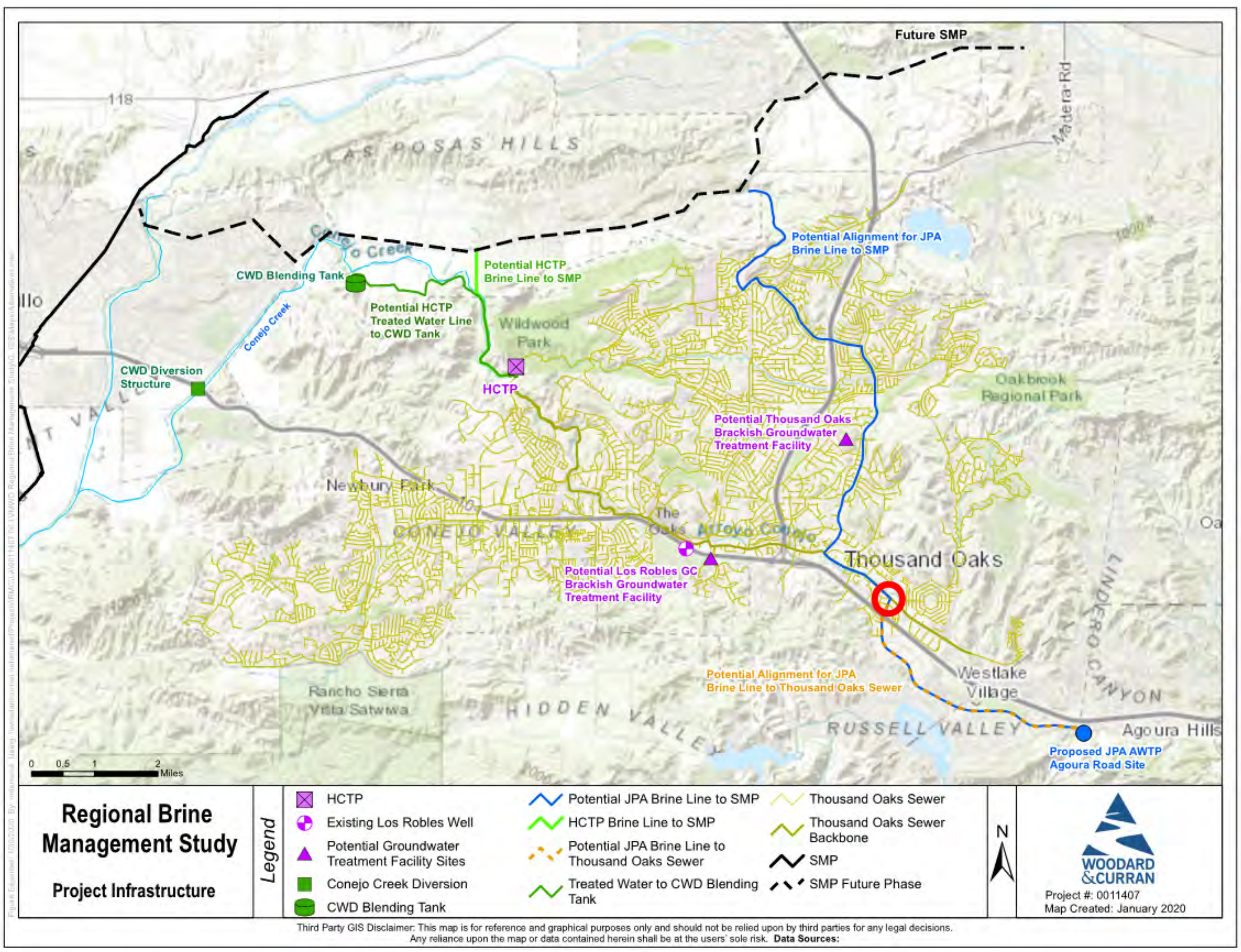


Figure 9.1 Brine Source Locations

Desalter plans for the Los Robles Well and Library Well indicate the brines will be discharged to manholes adjacent to the wells, as indicated on **Figure 9.2** and **Figure 9.3,** respectively.

Figure 9.2 Planned Los Robles Well Desalter

Figure 9.3 Planned Library Well Desalter

For the purposes of modeling, however, both well brines discharge into the **Unit W interceptor** at the same manhole locations as the Pure Water AWTP brine, indicated on **Figure 9.4**. Alternative 1 is the original connection for the Pure Water AWTP in Manhole J18-MH173. An alternative connection to manhole HJ19-MH125 (Alternative 2) was evaluated because it requires a shorter brine pipeline between the Pure Water AWTP and the sewer discharge point, which could potentially reduce construction costs.

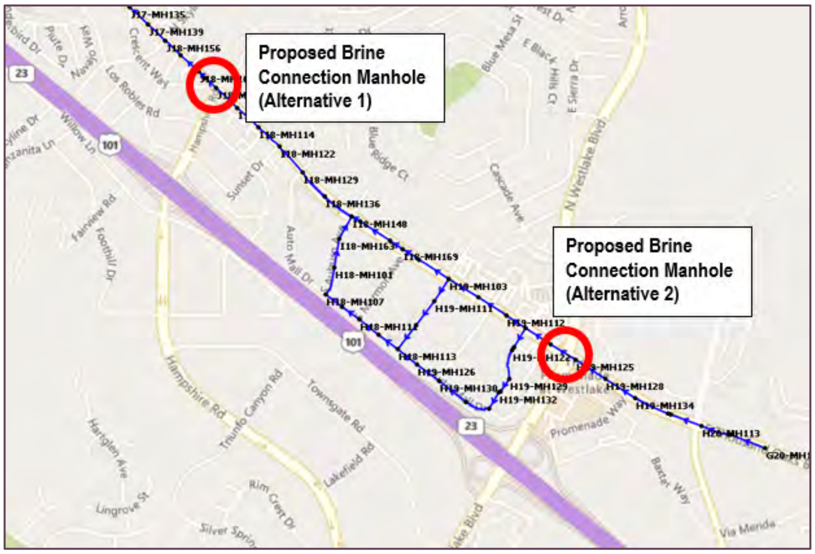


Figure 9.4 Modeled Brine Discharge Locations for All Brine Sources

The model assumes brine from the Pure Water AWTP discharges during the 6-month winter season (October through March), at a constant flow of 1.1 mgd. Brine flows generated by two groundwater desalters in the City of Thousand Oaks are assumed to discharge year-round. Brine from the Los Robles Well desalter is assumed to be a constant flow of 0.2 mgd and brine from the Library Well desalter is assumed at a constant flow of 0.10 mgd. Brine flow assumptions are summarized in **Table 9.1**.

Brine Source	Flow	Discharge Period	Notes
Pure Water	1.1 mgd	Oct - Mar	Discharge modeled to Alt 1 or Alt 2 manholes
Los Robles Well Desalter	0.2 mgd	Year-round	Discharge modeled to Alt 1 or Alt 2 manholes
Library Well Desalter	0.1 mgd	Year-round	Discharge modeled to Alt 1 or Alt 2 manholes

Table 9.1 Modeled Brine Flows

The project initiation criteria, or 'trigger' criteria, define the hydraulic conditions that prompt the need to upgrade a sewer pipeline to convey projected future peak flows. Deficiencies are often expressed as the flow depth-to-pipe diameter ratio (called "d/D", where "d" is the flow depth, and "D" is the pipe diameter). Surcharge occurs when the d/D of a given pipe is greater than 1.0, indicating that the water surface (i.e., hydraulic grade line) is higher than the pipe crown. The system performance criteria consider a combination of d/D, surcharge depth above pipe crown, and freeboard. Criteria differ for PDWF versus PWWF conditions. Furthermore, the City may consider other project aspects before approving a capacity improvement project. These guidelines are summarized below.

Peak Dry Weather Flow (PDWF)

Pipes identified as hydraulically deficient when:

- d/D > 0.75 (for existing pipes)
- d/D > 1.0 (for lined pipes)
- Sanitary sewer overflows (SSOs) occur (for all pipes)

Design Peak Wet Weather Flow (PWWF)

Pipes identified as hydraulically deficient when:

- Sanitary sewer overflows (SSOs) occur (for all pipes)
- Surcharge (d/D > 1) occurs (for pipes equal to or smaller than 12-inches; D ≤ 12-inches)
- Surcharge depth above pipe crown exceeds 2 feet (for pipes larger than 12-inches; D > 12-inches)
- Freeboard at the manhole is less than 5 feet

Capacity projects identified by the above trigger criteria were conservatively sized to flow at no greater than 60-percent of full-pipe capacity at design PWWF. This approach is based on the 2002 Master Plan and provides a buffer to cover the possibility of hydraulic deficiencies or higher-than-expected future flows, including higher I/I due to pipe deterioration.

9.3 Modeling Scenarios

The primary goal of the study is to identify any hydraulic deficiencies resulting from additional brine discharges entering the City's collection system from the source listed in Section 9.2. The model was used to evaluate the hydraulic issues for various options: 1) existing and future (build-out) population projections; 2) dry and peak wet weather conditions; and 3) two connection manholes (Alternative 1 and 2). All scenarios assume brine discharge over 24 hours, 7 days a week. **Table 9.1** summarizes the model scenarios analyzed during this study with the results described in the following section.

Model Scenario	Flow	Brine Discharge	Year
Existing Dry Weather Flow	DWF	N/A	2019
Existing Wet Weather Flow	PWWF	N/A	2019
Future Dry Weather Flow	DWF	N/A	Build-out
Future Wet Weather Flow	PWWF	N/A	Build-out
Future Dry Weather Flow	PWWF	Brine – 24-hr Discharge / Alternative 1 Connection	Build-out
Future Wet Weather Flow	PWWF	Brine – 24-hr Discharge / Alternative 2 Connection	Build-out

Table 9.1 Model Scenarios

9.4 Capacity Discussion

Initial model results from the scenarios in **Table 9.1** indicated that the 'worst-case' scenario resulted from capacity impacts from the future PWWF wet weather scenarios. The analysis focuses on the future peak wet weather flow scenario as this drives the hydraulic deficiencies resulting from the combination of peak wet weather flow, future population dry weather, and the planned brine discharges. The figures on the following pages document all the identified capacity deficiencies based on the system performance criteria discussed above.

Figure 9.5 shows the hydraulic profile for the future PWWF without any additional brine flow, focusing on the pipe segments with potential capacity deficiencies. The profile shows the maximum water level is contained within the pipe, (i.e., no surcharging) indicating no capacity deficiencies during the PWWF conditions. The profile shows the pipe segments local to the proposed brine connection manhole (Alternative 1) located at Manhole J18-MH173 as indicated by the red outline. In addition to the model results predicting no surcharging, the water level is within the recommended d/D (depth / pipe size) criteria of 75-percent.

Figure 9.6 shows the future PWWF with combined regional brines (1.4-mgd peak flow) entering at Manhole J18-MH173 (Alternative 1) over a 24-hr discharge. The brine flow significantly increases the peak flow within the pipe segments downstream of the manhole and d/D exceeds 75-percent for the pipe segment immediately downstream from the manhole. Although the hydraulic profile shows the water level close to the pipe crown for this segment, the model predicts no surcharging. As this potential capacity deficiency occurs during peak wet weather flow conditions with no predicted surcharging, no capacity improvements (such as pipe upsizing) are recommended for this modeled scenario. Flow increases resulting from significant rainfall events (i.e., events exceeding the current 'design storm') and/or increases in population-based flows will increase the risk of exceeding available capacity. Verifying future flow predictions is recommended.

Figures 9.7 and 9.8 show the hydraulic profile for the same scenario as depicted in **Figure 9.6**, albeit with the brine connection located at H19-MH125 (Alternative 2). Similar to Alternative 1, the pipe segment immediately downstream of J18-MH173 does not surcharge with a 70-percent (d/D). Overall, there are minor reductions in depths resulting from attenuated (dampened) peak flows which reduces the impact on downstream hydraulic deficiencies. Similar to the conclusions described above, no capacity improvements are recommended; however, verifying future flow predictions is recommended.

10. SUMMARY AND RECOMMENDATIONS

Under peak wet weather flows, brine flows released during a 24-hr discharge scenario will slightly increase the risk of exceeding pipe capacities downstream of Manhole J18-MH173 (Alternative 1). The model predictions show capacities exceeding 75-percent d/D between Manholes J18-MH173 and J18-MH168, albeit with no surcharging. Initially, this conclusion suggests no pipe improvements are necessary. For a connection at Manhole HJ19-MH125

(Alternative 2), there are no exceedances of the 75-percent d/D value and no surcharging. No pipe improvements are recommended for this connection.[1]

The model predictions are based on dry and wet weather flow criteria used for the 2002 Master Plan, allowing for reduced unit flows based on recent flow meter data. As these assumptions may change when the City updates their sewer master plan (accounting for more intense rainfall patterns along with revised growth predictions), it is possible more significant capacity issues will result from the additional brine flows. As the pipes identified above are considered 'at-risk' of exceeding their capacities during future flow conditions, the City may consider upsizing these pipes to prevent the design flows (based on future master plan predictions and including the peak brine flow) from exceeding a 75-percent d/D. Validation of the assumptions made in this study and previous studies can be included in the master plan update.

The addition of a concentrated brine stream could potentially add complexity to the City's sewer maintenance program. The brine would increase flows and the potential for scouring of the pipe. When inorganic and organic chemicals are mixed, chemical reactions between the wastewater and brine could result in solids precipitation within the pipelines. These solids could then cause scouring of the pipes. The Inland Empire Brine Line has experienced solids precipitation with inorganic and organic chemical reactions. To help minimize the inorganic component of the solids precipitation process, chemical softening is required is some cases to minimize scaling precursors such as calcium, magnesium, and silica (Santa Ana Watershed Salinity Management Program Summary Report, 2010)[2]. An additional study is recommended to model potential scouring and sedimentation issues from additional brine flows.

[1] If untreated groundwater from the Los Robles Well and Library Well Desalters is conveyed to the Pure Water AWTP for reverse osmosis treatment (an alternative to the current proposed configuration), the total amount of brine of the combined brines reaching either J18-MH173 (Alternative 1) or HJ19-MH125 (Alternative 2) would be approximately the same. Similar hydraulic analysis findings would be anticipated under these conditions.

[2] http://www.sawpa.org/wp-content/uploads/2012/07/6.-SAWPASummaryReportJuly2010.pdf

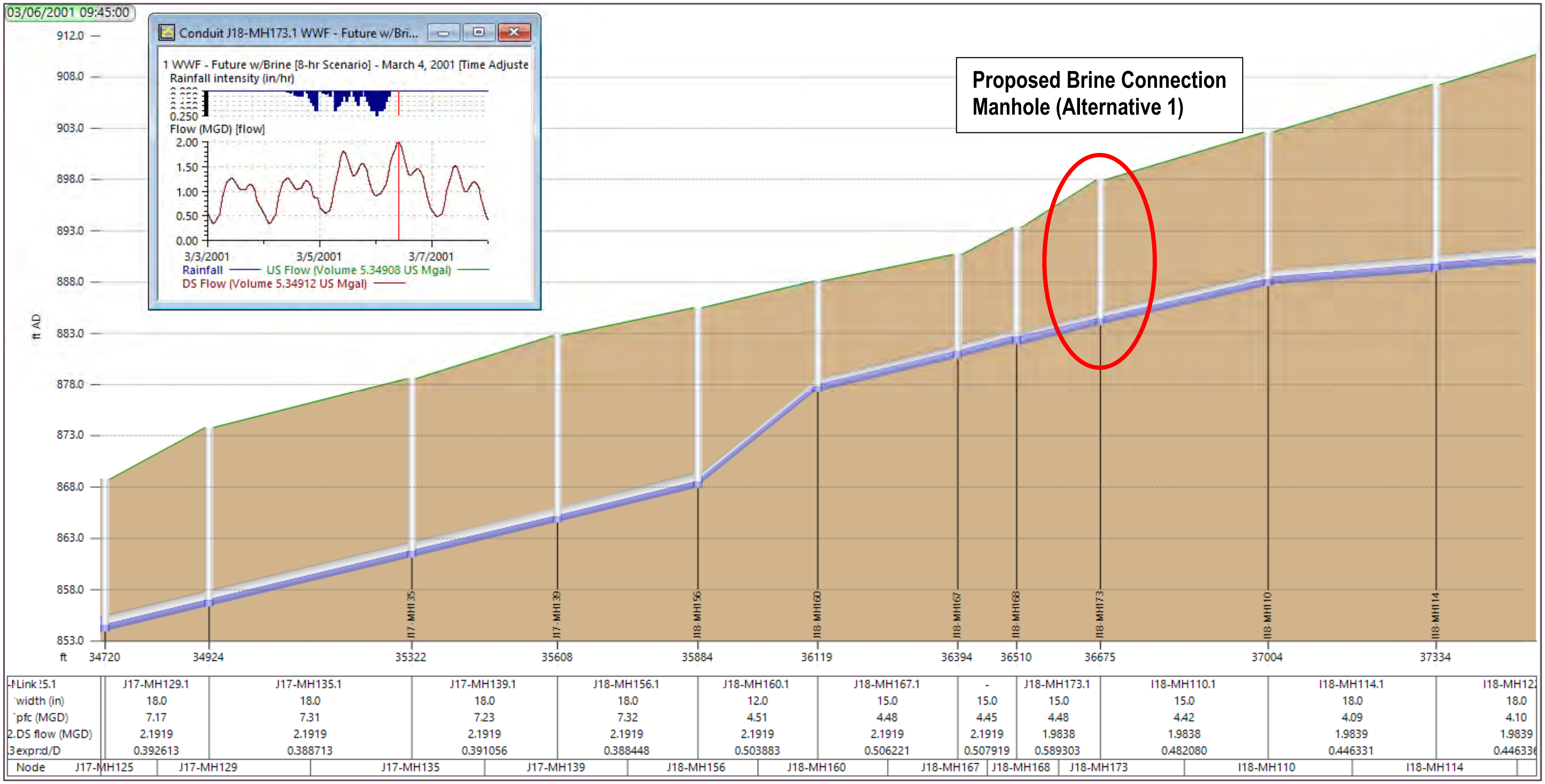


Figure 9.5 Future PWWF / No Brine / Design Storm / Manhole Connect Alternative 1

Green line = Ground level / Blue line = Hydraulic profile (with water depth) / Vertical lines = Manholes

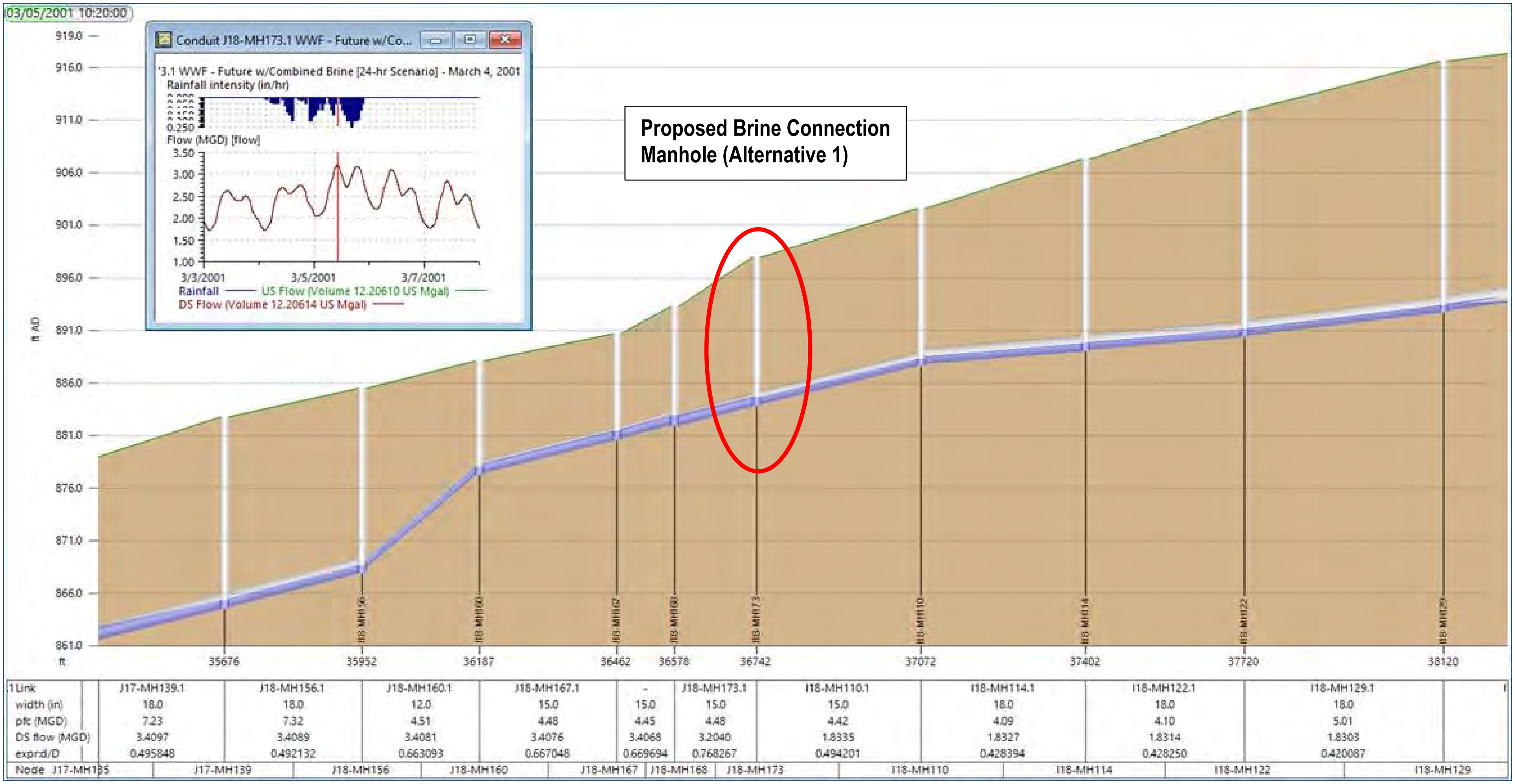


Figure 9.6 Future PWWF / 24-hr Brine / Design Storm / Manhole Connect Alternative 1

Green line = Ground level / Blue line = Hydraulic profile (with water depth) / Vertical lines = Manholes

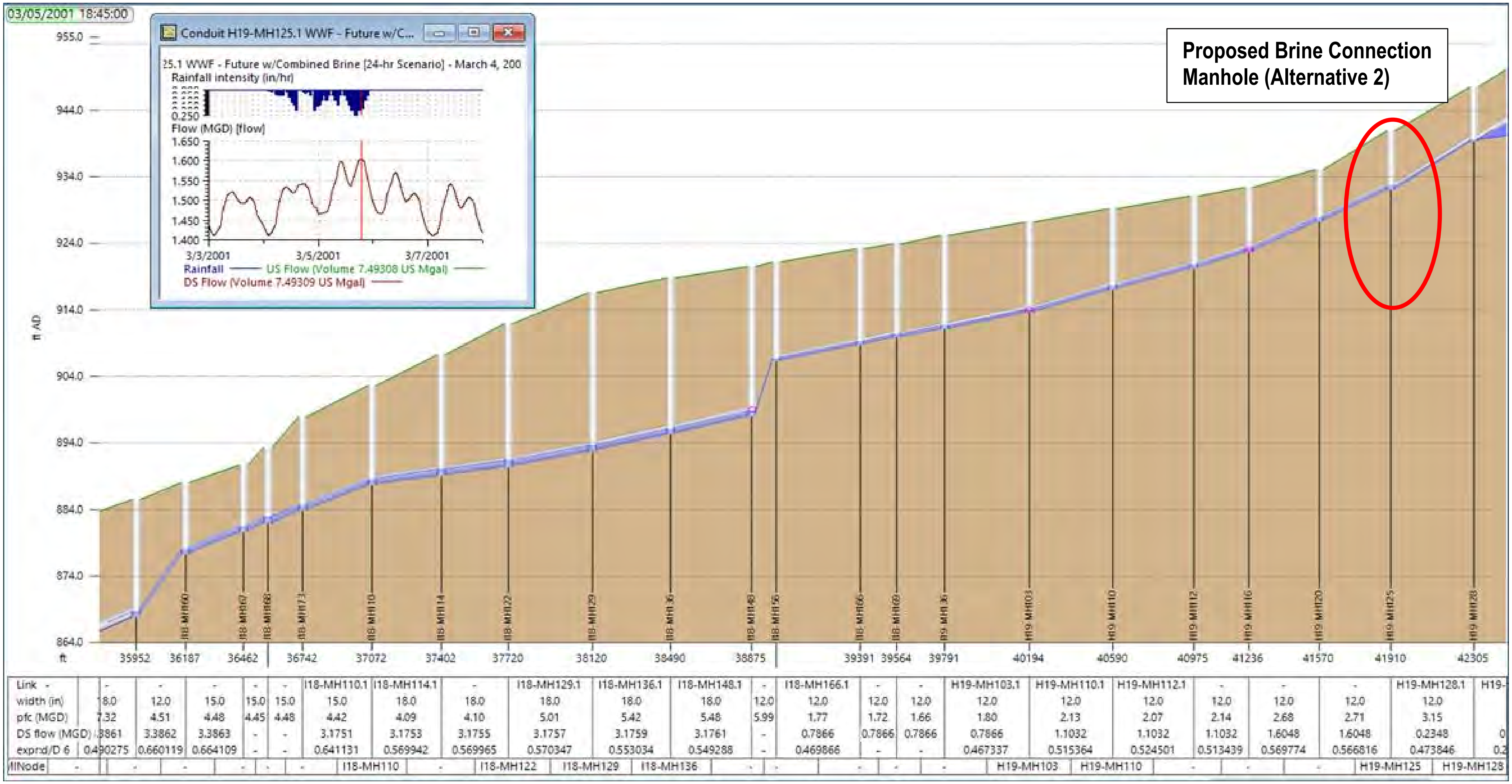
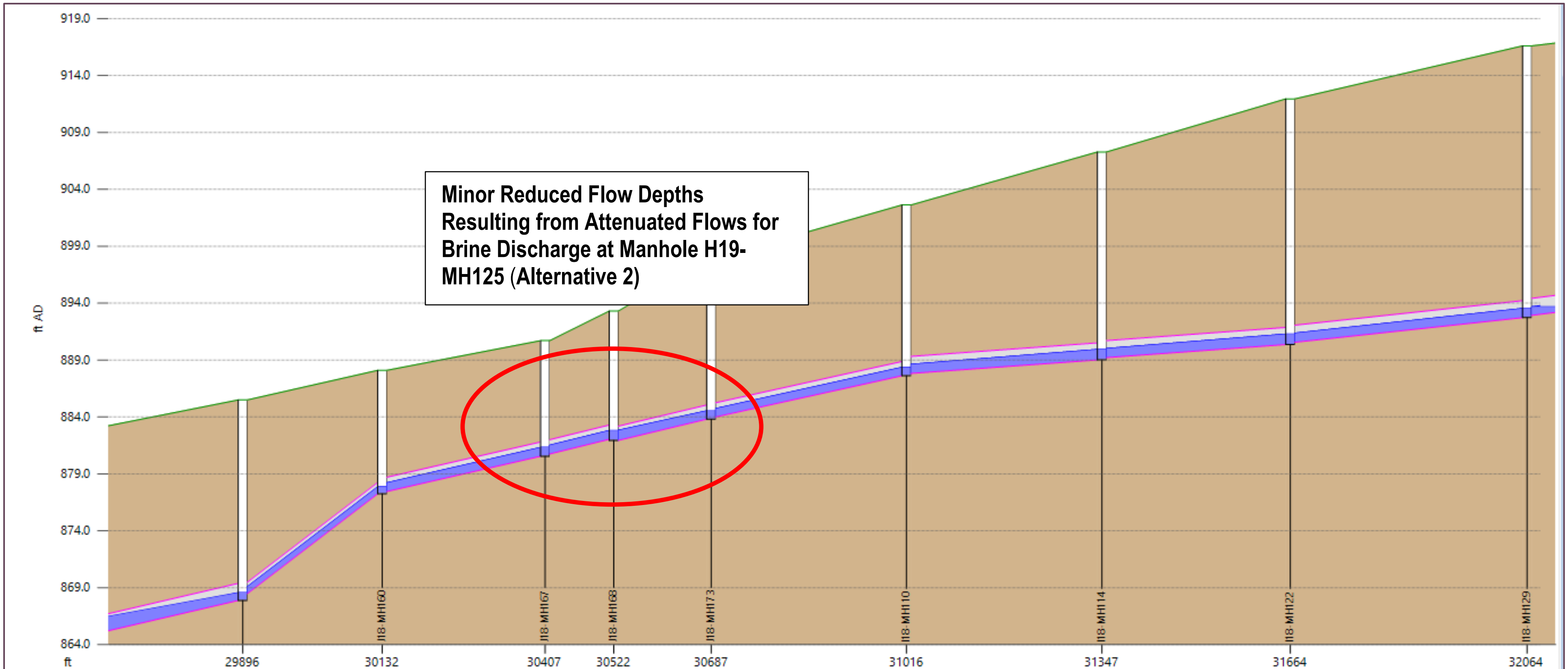


Figure 9.7 Future PWWF / 24-hr Brine / Design Storm / Manhole Connect Alternative 2

Green line = Ground level / Blue line = Hydraulic profile (with water depth) / Vertical lines = Manholes



Link	J18-MH156.1	J18-MH160.1	J18-MH167.1	-	J18-MH173.1	I18-MH110.1	I18-MH114.1	I18-MH122.1	I18-MH129.1
width (in)	18.0	12.0	15.0	15.0	15.0	15.0	18.0	18.0	18.0
pfc (MGD)	7.28	4.45	4.43	4.41	4.44	4.38	4.08	4.08	4.99
DS flow (MGD)	2.9441	2.9443	2.9445	2.9448	2.7924	2.7925	2.7928	2.7929	2.7928
expr:d/D	0.453952	0.608298	0.609832	0.613361	0.704954	0.588337	0.533131	0.533151	0.533523

Node 17-MH139	J18-MH156	J18-MH160	J18-MH167	J18-MH168	J18-MH173	I18-MH110	I18-MH114	I18-MH122	I18-MH129

Figure 9.8 Future PWWF / 24-hr Brine / Design Storm / Manhole Connect Alternative 2 – Detail Profile Showing d/D for Pipe Segments Downstream of J18-MH173

Green line = Ground level / Blue line = Hydraulic profile (with water depth) / Vertical lines = Manholes

APPENDIX B: HILL CANYON TREATMENT PLANT TREATMENT PROCESS ANALYSIS TECHNICAL MEMORANDUM

TECHNICAL MEMORANDUM

TO: Eric Schlageter, Las Virgenes Municipal Water District

CC: Nader Heydari, City of Thousand Oaks

PREPARED BY: Mary Beth Miller, P.E., Woodard & Curran

REVIEWED BY: Ed Helmig, Brian Dietrick, Janet Fordunski, Woodard & Curran

DATE: May 18, 2020

RE: Regional Brine Management Study – Task 9
Evaluation of Effects of Brine Discharge to the Hill Canyon Treatment Plant

---

The focus of this analysis is to evaluate the potential effects to the Hill Canyon Treatment Plant (HCTP) wastewater treatment process from accepting and treating several sources of Reverse Osmosis (RO) treatment brine residuals through the existing sewer network. Woodard & Curran (W&C) assessed the potential impact of increased total dissolved solids (TDS), among other key constituents, on biological treatment and settling at HCTP. Evaluating brine discharge impacts to the HCTP fits into the context of the larger Regional Brine Management Study currently in progress for the Las Virgenes Municipal Water District (LVMWD) and its partner agencies.

1. BACKGROUND

W&C prepared a HCTP influent mass balance with and without the new brine sources in order to assess the impact of the brine addition. There are three proposed brine sources that are under consideration for discharge to the HCTP:

1) RO brine from the Los Robles Well, system would run year-round;
2) RO brine from the Library Well, system would run year-round; and
3) RO brine from the LVMWD/Triunfo Pure Water Advanced Water Treatment (AWT) brine (Pure Water Brine) which will further treat reclaimed tertiary-treated wastewater from the Tapia Water Reclamation Facility (TWRF). This system would run six months per year from October through March.

2. PROJECT OBJECTIVES

The objectives of the mass balance were to evaluate the following potential impacts of the RO brine sources on the HCTP influent and biological treatment process:

1) The potential for biomass toxicity and inhibition due to the increase in TDS;
2) The potential for loss of nitrification and exceedance of ammonia limits; and
3) The potential for the deterioration and/loss of biomass settleability.

3. SUMMARY OF AVAILABLE WATER QUALITY DATA

The following sections outline the flow and water quality data that were available for the HCTP treatment plant and brine sources, and they outline any assumptions required to perform the mass balance. Additional information regarding specific data sources, data timeframes, and number of data points is included as **Attachment 1**.

3.1 Flows

Monthly HCTP influent flows were summarized as part of the Regional Brine Management Study. These same flows were used to define the current baseline for the HCTP influent. Flows vary seasonally with higher influent flows occurring during the winter months. The average monthly flow is 8.16 mgd. February represents the maximum monthly flow of 9.17 mgd.

Brine flow rates were assumed to be the same month to month and were estimated as part of the Regional Brine Management Study based on existing reclaimed and groundwater treatment feasibility studies performed for the City of Thousand Oaks, the Los Robles Golf Course, and LVMWD. Table 1 summarizes the anticipated RO performance and brine flow for each source.

Table 1: Brine Sources

Source	Flow (mgd)	Brine Concentration Factor	Discharge Period
Los Robles Well Brine[1]	0.18	5	Year-round
Library Well Brine[2]	0.09	5	Year-round
Pure Water Brine[3]	1.1	6.67	October through March (6 months/year)

3.2 Water Quality

Existing HCTP Influent (baseline influent)

Water quality information for the HCTP influent was compiled from several different sources including:

1) Historical facility monitoring and sampling data collected between January 2016 and October 2019. For some parameters, effluent results were used where influent results were not available (e.g., fluoride). This is acceptable in this case because TDS and major inorganic anion and cation components are not expected to change significantly throughout the treatment process.

[1] Brine flow and projected RO reject rate are from Los Robles Golf Course Groundwater Utilization Project Final Initial Study, Nov. 2018.

[2] Brine flow and projected RO reject rate are from City of Thousand Oaks Groundwater and Reclaimed Water Study, Feb. 2016.

[3] Brine flow and projected RO reject rate is from Pure Water Las Virgenes Title XVI Feasibility Study FINAL DRAFT, Sept. 2018 with correction of brine flow to 1.1 mgd in May 2020.

a. Average and maximum monthly values (94th percentile) concentrations were calculated and reported in the mass balance.

b. Maximum monthly (94th percentile) loading was calculated by multiplying the average flow by the maximum monthly concentration and the conversion factor 8.34.

c. This applies to temperature, hardness, TDS, iron, ammonia, chloride, sulfate, and fluoride.

2) For some parameters, such as copper and boron, concentration data were used directly from the Regional Brine Management Study mass balance[1].

3) A single sampling event (composite and grab) was collected on Feb. 24-25, 2020, to delineate additional parameters including concentrations of other major cations and anions that weren't available in the historical data set.

   a. The following results from the sampling event were used in the mass balance: pH, conductivity, alkalinity, calcium, magnesium, sodium, potassium, ammonium, aluminum, nitrate, phosphate, and silica.

Los Robles and Library Well RO Brines

Water quality parameters for the well brines were estimated using either the average or 90th percentile concentration data from 2019 pilot testing results. Pilot testing concentrations were converted to RO brine loading by multiplying the concentration by the brine flow, concentration factor, and conversion factor 8.34. The brine flows and concentration factors can be found in Table 1. The same concentrations from the Los Robles well pilot testing were assumed for the Library well for which no data were available.

Pure Water Brine

Water quality parameters for the Pure Water Brine were estimated by multiplying by the RO influent brine flow, concentration factor, and conversion factor of 8.34. The brine flows and concentration factors can be found in Table 1. Adjustments were made to some concentrations to account for expected chemical addition in the AWT system. Proposed chemical addition prior to RO treatment includes:

1) 2 – 5 mg/L sodium hypochlorite: mass balance assumes an active dose of 3.5 mg/L and 12.5% wt. sodium hypochlorite solution will be used for the bulk chemical.

2) 0.7 – 1.5 mg/L ammonia: mass balance assumes an active dose of 1.2 mg/L and 40% wt. ammonium sulfate will be used.

3) 0 – 100 mg/L sulfuric acid: mass balance assumes an active dose of 50 mg/L and 93% wt. sulfuric acid will be used.

Water quality parameters for the Pure Water Brine were estimated using several different information sources including:

1) Concentrations from the Regional Brine Management Study mass balance. This applied to:

[1] Data from the Regional Brine Management Study mass balance was provided by Thousand Oaks and downloaded from CIWQS eSMR reports online and 3-year averages for 1/1/2016-8/28/2019.

a. TDS – adjustments were made to the estimated brine TDS concentration to account for the proposed average addition rates prior to RO treatment of sodium hypochlorite, ammonium sulfate, and sulfuric acid. It was noted that an antiscalant chemical will also be added prior to the RO at a dose rate between 1 and 5 ppm. The additional contribution from the antiscalant was not quantified because the characteristics of the chemical are not known at this time and the impact on TDS is expected to be negligible in comparison to the other chemicals added.

b. Chloride – adjustment was made to account for the proposed average addition rate of sodium hypochlorite.

c. Sulfate – adjustment was made to account for the proposed average addition rates of ammonium sulfate (chemical assumed for ammonia required for chloramine residual) and sulfuric acid.

d. Boron

e. Copper

2) Average and maximum monthly discharge concentration from monitoring data collected from November 2010 to December 2015 from the TWRF NPDES permit or Recycled Water Quality at TWRF Table 3-23 (see footnote 3). This applied to:

a. Ammonia

b. Nitrate + Nitrite

c. Orthophosphate

d. Ammonium – adjustment was made to account for the proposed average addition rate of ammonium sulfate.

3) In some cases, where information wasn't available, the same concentrations were assumed for the Pure Water Brine that were used for the Los Robles Brine. This applied to:

a. Alkalinity, hardness, calcium, magnesium, potassium, silica; and

b. Sodium - adjustment was made to account for the proposed average addition rate of sodium hypochlorite.

The assumptions made regarding the Library Well and Pure Water Brine quality are considered to be appropriate for the purposes of this evaluation; however, W&C recommends that the Library Well and Pure Water influent be sampled for the additional parameters at some point in order to refine the mass balance. These additional results are not expected to have a major impact on overall results of this evaluation.

4. MASS BALANCE RESULTS – HCTP INFLUENT AND BRINE SOURCES

The mass balance is included as Attachment 1. In order to estimate the loadings and concentrations for the new HCTP influent, the mass loadings for the existing HCTP influent and each of the brine sources were added for each chemical constituent on a monthly basis. The concentration of each chemical constituent was then back calculated by dividing the mass loading by the combined monthly or average flow in mgd and conversion factor of 8.34. This calculation was also performed for the average and peak (maximum monthly) loadings.

Table 2 summarizes the major results of the mass balance, and the attachment includes many additional parameters. Table 2 compares the current and projected influent parameters. TDS levels are projected to increase by 83% on average and 136% under maximum monthly conditions.

Table 2: Summary of Mass Balance Results

	Current HCTP Influent		HCTP Influent w/ Brine		Percent Increase or Decrease	
	Average Conditions	Max Monthly Conditions	Average Conditions	Max Monthly Conditions	Average Conditions	Max Monthly Conditions
Flow	8.16	9.17	8.98	10.5	10%	15%
TDS (mg/L)	600	687	1,095	1,622	83%	136%
TDS (ppd)	40,866	46,807	83,559	121,464	104%	159%
Copper (mg/L)	0.049	0.049	0.045	0.052	-7%	7%
Copper (ppd)	3.3	3.71	3.4	3.9	3%	6%
Chloride (mg/L)	126	146	206	302	64%	107%
Chloride (ppd)	8,587	9,970	15,734	22,647	83%	127%
Sulfate (mg/L)	91.02	124	273	463	200%	274%
Sulfate (ppd)	6,197	8,417	21,004	34,707	239%	312%
M:D Ratio	1.75		0.9	1.2	-	-

TDS Impact on Biological Treatment

TDS is projected to more than double under peak conditions going from 600 mg/L to 1,622 mg/L with the addition of the three brine sources. The Pure Water Brine is expected to be discharged seasonally during the winter months, so when that source is not running the TDS concentrations will be in the 800 to 850 mg/L range.

The estimated increase in TDS is not expected to have a major impact on the biological treatment performance, including nitrification, at the HCTP. A 2005 study[1] indicated that organic removal efficiency and oxygen uptake rates (OUR) showed little to no deterioration for sodium chloride concentrations were increased by up to 500 mg/L. Relatively minor impacts to Total Organic Carbon (TOC) removal and OUR for a sodium chloride increase of 2,000 mg/L were observed.

W&C has experience performing treatability testing for and starting up industrial treatment plants receiving high TDS wastewater. When acclimating activated sludge to high TDS environments, a rule-of-thumb increase of 1,000 mg/L TDS per day for 3 consecutive days or 5,000 mg/L TDS per week can be applied. The TDS increase predicted for the HCTP influent (1,095 mg/L on average and 1,622 mg/L under peak conditions) is well within these guidelines. This indicates that a phased acclimation period is not needed and that the brine sources can be conveyed to the plant through the existing sewer system.

[1] Effect of salinity variations on the performance of activated sludge system. Jian-long Wang, Xin-min Zhan, and Yi Qian. Published in Biomedical and environmental sciences. 2005.

Monovalent to Divalent Cation Ratio and Impact on Settling

In conventional activated sludge treatment following by a clarifier, system failure or loss of performance is often the result of a failure of the solids-liquid separation process. The solid-liquids separation process depends on coagulation and flocculation followed by settling.

Activated sludge flocs usually consist of microbial aggregates, filamentous organisms, organic and inorganic particles, and exocellular polymers. Solid-liquid separation of activated sludge in wastewater treatment systems is achieved primarily by the bioflocculation of microbes and other particulate matter. Bioflocculation is responsible for changes in supernatant turbidity and variations in settling and dewatering properties. The activated sludge flocs are held together to form a three-dimensional matrix by means of exocellular polymers and divalent cations. It has been shown that excess monovalent cations can cause deterioration of floc structure, an increase in polymer demand, and deterioration of settling properties. Higgins and Novak (1997) evaluated the cations from seven industrial facilities and found that when the monovalent to divalent cation ratio (M:D) on a charge equivalent basis exceeded 2, deterioration in dewatering properties (specific resistance to filtration) occurred[1].

The monovalent to divalent cation ratio (M:D) is the ratio of +1 oxidation state cations (sodium, potassium, and ammonia) in milliequivalents per liter (meq/L) to +2 oxidation state cations (calcium and magnesium) in meq/L. M:D ratios greater than 2 can have a negative impact on sludge settleability. The existing HCTP effluent has an M:D ratio of about 1.75. The M:D ratio is expected to drop to about 0.9 on average with a peak ratio of 1.2 predicted for months when the Pure Water Brine is not produced. These M:D ratios indicate that the additional divalent cations provided by the brine sources may have the beneficial effect of improving settling. W&C recommends conducting settleability testing on the HCTP mixed liquor with and without the brine to further characterize the impact on settling.

5. CONCLUSIONS AND RECOMMENDATIONS

A mass balance was performed to assess how the HCTP will change with the addition of three new brine sources. The full mass balance is included with Attachment 1. The main conclusions of the mass balance analysis are:

1) The TDS increase predicted for the HCTP influent (1,095 mg/L on average and 1,622 mg/L under peak conditions) is well within acceptable guidelines for activated sludge acclimation, including nitrification performance, for high TDS. This indicates that a phased acclimation period is not needed and that the brine sources can be conveyed to the plant through the existing sewer system.

2) The existing HCTP effluent has an M:D ratio of about 1.75. The ratio is expected to drop to about 0.9 on average with a peak ratio of 1.2 predicted for months when the Pure Water Brine is not produced. M:D ratios below 2 are not expected result in negative impacts to settling performance and settling may even improve with the brine addition.

The main recommendations are:

1) Settleability testing of the HCTP mixed liquor with and without the brine is recommended to further characterize the impacts.

[1] The effect of cations on the settling and dewatering of activated sludges: Laboratory Results. Matthew J. Higgins and John T. Novak. Published in Water Environment Research. March 1997.

2) W&C recommends that the Library Well and Pure Water influent be sampled for the additional parameters at some point in order to refine the mass balance. These additional results are not expected to have a major impact on overall results of this evaluation. Assumptions were made for the quality of the Library Well Brine because sampling data for this well were not available. The water quality of the Library Well Brine was assumed to be identical to the Los Robles Well Brine. Assumptions were also made regarding several water quality parameters for the Pure Water Brine. Alkalinity, hardness, calcium, magnesium, potassium, silica, and sodium concentrations in the Pure Water Brine were assumed to be equal to the Los Robles Well Brine concentrations. These assumptions should be confirmed with further sampling and/or pilot testing.

Attachment 1 – HCTP Mass Balance

DRAFT Modeled Hill Canyon Treatment Plant (HCTP) Influent with Proposed RO Brine Inputs
Las Virgenes Municipal Water District (LVMWD)
Thousand Oaks, CA

Month		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average	94th Percentile or Max Monthly Value[2]	
Design Flows [1]																**Notes/Data Sources**
Current HCTP Influent	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72	**8.16**	**9.17**	LVMWD water and mass balance
Los Robles Well Brine	MGD	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	**0.18**	**0.18**	LVMWD water and mass balance
Library Well Brine	MGD	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	**0.09**	**0.09**	LVMWD water and mass balance
Pure Water Brine	MGD	1.1	1.1	1.1	0	0	0	0	0	0	1.1	1.1	1.1	**1.10**	**1.10**	LVMWD water and mass balance
Total Flow	**MGD**	**10.11**	**10.53**	**10.21**	**8.57**	**8.45**	**8.42**	**8.19**	**8.19**	**7.98**	**8.97**	**9.06**	**9.09**	**8.98**	**10.5**	

Design Concentrations and Loadings - Current HCTP Influent[3]

Conventional Parameters		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average	94th Percentile or Max Monthly Value[2]	Notes/Data Sources
pH	s.u.	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	**7.2**	**7.2**	sampling event grab
Temperature	deg. F	71.9	71.4	71.8	73.7	74.9	78.4	79.2	80.3	80.2	77.8	76.3	73.8	**75.8**	**80.3**	Average monthly values calculated from 199 results collected between 1/2016 and 10/2019
Conductivity	uS/cm	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	**1,250**	**1,250**	sampling event grab
Alkalinity ($CaCO_3$)	mg/L	260	260	260	260	260	260	260	260	260	260	260	260	**260**	**260**	sampling event grab
	ppd	18,963	19,873	19,163	18,003	17,748	17,678	17,168	17,185	16,726	16,480	16,689	16,747	**17,702**	**19,873**	
Hardness	mg/L	169	169	169	169	169	169	169	169	169	169	169	169	**169**	**221**	Average and 94th per. calculated from 46 results collected from 1/2016-10/2019
	ppd	12,326	12,918	12,456	11,702	11,536	11,491	11,159	11,170	10,872	10,712	10,848	10,886	**11,506**	**15,047**	Results for effluent. Sampling event grab was 197 mg/L
TDS	mg/L	600	600	600	600	600	600	600	600	600	600	600	600	**600**	**687**	Average and 94th per. calculated from 22 samples collected between 2/2016 and 5/2019.
	ppd	43,777	45,879	44,240	41,562	40,973	40,811	39,634	39,672	38,612	38,045	38,529	38,662	**40,866**	**46,807**	
Cations																
Calcium	mg/L	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	**44.2**	**44.2**	sampling event grab
	ppd	3,224	3,378	3,258	3,061	3,017	3,005	2,919	2,921	2,843	2,802	2,837	2,847	**3,009**	**3,378**	
Magnesium	mg/L	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	**21.1**	**21.1**	sampling event grab
	ppd	1,539	1,613	1,555	1,461	1,440	1,435	1,393	1,395	1,357	1,337	1,354	1,359	**1,437**	**1,613**	
Sodium	mg/L	100	100	100	100	100	100	100	100	100	100	100	100	**100**	**100**	sampling event grab
	ppd	7,293	7,644	7,370	6,924	6,826	6,799	6,603	6,609	6,433	6,338	6,419	6,441	**6,808**	**7,644**	
Potassium	mg/L	21	21	21	21	21	21	21	21	21	21	21	21	**21**	**21**	sampling event grab
	ppd	1,532	1,605	1,548	1,454	1,434	1,428	1,387	1,388	1,351	1,331	1,348	1,353	**1,430**	**1,605**	
Iron	mg/L	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	**0.34**	**0.56**	Average was calculated from 4 sample results collected between 2/2016 and 2/2019.
	ppd	24.8	26.0	25.1	23.5	23.2	23.1	22.5	22.5	21.9	21.6	21.8	21.9	**23.1**	**38.1**	Peak from grab sampling.
Ammonia (as NH_3)	mg/L	32.7	32.7	32.7	32.7	32.7	32.7	32.7	32.7	32.7	32.7	32.7	32.7	**32.7**	**35.6**	Average and 94th per. Calculated from 21 samples collected between 2/2016 and 5/2019
	ppd	2,385	2,499	2,410	2,264	2,232	2,223	2,159	2,161	2,103	2,072	2,099	2,106	**2,226**	**2,424**	
Ammonium (NH_4+)	mg/L	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	**36.1**	**36.1**	sampling event grab
	ppd	2,633	2,759	2,661	2,500	2,464	2,455	2,384	2,386	2,322	2,288	2,317	2,325	**2,458**	**2,759**	
Aluminum	mg/L	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	**0.3**	**0.3**	sampling event grab
	ppd	21.9	22.9	22.1	20.8	20.5	20.4	19.8	19.8	19.3	19.0	19.3	19.3	**20.4**	**22.9**	
Boron	mg/L	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	**0.46**	**0.46**	LVMWD water and mass balance
	ppd	33.4	35.0	33.8	31.7	31.3	31.1	30.2	30.3	29.5	29.0	29.4	29.5	**31.2**	**35.0**	
Copper	mg/L	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	**0.049**	**0.049**	LVMWD water and mass balance
	ppd	3.54	3.71	3.57	3.36	3.31	3.30	3.20	3.21	3.12	3.07	3.11	3.12	**3.30**	**3.71**	
Anions																
Chloride	mg/L	126	126	126	126	126	126	126	126	126	126	126	126	**126**	**146**	Average and 94th per. Calculated from 22 samples collected between 2/2016 and 8/2019
	ppd	9,199	9,641	9,296	8,733	8,610	8,575	8,328	8,336	8,114	7,994	8,096	8,124	**8,587**	**9,970**	
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	**91.0**	**124**	Average and 94th per. Calculated from 22 samples collected between 2/2016 and 8/2019
	ppd	6,638	6,957	6,709	6,303	6,213	6,189	6,010	6,016	5,855	5,769	5,843	5,863	**6,197**	**8,417**	
Nitrate	mg/L	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	**0.035**	**0.035**	sampling event grab
	ppd	2.55	2.68	2.58	2.42	2.39	2.38	2.31	2.31	2.25	2.22	2.25	2.25	**2.38**	**2.68**	
Phosphate	mg/L	25	25	25	25	25	25	25	25	25	25	25	25	**25**	**25**	sampling event grab
	ppd	1,823	1,911	1,843	1,731	1,707	1,700	1,651	1,652	1,608	1,585	1,605	1,610	**1,702**	**1,911**	
Fluoride	mg/L	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	**0.83**	**1.0**	Assume Inf Fl = Eff Fl. 54 samples collected between 1/2016 and 10/2019
	ppd	60	63	61	57	56	56	55	55	53	52	53	53	**56**	**68**	
Silica	mg/L	15	15	15	15	15	15	15	15	15	15	15	15	**15**	**15**	sampling event grab
	ppd	1,094	1,147	1,106	1,039	1,024	1,020	990	991	965	951	963	966	**1,021**	**1,147**	

Design Concentrations and Loadings - Los Robles Well Brine [4]																
Conventional Parameters		**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**	**94^{th} Percentile or Max Monthly Value** [2]	**Notes/Data Sources**
pH	s.u.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not predicted
Conductivity	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not predicted
Alkalinity ($CaCO_3$)	mg/L	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	**1,651**	**1,651**	
	ppd	2,459	2,459	2,459	2,459	2,459	2,459	2,459	2,459	2,459	2,459	2,459	2,459	**2,459**	**2,459**	Historical Avg or Pilot System Peak Data
Hardness	mg/L	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	**4,885**	**4,885**	
	ppd	7,275	7,275	7,275	7,275	7,275	7,275	7,275	7,275	7,275	7,275	7,275	7,275	**7,275**	**7,275**	Historical Avg or Pilot System Peak Data
TDS	mg/L	7,580	7,580	7,580	7,580	7,580	7,580	7,580	7,580	7,580	7,580	7,580	7,580	**7,580**	**7,580**	
	ppd	11,289	11,289	11,289	11,289	11,289	11,289	11,289	11,289	11,289	11,289	11,289	11,289	**11,289**	**11,289**	LVMWD water and mass balance
Cations																
Calcium	mg/L	743	743	743	743	743	743	743	743	743	743	743	743	**743**	**765**	
	ppd	1,106	1,106	1,106	1,106	1,106	1,106	1,106	1,106	1,106	1,106	1,106	1,106	**1,106**	**1,139**	Historical Avg or Pilot System Peak Data
Magnesium	mg/L	579	579	579	579	579	579	579	579	579	579	579	579	**579**	**775**	
	ppd	863	863	863	863	863	863	863	863	863	863	863	863	**863**	**1,154**	Historical Avg or Pilot System Peak Data
Sodium	mg/L	576	576	576	576	576	576	576	576	576	576	576	576	**576**	**576**	
	ppd	858	858	858	858	858	858	858	858	858	858	858	858	**858**	**858**	Historical Avg or Pilot System Peak Data
Potassium	mg/L	19	19	19	19	19	19	19	19	19	19	19	19	**19**	**20**	
	ppd	28	28	28	28	28	28	28	28	28	28	28	28	**28**	**30**	Historical Avg or Pilot System Peak Data
Iron	mg/L	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	**6.5**	**6.5**	
	ppd	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	**9.7**	**9.7**	Historical Avg or Pilot System Peak Data
Ammonia (as NH_3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	ppd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ammonium (NH_4+)	mg/L	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	**0.16**	**0.16**	
	ppd	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	**0.24**	**0.24**	Historical Avg or Pilot System Peak Data
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	ppd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No data available.
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	**1.0**	**1.0**	
	ppd	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	**1.5**	**1.5**	LVMWD water and mass balance
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	ppd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No data available.
Anions																
Chloride	mg/L	975	975	975	975	975	975	975	975	975	975	975	975	**975**	**975**	
	ppd	1,452	1,452	1,452	1,452	1,452	1,452	1,452	1,452	1,452	1,452	1,452	1,452	**1,452**	**1,452**	LVMWD water and mass balance
Sulfate	mg/L	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	**3,013**	**3,013**	
	ppd	4,487	4,487	4,487	4,487	4,487	4,487	4,487	4,487	4,487	4,487	4,487	4,487	**4,487**	**4,487**	LVMWD water and mass balance
Nitrate	mg/L	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	**3.38**	**3.38**	
	ppd	5.04	5.04	5.04	5.04	5.04	5.04	5.04	5.04	5.04	5.04	5.04	5.04	**5.04**	**5.04**	Historical Avg or Pilot System Peak Data
Phosphate	mg/L	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	**1.82**	**1.82**	
	ppd	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71	**2.71**	**2.71**	Historical Avg or Pilot System Peak Data
Fluoride	mg/L	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	**1.50**	**1.50**	
	ppd	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	**2.23**	**2.23**	Historical Avg or Pilot System Peak Data
Silica	mg/L	276	276	276	276	276	276	276	276	276	276	276	276	**276**	**355**	
	ppd	411	411	411	411	411	411	411	411	411	411	411	411	**411**	**529**	Historical Avg or Pilot System Peak Data

Design Concentrations and Loadings - Library Well Brine [5]																
Conventional Parameters		**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**	**94th Percentile or Max Monthly Value [2]**	**Notes/Data Sources**
pH	s.u.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not predicted
Conductivity	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not predicted
Alkalinity ($CaCO_3$)	mg/L	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	**1,651**	**1,651**	Assume same concentration as Los Robles
	ppd	1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230	**1,230**	**1,230**	
Hardness	mg/L	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	**4,885**	**4,885**	Assume same concentration as Los Robles
	ppd	3,638	3,638	3,638	3,638	3,638	3,638	3,638	3,638	3,638	3,638	3,638	3,638	**3,638**	**3,638**	
TDS	mg/L	7,571	7,571	7,571	7,571	7,571	7,571	7,571	7,571	7,571	7,571	7,571	7,571	**7,571**	**7,571**	
	ppd	5,644	5,644	5,644	5,644	5,644	5,644	5,644	5,644	5,644	5,644	5,644	5,644	**5,644**	**5,644**	LVMWD water and mass balance
Cations																
Calcium	mg/L	743	743	743	743	743	743	743	743	743	743	743	743	**743**	**765**	Assume same concentration as Los Robles
	ppd	553	553	553	553	553	553	553	553	553	553	553	553	**553**	**570**	
Magnesium	mg/L	579	579	579	579	579	579	579	579	579	579	579	579	**579**	**775**	Assume same concentration as Los Robles
	ppd	431	431	431	431	431	431	431	431	431	431	431	431	**431**	**577**	
Sodium	mg/L	576	576	576	576	576	576	576	576	576	576	576	576	**576**	**576**	Assume same concentration as Los Robles
	ppd	429	429	429	429	429	429	429	429	429	429	429	429	**429**	**429**	
Potassium	mg/L	19	19	19	19	19	19	19	19	19	19	19	19	**19**	**20**	Assume same concentration as Los Robles
	ppd	14	14	14	14	14	14	14	14	14	14	14	14	**14**	**15**	
Iron	mg/L	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	**6.5**	**6.5**	Assume same concentration as Los Robles
	ppd	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	**4.8**	**4.8**	
Ammonia (as NH_3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	ppd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ammonium (NH_4+)	mg/L	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	**0.16**	**0.16**	Assume same concentration as Los Robles
	ppd	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	**0.12**	**0.12**	
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	ppd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	**1.0**	**1.0**	
	ppd	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	**0.74**	**0.74**	Assume same concentration as Los Robles
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	ppd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Anions																
Chloride	mg/L	975	975	975	975	975	975	975	975	975	975	975	975	**975**	**975**	Assume same concentration as Los Robles
	ppd	726	726	726	726	726	726	726	726	726	726	726	726	**726**	**726**	
Sulfate	mg/L	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	**3,013**	**3,013**	Assume same concentration as Los Robles
	ppd	2,244	2,244	2,244	2,244	2,244	2,244	2,244	2,244	2,244	2,244	2,244	2,244	**2,244**	**2,244**	
Nitrate	mg/L	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	**3.38**	**3.38**	Assume same concentration as Los Robles
	ppd	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	**2.52**	**2.52**	
Phosphate	mg/L	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	**1.82**	**1.82**	Assume same concentration as Los Robles
	ppd	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	**1.35**	**1.35**	
Fluoride	mg/L	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	**1.50**	**1.50**	Assume same concentration as Los Robles
	ppd	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	**1.12**	**1.12**	
Silica	mg/L	276	276	276	276	276	276	276	276	276	276	276	276	**276**	**355**	Assume same concentration as Los Robles
	ppd	205	205	205	205	205	205	205	205	205	205	205	205	**205**	**264**	

Design Concentrations and Loadings - Pure Water Brine [6]																
Conventional Parameters		**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**	**94^{th} Percentile or Max Monthly Value[2]**	**Notes/Data Sources**
pH	s.u.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not predicted
Conductivity	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not predicted
Alkalinity ($CaCO_3$)	mg/L	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	**1,651**	**1,651**	Assume same concentration as Los Robles
	ppd	15,150	15,150	15,150	0	0	0	0	0	0	15,150	15,150	15,150	**15,150**	**15,150**	
Hardness	mg/L	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	4,885	**4,885**	**4,885**	Assume same concentration as Los Robles
	ppd	44,815	44,815	44,815	0	0	0	0	0	0	44,815	44,815	44,815	**44,815**	**44,815**	
TDS	mg/L	5,534	6,292	6,170	6,074	6,022	5,479	5,785	5,392	5,297	5,357	5,183	5,159	**5,645**	**6,292**	LVMWD water and mass balance + proposed chemical addition
	ppd	50,767	57,724	56,608	0	0	0	0	0	0	49,141	47,551	47,327	**51,520**	**57,724**	
Cations																
Calcium	mg/L	743	743	743	743	743	743	743	743	743	743	743	743	**743**	**765**	Assume same concentration as Los Robles
	ppd	6,813	6,813	6,813	0	0	0	0	0	0	6,813	6,813	6,813	**6,813**	**7,018**	
Magnesium	mg/L	579	579	579	579	579	579	579	579	579	579	579	579	**579**	**775**	Assume same concentration as Los Robles
	ppd	5,315	5,315	5,315	0	0	0	0	0	0	5,315	5,315	5,315	**5,315**	**7,110**	
Sodium	mg/L	583	583	583	583	583	583	583	583	583	583	583	583	**583**	**583**	Assume same concentration as Los Robles + Na from sodium hypochlorite addition
	ppd	5,351	5,351	5,351	0	0	0	0	0	0	5,351	5,351	5,351	**5,351**	**5,351**	
Potassium	mg/L	19	19	19	19	19	19	19	19	19	19	19	19	**19**	**20**	Assume same concentration as Los Robles
	ppd	173	173	173	0	0	0	0	0	0	173	173	173	**173**	**183**	
Iron	mg/L	6	6	6	6	6	6	6	6	6	6	6	6	**6**	**6**	Assume same concentration as Los Robles
	ppd	59.5	59.5	59.5	0	0	0	0	0	0	59.5	59.5	59.5	**59.5**	**59.5**	
Ammonia (as NH_3)	mg/L	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	**0.65**	**2.93**	Monitoring data (Nov 2010-Dec 2015) from NPDES Permit
	ppd	5.9	5.9	5.9	0	0	0	0	0	0	5.9	5.9	5.9	**5.9**	**26.9**	
Ammonium (NH_4+)	mg/L	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	**8.0**	**8.0**	Ammonium from ammonium sulfate addition for chloramine residual
	ppd	73.4	73.4	73.4	0	0	0	0	0	0	73.4	73.4	73.4	**73.4**	**73.4**	
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	ppd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Boron	mg/L	2.43	2.70	2.75	3.03	2.90	2.52	2.67	2.33	2.67	2.53	2.71	2.58	**2.65**	**3.03**	
	ppd	22.3	24.8	25.2	0	0	0	0	0	0	23.2	24.9	23.6	**24.0**	**25.2**	LVMWD water and mass balance
Copper	mg/L	0.018	0.022	0.018	0.022	0.042	0.015	0.024	0.030	0.023	0.023	0.023	0.024	**0.02**	**0.04**	
	ppd	0.17	0.20	0.17	0	0	0	0	0	0	0.21	0.21	0.22	**0.20**	**0.22**	LVMWD water and mass balance
Anions																
Chloride	mg/L	1,121	1,129	1,144	1,171	1,124	1,038	1,104	1,118	1,091	1,069	1,033	1,002	**1,096**	**1,171**	LVMWD water and mass balance + Cl from sodium hypochlorite addition
	ppd	10,285	10,361	10,499	0	0	0	0	0	0	9,806	9,480	9,194	**9,938**	**10,499**	
Sulfate	mg/L	1,785	2,132	2,094	1,937	1,804	1,667	1,547	1,594	1,476	1,514	1,529	1,509	**1,716**	**2,132**	LVMWD water and mass balance + sulfate from ammonium sulfate and sulfuric acid addition
	ppd	16,380	19,560	19,208	0	0	0	0	0	0	13,887	14,030	13,847	**16,152**	**19,560**	
Nitrate	mg/L	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	**46.7**	**66.0**	Monitoring data (Nov 2010-Dec 2015) from NPDES Permit
	ppd	428	428	428	0	0	0	0	0	0	428	428	428	**428**	**605**	
Phosphate	mg/L	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	**15.3**	**23.0**	Monitoring data (Nov 2010-Dec 2015) from NPDES Permit
	ppd	141	141	141	0	0	0	0	0	0	141	141	141	**141**	**211**	
Fluoride	mg/L	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	**6.2**	**6.2**	Monitoring data (Nov 2010-Dec 2015) from NPDES Permit
	ppd	57	57	57	0	0	0	0	0	0	57	57	57	**57**	**57**	
Silica	mg/L	276	276	276	276	276	276	276	276	276	276	276	276	**276**	**355**	Assume same concentration as Los Robles
	ppd	2,530	2,530	2,530	0	0	0	0	0	0	2,530	2,530	2,530	**2,530**	**3,257**	

Notes:

1) Flows are from the 2020 LVMWD Regional Water and Mass Balance.
2) Worst case (94th percentile or maximum monthly value) was calculated using 94th percentile concentration and average flow where applicable.
3) HCTP influent water quality data is from historical facility sampling data collected between 01/2016 and 10/2019. Additional data was collected during a single sample event 2/24/2020-2/25/2020.
4) Los Robles well brine quality was calculated using available historical well sampling data and 2019 pilot testing data. A brine concentration factor of 5 (80% recovery RO system) was assumed.
5) Library well brine quality was assumed to be the same as the Los Robles well brine since sampling data was unavailable. A brine concentration factor of 5 (80% recovery RO system) was assumed.
6) Pure water well brine quality was calculated using information available in the Pure Water Las Virgenes Title XVI Feasibility Study FINAL DRAFT, Sept. 2018 report and NPDES permit. The additional TDS and constituents from chemical addition were also estimated.

APPENDIX C: SPREADSHEET WATER QUALITY MODEL – ALTERNATIVES RESULTS

Spreadsheet Water Quality Model - Assumptions

The Excel spreadsheet-based water quality and mass balance model calculates the estimated water quality implications to key regional brine management system components, presented as nodes. Each number on the map represents an input and output node in the model, incorporating the water quality and flow data gathered for the Study. The 3-year average HCTP influent and effluent flow and water quality data for total dissolved solids (TDS), boron, sulfate, chloride, and copper were used for model development.

Water Quality Model Nodes

Node	Description and Purpose	Inputs
1	JPA Pure Water AWTP – calculate the anticipated monthly Pure Water brine flow and water quality	• Tapia WRF Effluent Water Quality • Pure Water AWTP Design Flows
2	Thousand Oaks Groundwater Treatment Facilities – calculate the anticipated monthly combined Thousand Oaks brine flows and water quality	• LRGC Well Raw Design Water Quality • Los Robles and Library Well Treatment Facilities Design Flows
3	Thousand Oaks Raw Sewage – document the influent raw water quality for HCTP and calculate the HCTP treatment process influence on water quality	• HCTP Influent and Effluent Water Quality and Flow
4	HCTP Conventional – calculate the HCTP influent water quality influenced by JPA and City brine discharges	• Nodes 1 & 2 – brine water quality • Node 3 – influent water quality
4a	Desalter Feed – calculate the new desalter feed water quality influenced by brine discharges and HCTP treatment processes	• Node 3 – HCTP treatment process influence • Node 4 – influent water quality + brine
5	Desalter Brine – calculate the new desalter brine flow and water quality	• Node 4a – desalter feed
6	Desalter Permeate – calculate the new desalter permeate flow and water quality	• Node 4a – desalter feed
7a	HCTP Conventional Effluent to Conejo Creek – calculate the HCTP effluent bypassing the desalter	• Node 3 – effluent water quality
7	HCTP Combined Effluent to Conejo Creek – calculate the HCTP effluent water quality combined with the new desalter permeate	• Node 4a – influent water quality + brine + HCTP effluent • Node 6 – desalter permeate
8	Conejo Creek Diversion Structure – calculate the water quality at the diversion point for CWD NPS[1]	• Node 7 – combined effluent water quality[1]
9	Single Brine Line to SMP – calculate the JPA and City brine water quality in single brine line	• Nodes 1 & 2 – brine water quality

Notes:

1. Includes the assumption that an estimated 40 mg/L of chlorides are added to the creek naturally in the winter months. Based on reviewing CWD's Diversion Structure chloride concentrations from 2016-2019, the average chloride concentrations ranged from 140-207 mg/L, while the average HCTP effluent chloride concentrations from 2016-2019 ranged from 143-163 mg/L.

Pure Water AWTP and Thousand Oaks Groundwater Treatment Brine Loadings

Parameter	Pure Water AWTP Brine	Los Robles Treatment Facility Brine	Library Treatment Facility Brine
Flow (mgd)	1.1 (Oct – Mar)	0.18 (year-round)	0.09 (year-round)
TDS (lbs/day)	48,200	11,290	5,650
Boron (lbs/day)	24	1.5	0.8
Sulfate (lbs/day)	13,000	4,490	2,250
Chloride (lbs/day)	9,850	1,460	730
Copper (lbs/day)	0.19[1]	0.00	0.00

Notes:

1. Based on the findings from the HCTP Treatment Process Analysis TM, the assumption that the copper loading from Pure Water is not removed within the HCTP process is not reflected in the model results but is discussed in Section 5 of the Study.

Hill Canyon Treatment Plant NPDES Discharge Limitations – Target Loading Limitations

Parameter	Units	Effluent Limitations (NPDES Limits)			Target Loading Limitations (20% of NPDES Limits)		
		Average Monthly	Average Weekly	Maximum Daily	Average Monthly	Average Weekly	Maximum Daily
Boron	mg/L	1	--	--	--	--	--
	lbs/day[1]	120	--	--	96	--	--
Total dissolved solids (TDS) (dry weather[2])	lbs/day	99,250	--	--	79,400	--	--
Sulfate (dry weather[2])	lbs/day	29,200	--	--	23,360	--	--
Chloride (dry weather[2])	lbs/day	17,500	--	--	14,000	--	--
Copper	ug/L	6	--	8.8	--	--	--
	lbs/day	--	--	0.7	--	--	0.56

Notes:

1. The mass-based effluent limitations are based on the plant design flow rate of 14 MGD and are calculated as follows: Flow (MGD) x Concentration (mg/L) x 8.34 (conversion factor) = lbs/day. During wet-weather storm events in which the flow exceeds the design capacity, the mass discharge rate limitations shall not apply, and concentration limitations shall be the only applicable effluent limitations.
2. For TDS, sulfate, chloride, and boron discharges during wet- and dry- weather; dry-weather is defined in the Calleguas Creek Watershed Salts Total Maximum Daily Load (Salts TMDL) as the condition when the flows in the receiving water are below the 86th percentile flow. Wet weather is defined in the Salts TMDL as the condition when the flows in the receiving water are greater than or equal to the 86th percentile flow.

Water Quality Model – Treatment Assumptions

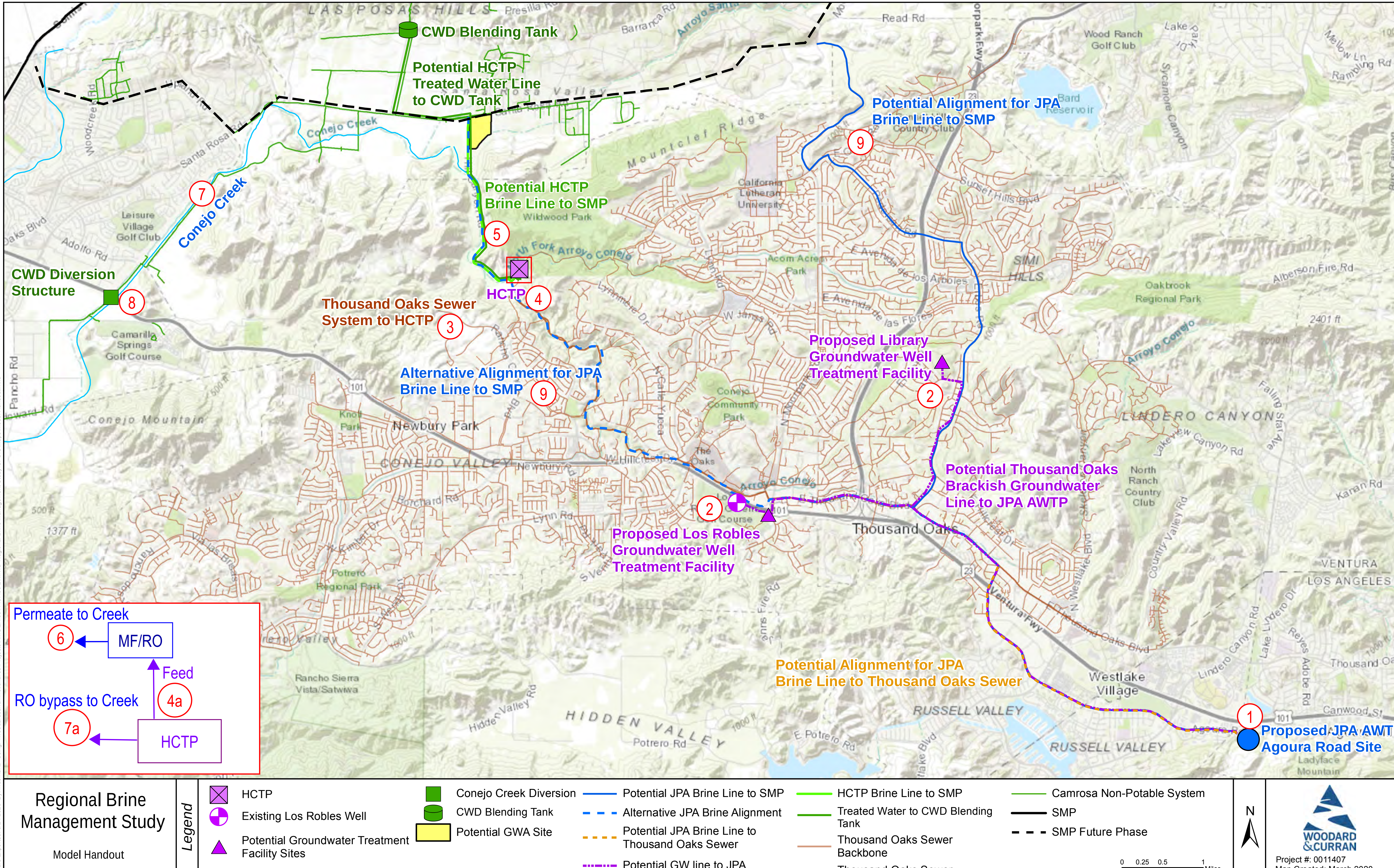
Treatment Process	Assumed Product Recovery	Assumptions
UV Disinfection[1]	100%	*Replacing the existing chlorine disinfection process at HCTP would lower the salts added to the HCTP effluent during the chlorination/ dichlorination processes and potentially lower chemical costs at the plant. A UV disinfection system was added to some alternatives for evaluation.*
MF/UF	93%	Backwash would be re-routed to the headworks of the HCTP (no net RO feed reduction).
RO	85%	RO concentrate (brine) would be sent to a future SMP extension via Hill Canyon Road for disposal.

Notes:

1. Potential treatment alternative to existing chlorine disinfection system at HCTP

Water Quality Model Targets

Node	Agency	Parameter	Units	Target Concentration or Loading
8 – Conejo Creek	CWD	Chloride	mg/L	90 – 110
7 – Combined HCTP effluent flow	City	Boron	lbs/day	96
7 – Combined HCTP effluent flow	City	TDS	lbs/day	79,400
7 – Combined HCTP effluent flow	City	Sulfate	lbs/day	23,360
7 – Combined HCTP effluent flow	City	Chloride	lbs/day	14,000
7 – Combined HCTP effluent flow	City	Copper	ug/l	6
5 – HCTP Brine to SMP 9 – Pure Water Brine to SMP	CMWD	Copper	ug/l	75



Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions. Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:**

Date: 03/24/2020
Early Phase Project A

Legend

Output	Exceeds	>90 < 110 mg/L	N/A

Scenario Description: *This scenario was to determine the Thousand Oaks Groundwater (no brine) influences to the Conejo Creek discharge (conventional HCTP treatment).*

Node 1: LVMWD AWPF Brine													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 2: Thousand Oaks Groundwater Well (Los Robles Well)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
TDS	mg/L	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0
	PPD	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79
Boron	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	PPD	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49
Sulfate	mg/L	603.0	603.0	603.0	603.0	603.0	603.0	603.0	603.0	603.0	603.0	603.0	603.0
	PPD	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20
Chloride	mg/L	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0
	PPD	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05
Copper	ug/L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Groundwater Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Groundwater Influence													
Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.64	10.06	9.73	9.20	9.08	9.05	8.81	8.82	8.61	8.49	8.59	8.62
TDS	mg/L	685.1	681.5	684.3	689.1	690.3	690.6	693.0	693.0	695.2	696.5	695.4	695.1
	PPD	55,065.5	57,168.0	55,528.5	52,850.4	52,262.2	52,099.5	50,923.1	50,960.6	49,901.0	49,333.7	49,817.6	49,951.1
Boron	mg/L	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	PPD	34.9	36.5	35.2	33.2	32.8	32.6	31.7	31.8	31.0	30.5	30.9	31.0
Sulfate	mg/L	138.5	136.5	138.0	140.7	141.4	141.6	142.9	142.9	144.1	144.8	144.2	144.1
	PPD	11,128.6	11,447.5	11,198.9	10,792.7	10,703.5	10,678.9	10,500.5	10,506.2	10,345.5	10,259.5	10,332.8	10,353.1
Chloride	mg/L	132.5	132.2	132.4	132.8	132.9	132.9	133.1	133.1	133.3	133.4	133.3	133.3
	PPD	10,650.8	11,092.6	10,748.1	10,185.3	10,061.7	10,027.5	9,780.3	9,788.2	9,565.6	9,446.4	9,548.0	9,576.1
Copper	ug/L	44.0	44.2	44.0	43.8	43.7	43.7	43.6	43.6	43.5	43.4	43.5	43.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4a: HCTP RO System Feed													
Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												

Node 5: HCTP RO System Brine													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 6: HCTP RO System Product Water													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 7a: HCTP Conventional Effluent (Bypass RO System)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.64	10.06	9.73	9.20	9.08	9.05	8.81	8.82	8.61	8.49	8.59	8.62

Node 7: HCTP Combined Effluent Flow (Conventional Effluent + RO System Product Water)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.64	10.06	9.73	9.20	9.08	9.05	8.81	8.82	8.61	8.49	8.59	8.62
TDS	mg/L	693.9	690.3	693.1	698.0	699.2	699.5	702.0	701.9	704.2	705.5	704.4	704.1
	PPD	55,773.9	57,903.5	56,242.9	53,530.3	52,934.5	52,769.8	51,578.2	51,616.3	50,543.0	49,968.4	50,458.5	50,593.8
Boron	mg/L	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	PPD	34.9	36.5	35.2	33.2	32.8	32.6	31.7	31.8	31.0	30.5	30.9	31.0
Sulfate	mg/L	172.1	169.7	171.6	175.0	175.8	176.0	177.7	177.6	179.2	180.1	179.3	179.1
	PPD	13,835.5	14,231.8	13,922.8	13,417.8	13,307.0	13,276.3	13,054.5	13,061.6	12,861.8	12,754.9	12,846.1	12,871.3
Chloride	mg/L	157.9	157.6	157.8	158.3	158.4	158.4	158.6	158.6	158.8	158.9	158.8	158.8
	PPD	12,692.3	13,218.8	12,808.2	12,137.6	11,990.3	11,949.6	11,655.0	11,664.4	11,399.1	11,257.0	11,378.2	11,411.6
Copper	ug/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	PPD	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Node 8: Camrosa WD Diversion Water Quality													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.64	10.06	9.73	9.20	9.08	9.05	8.81	8.82	8.61	8.49	8.59	8.62
Chloride	mg/L	197.9	197.6	197.8	158.3	158.4	158.4	158.6	158.6	158.8	198.9	198.8	198.8

Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Date: 03/24/2020

Early Phase Project B

Legend | Output | Exceeds | >90 < 110 mg/L | N/A

Scenario Description: *This scenario was to determine the Thousand Oaks Groundwater (no brine) influences to the Conejo Creek discharge (conventional HCTP treatment) with UV treatment at HCTP.*

Node 1: LVMWD AWPF Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 2: Thousand Oaks Groundwater Well (Los Robles Well)

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
TDS	mg/L	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0	1,516.0
	PPD	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79	11,288.79
Boron	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	PPD	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49
Sulfate	mg/L	603.0	603.0	603.0	603.0	603.0	603.0	603.0	603.0	603.0	603.0	603.0	603.0
	PPD	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20	4,490.20
Chloride	mg/L	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0
	PPD	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05	1,452.05
Copper	ug/L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Groundwater Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Groundwater Influence

Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.64	10.06	9.73	9.20	9.08	9.05	8.81	8.82	8.61	8.49	8.59	8.62
TDS	mg/L	685.1	681.5	684.3	689.1	690.3	690.6	693.0	693.0	695.2	696.5	695.4	695.1
	PPD	55,065.5	57,168.0	55,528.5	52,850.4	52,262.2	52,099.5	50,923.1	50,960.6	49,901.0	49,333.7	49,817.6	49,951.1
Boron	mg/L	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	PPD	34.9	36.5	35.2	33.2	32.8	32.6	31.7	31.8	31.0	30.5	30.9	31.0
Sulfate	mg/L	138.5	136.5	138.0	140.7	141.4	141.6	142.9	142.9	144.1	144.8	144.2	144.1
	PPD	11,128.6	11,447.5	11,198.9	10,792.7	10,703.5	10,678.9	10,500.5	10,506.2	10,345.5	10,259.5	10,332.8	10,353.1
Chloride	mg/L	132.5	132.2	132.4	132.8	132.9	132.9	133.1	133.1	133.3	133.4	133.3	133.3
	PPD	10,650.8	11,092.6	10,748.1	10,185.3	10,061.7	10,027.5	9,780.3	9,788.2	9,565.6	9,446.4	9,548.0	9,576.1
Copper	ug/L	44.0	44.2	44.0	43.8	43.7	43.7	43.6	43.6	43.5	43.4	43.5	43.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4a: HCTP RO System Feed

Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												

Node 5: HCTP RO System Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 6: HCTP RO System Product Water													
Consitutent	**Units**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 7a: HCTP Conventional Effluent (Bypass RO System)													
Consitutent	**Units**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Flow	MGD	9.64	10.06	9.73	9.20	9.08	9.05	8.81	8.82	8.61	8.49	8.59	8.62

Node 7: HCTP Combined Effluent Flow (Conventional Effluent+ UV + RO System Product Water)													
Consitutent	**Units**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Flow	MGD	9.64	10.06	9.73	9.20	9.08	9.05	8.81	8.82	8.61	8.49	8.59	8.62
TDS	mg/L	685.1	681.5	684.3	689.1	690.3	690.6	693.0	693.0	695.2	696.5	695.4	695.1
	PPD	55,065.5	57,168.0	55,528.5	52,850.4	52,262.2	52,099.5	50,923.1	50,960.6	49,901.0	49,333.7	49,817.6	49,951.1
Boron	mg/L	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	PPD	34.9	36.5	35.2	33.2	32.8	32.6	31.7	31.8	31.0	30.5	30.9	31.0
Sulfate	mg/L	138.5	136.5	138.0	140.7	141.4	141.6	142.9	142.9	144.1	144.8	144.2	144.1
	PPD	11,128.6	11,447.5	11,198.9	10,792.7	10,703.5	10,678.9	10,500.5	10,506.2	10,345.5	10,259.5	10,332.8	10,353.1
Chloride	mg/L	132.5	132.2	132.4	132.8	132.9	132.9	133.1	133.1	133.3	133.4	133.3	133.3
	PPD	10,650.8	11,092.6	10,748.1	10,185.3	10,061.7	10,027.5	9,780.3	9,788.2	9,565.6	9,446.4	9,548.0	9,576.1
Copper	ug/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	PPD	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Node 8: Camrosa WD Diversion Water Quality													
Consitutent	**Units**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Flow	MGD	9.64	10.06	9.73	9.20	9.08	9.05	8.81	8.82	8.61	8.49	8.59	8.62
Chloride	mg/L	172.5	172.2	172.4	132.8	132.9	132.9	133.1	133.1	133.3	173.4	173.3	173.3

Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence													
Consitutent	**Units**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Date: 04/13/2020
Early Phase Project C

Legend

Output	Exceeds	>90 < 110 mg/L	N/A

Scenario Description: *This scenario was to determine the Thousand Oaks Groundwater brine influences to the Conejo Creek discharge (conventional HCTP treatment) with UV treatment at HCTP.*

Node 1: LVMWD AWPF Brine													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 2: Thousand Oaks Groundwater Well Brine													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
TDS	mg/L	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0
	PPD	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	PPD	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Sulfate	mg/L	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0
	PPD	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83
Chloride	mg/L	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0
	PPD	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08
Copper	ug/L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Brine Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Brine Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.01	9.43	9.11	8.57	8.45	8.42	8.19	8.19	7.98	7.87	7.96	7.99
TDS	mg/L	807.7	798.4	805.6	818.4	821.4	822.3	828.6	828.4	834.5	837.9	835.0	834.2
	PPD	60,709.9	62,812.4	61,172.9	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	54,978.1	55,462.0	55,595.5
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	35.6	37.2	36.0	33.9	33.5	33.4	32.5	32.5	31.7	31.3	31.6	31.7
Sulfate	mg/L	177.9	174.0	177.0	182.3	183.6	184.0	186.6	186.6	189.1	190.5	189.3	189.0
	PPD	13,369.3	13,688.1	13,439.5	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	12,500.1	12,573.5	12,593.7
Chloride	mg/L	151.4	150.2	151.1	152.7	153.0	153.1	153.9	153.9	154.6	155.0	154.7	154.6
	PPD	11,376.8	11,818.6	11,474.1	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	10,172.4	10,274.1	10,302.1
Copper	ug/L	47.1	47.1	47.1	47.0	47.0	47.0	46.9	46.9	46.9	46.8	46.9	46.9
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4a: HCTP RO System Feed													
Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												

Node 5: HCTP RO System Brine													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 6: HCTP RO System Product Water													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 7a: HCTP Conventional Effluent (Bypass RO System)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.01	9.43	9.11	8.57	8.45	8.42	8.19	8.19	7.98	7.87	7.96	7.99

Node 7: HCTP Combined Effluent Flow (Conventional Effluent+ UV + RO System Product Water)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.01	8.43	8.11	7.57	7.45	7.42	7.19	7.19	6.98	6.87	6.96	6.99
TDS	mg/L	908.5	893.1	904.9	926.5	931.6	933.1	944.0	943.6	954.0	959.8	954.9	953.5
	PPD	60,709.9	62,812.4	61,172.9	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	54,978.1	55,462.0	55,595.5
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	35.6	37.2	36.0	33.9	33.5	33.4	32.5	32.5	31.7	31.3	31.6	31.7
Sulfate	mg/L	200.1	194.6	198.8	206.4	208.3	208.8	212.6	212.5	216.2	218.2	216.5	216.0
	PPD	13,369.3	13,688.1	13,439.5	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	12,500.1	12,573.5	12,593.7
Chloride	mg/L	170.2	168.0	169.7	172.8	173.6	173.8	175.3	175.3	176.8	177.6	176.9	176.7
	PPD	11,376.8	11,818.6	11,474.1	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	10,172.4	10,274.1	10,302.1
Copper	ug/L	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1
	PPD	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Node 8: Camrosa WD Diversion Water Quality													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.01	8.43	8.11	7.57	7.45	7.42	7.19	7.19	6.98	6.87	6.96	6.99
Chloride	mg/L	210.2	208.0	209.7	172.8	173.6	173.8	175.3	175.3	176.8	217.6	216.9	216.7

Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Date: 07/06/2020

Scenario 1

Legend	Output	Exceeds	>90 < 110 mg/L

Scenario Description: *This scenario was to determine the size of the HCTP RO system that would allow the HCTP effluent to meet the NPDES limits with the influence of the brine systems. Based on these results, a 5.2 mgd desalter feed is required to meet creek discharge limits with a 20% buffer for future growth.*

Node 1: LVMWD AWPF Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.10	1.10	1.10	0.00	0.00	0.00	0.00	0.00	0.00	1.10	1.10	1.10
TDS	mg/L	5,168.33	5,926.67	5,805.00	5,708.89	5,656.67	5,113.33	5,420.00	5,026.67	4,931.11	4,991.11	4,817.78	4,793.33
	PPD	47,414.29	54,371.24	53,255.07	0.00	0.00	0.00	0.00	0.00	0.00	45,788.45	44,198.29	43,974.04
Boron	mg/L	2.43	2.70	2.75	3.03	2.90	2.52	2.67	2.33	2.67	2.53	2.71	2.58
	PPD	22.32	24.77	25.23	0.00	0.00	0.00	0.00	0.00	0.00	23.24	24.87	23.65
Sulfate	mg/L	1,438.33	1,785.00	1,746.67	1,590.00	1,456.67	1,320.00	1,200.00	1,246.67	1,128.89	1,166.67	1,182.22	1,162.22
	PPD	13,195.27	16,375.59	16,023.92	0.00	0.00	0.00	0.00	0.00	0.00	10,703.00	10,845.71	10,662.23
Chloride	mg/L	1,110.00	1,118.33	1,133.33	1,160.00	1,113.33	1,026.67	1,093.33	1,106.67	1,080.00	1,057.78	1,022.22	991.11
	PPD	10,183.14	10,259.59	10,397.20	0.00	0.00	0.00	0.00	0.00	0.00	9,704.05	9,377.87	9,092.45
Copper	ug/L	18.00	22.00	18.17	21.83	42.33	14.67	24.33	30.00	22.89	22.67	22.56	24.44
	PPD	0.17	0.20	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.21	0.22

Node 2: Thousand Oaks Groundwater Well Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
TDS	mg/L	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0
	PPD	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	PPD	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Sulfate	mg/L	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0
	PPD	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83
Chloride	mg/L	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0
	PPD	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08
Copper	ug/L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	10.11	10.53	10.21	8.57	8.45	8.42	8.19	8.19	7.98	8.97	9.06	9.09
TDS	mg/L	1,282.0	1,334.0	1,344.4	818.4	821.4	822.3	828.6	828.4	834.5	1,347.3	1,318.3	1,313.2
	PPD	108,124.2	117,183.6	114,428.0	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	100,766.6	99,660.3	99,569.5
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	58.0	62.0	61.2	33.9	33.5	33.4	32.5	32.5	31.7	54.5	56.5	55.4
Sulfate	mg/L	315.0	342.2	346.2	182.3	183.6	184.0	186.6	186.6	189.1	310.2	309.8	306.7
	PPD	26,564.5	30,063.7	29,463.4	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	23,203.1	23,419.2	23,255.9
Chloride	mg/L	255.6	251.3	257.0	152.7	153.0	153.1	153.9	153.9	154.6	265.8	260.0	255.8
	PPD	21,559.9	22,078.2	21,871.3	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	19,876.4	19,651.9	19,394.6
Copper	ug/L	43.9	44.5	44.0	47.0	47.0	47.0	46.9	46.9	46.9	43.9	43.9	44.2
	PPD	3.7	3.9	3.7	3.4	3.3	3.3	3.2	3.2	3.1	3.3	3.3	3.3

Node 4a: HCTP RO System Feed

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	5.0	5.2	5.0	4.2	4.1	4.1	4.0	4.0	3.9	4.4	4.4	4.5

Node 5: HCTP RO System Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.74	0.77	0.75	0.63	0.62	0.62	0.60	0.60	0.59	0.66	0.67	0.67
TDS	mg/L	8,656.5	9,007.7	9,078.2	5,526.0	5,546.5	5,552.3	5,595.3	5,593.9	5,634.8	9,097.5	8,901.7	8,867.5
	PPD	53,662.5	58,158.7	56,791.1	29,031.2	28,739.3	28,658.5	28,074.7	28,093.3	27,567.4	50,010.9	49,461.8	49,416.8
Boron	mg/L	4.6	4.7	4.8	3.2	3.2	3.2	3.2	3.2	3.2	4.9	5.0	4.9
	PPD	28.4	30.4	30.0	16.6	16.4	16.4	15.9	15.9	15.5	26.7	27.7	27.1
Sulfate	mg/L	2,610.5	2,836.5	2,869.1	1,511.3	1,521.8	1,524.8	1,546.9	1,546.2	1,567.2	2,571.3	2,567.6	2,542.2
	PPD	16,182.6	18,314.3	17,948.6	7,939.7	7,885.4	7,870.3	7,761.7	7,765.1	7,667.2	14,134.9	14,266.5	14,167.1
Chloride	mg/L	2,030.8	1,996.7	2,041.5	1,212.8	1,215.7	1,216.5	1,222.7	1,222.5	1,228.3	2,111.3	2,065.2	2,032.2
	PPD	12,589.3	12,891.9	12,771.1	6,371.4	6,299.2	6,279.2	6,134.9	6,139.5	6,009.5	11,606.3	11,475.2	11,324.9
Copper	ug/L	16.8	17.0	16.8	18.0	18.0	18.0	17.9	17.9	17.9	16.8	16.8	16.9
	PPD	0.10	0.11	0.11	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09

Node 6: HCTP RO System Product Water													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	4.21	4.39	4.25	3.57	3.52	3.51	3.41	3.41	3.32	3.74	3.78	3.79
TDS	mg/L	64.9	67.6	68.1	41.4	41.6	41.6	42.0	42.0	42.3	68.2	66.8	66.5
	PPD	2,280.7	2,471.7	2,413.6	1,233.8	1,221.4	1,218.0	1,193.2	1,194.0	1,171.6	2,125.5	2,102.1	2,100.2
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	24.1	25.8	25.5	14.1	14.0	13.9	13.5	13.5	13.2	22.7	23.5	23.1
Sulfate	mg/L	19.6	21.3	21.5	11.3	11.4	11.4	11.6	11.6	11.8	19.3	19.3	19.1
	PPD	687.8	778.4	762.8	337.4	335.1	334.5	329.9	330.0	325.9	600.7	606.3	602.1
Chloride	mg/L	15.2	15.0	15.3	9.1	9.1	9.1	9.2	9.2	9.2	15.8	15.5	15.2
	PPD	535.0	547.9	542.8	270.8	267.7	266.9	260.7	260.9	255.4	493.3	487.7	481.3
Copper	ug/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	PPD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Node 7a: HCTP Conventional Effluent (Bypass RO System)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	5.16	5.37	5.20	4.37	4.31	4.29	4.17	4.18	4.07	4.57	4.62	4.64

Node 7: HCTP Combined Effluent Flow (Conventional Effluent + RO System Product Water)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.37	9.76	9.46	7.94	7.83	7.80	7.58	7.59	7.39	8.31	8.40	8.42
TDS	mg/L	743.9	774.1	780.2	474.9	476.7	477.2	480.9	480.7	484.3	781.8	765.0	762.1
	PPD	58,133.4	63,004.3	61,522.7	31,450.0	31,133.7	31,046.2	30,413.7	30,433.9	29,864.2	54,177.6	53,582.8	53,534.0
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	53.7	57.5	56.7	31.5	31.0	30.9	30.1	30.1	29.4	50.5	52.4	51.3
Sulfate	mg/L	224.3	243.8	246.6	129.9	130.8	131.0	132.9	132.9	134.7	221.0	220.7	218.5
	PPD	17,530.9	19,840.1	19,444.0	8,601.2	8,542.3	8,526.1	8,408.3	8,412.1	8,306.0	15,312.6	15,455.2	15,347.5
Chloride	mg/L	174.5	171.6	175.4	104.2	104.5	104.5	105.1	105.1	105.6	181.4	177.5	174.6
	PPD	13,638.2	13,966.0	13,835.2	6,902.2	6,824.0	6,802.4	6,646.0	6,651.0	6,510.2	12,573.3	12,431.3	12,268.5
Copper	ug/L	1.4	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.5
	PPD	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Node 8: Camrosa WD Diversion Water Quality													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.37	9.76	9.46	7.94	7.83	7.80	7.58	7.59	7.39	8.31	8.40	8.42
Chloride	mg/L	214.5	211.6	215.4	104.2	104.5	104.5	105.1	105.1	105.6	221.4	217.5	214.6

Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.37	1.37	1.37	0.27	0.27	0.27	0.27	0.27	0.27	1.37	1.37	1.37
TDS	mg/L	5,640.6	6,250.4	6,152.6	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	5,498.1	5,358.7	5,339.0
	PPD	64,347.5	71,304.4	70,188.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	62,721.6	61,131.5	60,907.2
Boron	mg/L	2.2	2.4	2.4	1.0	1.0	1.0	1.0	1.0	1.0	2.2	2.4	2.3
	PPD	24.6	27.0	27.5	2.2	2.2	2.2	2.2	2.2	2.2	25.5	27.1	25.9
Sulfate	mg/L	1,746.7	2,025.5	1,994.6	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	1,528.2	1,540.7	1,524.6
	PPD	19,926.1	23,106.4	22,754.7	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	17,433.8	17,576.5	17,393.1
Chloride	mg/L	1,083.6	1,090.3	1,102.3	975.0	975.0	975.0	975.0	975.0	975.0	1,041.6	1,013.0	988.0
	PPD	12,361.2	12,437.7	12,575.3	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	11,882.1	11,555.9	11,270.5
Copper	ug/L	14.5	17.7	14.6	0.0	0.0	0.0	0.0	0.0	0.0	18.2	18.1	19.7
	PPD	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2

Date: 07/06/2020
Scenario 2

Legend | Output | Exceeds | >90 < 110 mg/L

Scenario Description:

This scenario was to determine the size of the HCTP RO system that would allow the HCTP effluent to meet the lower CWD NPS chloride limits with the influence of the brine systems. Based on these results, a 6.0 mgd desalter feed is required to meet the chloride limits during the summer months, CWD would still need to blend during the winter.

Node 1: LVMWD AWPF Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.10	1.10	1.10	0.00	0.00	0.00	0.00	0.00	0.00	1.10	1.10	1.10
TDS	mg/L	5,168.33	5,926.67	5,805.00	5,708.89	5,656.67	5,113.33	5,420.00	5,026.67	4,931.11	4,991.11	4,817.78	4,793.33
	PPD	47,414.29	54,371.24	53,255.07	0.00	0.00	0.00	0.00	0.00	0.00	45,788.45	44,198.29	43,974.04
Boron	mg/L	2.43	2.70	2.75	3.03	2.90	2.52	2.67	2.33	2.67	2.53	2.71	2.58
	PPD	22.32	24.77	25.23	0.00	0.00	0.00	0.00	0.00	0.00	23.24	24.87	23.65
Sulfate	mg/L	1,438.33	1,785.00	1,746.67	1,590.00	1,456.67	1,320.00	1,200.00	1,246.67	1,128.89	1,166.67	1,182.22	1,162.22
	PPD	13,195.27	16,375.59	16,023.92	0.00	0.00	0.00	0.00	0.00	0.00	10,703.00	10,845.71	10,662.23
Chloride	mg/L	1,110.00	1,118.33	1,133.33	1,160.00	1,113.33	1,026.67	1,093.33	1,106.67	1,080.00	1,057.78	1,022.22	991.11
	PPD	10,183.14	10,259.59	10,397.20	0.00	0.00	0.00	0.00	0.00	0.00	9,704.05	9,377.87	9,092.45
Copper	ug/L	18.00	22.00	18.17	21.83	42.33	14.67	24.33	30.00	22.89	22.67	22.56	24.44
	PPD	0.17	0.20	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.21	0.22

Node 2: Thousand Oaks Groundwater Well Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
TDS	mg/L	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0
	PPD	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	PPD	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Sulfate	mg/L	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0
	PPD	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83
Chloride	mg/L	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0
	PPD	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08
Copper	ug/L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	10.11	10.53	10.21	8.57	8.45	8.42	8.19	8.19	7.98	8.97	9.06	9.09
TDS	mg/L	1,282.0	1,334.0	1,344.4	818.4	821.4	822.3	828.6	828.4	834.5	1,347.3	1,318.3	1,313.2
	PPD	108,124.2	117,183.6	114,428.0	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	100,766.6	99,660.3	99,569.5
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	58.0	62.0	61.2	33.9	33.5	33.4	32.5	32.5	31.7	54.5	56.5	55.4
Sulfate	mg/L	315.0	342.2	346.2	182.3	183.6	184.0	186.6	186.6	189.1	310.2	309.8	306.7
	PPD	26,564.5	30,063.7	29,463.4	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	23,203.1	23,419.2	23,255.9
Chloride	mg/L	255.6	251.3	257.0	152.7	153.0	153.1	153.9	153.9	154.6	265.8	260.0	255.8
	PPD	21,559.9	22,078.2	21,871.3	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	19,876.4	19,651.9	19,394.6
Copper	ug/L	43.9	44.5	44.0	47.0	47.0	47.0	46.9	46.9	46.9	43.9	43.9	44.2
	PPD	3.7	3.9	3.7	3.4	3.3	3.3	3.2	3.2	3.1	3.3	3.3	3.3

Node 4a: HCTP RO System Feed

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	5.8	6.0	5.8	4.9	4.8	4.8	4.7	4.7	4.5	5.1	5.2	5.2

Node 5: HCTP RO System Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.86	0.90	0.87	0.73	0.72	0.72	0.70	0.70	0.68	0.77	0.78	0.78
TDS	mg/L	8,656.5	9,007.7	9,078.2	5,526.0	5,546.5	5,552.3	5,595.3	5,593.9	5,634.8	9,097.5	8,901.7	8,867.5
	PPD	62,423.7	67,654.0	66,063.1	33,771.0	33,431.4	33,337.5	32,658.3	32,680.0	32,068.2	58,175.9	57,537.2	57,484.8
Boron	mg/L	4.6	4.7	4.8	3.2	3.2	3.2	3.2	3.2	3.2	4.9	5.0	4.9
	PPD	33.0	35.3	34.9	19.4	19.1	19.0	18.5	18.5	18.1	31.1	32.2	31.6
Sulfate	mg/L	2,610.5	2,836.5	2,869.1	1,511.3	1,521.8	1,524.8	1,546.9	1,546.2	1,567.2	2,571.3	2,567.6	2,542.2
	PPD	18,824.7	21,304.3	20,879.0	9,236.0	9,172.8	9,155.3	9,028.9	9,032.9	8,919.0	16,442.6	16,595.8	16,480.1
Chloride	mg/L	2,030.8	1,996.7	2,041.5	1,212.8	1,215.7	1,216.5	1,222.7	1,222.5	1,228.3	2,111.3	2,065.2	2,032.2
	PPD	14,644.7	14,996.7	14,856.2	7,411.6	7,327.6	7,304.4	7,136.5	7,141.9	6,990.6	13,501.2	13,348.7	13,173.9
Copper	ug/L	16.8	17.0	16.8	18.0	18.0	18.0	17.9	17.9	17.9	16.8	16.8	16.9
	PPD	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Node 6: HCTP RO System Product Water													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	4.90	5.10	4.94	4.15	4.10	4.08	3.97	3.97	3.87	4.34	4.39	4.40
TDS	mg/L	64.9	67.6	68.1	41.4	41.6	41.6	42.0	42.0	42.3	68.2	66.8	66.5
	PPD	2,653.0	2,875.3	2,807.7	1,435.3	1,420.8	1,416.8	1,388.0	1,388.9	1,362.9	2,472.5	2,445.3	2,443.1
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	28.1	30.0	29.7	16.4	16.2	16.2	15.7	15.7	15.4	26.4	27.4	26.8
Sulfate	mg/L	19.6	21.3	21.5	11.3	11.4	11.4	11.6	11.6	11.8	19.3	19.3	19.1
	PPD	800.1	905.4	887.4	392.5	389.8	389.1	383.7	383.9	379.1	698.8	705.3	700.4
Chloride	mg/L	15.2	15.0	15.3	9.1	9.1	9.1	9.2	9.2	9.2	15.8	15.5	15.2
	PPD	622.4	637.4	631.4	315.0	311.4	310.4	303.3	303.5	297.1	573.8	567.3	559.9
Copper	ug/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	PPD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Node 7a: HCTP Conventional Effluent (Bypass RO System)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	4.35	4.53	4.39	3.69	3.63	3.62	3.52	3.52	3.43	3.86	3.90	3.91

Node 7: HCTP Combined Effluent Flow (Conventional Effluent + RO System Product Water)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.25	9.63	9.33	7.84	7.73	7.70	7.49	7.49	7.30	8.20	8.29	8.31
TDS	mg/L	644.9	671.1	676.4	411.7	413.2	413.7	416.9	416.8	419.8	677.8	663.2	660.7
	PPD	49,744.6	53,912.5	52,644.7	26,911.6	26,641.0	26,566.2	26,024.9	26,042.2	25,554.7	46,359.6	45,850.6	45,808.8
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	53.0	56.7	56.0	31.0	30.6	30.5	29.7	29.7	29.0	49.8	51.7	50.6
Sulfate	mg/L	194.5	211.3	213.8	112.6	113.4	113.6	115.3	115.2	116.8	191.6	191.3	189.4
	PPD	15,001.1	16,977.1	16,638.2	7,360.0	7,309.6	7,295.7	7,195.0	7,198.2	7,107.5	13,102.9	13,224.9	13,132.8
Chloride	mg/L	151.3	148.8	152.1	90.4	90.6	90.6	91.1	91.1	91.5	157.3	153.9	151.4
	PPD	11,670.2	11,950.7	11,838.7	5,906.2	5,839.3	5,820.8	5,687.0	5,691.3	5,570.7	10,758.9	10,637.4	10,498.1
Copper	ug/L	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
	PPD	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Node 8: Camrosa WD Diversion Water Quality													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.25	9.63	9.33	7.84	7.73	7.70	7.49	7.49	7.30	8.20	8.29	8.31
Chloride	mg/L	191.3	188.8	192.1	90.4	90.6	90.6	91.1	91.1	91.5	197.3	193.9	191.4

Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.37	1.37	1.37	0.27	0.27	0.27	0.27	0.27	0.27	1.37	1.37	1.37
TDS	mg/L	5,640.6	6,250.4	6,152.6	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	5,498.1	5,358.7	5,339.0
	PPD	64,347.5	71,304.4	70,188.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	62,721.6	61,131.5	60,907.2
Boron	mg/L	2.2	2.4	2.4	1.0	1.0	1.0	1.0	1.0	1.0	2.2	2.4	2.3
	PPD	24.6	27.0	27.5	2.2	2.2	2.2	2.2	2.2	2.2	25.5	27.1	25.9
Sulfate	mg/L	1,746.7	2,025.5	1,994.6	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	1,528.2	1,540.7	1,524.6
	PPD	19,926.1	23,106.4	22,754.7	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	17,433.8	17,576.5	17,393.1
Chloride	mg/L	1,083.6	1,090.3	1,102.3	975.0	975.0	975.0	975.0	975.0	975.0	1,041.6	1,013.0	988.0
	PPD	12,361.2	12,437.7	12,575.3	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	11,882.1	11,555.9	11,270.5
Copper	ug/L	14.5	17.7	14.6	0.0	0.0	0.0	0.0	0.0	0.0	18.2	18.1	19.7
	PPD	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2

Date: 07/06/2020

Scenario 3

Legend | Output | Exceeds | >90 < 110 mg/L

Scenario Description: *This scenario was to upsize the HCTP desalter to offset the imported water CWD uses to blend for their NPS. Sending 1.0 mgd of desalted water to NPS tank to offset their imported water. (Maximum fall demand approximately 117 af/mo, 60% imported water blend). Feed water 6.4 mgd.*

Node 1: LVMWD AWPF Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.10	1.10	1.10	0.00	0.00	0.00	0.00	0.00	0.00	1.10	1.10	1.10
TDS	mg/L	5,168.33	5,926.67	5,805.00	5,708.89	5,656.67	5,113.33	5,420.00	5,026.67	4,931.11	4,991.11	4,817.78	4,793.33
	PPD	47,414.29	54,371.24	53,255.07	0.00	0.00	0.00	0.00	0.00	0.00	45,788.45	44,198.29	43,974.04
Boron	mg/L	2.43	2.70	2.75	3.03	2.90	2.52	2.67	2.33	2.67	2.53	2.71	2.58
	PPD	22.32	24.77	25.23	0.00	0.00	0.00	0.00	0.00	0.00	23.24	24.87	23.65
Sulfate	mg/L	1,438.33	1,785.00	1,746.67	1,590.00	1,456.67	1,320.00	1,200.00	1,246.67	1,128.89	1,166.67	1,182.22	1,162.22
	PPD	13,195.27	16,375.59	16,023.92	0.00	0.00	0.00	0.00	0.00	0.00	10,703.00	10,845.71	10,662.23
Chloride	mg/L	1,110.00	1,118.33	1,133.33	1,160.00	1,113.33	1,026.67	1,093.33	1,106.67	1,080.00	1,057.78	1,022.22	991.11
	PPD	10,183.14	10,259.59	10,397.20	0.00	0.00	0.00	0.00	0.00	0.00	9,704.05	9,377.87	9,092.45
Copper	ug/L	18.00	22.00	18.17	21.83	42.33	14.67	24.33	30.00	22.89	22.67	22.56	24.44
	PPD	0.17	0.20	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.21	0.22

Node 2: Thousand Oaks Groundwater Well Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
TDS	mg/L	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0
	PPD	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	PPD	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Sulfate	mg/L	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0
	PPD	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83
Chloride	mg/L	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0
	PPD	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08
Copper	ug/L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Brine Influence

Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	10.11	10.53	10.21	8.57	8.45	8.42	8.19	8.19	7.98	8.97	9.06	9.09
TDS	mg/L	1,282.0	1,334.0	1,344.4	818.4	821.4	822.3	828.6	828.4	834.5	1,347.3	1,318.3	1,313.2
	PPD	108,124.2	117,183.6	114,428.0	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	100,766.6	99,660.3	99,569.5
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	58.0	62.0	61.2	33.9	33.5	33.4	32.5	32.5	31.7	54.5	56.5	55.4
Sulfate	mg/L	315.0	342.2	346.2	182.3	183.6	184.0	186.6	186.6	189.1	310.2	309.8	306.7
	PPD	26,564.5	30,063.7	29,463.4	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	23,203.1	23,419.2	23,255.9
Chloride	mg/L	255.6	251.3	257.0	152.7	153.0	153.1	153.9	153.9	154.6	265.8	260.0	255.8
	PPD	21,559.9	22,078.2	21,871.3	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	19,876.4	19,651.9	19,394.6
Copper	ug/L	43.9	44.5	44.0	47.0	47.0	47.0	46.9	46.9	46.9	43.9	43.9	44.2
	PPD	3.7	3.9	3.7	3.4	3.3	3.3	3.2	3.2	3.1	3.3	3.3	3.3

Node 4a: HCTP RO System Feed

Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	6.2	6.4	6.2	5.2	5.2	5.1	5.0	5.0	4.9	5.5	5.5	5.5

Node 5: HCTP RO System Brine

Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.9	1.0	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.8	0.8	0.8
TDS	mg/L	8,656.5	9,007.7	9,078.2	5,526.0	5,546.5	5,552.3	5,595.3	5,593.9	5,634.8	9,097.5	8,901.7	8,867.5
	PPD	66,804.3	72,401.6	70,699.1	36,140.9	35,777.4	35,676.9	34,950.1	34,973.3	34,318.6	62,258.4	61,574.9	61,518.8
Boron	mg/L	4.6	4.7	4.8	3.2	3.2	3.2	3.2	3.2	3.2	4.9	5.0	4.9
	PPD	35.4	37.8	37.3	20.7	20.4	20.4	19.8	19.8	19.3	33.2	34.5	33.8
Sulfate	mg/L	2,610.5	2,836.5	2,869.1	1,511.3	1,521.8	1,524.8	1,546.9	1,546.2	1,567.2	2,571.3	2,567.6	2,542.2
	PPD	20,145.7	22,799.4	22,344.2	9,884.1	9,816.5	9,797.8	9,662.5	9,666.8	9,544.9	17,596.5	17,760.4	17,636.6
Chloride	mg/L	2,030.8	1,996.7	2,041.5	1,212.8	1,215.7	1,216.5	1,222.7	1,222.5	1,228.3	2,111.3	2,065.2	2,032.2
	PPD	15,672.4	16,049.1	15,898.8	7,931.7	7,841.9	7,817.0	7,637.3	7,643.1	7,481.2	14,448.6	14,285.5	14,098.4
Copper	ug/L	16.8	17.0	16.8	18.0	18.0	18.0	17.9	17.9	17.9	16.8	16.8	16.9
	PPD	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Node 6: HCTP RO System Product Water													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	5.2	5.5	5.3	4.4	4.4	4.4	4.2	4.2	4.1	4.6	4.7	4.7
TDS	mg/L	64.9	67.6	68.1	41.4	41.6	41.6	42.0	42.0	42.3	68.2	66.8	66.5
	PPD	2,839.2	3,077.1	3,004.7	1,536.0	1,520.5	1,516.3	1,485.4	1,486.4	1,458.5	2,646.0	2,616.9	2,614.6
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	30.1	32.2	31.7	17.6	17.4	17.3	16.8	16.9	16.4	28.3	29.3	28.7
Sulfate	mg/L	19.6	21.3	21.5	11.3	11.4	11.4	11.6	11.6	11.8	19.3	19.3	19.1
	PPD	856.2	969.0	949.6	420.1	417.2	416.4	410.7	410.8	405.7	747.9	754.8	749.6
Chloride	mg/L	15.2	15.0	15.3	9.1	9.1	9.1	9.2	9.2	9.2	15.8	15.5	15.2
	PPD	666.1	682.1	675.7	337.1	333.3	332.2	324.6	324.8	318.0	614.1	607.1	599.2
Copper	ug/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	PPD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Node 6a: HCTP RO Permeate sent to CWD Blending Tank													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Node 7a: HCTP Conventional Effluent (Bypass RO System)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	3.94	4.11	3.98	3.34	3.30	3.28	3.19	3.20	3.11	3.50	3.54	3.55

Node 7: HCTP Combined Effluent Flow (Conventional Effluent + RO System Product Water)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.19	8.57	8.27	6.79	6.68	6.65	6.44	6.44	6.25	7.15	7.24	7.26
TDS	mg/L	667.1	690.8	698.8	435.4	437.9	438.6	443.9	443.8	448.9	712.2	695.8	692.8
	PPD	45,550.1	49,366.6	48,205.8	24,642.4	24,394.6	24,326.1	23,830.5	23,846.3	23,400.0	42,450.5	41,984.5	41,946.3
Boron	mg/L	0.8	0.8	0.8	0.5	0.5	0.5	0.5	0.5	0.6	0.8	0.9	0.8
	PPD	52.7	56.3	55.6	30.8	30.4	30.3	29.5	29.5	28.8	49.5	51.3	50.3
Sulfate	mg/L	201.2	217.5	220.8	119.1	120.2	120.5	122.7	122.7	124.8	201.3	200.7	198.6
	PPD	13,736.3	15,545.6	15,235.2	6,739.4	6,693.3	6,680.5	6,588.3	6,591.2	6,508.2	11,998.1	12,109.8	12,025.4
Chloride	mg/L	156.5	153.1	157.1	95.6	96.0	96.1	97.0	97.0	97.8	165.3	161.4	158.8
	PPD	10,686.1	10,943.0	10,840.5	5,408.2	5,346.9	5,330.0	5,207.5	5,211.4	5,101.0	9,851.7	9,740.5	9,612.9
Copper	ug/L	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3
	PPD	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Node 8: Camrosa WD Diversion Water Quality													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.19	8.57	8.27	6.79	6.68	6.65	6.44	6.44	6.25	7.15	7.24	7.26
Chloride	mg/L	196.5	193.1	197.1	95.6	96.0	96.1	97.0	97.0	97.8	205.3	201.4	198.8

Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.37	1.37	1.37	0.27	0.27	0.27	0.27	0.27	0.27	1.37	1.37	1.37
TDS	mg/L	5,640.6	6,250.4	6,152.6	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	5,498.1	5,358.7	5,339.0
	PPD	64,347.5	71,304.4	70,188.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	62,721.6	61,131.5	60,907.2
Boron	mg/L	2.2	2.4	2.4	1.0	1.0	1.0	1.0	1.0	1.0	2.2	2.4	2.3
	PPD	24.6	27.0	27.5	2.2	2.2	2.2	2.2	2.2	2.2	25.5	27.1	25.9
Sulfate	mg/L	1,746.7	2,025.5	1,994.6	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	1,528.2	1,540.7	1,524.6
	PPD	19,926.1	23,106.4	22,754.7	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	17,433.8	17,576.5	17,393.1
Chloride	mg/L	1,083.6	1,090.3	1,102.3	975.0	975.0	975.0	975.0	975.0	975.0	1,041.6	1,013.0	988.0
	PPD	12,361.2	12,437.7	12,575.3	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	11,882.1	11,555.9	11,270.5
Copper	ug/L	14.5	17.7	14.6	0.0	0.0	0.0	0.0	0.0	0.0	18.2	18.1	19.7
	PPD	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2

Date: 07/06/2020
Scenario 4

Legend | Output | Exceeds | >90 < 110 mg/L

Scenario Description:

This scenario was to determine the LVMWD Purewater and Thousand Oaks Groundwater Desalter Brine influences with HCTP UV disinfection and sizing the desalter for NPDES compliance with buffer for future growth. Based on this analysis a 4.1 mgd feed would be needed on top of UV.

Node 1: LVMWD AWPF Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.10	1.10	1.10	0.00	0.00	0.00	0.00	0.00	0.00	1.10	1.10	1.10
TDS	mg/L	5,168.33	5,926.67	5,805.00	5,708.89	5,656.67	5,113.33	5,420.00	5,026.67	4,931.11	4,991.11	4,817.78	4,793.33
	PPD	47,414.29	54,371.24	53,255.07	0.00	0.00	0.00	0.00	0.00	0.00	45,788.45	44,198.29	43,974.04
Boron	mg/L	2.43	2.70	2.75	3.03	2.90	2.52	2.67	2.33	2.67	2.53	2.71	2.58
	PPD	22.32	24.77	25.23	0.00	0.00	0.00	0.00	0.00	0.00	23.24	24.87	23.65
Sulfate	mg/L	1,438.33	1,785.00	1,746.67	1,590.00	1,456.67	1,320.00	1,200.00	1,246.67	1,128.89	1,166.67	1,182.22	1,162.22
	PPD	13,195.27	16,375.59	16,023.92	0.00	0.00	0.00	0.00	0.00	0.00	10,703.00	10,845.71	10,662.23
Chloride	mg/L	1,110.00	1,118.33	1,133.33	1,160.00	1,113.33	1,026.67	1,093.33	1,106.67	1,080.00	1,057.78	1,022.22	991.11
	PPD	10,183.14	10,259.59	10,397.20	0.00	0.00	0.00	0.00	0.00	0.00	9,704.05	9,377.87	9,092.45
Copper	ug/L	18.00	22.00	18.17	21.83	42.33	14.67	24.33	30.00	22.89	22.67	22.56	24.44
	PPD	0.17	0.20	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.21	0.22

Node 2: Thousand Oaks Groundwater Well Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
TDS	mg/L	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0
	PPD	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	PPD	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Sulfate	mg/L	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0
	PPD	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83
Chloride	mg/L	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0
	PPD	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08
Copper	ug/L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	10.11	10.53	10.21	8.57	8.45	8.42	8.19	8.19	7.98	8.97	9.06	9.09
TDS	mg/L	1,282.0	1,334.0	1,344.4	818.4	821.4	822.3	828.6	828.4	834.5	1,347.3	1,318.3	1,313.2
	PPD	108,124.2	117,183.6	114,428.0	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	100,766.6	99,660.3	99,569.5
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	58.0	62.0	61.2	33.9	33.5	33.4	32.5	32.5	31.7	54.5	56.5	55.4
Sulfate	mg/L	315.0	342.2	346.2	182.3	183.6	184.0	186.6	186.6	189.1	310.2	309.8	306.7
	PPD	26,564.5	30,063.7	29,463.4	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	23,203.1	23,419.2	23,255.9
Chloride	mg/L	255.6	251.3	257.0	152.7	153.0	153.1	153.9	153.9	154.6	265.8	260.0	255.8
	PPD	21,559.9	22,078.2	21,871.3	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	19,876.4	19,651.9	19,394.6
Copper	ug/L	43.9	44.5	44.0	47.0	47.0	47.0	46.9	46.9	46.9	43.9	43.9	44.2
	PPD	3.7	3.9	3.7	3.4	3.3	3.3	3.2	3.2	3.1	3.3	3.3	3.3

Node 4a: HCTP RO System Feed

Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	3.9	4.1	3.9	3.3	3.3	3.2	3.2	3.2	3.1	3.5	3.5	3.5

Node 5: HCTP RO System Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.58	0.61	0.59	0.49	0.49	0.49	0.47	0.47	0.46	0.52	0.52	0.53
TDS	mg/L	8,546.6	8,893.3	8,962.9	5,455.8	5,476.0	5,481.7	5,524.2	5,522.8	5,563.2	8,981.9	8,788.6	8,754.8
	PPD	41,627.8	45,115.7	44,054.8	22,520.5	22,294.0	22,231.4	21,778.5	21,792.9	21,385.0	38,795.1	38,369.2	38,334.3
Boron	mg/L	4.6	4.7	4.8	3.2	3.2	3.2	3.2	3.2	3.2	4.9	5.0	4.9
	PPD	22.3	23.9	23.6	13.1	12.9	12.8	12.5	12.5	12.2	21.0	21.8	21.3
Sulfate	mg/L	2,099.8	2,281.6	2,307.8	1,215.6	1,224.1	1,226.5	1,244.3	1,243.7	1,260.6	2,068.2	2,065.2	2,044.8
	PPD	10,227.4	11,574.5	11,343.4	5,017.8	4,983.5	4,974.0	4,905.3	4,907.5	4,845.7	8,933.2	9,016.4	8,953.5
Chloride	mg/L	1,704.2	1,675.6	1,713.1	1,017.7	1,020.2	1,020.9	1,026.0	1,025.9	1,030.8	1,771.7	1,733.0	1,705.3
	PPD	8,300.6	8,500.1	8,420.4	4,200.9	4,153.3	4,140.1	4,044.9	4,048.0	3,962.3	7,652.4	7,566.0	7,466.9
Copper	ug/L	16.8	17.0	16.8	18.0	18.0	18.0	17.9	17.9	17.9	16.8	16.8	16.9
	PPD	0.08	0.09	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07

Node 6: HCTP RO System Product Water													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	3.31	3.45	3.34	2.80	2.77	2.76	2.68	2.68	2.61	2.93	2.97	2.98
TDS	mg/L	64.1	66.7	67.2	40.9	41.1	41.1	41.4	41.4	41.7	67.4	65.9	65.7
	PPD	1,769.2	1,917.4	1,872.3	957.1	947.5	944.8	925.6	926.2	908.9	1,648.8	1,630.7	1,629.2
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	19.0	20.3	20.0	11.1	11.0	10.9	10.6	10.6	10.4	17.8	18.5	18.1
Sulfate	mg/L	15.7	17.1	17.3	9.1	9.2	9.2	9.3	9.3	9.5	15.5	15.5	15.3
	PPD	434.7	491.9	482.1	213.3	211.8	211.4	208.5	208.6	205.9	379.7	383.2	380.5
Chloride	mg/L	12.8	12.6	12.8	7.6	7.7	7.7	7.7	7.7	7.7	13.3	13.0	12.8
	PPD	352.8	361.3	357.9	178.5	176.5	176.0	171.9	172.0	168.4	325.2	321.6	317.3
Copper	ug/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	PPD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Node 7a: HCTP Conventional Effluent (Bypass RO System)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	6.22	6.48	6.28	5.27	5.20	5.18	5.03	5.04	4.91	5.52	5.57	5.59

Node 7: HCTP Combined Effluent Flow (Conventional Effluent + RO System Product Water)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.53	9.92	9.62	8.08	7.96	7.93	7.71	7.72	7.52	8.45	8.54	8.57
TDS	mg/L	859.0	893.9	900.8	548.4	550.4	551.0	555.2	555.1	559.1	902.8	883.3	879.9
	PPD	68,265.5	73,985.3	72,245.5	36,931.4	36,560.0	36,457.3	35,714.6	35,738.3	35,069.3	63,620.2	62,921.8	62,864.5
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	54.6	58.4	57.7	32.0	31.6	31.4	30.6	30.6	29.9	51.4	53.2	52.2
Sulfate	mg/L	211.0	229.3	232.0	122.2	123.0	123.3	125.1	125.0	126.7	207.9	207.6	205.5
	PPD	16,771.9	18,981.1	18,602.1	8,228.8	8,172.5	8,156.9	8,044.3	8,047.9	7,946.4	14,649.6	14,786.0	14,682.9
Chloride	mg/L	171.3	168.4	172.2	102.3	102.5	102.6	103.1	103.1	103.6	178.1	174.2	171.4
	PPD	13,612.1	13,939.3	13,808.7	6,889.0	6,811.0	6,789.4	6,633.3	6,638.3	6,497.7	12,549.2	12,407.5	12,245.0
Copper	ug/L	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.7	1.7
	PPD	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Node 8: Camrosa WD Diversion Water Quality													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.53	9.92	9.62	8.08	7.96	7.93	7.71	7.72	7.52	8.45	8.54	8.57
Chloride	mg/L	211.3	208.4	212.2	102.3	102.5	102.6	103.1	103.1	103.6	218.1	214.2	211.4

Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.37	1.37	1.37	0.27	0.27	0.27	0.27	0.27	0.27	1.37	1.37	1.37
TDS	mg/L	5,640.6	6,250.4	6,152.6	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	5,498.1	5,358.7	5,339.0
	PPD	64,347.5	71,304.4	70,188.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	62,721.6	61,131.5	60,907.2
Boron	mg/L	2.2	2.4	2.4	1.0	1.0	1.0	1.0	1.0	1.0	2.2	2.4	2.3
	PPD	24.6	27.0	27.5	2.2	2.2	2.2	2.2	2.2	2.2	25.5	27.1	25.9
Sulfate	mg/L	1,746.7	2,025.5	1,994.6	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	1,528.2	1,540.7	1,524.6
	PPD	19,926.1	23,106.4	22,754.7	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	17,433.8	17,576.5	17,393.1
Chloride	mg/L	1,083.6	1,090.3	1,102.3	975.0	975.0	975.0	975.0	975.0	975.0	1,041.6	1,013.0	988.0
	PPD	12,361.2	12,437.7	12,575.3	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	11,882.1	11,555.9	11,270.5
Copper	ug/L	14.5	17.7	14.6	0.0	0.0	0.0	0.0	0.0	0.0	18.2	18.1	19.7
	PPD	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2

Date: 07/06/2020
Scenario 5

Legend | Output | Exceeds | >90 < 110 mg/L |

Scenario Description: *This scenario was to determine the LVMWD Purewater and Thousand Oaks Groundwater Desalter Brine influences with HCTP UV disinfection and sizing the RO for the lower CWD NPS limit. Camrosa would still need to blend in the winter. Based on this analysis a 5.0 mgd feed would be needed on top of UV.*

Node 1: LVMWD AWPF Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.10	1.10	1.10	0.00	0.00	0.00	0.00	0.00	0.00	1.10	1.10	1.10
TDS	mg/L	5,168.33	5,926.67	5,805.00	5,708.89	5,656.67	5,113.33	5,420.00	5,026.67	4,931.11	4,991.11	4,817.78	4,793.33
	PPD	47,414.29	54,371.24	53,255.07	0.00	0.00	0.00	0.00	0.00	0.00	45,788.45	44,198.29	43,974.04
Boron	mg/L	2.43	2.70	2.75	3.03	2.90	2.52	2.67	2.33	2.67	2.53	2.71	2.58
	PPD	22.32	24.77	25.23	0.00	0.00	0.00	0.00	0.00	0.00	23.24	24.87	23.65
Sulfate	mg/L	1,438.33	1,785.00	1,746.67	1,590.00	1,456.67	1,320.00	1,200.00	1,246.67	1,128.89	1,166.67	1,182.22	1,162.22
	PPD	13,195.27	16,375.59	16,023.92	0.00	0.00	0.00	0.00	0.00	0.00	10,703.00	10,845.71	10,662.23
Chloride	mg/L	1,110.00	1,118.33	1,133.33	1,160.00	1,113.33	1,026.67	1,093.33	1,106.67	1,080.00	1,057.78	1,022.22	991.11
	PPD	10,183.14	10,259.59	10,397.20	0.00	0.00	0.00	0.00	0.00	0.00	9,704.05	9,377.87	9,092.45
Copper	ug/L	18.00	22.00	18.17	21.83	42.33	14.67	24.33	30.00	22.89	22.67	22.56	24.44
	PPD	0.17	0.20	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.21	0.22

Node 2: Thousand Oaks Groundwater Well Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
TDS	mg/L	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0
	PPD	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	PPD	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Sulfate	mg/L	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0
	PPD	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83
Chloride	mg/L	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0
	PPD	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08
Copper	ug/L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	10.11	10.53	10.21	8.57	8.45	8.42	8.19	8.19	7.98	8.97	9.06	9.09
TDS	mg/L	1,282.0	1,334.0	1,344.4	818.4	821.4	822.3	828.6	828.4	834.5	1,347.3	1,318.3	1,313.2
	PPD	108,124.2	117,183.6	114,428.0	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	100,766.6	99,660.3	99,569.5
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	58.0	62.0	61.2	33.9	33.5	33.4	32.5	32.5	31.7	54.5	56.5	55.4
Sulfate	mg/L	315.0	342.2	346.2	182.3	183.6	184.0	186.6	186.6	189.1	310.2	309.8	306.7
	PPD	26,564.5	30,063.7	29,463.4	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	23,203.1	23,419.2	23,255.9
Chloride	mg/L	255.6	251.3	257.0	152.7	153.0	153.1	153.9	153.9	154.6	265.8	260.0	255.8
	PPD	21,559.9	22,078.2	21,871.3	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	19,876.4	19,651.9	19,394.6
Copper	ug/L	43.9	44.5	44.0	47.0	47.0	47.0	46.9	46.9	46.9	43.9	43.9	44.2
	PPD	3.7	3.9	3.7	3.4	3.3	3.3	3.2	3.2	3.1	3.3	3.3	3.3

Node 4a: HCTP RO System Feed

Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	4.8	5.0	4.8	4.0	4.0	4.0	3.8	3.9	3.8	4.2	4.3	4.3

Node 5: HCTP RO System Brine

Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.71	0.74	0.72	0.60	0.60	0.59	0.58	0.58	0.56	0.63	0.64	0.64
TDS	mg/L	8,546.6	8,893.3	8,962.9	5,455.8	5,476.0	5,481.7	5,524.2	5,522.8	5,563.2	8,981.9	8,788.6	8,754.8
	PPD	50,818.4	55,076.3	53,781.2	27,492.5	27,216.1	27,139.6	26,586.7	26,604.4	26,106.4	47,360.3	46,840.3	46,797.7
Boron	mg/L	4.6	4.7	4.8	3.2	3.2	3.2	3.2	3.2	3.2	4.9	5.0	4.9
	PPD	27.2	29.1	28.8	16.0	15.7	15.7	15.3	15.3	14.9	25.6	26.6	26.0
Sulfate	mg/L	2,099.8	2,281.6	2,307.8	1,215.6	1,224.1	1,226.5	1,244.3	1,243.7	1,260.6	2,068.2	2,065.2	2,044.8
	PPD	12,485.3	14,129.9	13,847.8	6,125.7	6,083.8	6,072.2	5,988.3	5,991.0	5,915.5	10,905.5	11,007.0	10,930.3
Chloride	mg/L	1,704.2	1,675.6	1,713.1	1,017.7	1,020.2	1,020.9	1,026.0	1,025.9	1,030.8	1,771.7	1,733.0	1,705.3
	PPD	10,133.2	10,376.7	10,279.5	5,128.3	5,070.2	5,054.2	4,938.0	4,941.7	4,837.1	9,341.9	9,236.4	9,115.4
Copper	ug/L	16.8	17.0	16.8	18.0	18.0	18.0	17.9	17.9	17.9	16.8	16.8	16.9
	PPD	0.10	0.11	0.10	0.09	0.09	0.09	0.09	0.09	0.08	0.09	0.09	0.09

Node 6: HCTP RO System Product Water

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	4.04	4.21	4.08	3.42	3.38	3.36	3.27	3.27	3.19	3.58	3.62	3.63
TDS	mg/L	64.1	66.7	67.2	40.9	41.1	41.1	41.4	41.4	41.7	67.4	65.9	65.7
	PPD	2,159.8	2,340.7	2,285.7	1,168.4	1,156.7	1,153.4	1,129.9	1,130.7	1,109.5	2,012.8	1,990.7	1,988.9
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	23.2	24.8	24.5	13.6	13.4	13.3	13.0	13.0	12.7	21.8	22.6	22.1
Sulfate	mg/L	15.7	17.1	17.3	9.1	9.2	9.2	9.3	9.3	9.5	15.5	15.5	15.3
	PPD	530.6	600.5	588.5	260.3	258.6	258.1	254.5	254.6	251.4	463.5	467.8	464.5
Chloride	mg/L	12.8	12.6	12.8	7.6	7.7	7.7	7.7	7.7	7.7	13.3	13.0	12.8
	PPD	430.7	441.0	436.9	218.0	215.5	214.8	209.9	210.0	205.6	397.0	392.5	387.4
Copper	ug/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	PPD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Node 7a: HCTP Conventional Effluent (Bypass RO System)

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	5.36	5.58	5.41	4.54	4.48	4.46	4.34	4.34	4.23	4.75	4.80	4.82

Node 7: HCTP Combined Effluent Flow (Conventional Effluent + RO System Product Water)

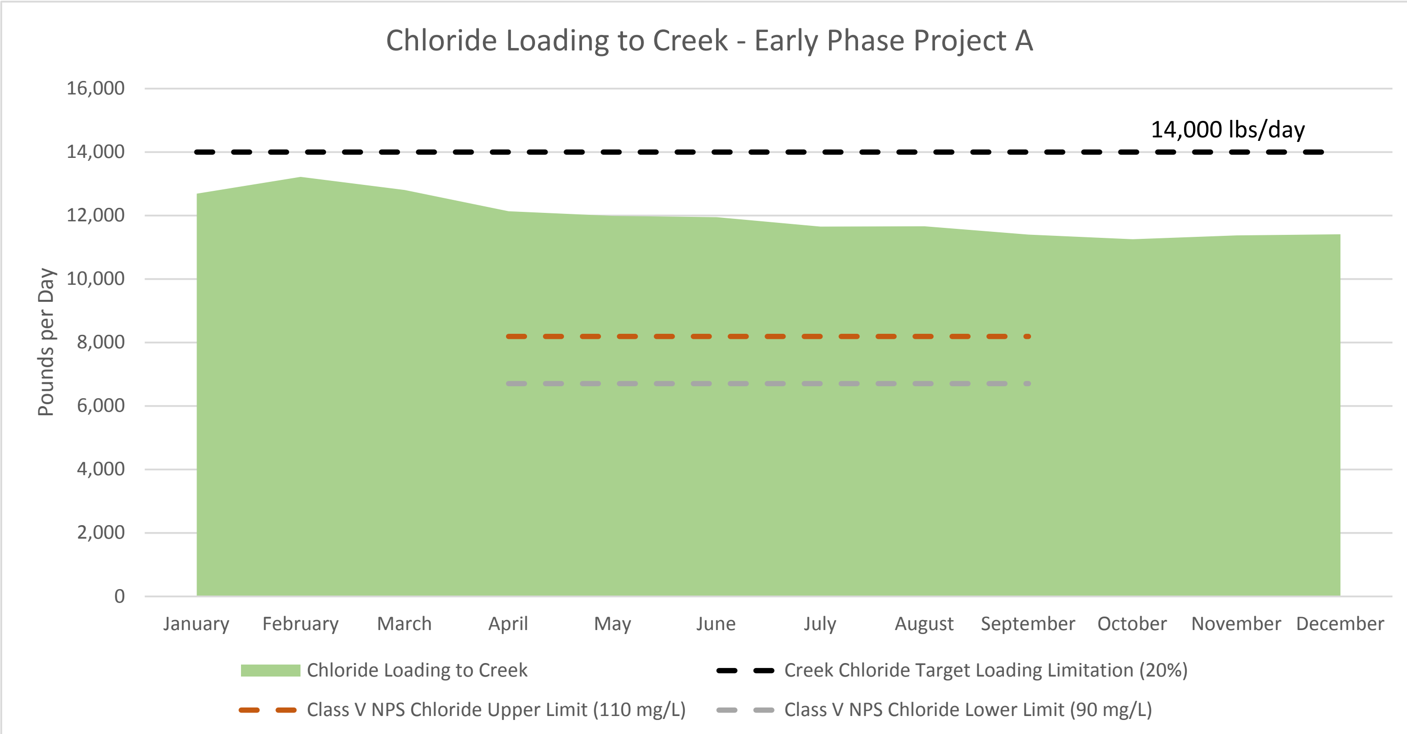
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.40	9.79	9.49	7.97	7.86	7.83	7.61	7.62	7.42	8.34	8.43	8.45
TDS	mg/L	758.5	789.3	795.5	484.2	486.0	486.5	490.3	490.2	493.8	797.2	780.0	777.0
	PPD	59,465.6	64,448.0	62,932.5	32,170.7	31,847.2	31,757.7	31,110.7	31,131.3	30,548.6	55,419.1	54,810.7	54,760.8
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	53.9	57.6	56.9	31.6	31.1	31.0	30.2	30.2	29.5	50.7	52.5	51.5
Sulfate	mg/L	186.4	202.5	204.8	107.9	108.6	108.9	110.4	110.4	111.9	183.6	183.3	181.5
	PPD	14,609.8	16,534.3	16,204.1	7,168.0	7,119.0	7,105.4	7,007.3	7,010.4	6,922.1	12,761.1	12,880.0	12,790.2
Chloride	mg/L	151.3	148.7	152.0	90.3	90.5	90.6	91.1	91.0	91.5	157.2	153.8	151.4
	PPD	11,857.4	12,142.4	12,028.7	6,001.0	5,933.0	5,914.2	5,778.2	5,782.6	5,660.1	10,931.5	10,808.1	10,666.5
Copper	ug/L	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5
	PPD	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

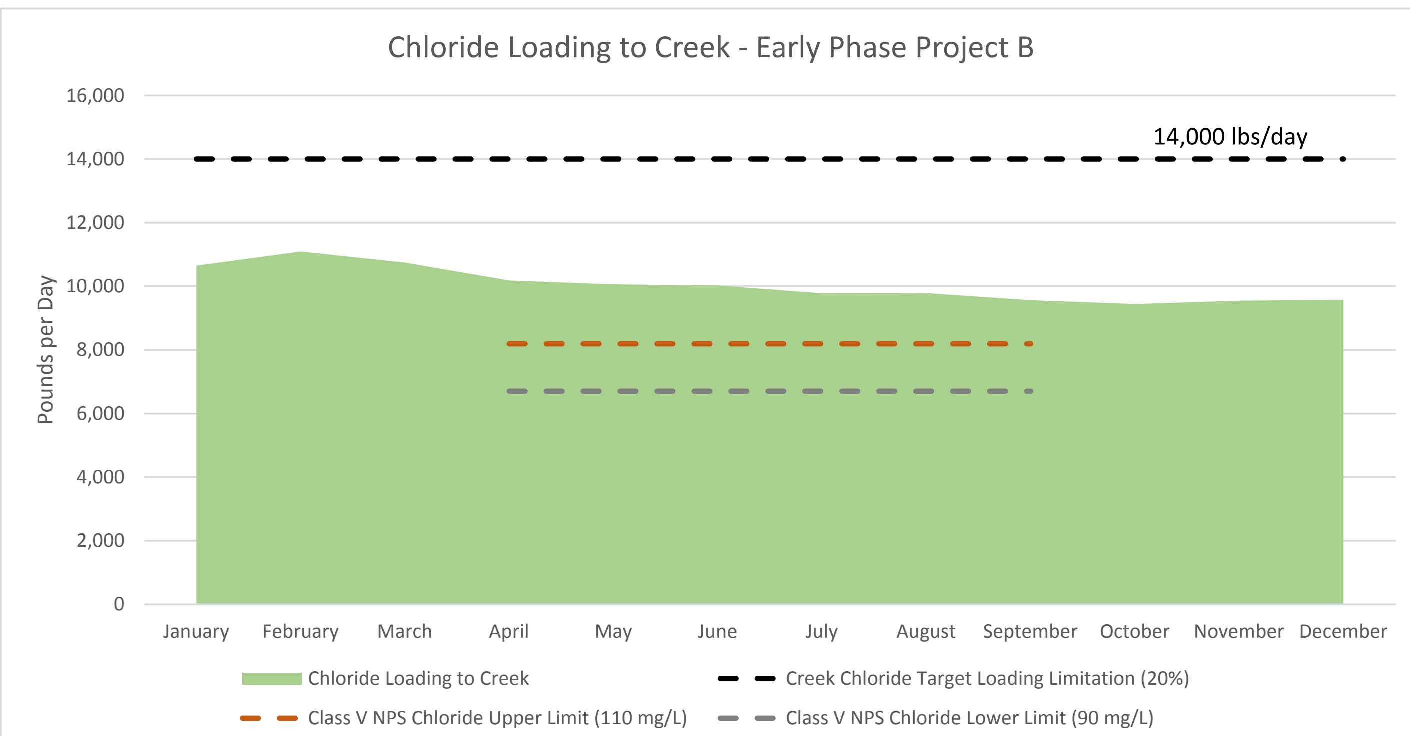
Node 8: Camrosa WD Diversion Water Quality

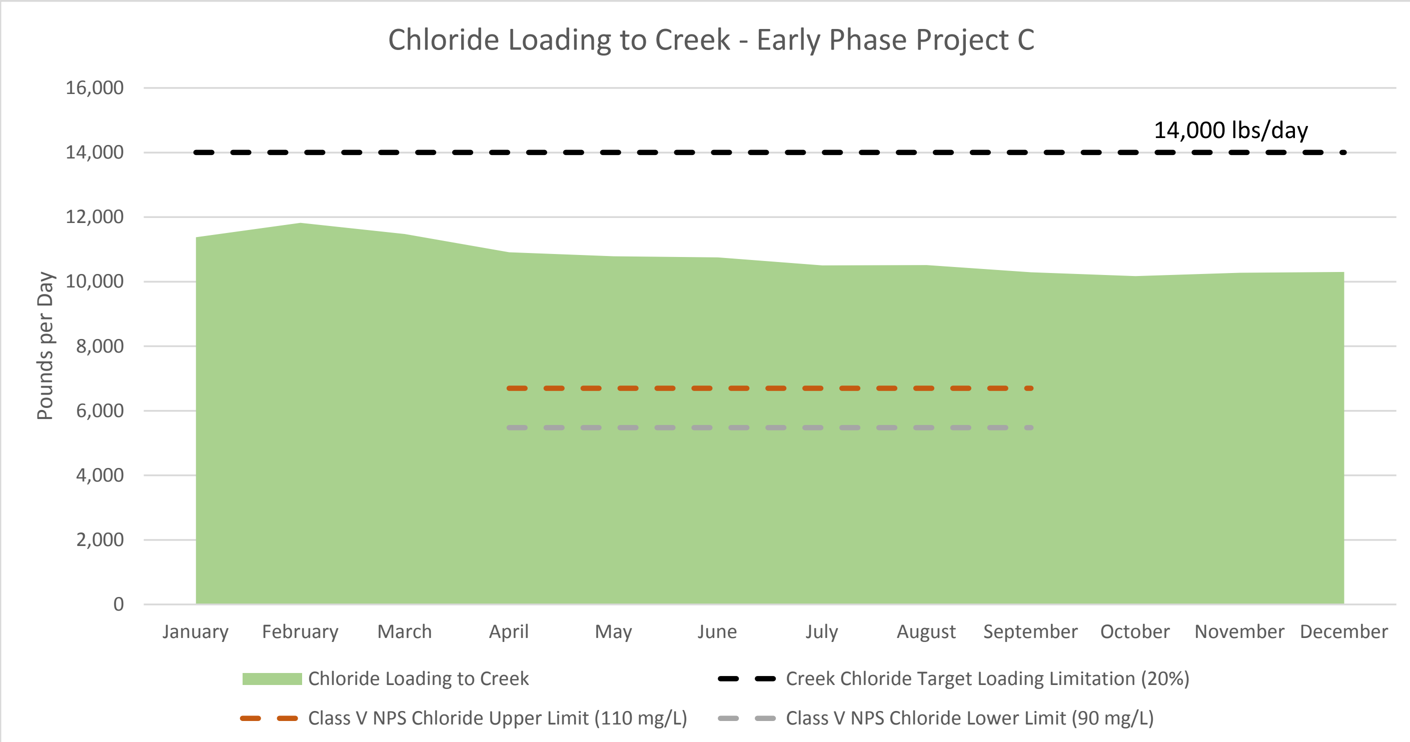
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.40	9.79	9.49	7.97	7.86	7.83	7.61	7.62	7.42	8.34	8.43	8.45
Chloride	mg/L	191.3	188.7	192.0	90.3	90.5	90.6	91.1	91.0	91.5	197.2	193.8	191.4

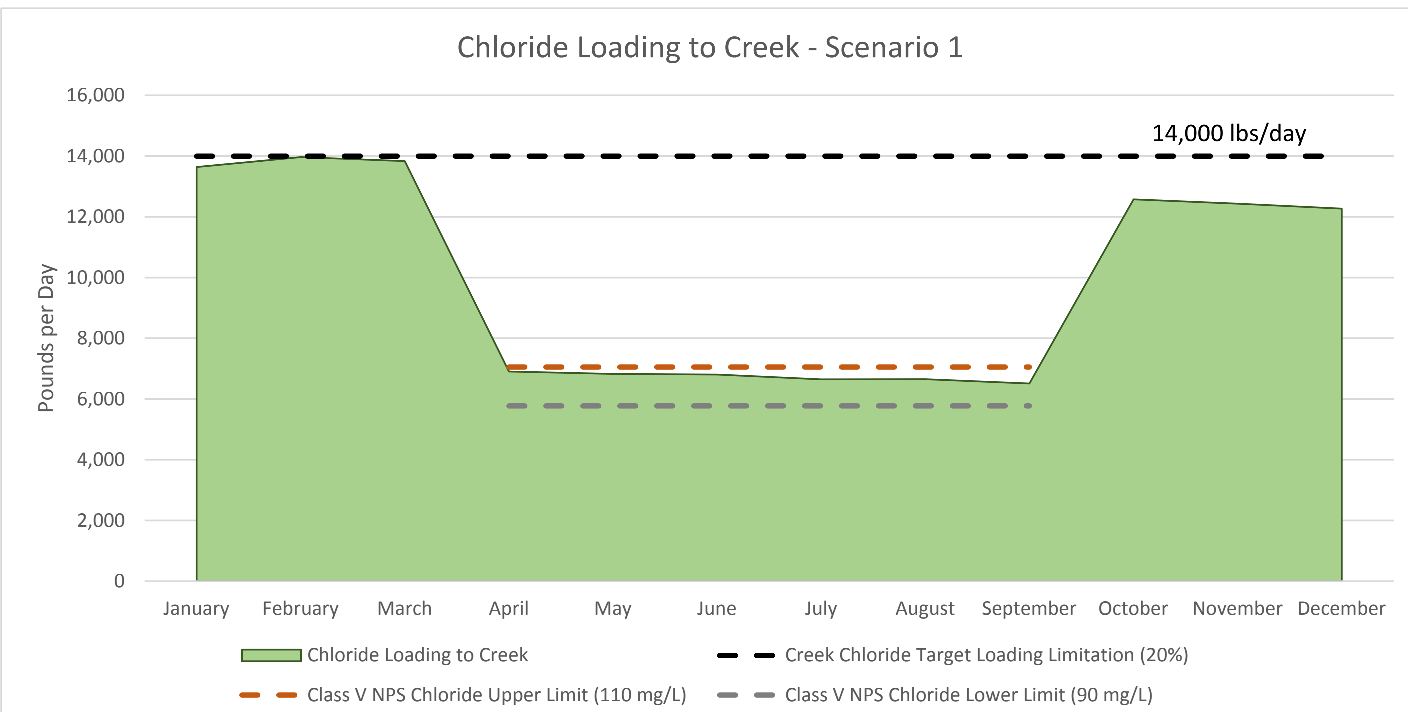
Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence

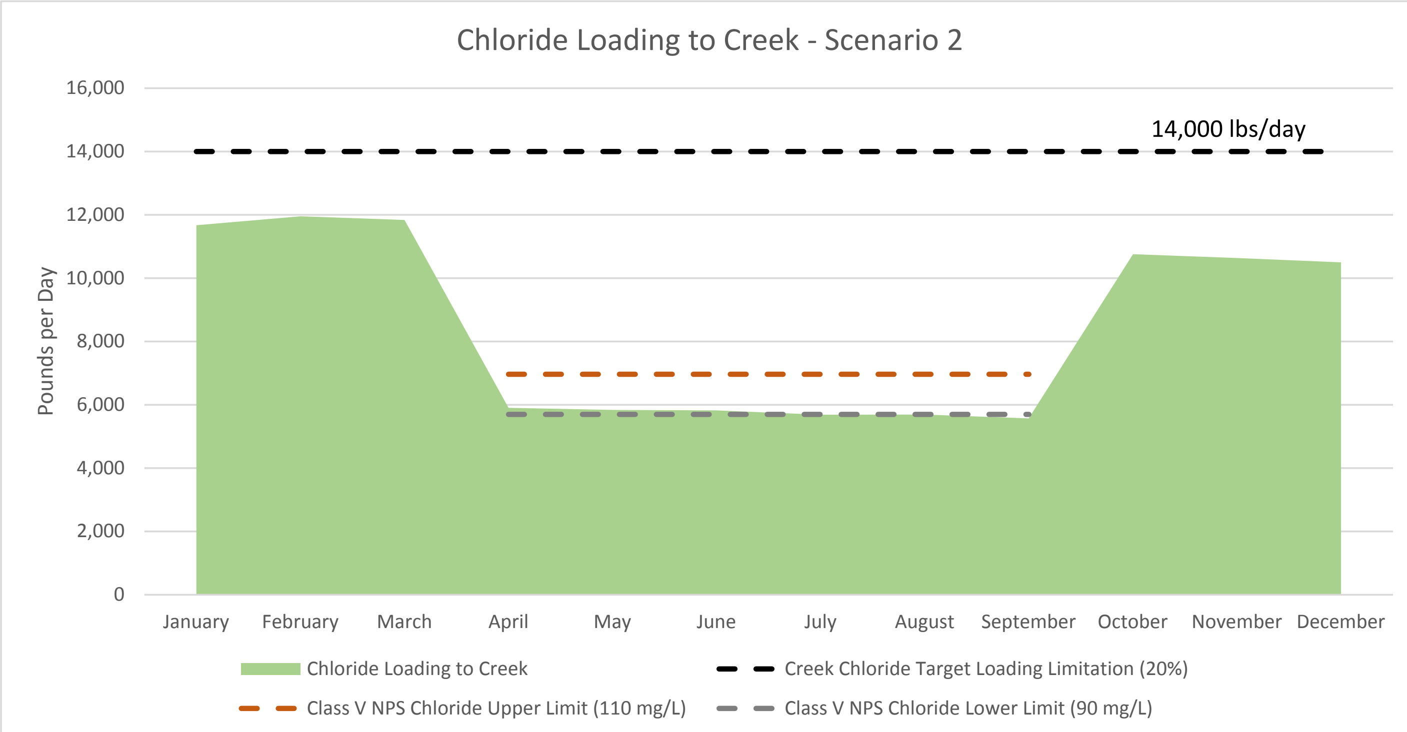
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.37	1.37	1.37	0.27	0.27	0.27	0.27	0.27	0.27	1.37	1.37	1.37
TDS	mg/L	5,640.6	6,250.4	6,152.6	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	5,498.1	5,358.7	5,339.0
	PPD	64,347.5	71,304.4	70,188.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	62,721.6	61,131.5	60,907.2
Boron	mg/L	2.2	2.4	2.4	1.0	1.0	1.0	1.0	1.0	1.0	2.2	2.4	2.3
	PPD	24.6	27.0	27.5	2.2	2.2	2.2	2.2	2.2	2.2	25.5	27.1	25.9
Sulfate	mg/L	1,746.7	2,025.5	1,994.6	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	1,528.2	1,540.7	1,524.6
	PPD	19,926.1	23,106.4	22,754.7	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	17,433.8	17,576.5	17,393.1
Chloride	mg/L	1,083.6	1,090.3	1,102.3	975.0	975.0	975.0	975.0	975.0	975.0	1,041.6	1,013.0	988.0
	PPD	12,361.2	12,437.7	12,575.3	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	11,882.1	11,555.9	11,270.5
Copper	ug/L	14.5	17.7	14.6	0.0	0.0	0.0	0.0	0.0	0.0	18.2	18.1	19.7
	PPD	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2

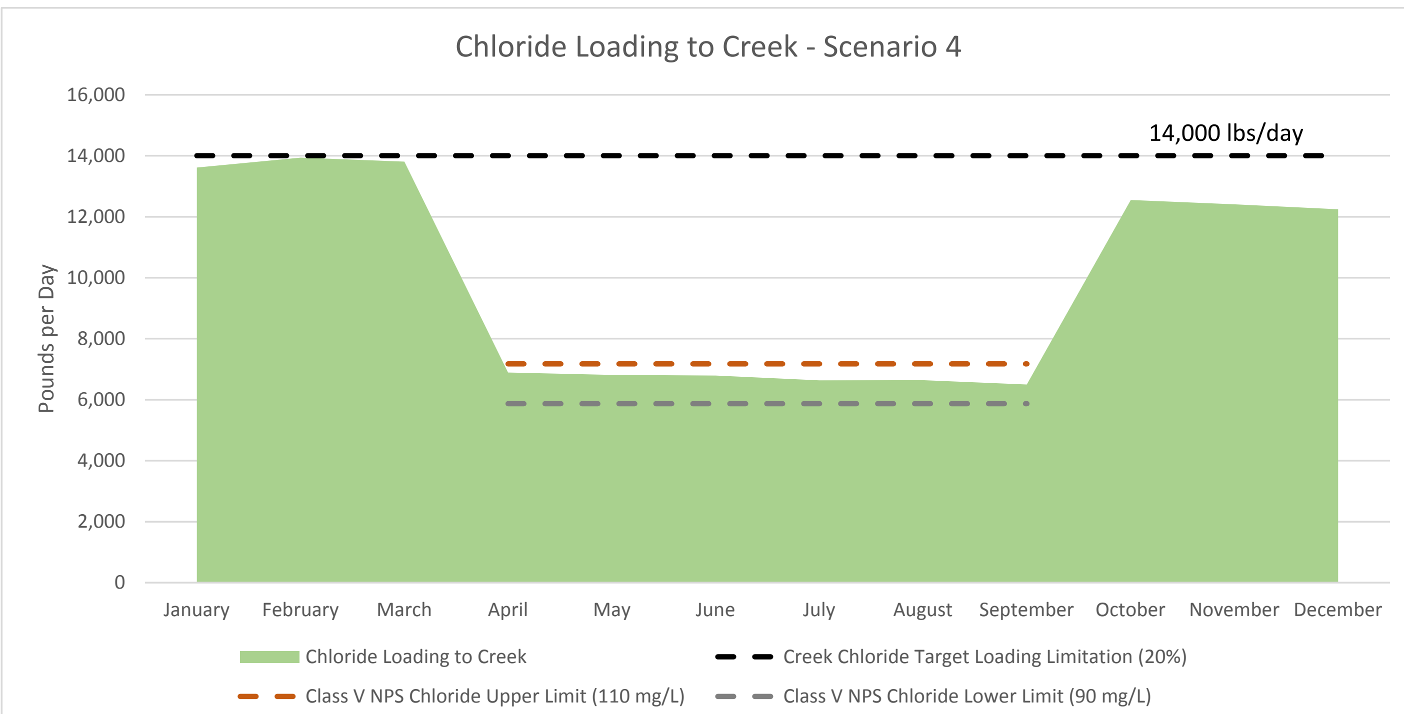

Chloride Loading to Creek - Early Phase Project A
14,000 lbs/day
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Pounds per Day
January
February
March
April
May
June
July
August
September
October
November
December
Chloride Loading to Creek
Creek Chloride Target Loading Limitation (20%)
Class V NPS Chloride Upper Limit (110 mg/L)
Class V NPS Chloride Lower Limit (90 mg/L)


Chloride Loading to Creek - Early Phase Project B
14,000 lbs/day
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Pounds per Day
January
February
March
April
May
June
July
August
September
October
November
December
Chloride Loading to Creek
Creek Chloride Target Loading Limitation (20%)
Class V NPS Chloride Upper Limit (110 mg/L)
Class V NPS Chloride Lower Limit (90 mg/L)

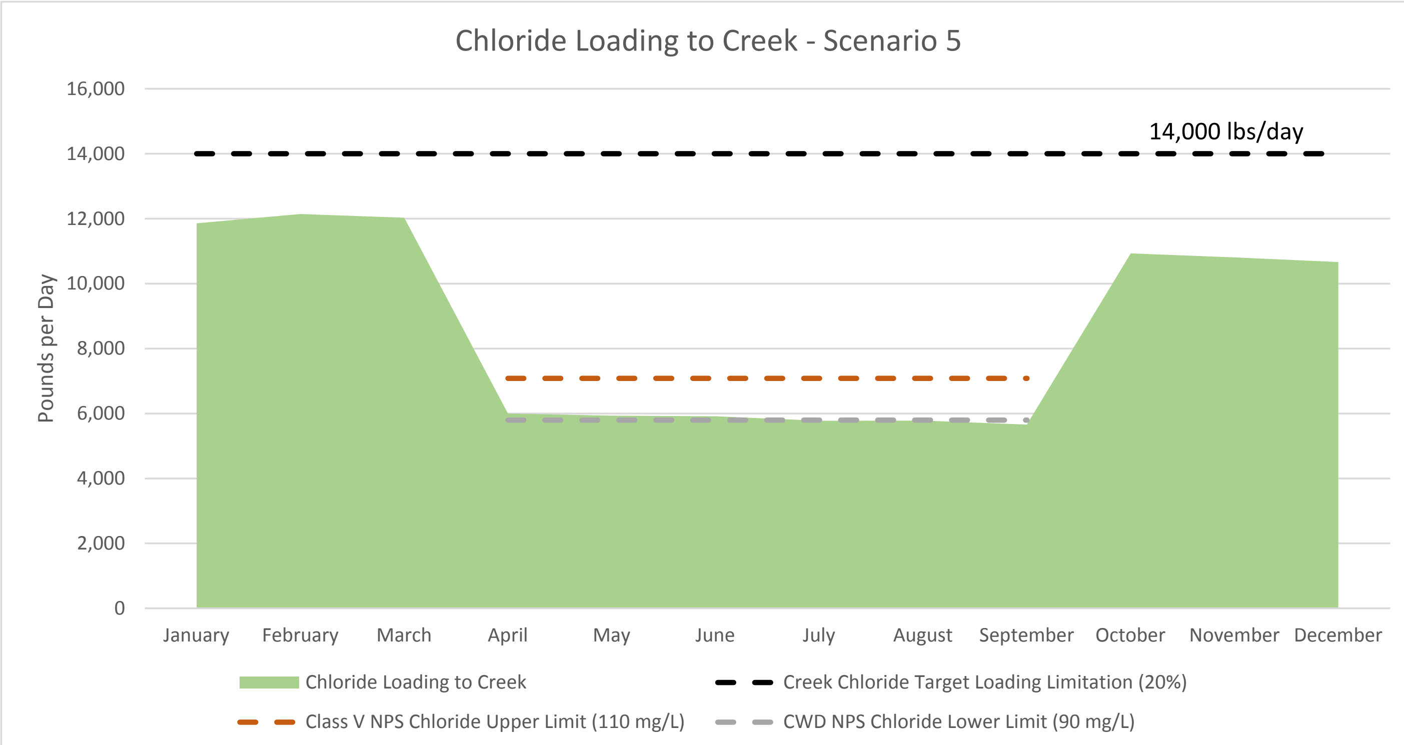

Chloride Loading to Creek - Early Phase Project C
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Pounds per Day
14,000 lbs/day
January
February
March
April
May
June
July
August
September
October
November
December
Chloride Loading to Creek
Creek Chloride Target Loading Limitation (20%)
Class V NPS Chloride Upper Limit (110 mg/L)
Class V NPS Chloride Lower Limit (90 mg/L)


Chloride Loading to Creek - Scenario 1
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Pounds per Day
14,000 lbs/day
January
February
March
April
May
June
July
August
September
October
November
December
Chloride Loading to Creek
Creek Chloride Target Loading Limitation (20%)
Class V NPS Chloride Upper Limit (110 mg/L)
Class V NPS Chloride Lower Limit (90 mg/L)





Scenario 3 -
The HCTP desalter was sized up to produce and extra 1.0 mgd to be sent directly to CWD NPS blending tank to offest imported water use. This scenario discharges 1.0 mgd less to Conejo Creek, but tailored to meet NPDES target like Scenario 1. The chloride loading to the creek is the same as Scenario 1.



Chloride Loading to Creek - Scenario 5
14,000 lbs/day
Pounds per Day
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
January
February
March
April
May
June
July
August
September
October
November
December
Chloride Loading to Creek
Creek Chloride Target Loading Limitation (20%)
Class V NPS Chloride Upper Limit (110 mg/L)
CWD NPS Chloride Lower Limit (90 mg/L)

APPENDIX D: CONCEPTUAL COST ESTIMATES – ALTERNATIVES DEVELOPMENT

LVMWD Regional Brine Management Study

Preliminary Engineering Concepts

Total Capital and O&M Cost Summary

August 2020

Conceptual Alternatives	Total Capital Cost	Annualized Capital Cost[1]	Annual O&M Cost	Total Annualized Cost	Chloride Export (lbs/day)	Chloride Export Unit Cost
Early Phase Project A - Thousand Oaks Groundwater to HCTP	$ 640,000	$ 33,000	$ 2,000	$ 35,000	-	
Early Phase Project B - Thousand Oaks Groundwater to HCTP with UV Disinfection	$ 3,140,000	$ 160,000	$ (458,000)	$ (298,000)	1,680	$ (177)
Early Phase Project C - Thousand Oaks Brine Lines and HCTP UV Disinfection	$ 3,260,000	$ 166,000	$ (458,000)	$ (292,000)	1,680	$ (174)
Scenario 1: LVMWD and Thousand Oaks Brine and 4.1 mgd HCTP Desalter/ Brine Line	$ 65,900,000	$ 3,362,000	$ 2,366,000	$ 5,728,000	12,110	$ 473
Scenario 2: LVMWD and Thousand Oaks Brine and 4.7 mgd HCTP Desalter/ Brine Line	$ 73,790,000	$ 3,765,000	$ 2,610,000	$ 6,375,000	14,090	$ 452
Scenario 3: LVMWD and Thousand Oaks Brine and 5.1 mgd HCTP Desalter/ Brine Line, 1.0 mgd to CWD NPS Tank	$ 86,090,000	$ 4,392,000	$ 2,883,000	$ 7,275,000	15,075	$ 483
Scenario 4: LVMWD and Thousand Oaks Brine and HCTP UV Disinfection, 3.2 mgd HCTP Desalter/ Brine Line	$ 58,010,000	$ 2,960,000	$ 1,545,000	$ 4,505,000	9,665	$ 466
Scenario 5: LVMWD and Thousand Oaks Brine with UV and 4.0 mgd Desalter at HCTP	$ 66,200,000	$ 3,377,000	$ 1,857,000	$ 5,234,000	11,430	$ 458
Scenario 6: LVMWD Pure Water Brine Line to SMP - Moorpark Road	$ 31,680,000	$ 1,616,000	$ 583,000	$ 2,199,000	12,015	$ 183
Scenario 7: LVMWD Pure Water Brine Line to SMP - Hill Canyon Road	$ 34,620,000	$ 1,766,000	$ 529,000	$ 2,295,000	12,015	$ 191
Scenario 8: Thousand Oaks Groundwater LVMWD Pure Water and Brine Line to SMP (Hill Canyon Road)	$ 43,590,000	$ 2,224,000	$ 1,007,000	$ 3,231,000	11,700	$ 276
Sensitivity 1: LVMWD and Thousand Oaks Brine and HCTP UV Disinfection, 2.5 mgd HCTP Desalter/ Brine Line	$ 47,940,000	$ 2,446,000	$ 1,260,000	$ 3,706,000	7,900	$ 469
Sensitivity 2: 0.4 mgd LVMWD brine and 0.27 mgd Thousand Oaks Brine and HCTP UV Disinfection	$ 8,650,000	$ 441,000	$ 55,000	$ 496,000	1,680	$ 295
Sensitivity 2: 0.15 mgd LVMWD brine and 0.27 mgd Thousand Oaks Brine	$ 6,030,000	$ 308,000	$ 510,000	$ 818,000	-	

Note:

1. Annualized cost based on 3% interest rate over 30 year period

Regional Brine Management Alternatives

Early Phase Project A - Thousand Oaks Groundwater to HCTP

	Size	Units	Qty	Unit	Unit Cost	Subtotal
TO Groundwater Well to TO Sewer						
Groundwater Pump Station			-	HP	$6,500	-
Los Robles Well Groundwater Line	8	inches	1,940	per LF	$200	388,000
Raw Construction Cost						**390,000**
Construction Contingency				30%		120,000
Total Construction Cost						**510,000**
Implementation Cost				25%		130,000
Total Capital Cost						**640,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		0	AF	$668	-
Discharge Station O&M		0	LS	$45,000	-
Discharge Station Replacement		0	LS	$13,860	-
Thousand Oaks Sewer Discharge		0	LS	$489,000	-
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
				$0.18	-
				$0.18	-
Energy Consumption			**kwh-yr**	**Unit Cost**	
				$0.18	-
Consumables			**Quantity**	**Cost**	
					-
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
				$60	-
		Construction Cost		**Unit Cost**	
Treatment		-		1.0%	-
Storage		-		0.5%	-
Pump Stations		-		3.0%	-
Pipelines		388,000		0.5%	1,940
Total Annual Operations & Maintenance Cost					**1,940**
Annualized Capital Cost				0.05102	33,000
Annual O&M Cost					2,000
Total Annualized Cost					**35,000**

Regional Brine Management Alternatives

Early Phase Project B - Thousand Oaks Groundwater to HCTP with UV Disinfection

	Size	Units	Qty	Unit	Unit Cost	Subtotal
TO Groundwater Well to TO Sewer						
Groundwater Pump Station			-	HP	$6,500	-
Los Robles Well Groundwater Line	8	inches	1,940	per LF	$200	388,000
HCTP Disinfection Upgrade						
UV Disinfection			10	per MGD	$140,000	1,400,000
Sitework/Piping/Structures			10%	allowance	$1,400,000	140,000
Raw Construction Cost						**1,930,000**
Construction Contingency				30%		580,000
Total Construction Cost						**2,510,000**
Implementation Cost				25%		630,000
Total Capital Cost						**3,140,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		0	AF	$668	-
Discharge Station O&M		0	LS	$45,000	-
Discharge Station Replacement		0	LS	$13,860	-
Thousand Oaks Sewer Discharge		0	LS	$489,000	-
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
				$0.18	-
				$0.18	-
Energy Consumption			**kwh-yr**	**Unit Cost**	
UV Disinfection			202,620	$0.18	36,472
Consumables			**Quantity**	**Cost**	
Sodium Hypochlorite (Chlorine Disinfection)			(248,300)	$0.70	(172,680)
Sodium Bisulfite (De-Chlorination)			(176,500)	$1.92	(338,025)
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
				$60	-
		Construction Cost		**Unit Cost**	
Treatment		1,400,000		1.0%	14,000
Storage		-		0.5%	-
Pump Stations		-		3.0%	-
Pipelines		388,000		0.5%	1,940
Total Annual Operations & Maintenance Cost					**(458,293)**
Annualized Capital Cost				0.05102	160,000
Annual O&M Cost					(458,000)
Total Annualized Cost					**(298,000)**

Regional Brine Management Alternatives

Early Phase Project C: Thousand Oaks Brine Lines and HCTP UV Disinfection	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD Purewater AWT Brine to TO Sewer						
Brine Pump Station			0	HP	$0	-
Brine Line	12	inches	17,830	per LF	$0	-
Pipe Crossings (HWY 101)			1	EA	$0	-
TO Groundwater Well Brine to TO Sewer						
Brine Pump Station			-	HP	$6,500	-
Library Treatment Facility Brine Line	4	inches	2,640	per LF	$150	396,000
Los Robles Treatment Facility Brine Line	6	inches	500	per LF	$150	75,000
HCTP Disinfection Upgrade						
UV Disinfection			10	per MGD	$140,000	1,400,000
Sitework/Piping/Structures			10%	allowance	$1,400,000	140,000
Raw Construction Cost						**2,010,000**
Construction Contingency				30%		600,000
Total Construction Cost						**2,610,000**
Implementation Cost				25%		650,000
Total Capital Cost						**3,260,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		0	AF	$668	-
Discharge Station O&M		0	LS	$45,000	-
Discharge Station Replacement		0	LS	$13,860	-
Thousand Oaks Sewer Discharge		0	LS	$489,000	-
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	0	119	0	$0.18	-
Energy Consumption			**kwh-yr**	**Unit Cost**	
UV Disinfection			202,620	$0.18	36,472
Consumables			**Quantity**	**Cost**	
Sodium Hypochlorite (Chlorine Disinfection)			(248,300)	$0.70	(172,680)
Sodium Bisulfite (De-Chlorination)			(176,500)	$1.92	(338,025)
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
				$60	-
		Construction Cost		**Unit Cost**	
Treatment		1,400,000		1.0%	14,000
Storage		-		0.5%	-
Pump Stations		-		3.0%	-
Pipelines		471,000		0.5%	2,355
Total Annual Operations & Maintenance Cost					**(457,878)**
Annualized Capital Cost				0.05102	166,000
Annual O&M Cost					(458,000)
Total Annualized Cost					**(292,000)**

Regional Brine Management Alternatives

Scenario 1: LVMWD and Thousand Oaks Brine and 4.1 mgd HCTP Desalter/ Brine Line	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD Purewater AWT Brine to TO Sewer						
Brine Pump Station			40	HP	$6,500	260,000
Brine Line	12	inches	17,830	per LF	$250	4,458,000
Pipe Crossings (HWY 101)			1	EA	$500,000	500,000
TO Groundwater Well Brine to TO Sewer						
Brine Pump Station			-	HP	$6,500	-
Library Treatment Facility Brine Line	4	inches	2,640	per LF	$150	396,000
Los Robles Treatment Facility Brine Line	6	inches	500	per LF	$150	75,000
HCTP Desalter						
MF/UF			4.8	per MGD	$1,510,000	7,302,000
Interprocess Tank			101,000	per gallon	$1.25	126,000
RO			4.1	per MGD	$1,810,000	7,440,000
Chemicals (Storage and Feed Systems)			4.1	per MGD	$150,000	617,000
Sitework/Piping/Structures			4.1	per MGD	$3,920,000	16,114,000
HCTP Brine Disposal						
Brine Pump Station			20	HP	$6,500	130,000
Brine Line	8	inches	11,410	per LF	$200	2,282,000
Pipe Crossings (Conejo Creek)			1	EA	$500,000	500,000
Brine Discharge Station			1	LS	$350,000	350,000
Raw Construction Cost						**40,550,000**
Construction Contingency				30%		12,170,000
Total Construction Cost						**52,720,000**
Implementation Cost				25%		13,180,000
Total Capital Cost						**65,900,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		812	AF	$668	543,000
Discharge Station O&M		1	LS	$45,000	45,000
Discharge Station Replacement		1	LS	$13,860	14,000
Thousand Oaks Sewer Discharge		1	LS	$489,000	489,000
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	764	119	107,000	$0.18	19,000
Brine Pump Station	504	71	84,300	$0.18	15,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
Desalter			3,256,520	$0.18	586,174
Consumables			**Quantity**	**Cost**	
Chemicals - Desalter			1	$334,663	334,663
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
Desalter Staff		1.0	2,080	$60	124,800
		Construction Cost		**Unit Cost**	
Treatment		14,742,000		1.0%	147,420
Storage		126,000		0.5%	630
Pump Stations		390,000		3.0%	11,700
Pipelines		7,211,000		0.5%	36,055
Total Annual Operations & Maintenance Cost					**2,366,441**
Annualized Capital Cost				0.05102	3,362,000
Annual O&M Cost					2,366,000
Total Annualized Cost					**5,728,000**

Regional Brine Management Alternatives

Scenario 2: LVMWD and Thousand Oaks Brine and 4.7 mgd HCTP Desalter/ Brine Line

	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD AWT Brine to TO Sewer						
Brine Pump Station			40	HP	$6,500	260,000
Brine Line	12	inches	17,830	per LF	$250	4,458,000
Pipe Crossings (HWY 101)			1	EA	$500,000	500,000
TO Groundwater Well Brine to TO Sewer						
Brine Pump Station			-	HP	$6,500	-
Library Treatment Facility Brine Line	4	inches	2,640	per LF	$150	396,000
Los Robles Treatment Facility Brine Line	6	inches	500	per LF	$150	75,000
HCTP Desalter						
MF/UF			5.6	per MGD	$1,510,000	8,426,000
Interprocess Tank			117,000	per gallon	$1.25	146,000
RO			4.7	per MGD	$1,810,000	8,585,000
Chemicals (Storage and Feed Systems)			4.7	per MGD	$150,000	711,000
Sitework/Piping/Structures			4.7	per MGD	$3,920,000	18,593,000
HCTP Brine Disposal						
Brine Pump Station			20	HP	$6,500	130,000
Brine Line	8	inches	11,410	per LF	$200	2,282,000
Pipe Crossings (Conejo Creek)			1	EA	$500,000	500,000
Brine Discharge Station			1	LS	$350,000	350,000
Raw Construction Cost						**45,410,000**
Construction Contingency				30%		13,620,000
Total Construction Cost						**59,030,000**
Implementation Cost				25%		14,760,000
Total Capital Cost						**73,790,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		937	AF	$668	626,000
Discharge Station O&M		1	LS	$45,000	45,000
Discharge Station Replacement		1	LS	$13,860	14,000
Thousand Oaks Sewer Discharge		1	LS	$489,000	489,000
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	764	119	107,000	$0.18	19,000
Brine Pump Station	581	71	97,300	$0.18	18,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
Desalter			3,733,084	$0.18	671,955
Consumables			**Quantity**	**Cost**	
Chemicals - Desalter			1	$383,638	383,638
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
Desalter Staff		1.0	2,080	$60	124,800
		Construction Cost		**Unit Cost**	
Treatment		17,011,000		1.0%	170,110
Storage		146,000		0.5%	730
Pump Stations		390,000		3.0%	11,700
Pipelines		7,211,000		0.5%	36,055
Total Annual Operations & Maintenance Cost					**2,609,988**
Annualized Capital Cost				0.05102	3,765,000
Annual O&M Cost					2,610,000
Total Annualized Cost					**6,375,000**

Regional Brine Management Alternatives

Scenario 3: LVMWD and Thousand Oaks Brine and 5.1 mgd HCTP Desalter/ Brine Line, 1.0 mgd to CWD NPS	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD Purewater AWT Brine to TO Sewer						
Brine Pump Station			40	HP	$6,500	260,000
Brine Line	12	inches	17,830	per LF	$250	4,458,000
Pipe Crossings (HWY 101)			1	EA	$500,000	500,000
TO Groundwater Well Brine to TO Sewer						
Brine Pump Station			-	HP	$6,500	-
Library Treatment Facility Brine Line	4	inches	2,640	per LF	$150	396,000
Los Robles Treatment Facility Brine Line	6	inches	500	per LF	$150	75,000
HCTP Desalter						
MF/UF			6.0	per MGD	$1,510,000	8,988,000
Interprocess Tank			124,000	per gallon	$1.25	155,000
RO			5.1	per MGD	$1,810,000	9,157,000
Chemicals (Storage and Feed Systems)			5.1	per MGD	$150,000	759,000
Sitework/Piping/Structures			5.1	per MGD	$3,920,000	19,832,000
HCTP Brine Disposal						
Brine Pump Station			20	HP	$6,500	130,000
Brine Line	8	inches	11,410	per LF	$200	2,282,000
Pipe Crossings (Conejo Creek)			1	EA	$500,000	500,000
Brine Discharge Station			1	LS	$350,000	350,000
HCTP RO Water to Camrosa Blending Tank						
Product Water Pump Station			90	HP	$6,500	585,000
Pipeline	10	inches	20,240	per LF	$200	4,048,000
Pipe Crossings (Conejo Creek)			1	EA	$500,000	500,000
Raw Construction Cost						**52,980,000**
Construction Contingency				30%		15,890,000
Total Construction Cost						**68,870,000**
Implementation Cost				25%		17,220,000
Total Capital Cost						**86,090,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		Qty	Unit	Unit Cost	
SMP Brine Discharge Rate		1,000	AF	$668	668,000
Discharge Station O&M		1	LS	$45,000	45,000
Discharge Station Replacement		1	LS	$13,860	14,000
Thousand Oaks Sewer Discharge		1	LS	$489,000	489,000
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	764	119	107,000	$0.18	19,000
Brine Pump Station	620	71	103,800	$0.18	19,000
Product Water Pump Station	694	332	506,800	$0.18	91,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
Desalter			4,050,793	$0.18	729,143
Consumables			**Quantity**	**Cost**	
Chemicals - Desalter			1	$416,288	416,288
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
Desalter Staff		1.0	2,080	$60	124,800
		Construction Cost		**Unit Cost**	
Treatment		18,145,000		1.0%	181,450
Storage		155,000		0.5%	775
Pump Stations		975,000		3.0%	29,250
Pipelines		11,259,000		0.5%	56,295
Total Annual Operations & Maintenance Cost					**2,883,000**
Annualized Capital Cost				0.05102	4,392,000
Annual O&M Cost					2,883,000
Total Annualized Cost					**7,275,000**

Regional Brine Management Alternatives

Scenario 4: LVMWD and Thousand Oaks Brine and HCTP UV Disinfection, 3.2 mgd HCTP Desalter/ Brine Lir

	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD AWT Brine to TO Sewer						
Brine Pump Station			40	HP	$6,500	260,000
Brine Line	12	inches	17,830	per LF	$250	4,458,000
Pipe Crossings (HWY 101)			1	EA	$500,000	500,000
TO Groundwater Well Brine to TO Sewer						
Brine Pump Station			-	HP	$6,500	-
Library Treatment Facility Brine Line	4	inches	2,640	per LF	$150	396,000
Los Robles Treatment Facility Brine Line	6	inches	500	per LF	$150	75,000
HCTP Disinfection Upgrade						
UV Disinfection			10	per MGD	$140,000	1,400,000
HCTP Desalter						
MF/UF			4.1	per MGD	$1,510,000	6,191,000
Interprocess Tank			80,000	per gallon	$1.25	100,000
RO			3.2	per MGD	$1,810,000	5,866,000
Chemicals (Storage and Feed Systems)			3.2	per MGD	$150,000	486,000
Sitework/Piping/Structures			3.2	per MGD	$3,920,000	12,705,000
HCTP Brine Disposal						
Brine Pump Station			20	HP	$6,500	130,000
Brine Line	8	inches	11,410	per LF	$200	2,282,000
Pipe Crossings (Conejo Creek)			1	EA	$500,000	500,000
Brine Discharge Station			1	LS	$350,000	350,000
Raw Construction Cost						**35,700,000**
Construction Contingency				30%		10,710,000
Total Construction Cost						**46,410,000**
Implementation Cost				25%		11,600,000
Total Capital Cost						**58,010,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		641	AF	$668	428,000
Discharge Station O&M		1	LS	$45,000	45,000
Discharge Station Replacement		1	LS	$13,860	14,000
Thousand Oaks Sewer Discharge		1	LS	$489,000	489,000
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	764	119	107,000	$0.18	19,000
Brine Pump Station	397	71	66,500	$0.18	12,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
UV Disinfection			202,620	$0.18	36,472
Desalter			2,541,674	$0.18	457,501
Consumables			**Quantity**	**Cost**	
Chemicals			1	$261,200	261,200
Sodium Hypochlorite (Chlorine Disinfection)			(248,300)	$0.70	(172,680)
Sodium Bisulfite (De-Chlorination)			(176,500)	$1.92	(338,025)
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
Desalter Staff		1.0	2,080	$60	124,800
		Construction Cost		**Unit Cost**	
Treatment		12,057,000		1.0%	120,570
Storage		100,000		0.5%	500
Pump Stations		390,000		3.0%	11,700
Pipelines		7,211,000		0.5%	36,055
Total Annual Operations & Maintenance Cost					**1,545,094**
Annualized Capital Cost				0.05102	2,960,000
Annual O&M Cost					1,545,000
Total Annualized Cost					**4,505,000**

Regional Brine Management Alternatives

Scenario 5: LVMWD and Thousand Oaks Brine with UV and 4.0 mgd Desalter at HCTP

	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD Purewater AWT Brine to TO Sewer						
Brine Pump Station			40	HP	$6,500	260,000
Brine Line	12	inches	17,830	per LF	$250	4,458,000
Pipe Crossings (HWY 101)			1	EA	$500,000	500,000
TO Groundwater Well Brine to TO Sewer						
Brine Pump Station			-	HP	$6,500	-
Library Treatment Facility Brine Line	4	inches	2,640	per LF	$150	396,000
Los Robles Treatment Facility Brine Line	6	inches	500	per LF	$150	75,000
HCTP Disinfection Upgrade						
UV Disinfection			10	per MGD	$140,000	1,400,000
HCTP Desalter						
MF/UF			4.7	per MGD	$1,510,000	7,022,000
Interprocess Tank			97,000	per gallon	$1.25	121,000
RO			4.0	per MGD	$1,810,000	7,154,000
Chemicals (Storage and Feed Systems)			4.0	per MGD	$150,000	593,000
Sitework/Piping/Structures			4.0	per MGD	$3,920,000	15,494,000
HCTP Brine Disposal						
Brine Pump Station			20	HP	$6,500	130,000
Brine Line	8	inches	11,410	per LF	$200	2,282,000
Pipe Crossings (Conejo Creek)			1	EA	$500,000	500,000
Brine Discharge Station			1	LS	$350,000	350,000
Raw Construction Cost						**40,740,000**
Construction Contingency				30%		12,220,000
Total Construction Cost						**52,960,000**
Implementation Cost				25%		13,240,000
Total Capital Cost						**66,200,000**

Annual Operations & Maintenance Cost					Annual O&M
Brine Discharge Fees		Qty	Unit	Unit Cost	
SMP Brine Discharge Rate		781	AF	$668	522,000
Discharge Station O&M		1	LS	$45,000	45,000
Discharge Station Replacement		1	LS	$13,860	14,000
Thousand Oaks Sewer Discharge		1	LS	$489,000	489,000
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	764	119	107,000	$0.18	19,000
Brine Pump Station	484	71	81,100	$0.18	15,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
UV Disinfection			202,620	$0.18	36,472
Desalter			3,177,093	$0.18	571,877
Consumables			**Quantity**	**Cost**	
Chemicals			1	$326,500	326,500
Sodium Hypochlorite (Chlorine Disinfection)			(248,300)	$0.70	(172,680)
Sodium Bisulfite (De-Chlorination)			(176,500)	$1.92	(338,025)
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
Desalter Staff		1.0	2,080	$60	124,800
		Construction Cost		**Unit Cost**	
Treatment		15,576,000		1.0%	155,760
Storage		121,000		0.5%	605
Pump Stations		390,000		3.0%	11,700
Pipelines		7,211,000		0.5%	36,055
Total Annual Operations & Maintenance Cost					**1,857,064**
Annualized Capital Cost				0.05102	3,377,000
Annual O&M Cost					1,857,000
Total Annualized Cost					**5,234,000**

Regional Brine Management Alternatives

Scenario 6: LVMWD Pure Water Brine Line to SMP - Moorpark Road

	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD Purewater Brine Disposal						
Brine Pump Station			130	HP	$6,500	845,000
Brine Booster Station			60	HP	$6,500	390,000
Brine Line	12	inches	62,800	per LF	$250	15,700,000
Pipe Crossings (HWY 101 & HWY 23)			3	EA	$500,000	1,500,000
Brine Discharge Station			1	LS	$350,000	350,000
TO Groundwater Well Brine to Brine line						
Los Robles Brine Pump Station			10	HP	$6,500	65,000
Library Brine Pump Station			10	HP	$6,500	65,000
Library Treatment Facility Brine Line	4	inches	3,960	per LF	$150	594,000
Los Robles Treatment Facility Brine Line	6	inches	11,200	per LF	$150	1,680,000
Raw Construction Cost						**21,190,000**
Construction Contingency				30%		6,360,000
Total Construction Cost						**27,550,000**
Implementation Cost				15%		4,130,000
Total Capital Cost						**31,680,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		448	AF	$668	299,000
Discharge Station O&M		1	LS	$45,000	45,000
Discharge Station Replacement		1	LS	$13,860	14,000
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	951	359	402,200	$0.18	72,000
Brine Booster Station	743	164	143,900	$0.18	26,000
Los Robles Brine Pump Station	125	162	47,600	$0.18	9,000
Library Brine Pump Station	63	20	2,900	$0.18	1,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
				$0.18	-
Consumables			**Quantity**	**Cost**	
					-
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
				$60	-
		Construction Cost		**Unit Cost**	
Treatment		-		1.0%	-
Storage		-		0.5%	-
Pump Stations		910,000		3.0%	27,300
Pipelines		17,974,000		0.5%	89,870
Total Annual Operations & Maintenance Cost					**583,170**
Annualized Capital Cost				0.05102	1,616,000
Annual O&M Cost					583,000
Total Annualized Cost					**2,199,000**

Regional Brine Management Alternatives

Scenario 7: LVMWD Pure Water Brine Line to SMP - Hill Canyon Road	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD Purewater Brine Disposal						
Brine Pump Station			90	HP	$6,500	585,000
Brine Line	12	inches	69,900	per LF	$250	17,475,000
Pipe Crossings (North Fork Arroyo, Conejo Creek, HWY 101 & HWY 23)			5	EA	$500,000	2,500,000
Brine Discharge Station			1	LS	$350,000	350,000
TO Groundwater Well Brine to Brine line						
Los Robles Brine Pump Station			10	HP	$6,500	65,000
Library Brine Pump Station			10	HP	$6,500	65,000
Library Treatment Facility Brine Line	4	inches	10,720	per LF	$150	1,608,000
Los Robles Treatment Facility Brine Line	6	inches	3,350	per LF	$150	503,000
Raw Construction Cost						**23,150,000**
Construction Contingency				30%		6,950,000
Total Construction Cost						**30,100,000**
Implementation Cost				15%		4,520,000
Total Capital Cost						**34,620,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		448	AF	$668	299,000
Discharge Station O&M		1	LS	$45,000	45,000
Discharge Station Replacement		1	LS	$13,860	14,000
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	951	241	270,200	$0.18	49,000
Los Robles Brine Pump Station	125	68	20,000	$0.18	4,000
Library Brine Pump Station	63	112	16,400	$0.18	3,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
				$0.18	-
Consumables			**Quantity**	**Cost**	
					-
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
				$60	-
		Construction Cost		**Unit Cost**	
Treatment		-		1.0%	-
Storage		-		0.5%	-
Pump Stations		585,000		3.0%	17,550
Pipelines		19,586,000		0.5%	97,930
Total Annual Operations & Maintenance Cost					**529,480**
Annualized Capital Cost				0.05102	1,766,000
Annual O&M Cost					529,000
Total Annualized Cost					**2,295,000**

Regional Brine Management Alternatives

Scenario 8: Thousand Oaks Groundwater LVMWD Pure Water and Brine Line to SMP (Hill Canyon Road)

	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD Purewater Brine Disposal						
Brine Pump Station			50	HP	$6,500	325,000
Brine Line	12	inches	37,520	per LF	$250	9,380,000
Pipe Crossings (North Fork Arroyo, Conejo Creek)			2	EA	$500,000	1,000,000
Brine Discharge Station			1	LS	$350,000	350,000
Thousand Oaks Groundwater to LVMWD						
Groundwater Pump Station			150	HP	$6,500	975,000
Library Well Groundwater Line	6	inches	10,700	per LF	$150	1,605,000
Los Robles Well Groundwater Line	8	inches	3,390	per LF	$200	678,000
Pipe Crossings (HWY 101)			1	EA	$500,000	500,000
Dual Trench Brine and Brackish Groundwater Lines						
12-inch Brine and 12-inch Brackish Groundwater Lines Dual Trench			32,380	per LF	$340	11,009,000
Pipe Crossings (HWY 101 & HWY 23)			2	EA	$500,000	1,000,000
Raw Construction Cost						**26,820,000**
Construction Contingency				30%		8,050,000
Total Construction Cost						**34,870,000**
Implementation Cost				25%		8,720,000
Total Capital Cost						**43,590,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		918	AF	$668	613,000
Discharge Station O&M		1	LS	$45,000	45,000
Discharge Station Replacement		1	LS	$13,860	14,000
Thousand Oaks Sewer Discharge		0	LS	$489,000	-
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	764	178	160,500	$0.18	29,000
Groundwater Pump Station	931	418	916,400	$0.18	165,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
					-
Consumables			**Quantity**	**Cost**	
					-
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
					-
		Construction Cost		**Unit Cost**	
Treatment				1.0%	-
Storage		-		0.5%	-
Pump Stations		1,300,000		3.0%	39,000
Pipelines		20,389,000		0.5%	101,945
Total Annual Operations & Maintenance Cost					**1,006,945**
Annualized Capital Cost				0.05102	2,224,000
Annual O&M Cost					1,007,000
Total Annualized Cost					**3,231,000**

Regional Brine Management Alternatives

Sensitivity 1: LVMWD and Thousand Oaks Brine and HCTP UV Disinfection, 2.5 mgd HCTP Desalter/ Brine

	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD AWT Brine to TO Sewer						
Brine Pump Station			40	HP	$6,500	260,000
Brine Line	12	inches	17,830	per LF	$250	4,458,000
Pipe Crossings (HWY 101)			1	EA	$500,000	500,000
TO Groundwater Well Brine to TO Sewer						
Brine Pump Station			-	HP	$6,500	-
Library Treatment Facility Brine Line	4	inches	2,640	per LF	$150	396,000
Los Robles Treatment Facility Brine Line	6	inches	500	per LF	$150	75,000
HCTP Disinfection Upgrade						
UV Disinfection			10	per MGD	$140,000	1,400,000
HCTP Desalter						
MF/UF			3.2	per MGD	$1,510,000	4,832,000
Interprocess Tank			62,000	per gallon	$1.25	78,000
RO			2.5	per MGD	$1,810,000	4,579,000
Chemicals (Storage and Feed Systems)			2.5	per MGD	$150,000	379,000
Sitework/Piping/Structures			2.5	per MGD	$3,920,000	9,916,000
HCTP Brine Disposal						
Brine Pump Station			10	HP	$6,500	65,000
Brine Line	6	inches	11,410	per LF	$150	1,712,000
Pipe Crossings (Conejo Creek)			1	EA	$500,000	500,000
Brine Discharge Station			1	LS	$350,000	350,000
Raw Construction Cost						**29,500,000**
Construction Contingency				30%		8,850,000
Total Construction Cost						**38,350,000**
Implementation Cost				25%		9,590,000
Total Capital Cost						**47,940,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		500	AF	$668	334,000
Discharge Station O&M		1	LS	$45,000	45,000
Discharge Station Replacement		1	LS	$13,860	14,000
Thousand Oaks Sewer Discharge		1	LS	$489,000	489,000
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	764	119	107,000	$0.18	19,000
Brine Pump Station	310	71	51,900	$0.18	9,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
UV Disinfection			202,620	$0.18	36,472
Desalter			1,985,683	$0.18	357,423
Consumables			**Quantity**	**Cost**	
Chemicals			1	$204,063	204,063
Sodium Hypochlorite (Chlorine Disinfection)			(248,300)	$0.70	(172,680)
Sodium Bisulfite (De-Chlorination)			(176,500)	$1.92	(338,025)
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
Desalter Staff		1.0	2,080	$60	124,800
		Construction Cost		**Unit Cost**	
Treatment		9,411,000		1.0%	94,110
Storage		78,000		0.5%	390
Pump Stations		325,000		3.0%	9,750
Pipelines		6,641,000		0.5%	33,205
Total Annual Operations & Maintenance Cost					**1,259,508**
Annualized Capital Cost				0.05102	2,446,000
Annual O&M Cost					1,260,000
Total Annualized Cost					**3,706,000**

Regional Brine Management Alternatives

Sensitivity 2: 0.15 mgd LVMWD brine and 0.27 mgd Thousand Oaks Brine	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD AWT Brine to TO Sewer						
Brine Pump Station			10	HP	$6,500	65,000
Brine Line	4	inches	17,830	per LF	$150	2,675,000
Pipe Crossings (HWY 101)			1	EA	$500,000	500,000
TO Groundwater Well Brine to TO Sewer						
Brine Pump Station			-	HP	$6,500	-
Library Treatment Facility Brine Line	4	inches	2,640	per LF	$150	396,000
Los Robles Treatment Facility Brine Line	6	inches	500	per LF	$150	75,000
Raw Construction Cost						**3,710,000**
Construction Contingency				30%		1,110,000
Total Construction Cost						**4,820,000**
Implementation Cost				25%		1,210,000
Total Capital Cost						**6,030,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		0	AF	$668	-
Discharge Station O&M		0	LS	$45,000	-
Discharge Station Replacement		0	LS	$13,860	-
Thousand Oaks Sewer Discharge		1	LS	$489,000	489,000
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	104	119	14,600	$0.18	3,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
Consumables			**Quantity**	**Cost**	
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
		Construction Cost		**Unit Cost**	
Treatment		-		1.0%	-
Storage		-		0.5%	-
Pump Stations		65,000		3.0%	1,950
Pipelines		3,146,000		0.5%	15,730
Total Annual Operations & Maintenance Cost					**509,680**
Annualized Capital Cost				0.05102	308,000
Annual O&M Cost					510,000
Total Annualized Cost					**818,000**

Regional Brine Management Alternatives

Sensitivity 2: 0.4 mgd LVMWD brine and 0.27 mgd Thousand Oaks Brine and HCTP UV Disinfection	Size	Units	Qty	Unit	Unit Cost	Subtotal
LVMWD AWT Brine to TO Sewer						
Brine Pump Station			20	HP	$6,500	130,000
Brine Line	6	inches	17,830	per LF	$150	2,675,000
Pipe Crossings (HWY 101)			1	EA	$500,000	500,000
TO Groundwater Well Brine to TO Sewer						
Brine Pump Station			-	HP	$6,500	-
Library Treatment Facility Brine Line	4	inches	2,640	per LF	$150	396,000
Los Robles Treatment Facility Brine Line	6	inches	500	per LF	$150	75,000
HCTP Disinfection Upgrade						
UV Disinfection			10	per MGD	$140,000	1,400,000
Sitework/Piping/Structures			10%	allowance	$1,400,000	140,000
Raw Construction Cost						**5,320,000**
Construction Contingency				30%		1,600,000
Total Construction Cost						**6,920,000**
Implementation Cost				25%		1,730,000
Total Capital Cost						**8,650,000**

Annual Operations & Maintenance Cost					**Annual O&M**
Brine Discharge Fees		**Qty**	**Unit**	**Unit Cost**	
SMP Brine Discharge Rate		0	AF	$668	-
Discharge Station O&M		0	LS	$45,000	-
Discharge Station Replacement		0	LS	$13,860	-
Thousand Oaks Sewer Discharge		1	LS	$489,000	489,000
Pumping Energy	**GPM**	**TDH (ft)**	**kwh-yr**	**Unit Cost**	
Brine Pump Station	278	119	38,900	$0.18	7,000
Energy Consumption			**kwh-yr**	**Unit Cost**	
UV Disinfection			202,620	$0.18	36,472
Consumables			**Quantity**	**Cost**	
Sodium Hypochlorite (Chlorine Disinfection)			(248,300)	$0.70	(172,680)
Sodium Bisulfite (De-Chlorination)			(176,500)	$1.92	(338,025)
Labor		**FTE**	**Hours/ yr**	**Labor Rate**	
		Construction Cost		**Unit Cost**	
Treatment		1,400,000		1.0%	14,000
Storage		-		0.5%	-
Pump Stations		130,000		3.0%	3,900
Pipelines		3,146,000		0.5%	15,730
Total Annual Operations & Maintenance Cost					**55,397**
Annualized Capital Cost				0.05102	441,000
Annual O&M Cost					55,000
Total Annualized Cost					**496,000**

WOODARD & CURRAN

APPENDIX E: SPREADSHEET WATER QUALITY MODEL – SENSITIVITY ANALYSIS RESULTS

Date: 07/06/2020

Sensitivity 1

Legend | Output | Exceeds | >90 < 110 mg/L |

Scenario Description:

This scenario was to determine the LVMWD Purewater and Thousand Oaks Groundwater Desalter Brine influences with HCTP UV disinfection and sizing the desalter for NPDES compliance with 10% buffer for future growth. Based on this analysis a 3.2 mgd feed would be needed on top of UV.

Node 1: LVMWD AWPF Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.10	1.10	1.10	0.00	0.00	0.00	0.00	0.00	0.00	1.10	1.10	1.10
TDS	mg/L	5,168.33	5,926.67	5,805.00	5,708.89	5,656.67	5,113.33	5,420.00	5,026.67	4,931.11	4,991.11	4,817.78	4,793.33
	PPD	47,414.29	54,371.24	53,255.07	0.00	0.00	0.00	0.00	0.00	0.00	45,788.45	44,198.29	43,974.04
Boron	mg/L	2.43	2.70	2.75	3.03	2.90	2.52	2.67	2.33	2.67	2.53	2.71	2.58
	PPD	22.32	24.77	25.23	0.00	0.00	0.00	0.00	0.00	0.00	23.24	24.87	23.65
Sulfate	mg/L	1,438.33	1,785.00	1,746.67	1,590.00	1,456.67	1,320.00	1,200.00	1,246.67	1,128.89	1,166.67	1,182.22	1,162.22
	PPD	13,195.27	16,375.59	16,023.92	0.00	0.00	0.00	0.00	0.00	0.00	10,703.00	10,845.71	10,662.23
Chloride	mg/L	1,110.00	1,118.33	1,133.33	1,160.00	1,113.33	1,026.67	1,093.33	1,106.67	1,080.00	1,057.78	1,022.22	991.11
	PPD	10,183.14	10,259.59	10,397.20	0.00	0.00	0.00	0.00	0.00	0.00	9,704.05	9,377.87	9,092.45
Copper	ug/L	18.00	22.00	18.17	21.83	42.33	14.67	24.33	30.00	22.89	22.67	22.56	24.44
	PPD	0.17	0.20	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.21	0.22

Node 2: Thousand Oaks Groundwater Well Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
TDS	mg/L	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0
	PPD	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	PPD	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Sulfate	mg/L	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0
	PPD	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83
Chloride	mg/L	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0
	PPD	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08
Copper	ug/L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	10.11	10.53	10.21	8.57	8.45	8.42	8.19	8.19	7.98	8.97	9.06	9.09
TDS	mg/L	1,282.0	1,334.0	1,344.4	818.4	821.4	822.3	828.6	828.4	834.5	1,347.3	1,318.3	1,313.2
	PPD	108,124.2	117,183.6	114,428.0	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	100,766.6	99,660.3	99,569.5
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	58.0	62.0	61.2	33.9	33.5	33.4	32.5	32.5	31.7	54.5	56.5	55.4
Sulfate	mg/L	315.0	342.2	346.2	182.3	183.6	184.0	186.6	186.6	189.1	310.2	309.8	306.7
	PPD	26,564.5	30,063.7	29,463.4	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	23,203.1	23,419.2	23,255.9
Chloride	mg/L	255.6	251.3	257.0	152.7	153.0	153.1	153.9	153.9	154.6	265.8	260.0	255.8
	PPD	21,559.9	22,078.2	21,871.3	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	19,876.4	19,651.9	19,394.6
Copper	ug/L	43.9	44.5	44.0	47.0	47.0	47.0	46.9	46.9	46.9	43.9	43.9	44.2
	PPD	3.7	3.9	3.7	3.4	3.3	3.3	3.2	3.2	3.1	3.3	3.3	3.3

Node 4a: HCTP RO System Feed

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	3.0	3.2	3.1	2.6	2.5	2.5	2.5	2.5	2.4	2.7	2.7	2.7

Node 5: HCTP RO System Brine

Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.46	0.47	0.46	0.39	0.38	0.38	0.37	0.37	0.36	0.40	0.41	0.41
TDS	mg/L	8,546.6	8,893.3	8,962.9	5,455.8	5,476.0	5,481.7	5,524.2	5,522.8	5,563.2	8,981.9	8,788.6	8,754.8
	PPD	32,437.2	35,155.1	34,328.4	17,548.4	17,372.0	17,323.2	16,970.2	16,981.5	16,663.6	30,230.0	29,898.1	29,870.9
Boron	mg/L	4.6	4.7	4.8	3.2	3.2	3.2	3.2	3.2	3.2	4.9	5.0	4.9
	PPD	17.4	18.6	18.4	10.2	10.0	10.0	9.7	9.8	9.5	16.4	17.0	16.6
Sulfate	mg/L	2,099.8	2,281.6	2,307.8	1,215.6	1,224.1	1,226.5	1,244.3	1,243.7	1,260.6	2,068.2	2,065.2	2,044.8
	PPD	7,969.4	9,019.1	8,839.0	3,910.0	3,883.3	3,875.9	3,822.3	3,824.0	3,775.8	6,960.9	7,025.8	6,976.8
Chloride	mg/L	1,704.2	1,675.6	1,713.1	1,017.7	1,020.2	1,020.9	1,026.0	1,025.9	1,030.8	1,771.7	1,733.0	1,705.3
	PPD	6,468.0	6,623.5	6,561.4	3,273.4	3,236.3	3,226.1	3,151.9	3,154.3	3,087.5	5,962.9	5,895.6	5,818.4
Copper	ug/L	16.8	17.0	16.8	18.0	18.0	18.0	17.9	17.9	17.9	16.8	16.8	16.9
	PPD	0.06	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.06	0.06

Node 6: HCTP RO System Product Water													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	2.58	2.69	2.60	2.19	2.16	2.15	2.09	2.09	2.04	2.29	2.31	2.32
TDS	mg/L	64.1	66.7	67.2	40.9	41.1	41.1	41.4	41.4	41.7	67.4	65.9	65.7
	PPD	1,378.6	1,494.1	1,459.0	745.8	738.3	736.2	721.2	721.7	708.2	1,284.8	1,270.7	1,269.5
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	14.8	15.8	15.6	8.7	8.5	8.5	8.3	8.3	8.1	13.9	14.4	14.1
Sulfate	mg/L	15.7	17.1	17.3	9.1	9.2	9.2	9.3	9.3	9.5	15.5	15.5	15.3
	PPD	338.7	383.3	375.7	166.2	165.0	164.7	162.4	162.5	160.5	295.8	298.6	296.5
Chloride	mg/L	12.8	12.6	12.8	7.6	7.7	7.7	7.7	7.7	7.7	13.3	13.0	12.8
	PPD	274.9	281.5	278.9	139.1	137.5	137.1	134.0	134.1	131.2	253.4	250.6	247.3
Copper	ug/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	PPD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Node 7a: HCTP Conventional Effluent (Bypass RO System)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	7.08	7.37	7.14	6.00	5.92	5.89	5.73	5.74	5.59	6.28	6.35	6.36

Node 7: HCTP Combined Effluent Flow (Conventional Effluent + RO System Product Water)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.66	10.06	9.75	8.18	8.07	8.04	7.82	7.82	7.62	8.56	8.66	8.68
TDS	mg/L	956.8	995.6	1,003.4	610.8	613.0	613.7	618.4	618.3	622.8	1,005.5	983.9	980.1
	PPD	77,065.5	83,522.6	81,558.5	41,692.1	41,272.9	41,156.9	40,318.5	40,345.2	39,590.0	71,821.4	71,032.9	70,968.2
Boron	mg/L	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
	PPD	55.4	59.2	58.5	32.4	32.0	31.9	31.0	31.0	30.3	52.1	54.0	52.9
Sulfate	mg/L	235.1	255.4	258.4	136.1	137.0	137.3	139.3	139.2	141.1	231.5	231.2	228.9
	PPD	18,933.9	21,427.9	21,000.0	9,289.5	9,226.0	9,208.4	9,081.2	9,085.3	8,970.8	16,538.0	16,692.0	16,575.7
Chloride	mg/L	190.8	187.6	191.8	113.9	114.2	114.3	114.9	114.8	115.4	198.3	194.0	190.9
	PPD	15,366.8	15,736.2	15,588.8	7,777.1	7,689.0	7,664.6	7,488.4	7,494.0	7,335.3	14,166.9	14,006.9	13,823.5
Copper	ug/L	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9
	PPD	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Node 8: Camrosa WD Diversion Water Quality													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.66	10.06	9.75	8.18	8.07	8.04	7.82	7.82	7.62	8.56	8.66	8.68
Chloride	mg/L	230.8	227.6	231.8	113.9	114.2	114.3	114.9	114.8	115.4	238.3	234.0	230.9

Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	1.37	1.37	1.37	0.27	0.27	0.27	0.27	0.27	0.27	1.37	1.37	1.37
TDS	mg/L	5,640.6	6,250.4	6,152.6	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	5,498.1	5,358.7	5,339.0
	PPD	64,347.5	71,304.4	70,188.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	62,721.6	61,131.5	60,907.2
Boron	mg/L	2.2	2.4	2.4	1.0	1.0	1.0	1.0	1.0	1.0	2.2	2.4	2.3
	PPD	24.6	27.0	27.5	2.2	2.2	2.2	2.2	2.2	2.2	25.5	27.1	25.9
Sulfate	mg/L	1,746.7	2,025.5	1,994.6	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	1,528.2	1,540.7	1,524.6
	PPD	19,926.1	23,106.4	22,754.7	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	17,433.8	17,576.5	17,393.1
Chloride	mg/L	1,083.6	1,090.3	1,102.3	975.0	975.0	975.0	975.0	975.0	975.0	1,041.6	1,013.0	988.0
	PPD	12,361.2	12,437.7	12,575.3	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	11,882.1	11,555.9	11,270.5
Copper	ug/L	14.5	17.7	14.6	0.0	0.0	0.0	0.0	0.0	0.0	18.2	18.1	19.7
	PPD	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2

Date: 06/29/2020
Sensitivity Analysis No. 2

Legend	Output	Exceeds	>90 < 110 mg/L	N/A

Scenario Description:

This scenario was to determine the LVMWD Purewater and Thousand Oaks Groundwater Desalter Brine influences and receiving partial flow from Pure Water with 10% buffer for future growth. Based on this analysis 0.15 mgd of Pure water brine can be sent to the HCTP in the winter.

Node 1: LVMWD AWPF Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.15	0.15	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.15	0.15
TDS	mg/L	5,168.33	5,926.67	5,805.00	5,708.89	5,656.67	5,113.33	5,420.00	5,026.67	4,931.11	4,991.11	4,817.78	4,793.33
	PPD	6,336.27	7,265.97	7,116.81	0.00	0.00	0.00	0.00	0.00	0.00	6,119.00	5,906.50	5,876.53
Boron	mg/L	2.43	2.70	2.75	3.03	2.90	2.52	2.67	2.33	2.67	2.53	2.71	2.58
	PPD	2.98	3.31	3.37	0.00	0.00	0.00	0.00	0.00	0.00	3.11	3.32	3.16
Sulfate	mg/L	1,438.33	1,785.00	1,746.67	1,590.00	1,456.67	1,320.00	1,200.00	1,246.67	1,128.89	1,166.67	1,182.22	1,162.22
	PPD	1,763.37	2,188.37	2,141.38	0.00	0.00	0.00	0.00	0.00	0.00	1,430.31	1,449.38	1,424.86
Chloride	mg/L	1,110.00	1,118.33	1,133.33	1,160.00	1,113.33	1,026.67	1,093.33	1,106.67	1,080.00	1,057.78	1,022.22	991.11
	PPD	1,360.84	1,371.05	1,389.44	0.00	0.00	0.00	0.00	0.00	0.00	1,296.81	1,253.22	1,215.08
Copper	ug/L	18.00	22.00	18.17	21.83	42.33	14.67	24.33	30.00	22.89	22.67	22.56	24.44
	PPD	0.02	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03

Node 2: Thousand Oaks Groundwater Well Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
TDS	mg/L	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0
	PPD	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	PPD	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Sulfate	mg/L	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0
	PPD	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83
Chloride	mg/L	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0
	PPD	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08
Copper	ug/L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.16	9.58	9.25	8.57	8.45	8.42	8.19	8.19	7.98	8.01	8.11	8.14
TDS	mg/L	877.6	877.1	885.0	818.4	821.4	822.3	828.6	828.4	834.5	914.0	907.1	905.7
	PPD	67,046.1	70,078.3	68,289.7	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	61,097.1	61,368.5	61,472.0
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	38.6	40.6	39.4	33.9	33.5	33.4	32.5	32.5	31.7	34.4	35.0	34.9
Sulfate	mg/L	198.1	198.7	201.9	182.3	183.6	184.0	186.6	186.6	189.1	208.4	207.3	206.5
	PPD	15,132.6	15,876.5	15,580.9	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	13,930.4	14,022.9	14,018.6
Chloride	mg/L	166.7	165.1	166.7	152.7	153.0	153.1	153.9	153.9	154.6	171.6	170.4	169.7
	PPD	12,737.6	13,189.6	12,863.5	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	11,469.2	11,527.3	11,517.2
Copper	ug/L	46.6	46.7	46.6	47.0	47.0	47.0	46.9	46.9	46.9	46.4	46.4	46.5
	PPD	3.6	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.2

Node 4a: HCTP RO System Feed

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Node 5: HCTP RO System Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 6: HCTP RO System Product Water													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 7a: HCTP Conventional Effluent (Bypass RO System)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.16	9.58	9.25	8.57	8.45	8.42	8.19	8.19	7.98	8.01	8.11	8.14

Node 7: HCTP Combined Effluent Flow (Conventional Effluent + Brine)													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.16	9.58	9.25	8.57	8.45	8.42	8.19	8.19	7.98	8.01	8.11	8.14
TDS	mg/L	888.9	888.4	896.4	828.9	832.0	832.8	839.3	839.1	845.2	925.8	918.8	917.4
	PPD	67,908.7	70,979.9	69,168.3	59,247.3	58,651.6	58,486.8	57,295.2	57,333.3	56,260.1	61,883.1	62,158.0	62,262.9
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	38.6	40.6	39.4	33.9	33.5	33.4	32.5	32.5	31.7	34.4	35.0	34.9
Sulfate	mg/L	246.3	247.0	251.0	226.7	228.3	228.7	232.0	231.9	235.1	259.1	257.7	256.8
	PPD	18,813.3	19,738.1	19,370.6	16,203.5	16,092.6	16,061.9	15,840.1	15,847.2	15,647.4	17,318.7	17,433.6	17,428.3
Chloride	mg/L	198.7	196.7	198.7	181.9	182.4	182.5	183.4	183.4	184.3	204.5	203.1	202.2
	PPD	15,179.2	15,717.8	15,329.2	13,002.8	12,855.5	12,814.8	12,520.2	12,529.6	12,264.3	13,667.6	13,736.8	13,724.8
Copper	ug/L	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
	PPD	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Node 8: Camrosa WD Diversion Water Quality													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.16	9.58	9.25	8.57	8.45	8.42	8.19	8.19	7.98	8.01	8.11	8.14
Chloride	mg/L	238.7	236.7	238.7	181.9	182.4	182.5	183.4	183.4	184.3	244.5	243.1	242.2

Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence													
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.41	0.41	0.41	0.27	0.27	0.27	0.27	0.27	0.27	0.41	0.41	0.41
TDS	mg/L	6,725.5	6,994.2	6,951.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	6,662.7	6,601.2	6,592.6
	PPD	23,269.5	24,199.2	24,050.0	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	23,052.2	22,839.7	22,809.7
Boron	mg/L	1.5	1.6	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.6	1.6
	PPD	5.2	5.5	5.6	2.2	2.2	2.2	2.2	2.2	2.2	5.3	5.6	5.4
Sulfate	mg/L	2,455.0	2,577.9	2,564.3	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	2,358.8	2,364.3	2,357.2
	PPD	8,494.2	8,919.2	8,872.2	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	8,161.1	8,180.2	8,155.7
Chloride	mg/L	1,022.8	1,025.8	1,031.1	975.0	975.0	975.0	975.0	975.0	975.0	1,004.3	991.7	980.7
	PPD	3,538.9	3,549.1	3,567.5	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	3,474.9	3,431.3	3,393.2
Copper	ug/L	6.4	7.8	6.4	0.0	0.0	0.0	0.0	0.0	0.0	8.0	8.0	8.7
	PPD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Date: 07/07/2020
Sensitivity No. 2

Legend | Output | Exceeds | >90 < 110 mg/L | N/A

Scenario Description: *This scenario was to determine the LVMWD Purewater and Thousand Oaks Groundwater Desalter Brine influences and receiving partial flow from Pure Water with 10% buffer for future growth. Based on this analysis 0.4 mgd of Pure water brine can be sent to the HCTP with UV disinfection in the winter.*

Node 1: LVMWD AWPF Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.40	0.40	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.40	0.40
TDS	mg/L	5,168.33	5,926.67	5,805.00	5,708.89	5,656.67	5,113.33	5,420.00	5,026.67	4,931.11	4,991.11	4,817.78	4,793.33
	PPD	17,241.56	19,771.36	19,365.48	0.00	0.00	0.00	0.00	0.00	0.00	16,650.35	16,072.11	15,990.56
Boron	mg/L	2.43	2.70	2.75	3.03	2.90	2.52	2.67	2.33	2.67	2.53	2.71	2.58
	PPD	8.12	9.01	9.17	0.00	0.00	0.00	0.00	0.00	0.00	8.45	9.04	8.60
Sulfate	mg/L	1,438.33	1,785.00	1,746.67	1,590.00	1,456.67	1,320.00	1,200.00	1,246.67	1,128.89	1,166.67	1,182.22	1,162.22
	PPD	4,798.28	5,954.76	5,826.88	0.00	0.00	0.00	0.00	0.00	0.00	3,892.00	3,943.89	3,877.17
Chloride	mg/L	1,110.00	1,118.33	1,133.33	1,160.00	1,113.33	1,026.67	1,093.33	1,106.67	1,080.00	1,057.78	1,022.22	991.11
	PPD	3,702.96	3,730.76	3,780.80	0.00	0.00	0.00	0.00	0.00	0.00	3,528.75	3,410.13	3,306.35
Copper	ug/L	18.00	22.00	18.17	21.83	42.33	14.67	24.33	30.00	22.89	22.67	22.56	24.44
	PPD	0.06	0.07	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.08	0.08

Node 2: Thousand Oaks Groundwater Well Brine

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
TDS	mg/L	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0
	PPD	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18	16,933.18
Boron	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	PPD	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Sulfate	mg/L	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0
	PPD	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83	6,730.83
Chloride	mg/L	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0	975.0
	PPD	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08	2,178.08
Copper	ug/L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Node 3: Thousand Oaks Raw Sewage, before Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	8.75	9.17	8.84	8.30	8.19	8.15	7.92	7.93	7.71	7.60	7.70	7.72
TDS	mg/L	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2	600.2
	PPD	43,776.69	45,879.18	44,239.74	41,561.58	40,973.38	40,810.69	39,634.30	39,671.85	38,612.26	38,044.93	38,528.83	38,662.32
Boron	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PPD	33.40	35.01	33.76	31.71	31.27	31.14	30.24	30.27	29.46	29.03	29.40	29.50
Sulfate	mg/L	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
	PPD	6,638.45	6,957.28	6,708.67	6,302.54	6,213.35	6,188.67	6,010.28	6,015.98	5,855.30	5,769.26	5,842.65	5,862.89
Chloride	mg/L	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1	126.1
	PPD	9,198.71	9,640.50	9,296.01	8,733.25	8,609.66	8,575.47	8,328.28	8,336.17	8,113.52	7,994.31	8,095.99	8,124.04
Copper	ug/L	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
	PPD	3.5	3.7	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1

Node 4: Thousand Oaks HCTP Influent, with Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.41	9.83	9.51	8.57	8.45	8.42	8.19	8.19	7.98	8.27	8.36	8.39
TDS	mg/L	993.0	1,007.0	1,015.9	818.4	821.4	822.3	828.6	828.4	834.5	1,038.8	1,025.4	1,022.9
	PPD	77,951.4	82,583.7	80,538.4	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	71,628.5	71,534.1	71,586.1
Boron	mg/L	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
	PPD	43.8	46.2	45.2	33.9	33.5	33.4	32.5	32.5	31.7	39.7	40.7	40.3
Sulfate	mg/L	231.4	239.5	243.0	182.3	183.6	184.0	186.6	186.6	189.1	237.7	236.8	235.4
	PPD	18,167.6	19,642.9	19,266.4	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	16,392.1	16,517.4	16,470.9
Chloride	mg/L	192.1	189.6	192.4	152.7	153.0	153.1	153.9	153.9	154.6	198.7	196.2	194.5
	PPD	15,079.8	15,549.3	15,254.9	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	13,701.1	13,684.2	13,608.5
Copper	ug/L	45.8	46.1	45.9	47.0	47.0	47.0	46.9	46.9	46.9	45.7	45.7	45.8
	PPD	3.6	3.8	3.6	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.2	3.2

Node 4a: HCTP RO System Feed

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Node 5: HCTP RO System Brine

Constituent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 6: HCTP RO System Product Water

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD												
TDS	mg/L												
	PPD												
Boron	mg/L												
	PPD												
Sulfate	mg/L												
	PPD												
Chloride	mg/L												
	PPD												
Copper	ug/L												
	PPD												

Node 7a: HCTP Conventional Effluent (Bypass RO System)

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.41	9.83	9.51	8.57	8.45	8.42	8.19	8.19	7.98	8.27	8.36	8.39

Node 7: HCTP Combined Effluent Flow (Conventional Effluent + Brine)

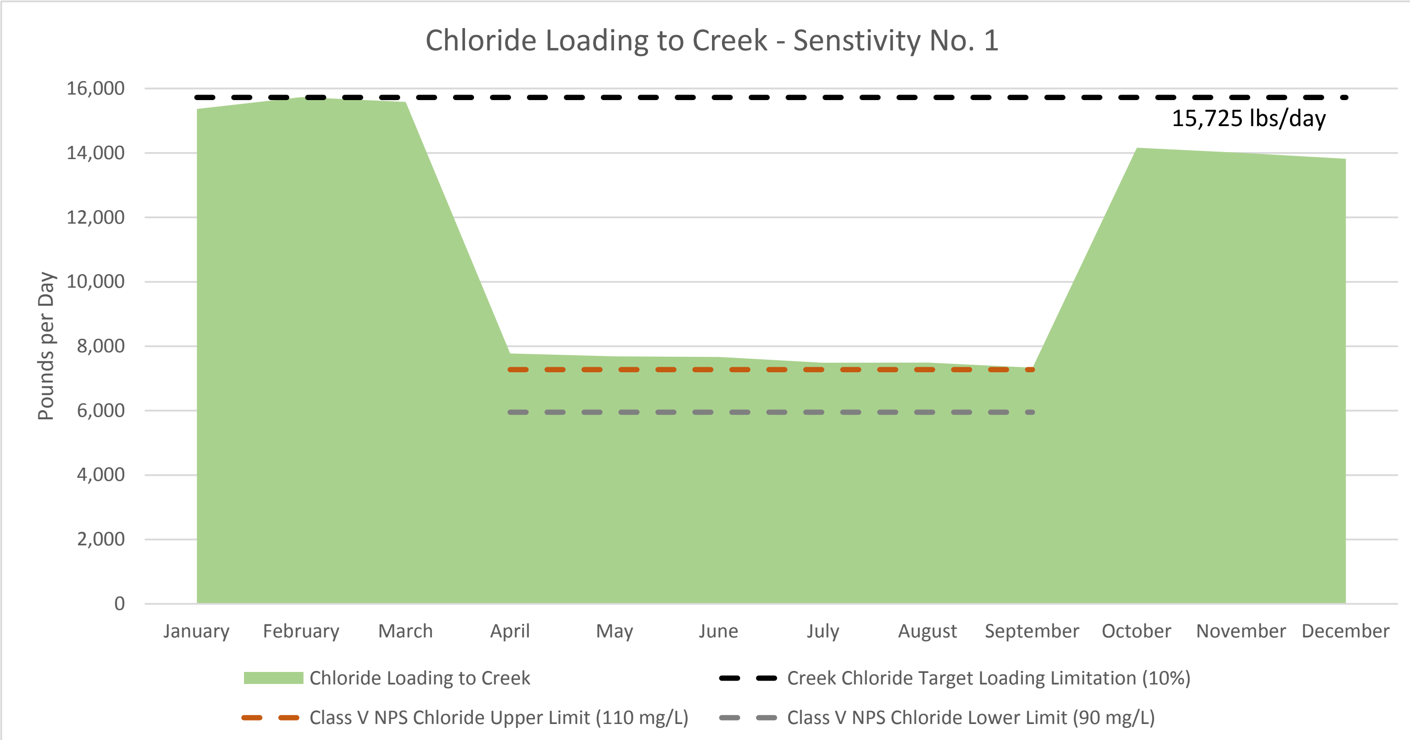
Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.41	9.83	9.51	8.57	8.45	8.42	8.19	8.19	7.98	8.27	8.36	8.39
TDS	mg/L	993.0	1,007.0	1,015.9	818.4	821.4	822.3	828.6	828.4	834.5	1,038.8	1,025.4	1,022.9
	PPD	77,951.4	82,583.7	80,538.4	58,494.8	57,906.6	57,743.9	56,567.5	56,605.0	55,545.4	71,628.5	71,534.1	71,586.1
Boron	mg/L	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
	PPD	43.8	46.2	45.2	33.9	33.5	33.4	32.5	32.5	31.7	39.7	40.7	40.3
Sulfate	mg/L	231.4	239.5	243.0	182.3	183.6	184.0	186.6	186.6	189.1	237.7	236.8	235.4
	PPD	18,167.6	19,642.9	19,266.4	13,033.4	12,944.2	12,919.5	12,741.1	12,746.8	12,586.1	16,392.1	16,517.4	16,470.9
Chloride	mg/L	192.1	189.6	192.4	152.7	153.0	153.1	153.9	153.9	154.6	198.7	196.2	194.5
	PPD	15,079.8	15,549.3	15,254.9	10,911.3	10,787.7	10,753.6	10,506.4	10,514.2	10,291.6	13,701.1	13,684.2	13,608.5
Copper	ug/L	2.6	2.6	2.6	2.7	2.7	2.7	2.7	2.7	2.7	2.6	2.6	2.6
	PPD	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

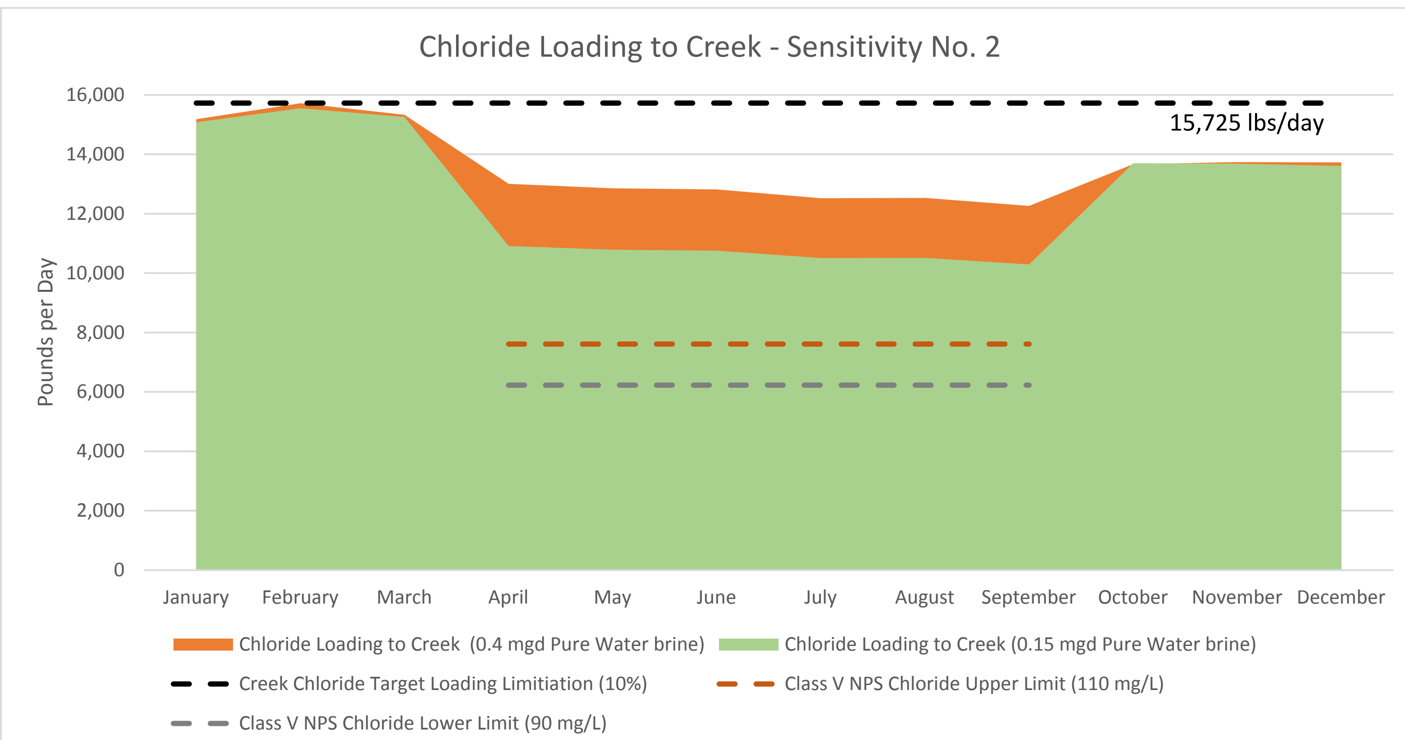
Node 8: Camrosa WD Diversion Water Quality

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	9.41	9.83	9.51	8.57	8.45	8.42	8.19	8.19	7.98	8.27	8.36	8.39
Chloride	mg/L	232.1	229.6	232.4	152.7	153.0	153.1	153.9	153.9	154.6	238.7	236.2	234.5

Node 9: LVMWD Brine Line to SMP with Thousand Oaks Groundwater Brine Influence

Consitutent	Units	January	February	March	April	May	June	July	August	September	October	November	December
Flow	MGD	0.67	0.67	0.67	0.27	0.27	0.27	0.27	0.27	0.27	0.67	0.67	0.67
TDS	mg/L	6,135.6	6,589.8	6,516.9	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	7,580.0	6,029.4	5,925.6	5,911.0
	PPD	34,174.7	36,704.5	36,298.7	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	16,933.2	33,583.5	33,005.3	32,923.7
Boron	mg/L	1.9	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.9	2.0	1.9
	PPD	10.4	11.2	11.4	2.2	2.2	2.2	2.2	2.2	2.2	10.7	11.3	10.8
Sulfate	mg/L	2,069.9	2,277.5	2,254.6	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	3,013.0	1,907.2	1,916.5	1,904.5
	PPD	11,529.1	12,685.6	12,557.7	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	6,730.8	10,622.8	10,674.7	10,608.0
Chloride	mg/L	1,055.9	1,060.8	1,069.8	975.0	975.0	975.0	975.0	975.0	975.0	1,024.6	1,003.3	984.6
	PPD	5,881.0	5,908.8	5,958.9	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	2,178.1	5,706.8	5,588.2	5,484.4
Copper	ug/L	10.8	13.2	10.9	0.0	0.0	0.0	0.0	0.0	0.0	13.6	13.5	14.6
	PPD	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1


Chloride Loading to Creek - Senstivity No. 1
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Pounds per Day
15,725 lbs/day
January
February
March
April
May
June
July
August
September
October
November
December
Chloride Loading to Creek
Creek Chloride Target Loading Limitation (10%)
Class V NPS Chloride Upper Limit (110 mg/L)
Class V NPS Chloride Lower Limit (90 mg/L)


Chloride Loading to Creek - Sensitivity No. 2
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Pounds per Day
15,725 lbs/day
January
February
March
April
May
June
July
August
September
October
November
December
Chloride Loading to Creek (0.4 mgd Pure Water brine)
Chloride Loading to Creek (0.15 mgd Pure Water brine)
Creek Chloride Target Loading Limitiation (10%)
Class V NPS Chloride Upper Limit (110 mg/L)
Class V NPS Chloride Lower Limit (90 mg/L)

APPENDIX F: U.S. FISH & WILDLIFE SERVICE IPAC RESOURCE LIST

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Ventura County, California

Local office

Ventura Fish And Wildlife Office

(805) 644-1766
(805) 644-3958

2493 Portola Road, Suite B
Ventura, CA 93003-7726

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS

Coastal California Gnatcatcher Polioptila californica californica There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8178	Threatened
Least Bell's Vireo Vireo bellii pusillus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5945	Endangered
Southwestern Willow Flycatcher Empidonax traillii extimus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6749	Endangered

Amphibians

NAME	STATUS
California Red-legged Frog Rana draytonii There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Crustaceans

NAME	STATUS
Riverside Fairy Shrimp Streptocephalus woottoni There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8148	Endangered
Vernal Pool Fairy Shrimp Branchinecta lynchi There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plants

NAME	STATUS
Braunton's Milk-vetch Astragalus brauntonii There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5674	Endangered

California Orcutt Grass Orcuttia californica No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4923	Endangered
Conejo Dudleya Dudleya abramsii ssp. parva No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4871	Threatened
Gambel's Watercress Rorippa gambellii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4201	Endangered
Lyon's Pentachaeta Pentachaeta lyonii There is **final** critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/4699	Endangered
Marcescent Dudleya Dudleya cymosa ssp. marcescens No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7145	Threatened
Marsh Sandwort Arenaria paludicola No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2229	Endangered
Santa Monica Mountains Dudleyea Dudleya cymosa ssp. ovatifolia No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2538	Threatened
Spreading Navarretia Navarretia fossalis There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/1334	Threatened
Verity's Dudleya Dudleya verityi No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4342	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE

Lyon's Pentachaeta Pentachaeta lyonii https://ecos.fws.gov/ecp/species/4699#crithab		Final

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN

THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Burrowing Owl Athene cunicularia This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9737	Breeds Mar 15 to Aug 31
Common Yellowthroat Geothlypis trichas sinuosa This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/2084	Breeds May 20 to Jul 31
Costa's Hummingbird Calypte costae This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9470	Breeds Jan 15 to Jun 10
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Lawrence's Goldfinch Carduelis lawrencei This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9464	Breeds Mar 20 to Sep 20
Nuttall's Woodpecker Picoides nuttallii This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9410	Breeds Apr 1 to Jul 20

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Song Sparrow Melospiza melodia — Breeds Feb 20 to Sep 5
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Spotted Towhee Pipilo maculatus clementae — Breeds Apr 15 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/4243

Tricolored Blackbird Agelaius tricolor — Breeds Mar 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3910

White Headed Woodpecker Picoides albolarvatus — Breeds May 1 to Aug 15
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9411

Wrentit Chamaea fasciata — Breeds Mar 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ “Proper Interpretation and Use of Your Migratory Bird Report” before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

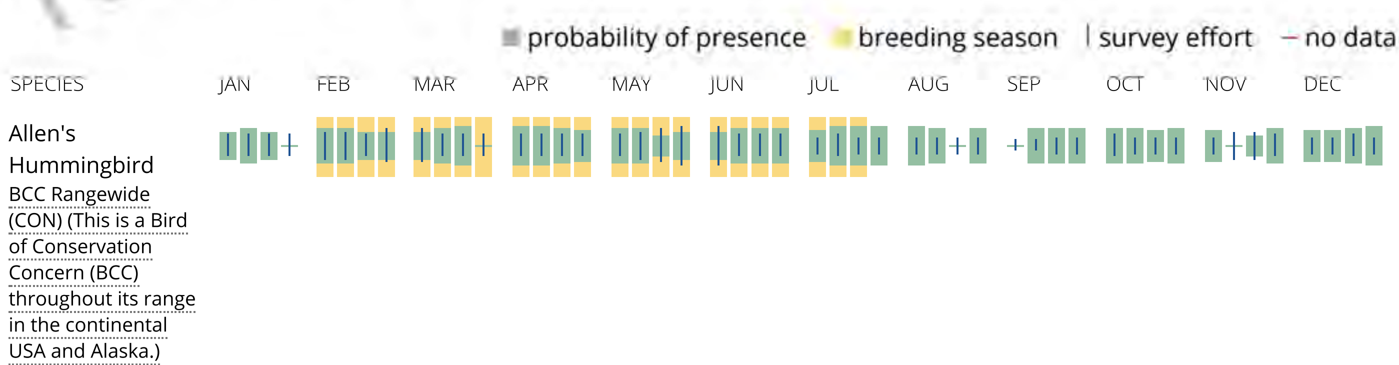
Breeding Season ( )
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

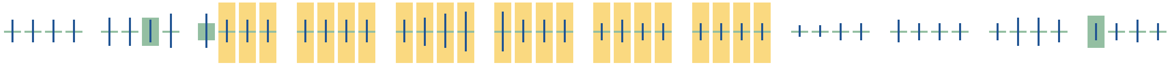
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

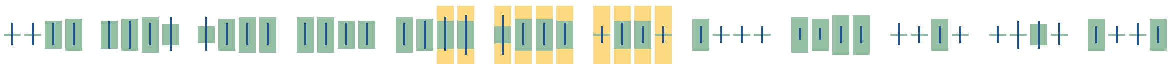
Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



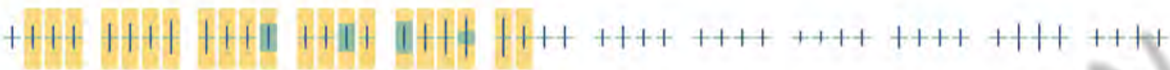
Burrowing Owl
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



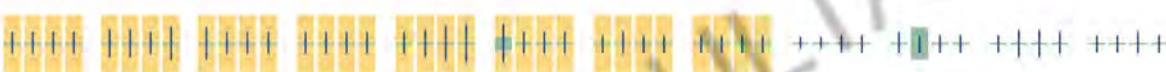
Common Yellowthroat
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



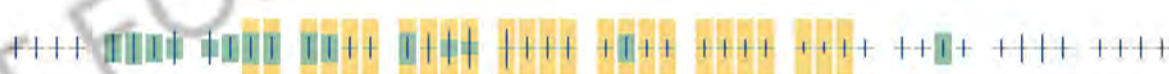
Costa's Hummingbird
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



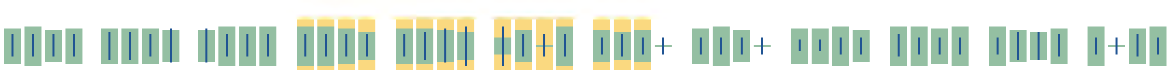
Golden Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



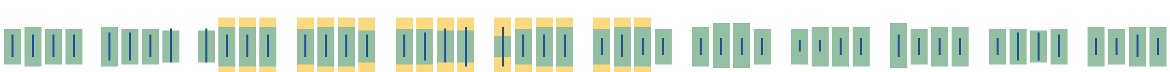
Lawrence's Goldfinch
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

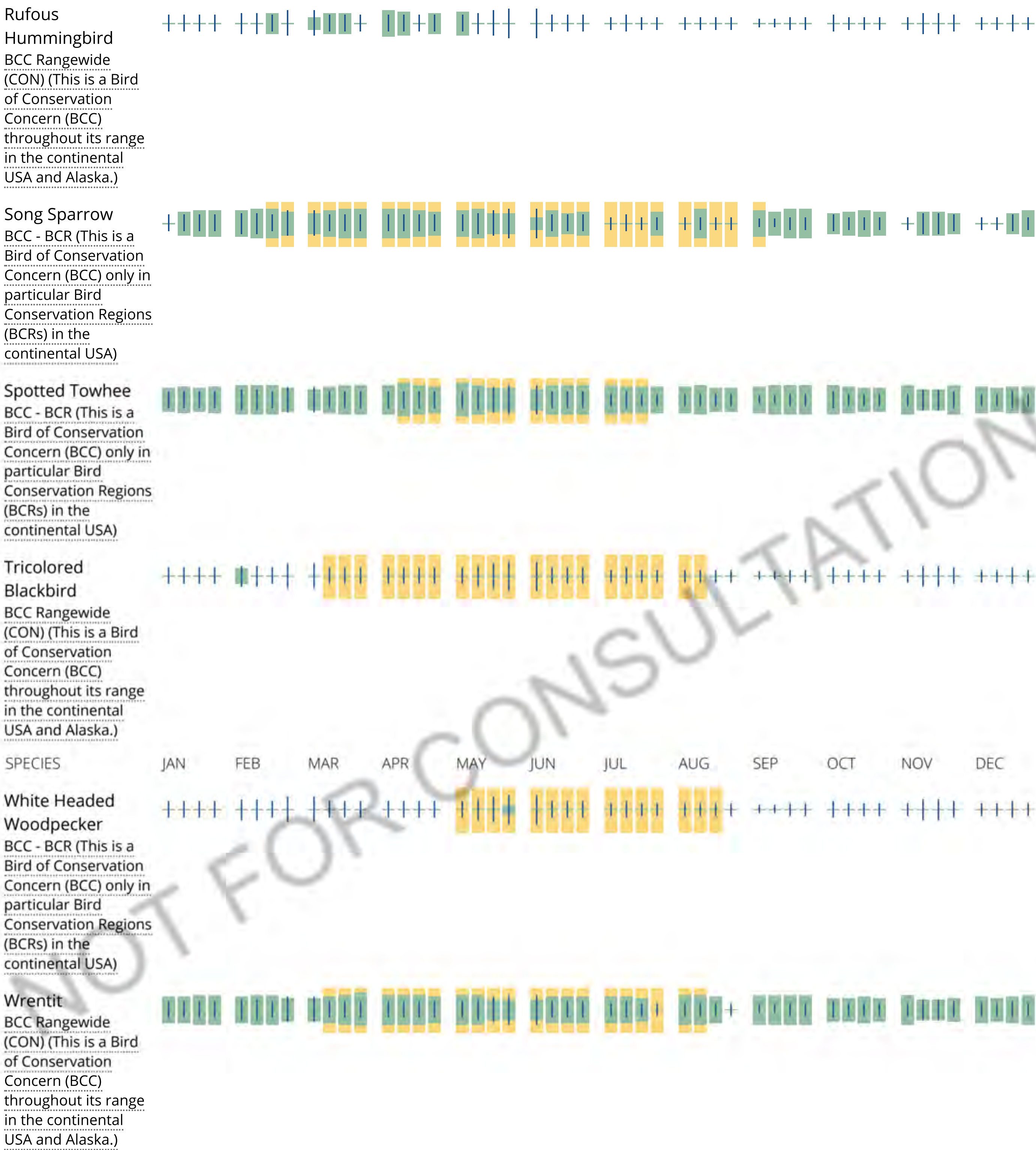


Nuttall's Woodpecker
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Oak Titmouse
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)





Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER FORESTED/SHRUB WETLAND

- PSSA
- PSSCx
- PSSC

RIVERINE

- R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

September 8, 2020 JPA Board Meeting

TO: JPA Board of Directors

FROM: Engineering and External Affairs

Subject : State and Federal Legislative and Regulatory Advocacy: Renewal of Professional Services Agreement

SUMMARY:

On August 1, 2016, the JPA Board authorized the Administering Agent/General Manager to execute a one-year professional services agreement with Best Best & Krieger LLP (BBK), in the amount of $130,000, for state and federal legislative and regulatory advocacy services. The JPA Board subsequently renewed the agreement three times with a current term of September 1, 2019 through August 31, 2020. Under the agreement, John Freshman and Ana Schwab have represented the JPA well on federal affairs, and Syrus Devers has done the same at the state level.

For the proposed renewal, BBK has not requested an increase in the contract amount. Last year, as part of the third renewal, the amount was increased from $130,000 to $155,000 annually. The proposed agreement, for September 1, 2020, through August 31, 2021, would remain at $155,000. Staff recommends authority to execute the renewed professional services agreement with two one-year renewal options to allow for the continuation of the advocacy services.

RECOMMENDATION(S):

Authorize the Administering Agent/General Manager to execute a one-year professional services agreement with Best Best & Krieger LLP, in the amount of $155,000, with two one-year renewal options adjusted for inflation, to provide state and federal legislative and regulatory advocacy services.

FISCAL IMPACT:

Yes

ITEM BUDGETED:

Yes

FINANCIAL IMPACT:

Sufficient funds are available in the adopted Fiscal Year 2020-21 JPA Budget for the services. The total cost of the work is not expected to exceed $155,000 for the first year and will be allocated 70.6% to LVMWD and 29.4% to Triunfo Water & Sanitation District. Annual renewals for the subsequent two years will be executed by the Administering Agent/General Manager provided that sufficient funds are budgeted for the work. The Administering Agent/General Manager may execute the two renewals with an adjustment of the amount to account for inflation based on the actual Consumer Price Indices for the Washington D.C. and Sacramento areas.

DISCUSSION:

The JPA Board has been authorizing the Administering Agent/General Manager to execute and renew professional services agreements with BBK for state and federal legislative and regulatory advocacy services since August 1, 2016. The latest extension to the Agreement expired on August 31, 2020. Since 2016, the District has started using a new and revised professional services agreement template, and staff determined it would be preferable to execute a new agreement with the updated template rather than to renew the original agreement for a fourth time.

The scope of services under this agreement will remain similar to past years and consist of the following tasks:

- Identify and Assist with Funding Opportunites: Utilize relationships to monitor federal and state grant programs, and other funding opportunities with a special focus on grants and low-interest loans.
- Advocacy and Updates: Represent the Las Virgenes Municipal Water District (LVMWD), Triunfo Water and Sanitation District (TWSD) and Las Virgenes-Triunfo Joint Powers Authority (JPA) before Congress, the State Legislature, and federal and state agencies. Support and oppose legislation according to the interests of LVMWD, TWSD or the JPA. Keep LVMWD, TWSD and the JPA informed of current events through updates and reports to ensure that they are informed of needs to advance legislative priorities. This includes activities such as drafting background papers, letters of support or opposition, and being prepared to attend and testify at legislative hearings.
- Relationship and Coalition Building: Set meetings with key decision-makers, and build coalitions.

Since August 1, 2016 and until 2019, the annual cost of the services provided by BBK remained unchanged at $130,000. For the last renewal on September 1, 2019, the cost increased to $155,000. This amount consists of $7,500 per month for federal lobbying services, $5,000 per month for state lobbying services and a $5,000 annual allowance for reimbursement of actual travel and direct costs. BBK has not requested an increase for this agreement. Federal lobbying services are provided jointly by John Freshman who formulates the strategic approach and Ana Schwab/Lowry Crook who are the operational leads. State lobbying services are provided by Syrus Devers. With the assistance of BBK, the JPA has substantially increased its profile on the state and federal levels and positioned itself well to receive future funding for the Pure Water Project Las Virgenes-Triunfo.

Last year, staff evaluated legislative and regulatory advocacy fees paid by other agencies. Although the fees vary depending on the level of service requested by each agency, the following summary provided a basis for comparison. The data shows that the median cost of federal lobbying services is $9,000 per month, which compares favorably to the $7,500 per month paid by the JPA for federal advocacy.

Agency	Monthly Fee
Eastern Municipal Water District	$13,500
West Basin Municipal Water District	$13,250
Irvine Ranch Water District	$10,000
Western Municipal Water District	$9,000
North San Diego County Water Agency Coalition	$9,000
Municipal Water District of Orange County	$8,000
Inland Empire Utilities Agency	$8,000
Median	**$9,000**

Staff proposes a new Agreement with BBK in the annual amount of $155,000, which includes $7,500 per month for federal lobbying services, $5,000 per month for state lobbying services and a $5,000 annual allowance for reimbursement of actual travel and direct costs. Authority is also requested for the Administering Agent/General Manager to increase the annual amount for two renewal options to account for inflationary effects based on the Consumer Price Indices for the Washington D.C. and Sacramento, California areas.

GOALS:

Ensure Effective Utilization of the Public's Assets and Money

Prepared by: Joe McDermott, Director of Engineering and External Affairs

ATTACHMENTS:

Professional Services Agreement w/BBK

Las Virgenes Municipal Water District
PROFESSIONAL SERVICES AGREEMENT

This Professional Services Agreement ("Agreement") is entered into this ____ day of ________, 2020 by and between Las Virgenes-Triunfo Joint Powers Authority ("Agency"), and Best Best & Krieger LLP ("Consultant"). Agency and Consultant are sometimes individually referred to as "Party" and collectively as "Parties."

1. PURPOSE.

1.1 Project.

Consultant desires to perform and assume responsibility for the provision of certain professional services required by the Agency on the terms and conditions set forth in this Agreement and Agency desires to engage Consultant to render such services for project ("Project") as set forth in this Agreement and its attached exhibits.

Now therefore, in consideration of the mutual covenants and agreements set forth herein, the Parties do contract and agree as follows:

2. TERMS.

2.1 Scope of Services.

2.1.1 General Scope of Services. Consultant promises and agrees to furnish to the Agency all labor, materials, tools, equipment, services, and incidental and customary work necessary to fully and adequately supply the professional services necessary for the Project ("Services"). The Services are more particularly described in the attached **Exhibit "A"** ("Scope of Services"). All Services shall be subject to, and performed in accordance with, this Agreement, the exhibits attached hereto and incorporated herein by reference, and all applicable local, state and federal laws, rules, and regulations.

2.1.2 Term. The term of this Agreement shall be from the date the Agreement is entered into as noted above to the one-year anniversary date. Consultant shall complete the Services within the term of this Agreement and shall meet any other established schedules and deadlines. The Parties may, by mutual, written consent, extend the term of this Agreement if necessary to complete the Services.]

2.2 Consideration.

2.2.1 Compensation. Consultant shall receive compensation, including authorized reimbursements, for all Services rendered under this Agreement at the rates set forth in **Exhibit "B"** ("Fee Schedule"). The total compensation shall not exceed one hundred fifty five thousand Dollars ($155,000.00) without written approval by Agency. Extra Work may be authorized, as described below, and if authorized, will be compensated at the rates and manner set forth in this Agreement.

2.2.2 Payment. Consultant shall submit to Agency a monthly itemized statement which indicates work completed and hours of Services rendered by Consultant. The statement shall describe the Services and supplies provided since the initial commencement date, or since the start of the subsequent billing periods, as appropriate, through the date of the statement. Agency shall pay all approved charges within forty-five (45) days of receiving such statement.

2.2.3 Extra Work. At any time during the term of this Agreement, Agency may request that Consultant perform Extra Work. As used herein, "Extra Work" means any work which is determined by Agency to be necessary for the proper completion of the Project, but which the Parties did not reasonably anticipate would be necessary at the execution of this Agreement. Consultant shall not perform, nor be compensated for, Extra Work without written authorization by Agency.

2.3 Responsibilities of Consultant.

2.3.1 Independent Contractor. The Services shall be performed by Consultant or under its supervision. Consultant will determine the means, methods and details of performing the Services subject to the requirements of this Agreement. Consultant is an independent contractor and not an employee of Agency. Except as Agency may specify in writing, Consultant shall have no authority, expressed or implied, to act on behalf of Agency in any capacity whatsoever as an agent. Any additional personnel performing the Services under this Agreement on behalf of Consultant shall also not be employees of Agency and shall at all times be under Consultant's exclusive direction and control.

2.3.2 Payment of Subordinates. Consultant shall pay all wages, salaries, and other amounts due such personnel in connection with their performance of Services under this Agreement and as required by law. Consultant shall be responsible for all reports and obligations respecting such additional personnel, including, but not limited to: social security taxes, income tax withholding, unemployment insurance, disability insurance, and workers' compensation insurance.

2.3.3 Standard of Care. Consultant shall perform all Services under this Agreement in a skillful and competent manner, consistent with the standards generally recognized as being employed by professionals in the same discipline in the State of California. Consultant represents and maintains that it is skilled in the professional calling necessary to perform the Services. Consultant warrants that all employees and subconsultants shall have sufficient skill and experience to perform the Services assigned to them.

2.3.4 Licensing. Consultant represents that it, its employees and subconsultants have all licenses, permits, qualifications, and approvals of whatever nature that are legally required to perform the Services, and that such licenses and approvals shall be maintained throughout the term of this Agreement.

2.3.5 Conformance to Applicable Requirements. All work prepared by Consultant shall be subject to the approval of Agency.

2.3.6 Substitution of Key Personnel. Consultant has represented to Agency that certain key personnel will perform and coordinate the Services under this Agreement. Key Consultant personnel to be assigned to this Agreement are identified in the List of Key Consultant Personnel set forth in the attached **Exhibit "C"** ("Key Personnel"). Key Personnel shall be available to perform under the terms and conditions of this Agreement immediately upon commencement of the term of this Agreement. Should one or more of such personnel become unavailable, Consultant may substitute other personnel of at least equal competence upon written approval of Agency. The Agency shall have the right to approve or disapprove the reassignment or substitution of Consultant key personnel listed in Exhibit C for any reason at its sole discretion. In the event that Agency and Consultant cannot agree as to the substitution of key personnel, Agency shall be entitled to terminate this Agreement for cause.

2.3.7 Unavailability of Key Personnel. In the event individual key personnel listed in Exhibit C are terminated either by the Consultant or the individual, with or without cause, or if individual key personnel are otherwise unavailable to perform services for the Consultant, the Consultant shall provide to the Agency written notification detailing the circumstances of the unavailability of the individual key personnel and designating replacement personnel prior to the effective date of individual key personnel termination or unavailability date, to the maximum extent feasible, but no later than five (5) business days after the effective date of the individual key personnel termination or unavailability. The Consultant shall propose replacement personnel that have a level of experience and expertise equivalent to the unavailable individual key personnel for Agency review and approval.

2.3.8 Removal of Consultant Personnel. The Consultant agrees to remove personnel from performing work under this Agreement if reasonably requested to do so by the Agency within 24 hours or as soon thereafter as is practicable.

2.3.9 Laws and Regulations. Consultant shall keep itself fully informed of and in compliance with all local, state and federal laws, rules and regulations in any manner affecting the performance of the Project or the Services, including all Cal/OSHA requirements, and shall give all notices required by law. Consultant shall be liable for all violations of such laws and regulations in connection with Services. If the Consultant performs any work knowing it to be contrary to such laws, rules, and regulations, Consultant shall be solely responsible for all costs arising therefrom.

2.3.10 Labor Code Provisions.

(a) Prevailing Wages. Consultant is aware of the requirements of California Labor Code Section 1720, et seq., and 1770, et seq., as well as California Code of

Regulations, Title 8, Section 16000, et seq., ("Prevailing Wage Laws"), which require the payment of prevailing wage rates and the performance of other requirements on "public works" and "maintenance" projects. If the Services are being performed as part of an applicable "public works" or "maintenance" project, as defined by the Prevailing Wage Laws, and if the total compensation is $1,000 or more, Consultant agrees to fully comply with such Prevailing Wage Laws. Consultant shall comply with all prevailing wage requirements under the California Labor Code and Consultant shall forfeit as penalty to the Agency a sum of not more than $200.00 for each calendar day, or portion thereof, for each worker paid less than the prevailing rates. This penalty shall be in addition to any shortfall in wages paid. The Agency has obtained the general prevailing rate of wages, as determined by the Director of the Department of Industrial Relations, a copy of which is on file in the Agency's office and shall be made available for viewing to any interested party upon request. Consultant shall make copies of the prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Services available to interested parties upon request and shall post copies at the Consultant's principal place of business and at the Project site.

(b) Registration and Labor Compliance. If the Services are being performed as part of an applicable "public works" or "maintenance" project, then, in addition to the foregoing, pursuant to Labor Code sections 1725.5 and 1771.1, the Consultant and all subconsultants must be registered with the Department of Industrial Relations ("DIR"). Consultant shall maintain registration for the duration of the Project and require the same of any subconsultants. This Project may also be subject to compliance monitoring and enforcement by the Department of Industrial Relations. It shall be Consultant's sole responsibility to comply with all applicable registration and labor compliance requirements, including the submission of payroll records directly to the DIR.

(c) Labor Certification. By its signature hereunder, Consultant certifies that it is aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for Workers' Compensation or to undertake self-insurance in accordance with the provisions of that Code and agrees to comply with such provisions before commencing the performance of the Services.

2.3.11 Accounting Records. Consultant shall maintain complete and accurate records with respect to all costs and expenses incurred under this Agreement. All such records shall be clearly identifiable. Consultant shall allow a representative of Agency during normal business hours to examine, audit, and make transcripts or copies of such records and any other documents created pursuant to this Agreement. Consultant shall allow inspection of all work, data, documents, proceedings, and activities related to the Agreement for a period of four (4) years from the date of final payment under this Agreement.

2.4 Representatives of the Parties.

2.4.1 Agency's Representative. The Agency hereby designates its General Manager, or his or her designee, to act as its representative for the performance of this

Agreement ("Agency's Representative"). Consultant shall not accept direction or orders from any person other than the Agency's Representative or his or her designee.

2.4.2 Consultant's Representative. Consultant hereby designates John Freshman, or his or her designee, to act as its representative for the performance of this Agreement ("Consultant's Representative"). Consultant's Representative shall have full authority to represent and act on behalf of the Consultant for all purposes under this Agreement. The Consultant's Representative shall supervise and direct the Services, using their best skill and attention, and shall be responsible for all means, methods, techniques, sequences, and procedures and for the satisfactory coordination of all portions of the Services under this Agreement.

2.5 Indemnification.

To the fullest extent permitted by law, Consultant shall immediately indemnify and hold the Agency, its directors, officials, officers, employees, volunteers, and agents free and harmless from any and all claims, demands, causes of action, costs, expenses, liability, loss, damage, or injury of any kind, in law or equity, to property or persons, including wrongful death, in any manner arising out of, pertaining to, or incident to any alleged negligent acts, errors, or omissions of Consultant, its officials, officers, employees, subcontractors, consultants, or agents in connection with the performance of the Consultant's Services, the Project, or this Agreement, including without limitation the payment of all consequential damages, attorneys' fees and costs, including expert witness fees. Notwithstanding the foregoing, to the extent Consultant's Services are subject to Civil Code Section 2782.8, the above indemnity shall be limited, to the extent required by Civil Code Section 2782.8, to claims that arise out of, pertain to, or relate to the negligence, recklessness, or willful misconduct of the Consultant.

Consultant shall immediately defend, with Counsel of Agency's choosing and at Consultant's own cost, expense and risk, any and all claims, suits, actions, or other proceedings of every kind that may be brought or instituted against Agency or its directors, officials, officers, employees, volunteers, and agents. Consultant shall pay and satisfy any judgment, award, or decree that may be rendered against Agency or its directors, officials, officers, employees, volunteers, and agents as part of any such claim, suit, action, or other proceeding. Consultant shall also reimburse Agency for the cost of any settlement paid by Agency or its directors, officials, officers, employees, agents, or volunteers as part of any such claim, suit, action, or other proceeding. Such reimbursement shall include payment for Agency's attorneys' fees and costs, including expert witness fees. Consultant's obligation to defend and indemnify shall survive expiration or termination of this Agreement, and shall not be restricted to insurance proceeds, if any, received by the Agency, its directors, officials, officers, employees, agents, or volunteers.

2.6 Insurance.

2.6.1 Time for Compliance. Consultant shall not commence Work under this Agreement until it has provided evidence satisfactory to the Agency that it has secured all insurance required under this section. In addition, Consultant shall not allow any subconsultant to commence work on any subcontract until it has provided evidence satisfactory to the Agency that the subconsultant has secured all insurance required under this section. Failure to provide and maintain all required insurance shall be grounds for the Agency to terminate this Agreement for cause.

2.6.2 Minimum Requirements. Consultant shall, at its expense, procure and maintain for the duration of the Agreement insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Agreement by the Consultant, its agents, representatives, employees, or subconsultants. Consultant shall also require all of its subconsultants to procure and maintain the same insurance for the duration of the Agreement. Such insurance shall meet at least the following minimum levels of coverage:

(a) Commercial General Liability. Coverage for commercial general liability insurance shall be at least as broad as Insurance Services Office (ISO) Commercial General Liability Coverage (Occurrence Form CG 0001). Consultant shall maintain limits no less than $2,000,000 per occurrence, or the full per occurrence limits of the policies available, whichever is greater, for bodily injury, personal injury, and property damage. If Commercial General Liability Insurance or other form with general aggregate limit or product-completed operations aggregate limit is used, including but not limited to form CG 2503, either the general aggregate limit shall apply separately to this Agreement/location or the general aggregate limit shall be twice the required occurrence limit.

(b) Automobile Liability. Coverage shall be at least as broad as the latest version of the Insurance Services Office Business Auto Coverage form number CA 0001, code 8 (hired) and code 9 (non-owned autos). Consultant shall maintain limits no less than $1,000,000 per accident for bodily injury and property damage. The automobile liability policy shall cover all non-owned and hired automobiles.

(c) Workers' Compensation and Employer's Liability Insurance. Consultant shall maintain Workers' Compensation insurance as required by the State of California and Employer's Liability Insurance in an amount no less than $1,000,000 per accident for bodily injury or disease. The insurer shall agree to waive all rights of subrogation against the Agency, its directors, officials, officers, employees, agents, and volunteers for losses paid under the terms of the insurance policy which arise from work performed by the Consultant.

(d) Professional Liability. Consultant shall procure and maintain, and require its subconsultants to procure and maintain, for a period of five (5) years following completion of the Project, errors and omissions liability insurance appropriate to their profession covering Consultant's wrongful acts, negligent actions, errors, or omissions. The retroactive date (if any) is to be no later than the effective date of this Agreement. Consultant shall purchase a one-year extended reporting period: i) if the retroactive date is advanced past the effective date of this Agreement; ii) if the policy is canceled or not renewed; or iii) if the policy is replaced by another claims-made policy with a retroactive date subsequent to the effective date of this Agreement. Such insurance shall be in an amount not less than $2,000,000 per claim.

(e) Excess Liability (if necessary). The limits of Insurance required in this Agreement may be satisfied by a combination of primary and umbrella or excess insurance. Any umbrella or excess coverage shall contain or be endorsed to contain a provision that such coverage shall also apply on a primary and non-contributory basis for the benefit of the Agency (if agreed to in a written contract or agreement) before the Agency's own primary or self-Insurance shall be called upon to protect it as a named insured. The policy shall be endorsed to state that the Agency, its directors, officials, officers, employees, agents, and volunteers shall be covered as additional insured at least as broad a form as CG 20 10 11 85 or the latest versions of both CG 20 10 and CG 20 37. The coverage shall contain no special limitations on the scope of protection afforded to the Agency, its directors, officials, officers, employees, agents, and volunteers.

2.6.3 All Coverages. The general liability and automobile liability policy shall include or be endorsed to state that: (1) the Agency, its directors, officials, officers, employees, agents, and volunteers shall be covered as additional insured with respect to work by or on behalf of the Consultant, including materials, parts, or equipment furnished in connection with such work using as broad a form as CG 20 10 11 85 or the latest versions of both CG 20 10 and CG 20 37; and (2) the insurance coverage shall be primary insurance as respects the Agency, its directors, officials, officers, employees, agents, and volunteers using as broad a form as CG 20 01 04 13, or if excess, shall stand in an unbroken chain of coverage excess of the Consultant's scheduled underlying coverage. Any insurance or self-insurance maintained by the Agency, its directors, officials, officers, employees, agents, and volunteers shall be excess of the Consultant's insurance and shall not be called upon to contribute with it in any way.

(a) The insurance policies required above shall contain or be endorsed to contain the following specific provisions:

(i) Except for the professional liability policy, the policies shall contain a waiver of transfer rights of recovery ("waiver of subrogation") against Agency, its board members, officers, employees, agents, and volunteers, for any claims arising out of the work of Consultant.

(ii) Policies may provide coverage which contains deductible or self-insured retentions. Such deductible and/or self-insured retentions shall not be applicable with respect to the coverage provided to Agency under such policies. Consultant shall be solely responsible for deductible and/or self-insured retention and Agency, at its option, may require Consultant to secure the payment of such deductible or self-insured retentions by a surety bond or an irrevocable and unconditional letter of credit. The insurance policies that contain deductibles or self-insured retentions in excess of $250,000 per occurrence and $500,000 in aggregate shall not be acceptable without the prior approval of Agency.

(iii) Prior to start of work under this Agreement, Consultant shall file with Agency evidence of insurance as required above from an insurer or insurers certifying to the required coverage. The coverage shall be evidenced on a certificate of insurance signed by an authorized representative of the insurer(s).

(iv) Each policy required in this section shall contain a policy cancellation clause that provides the policy shall not be cancelled or otherwise terminated by the insurer or the Consultant or reduced in limits except after thirty (30) days' prior written notice by mail has been given to the Agency, Attention: Director of Finance & Administration.

(v) Insurance required by this Agreement shall be placed with insurers licensed by the State of California to transact insurance business of the types required herein. Each insurer shall have a current Best Insurance Guide rating of not less than A: VII unless prior approval is secured from the Agency as to the use of such insurer.

(vi) Consultant shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein. Consultant shall maintain evidence of compliance with the insurance requirements by the subcontractors at the job site and make them available for review by Agency.

2.6.4 Reporting of Claims. Consultant shall report to the Agency, in addition to Consultant's insurer, any and all insurance claims submitted by Consultant in connection with the Services under this Agreement.

2.7 Termination of Agreement.

2.7.1 Grounds for Termination. Agency may, by written notice to Consultant, terminate the whole or any part of this Agreement without liability to the Agency if Consultant fails to perform or commits a substantial breach of the terms hereof. Either Party may terminate this agreement on thirty (30) days' written notice for any reason. Upon termination, Consultant shall be compensated only for those Services which have been adequately rendered to Agency, and Consultant shall be entitled to no further compensation. If the Agreement is terminated by Consultant without cause, Consultant shall reimburse Agency for additional costs to be incurred by Agency in obtaining the work from another consultant.

2.8 Ownership of Materials and Confidentiality.

2.8.1 Documents & Data; Licensing of Intellectual Property. This Agreement creates a non-exclusive and perpetual license for Agency to copy, use, modify, reuse, or sublicense any and all copyrights, designs, and other intellectual property embodied in plans, specifications, studies, drawings, estimates, and other documents or works of authorship fixed in any tangible medium of expression, including but not limited to, physical drawings or data magnetically or otherwise recorded on computer diskettes, which are prepared or caused to be prepared by Consultant under this Agreement ("Documents & Data"). The Consultant shall deliver to Agency on demand or upon completion of the Project, all such Documents & Data which shall be and remain the property of the Agency. If the Agency uses any of the data, reports, and documents furnished or prepared by the Consultant for projects other than the project shown on Exhibit A, the Consultant shall be released from responsibility to third parties concerning the use of the data, reports, and documents. The Consultant may retain copies of the materials. The Agency may use or reuse the materials prepared by Consultant without additional compensation to Consultant.

2.8.2 Confidentiality. All Documents & Data, either created by or provided to Consultant in connection with the performance of this Agreement, shall be held confidential by Consultant. All Documents & Data shall not, without the prior written consent of Agency, be used or reproduced by Consultant for any purposes other than the performance of the Services. Consultant shall not disclose, cause, or facilitate the disclosure of the Documents & Data to any person or entity not connected with the performance of the Services or the Project. Nothing furnished to Consultant that is otherwise known to Consultant or is generally known, or has become known, to the related industry shall be deemed confidential. Consultant shall not use Agency's name or insignia, photographs of the Project, or any publicity pertaining to the Services or the Project in any magazine, trade paper, newspaper, television, or radio production, or other similar medium without the prior written consent of Agency.

2.9 Subcontracting/Subconsulting.

2.9.1 Prior Approval Required. Consultant shall not subcontract any portion of the work required by this Agreement, except as expressly stated herein, without prior written approval of Agency. Subcontracts, if any, shall contain a provision making them subject to all provisions stipulated in this Agreement.

3. General Provisions.

3.1.1 Notices. All notices permitted or required under this Agreement shall be given to the respective parties at the following address, or at such other address as the respective parties may provide in writing for this purpose:

Agency:

Las Virgenes Municipal Water District
Attn: District Contact
4232 Las Virgenes Road
Calabasas, CA 91302

Consultant:

Best Best & Krieger LLP
Attn: John D. Freshman
2000 Pennsylvania Avenue, N.W.
Suite 5300
Washington, DC 20006

Such notice shall be deemed made when personally delivered or when mailed, upon deposit in the U.S. Mail, first class postage prepaid and registered or certified addressed to the Party at its applicable address. Actual notice shall be deemed adequate notice on the date actual notice occurred, regardless of the method of service.

3.1.2 Equal Opportunity Employment. Consultant represents that it is an equal opportunity employer and it shall not discriminate against any subconsultant, employee or applicant for employment because of race, religion, color, national origin, handicap, ancestry, sex, or age. Such non-discrimination shall include, but not be limited to, all activities related to initial employment, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff, or termination.

3.1.3 Time of Essence. Time is of the essence for each and every provision of this Agreement. The acceptance of late performance shall not waive the right to claim damages for such breach nor constitute a waiver of the requirement of timely performance of any obligations remaining to be performed.

3.1.4 Agency's Right to Employ Other Consultants. Agency reserves the right to employ other consultants in connection with this Project.

3.1.5 Successors and Assigns. This Agreement shall be binding on the successors and assigns of the Parties.

3.1.6 Assignment or Transfer. Consultant shall not assign, hypothecate, or transfer, either directly or by operation of law, this Agreement or any interest herein without the prior written consent of the Agency.

3.1.7 Amendment. This Agreement may not be altered or amended except in a writing signed by both Parties.

3.1.8 Waiver. No waiver of any default shall constitute a waiver of any other default or breach, whether of the same or other covenant or condition.

3.1.9 No Third Party Beneficiaries. There are no intended third party beneficiaries of any right or obligation assumed by the Parties.

3.1.10 Invalidity; Severability. If any portion of this Agreement is declared invalid, illegal, or otherwise unenforceable by a court of competent jurisdiction, the remaining provisions shall continue in full force and effect.

3.1.11 Governing Law. This Agreement shall be governed by the laws of the State of California. Venue shall be in Los Angeles County.

3.1.12 Attorneys' Fees. If either Party commences an action against the other Party, either legal, administrative or otherwise, arising out of or in connection with this Agreement, the prevailing party in such litigation shall be entitled to have and recover from the losing party reasonable attorneys' fees and all other costs of such action.

3.1.13 Authority to Enter Agreement. Consultant has all requisite power and authority to conduct its business and to execute, deliver, and perform the Agreement. Each

Party warrants that the individuals who have signed this Agreement have the legal power, right, and authority to make this Agreement and bind each respective Party.

3.1.14 Counterparts. This Agreement may be signed in counterparts, each of which shall constitute an original.

3.1.15 Integration. This Agreement represents the entire understanding of Agency and Consultant as to those matters contained herein. No prior oral or written understanding shall be of any force or effect with respect to those matters covered hereunder.

[*Signature Page following*]

IN WITNESS WHEREOF, the Parties hereby have caused this Agreement to be executed the date first written above:

APPROVED:	APPROVED:
Las Virgenes-Triunfo Joint Powers Authority	**Best Best & Krieger LLP**
______________________________________	______________________________________
David W. Pedersen	John Freshman
Administering Agent/General Manager	Senior Director of Governmental Affairs

EXHIBIT A
SCOPE OF SERVICES

1. Identify and Assist with Funding Opportunities: Utilize relationships to monitor federal and state grant programs, and other funding opportunities with a special focus on grants and low-interest loans.

2. Advocacy and Updates: Represent the Las Virgenes Municipal Water District (LVMWD), Triunfo Water and Sanitation District (TWSD), and the Las Virgenes-Triunfo Joint Powers Authority (JPA) before Congress, the state legislature, and federal and state agencies. Support and oppose legislation according to the interests of LVMWD, TWSD, or as the JPA. Keep LVMWD, TWSD, and the JPA informed of current events through updates and reports to ensure that they are informed of needs to advance legislative priorities. Effective advocacy is the result of a comprehensive plan of action that takes place all year long. This includes activities such as drafting background papers, letters of support or opposition, and being prepared to attend and testify at legislative hearings.

3. Relationship and Coalition Building: Set meetings with key decision-makers, and build coalitions. BB&K has a strong network within the Capitol in D.C. and in Sacramento and can utilize these connections to help build relationships and coalitions.

EXHIBIT B
FEE SCHEDULE

The fee for these services is $12,500.00 per month. This covers a fee of $5,000.00 for state services per month, and $7,500.00 for federal services per month. The fee also includes an allowance of $5,000.00 for reimbursable expenses (i.e. travel costs) for the year. The annual total under this Agreement is $155,000.00 for the period beginning the date the Agreement is entered into until the one-year anniversary date.

This Agreement may be renewed, if agreed to in writing by both Parties, each subsequent year for up to two additional years after the expiration of the original Agreement. Any changes in monthly fees and reimbursable expenses for Agreement renewals shall be negotiated and agreed to in writing between the Parties for each renewal period.

EXHIBIT C
KEY PERSONNEL

Key Personnel with Consultant are as follows:

Main Contact:	John Freshman, Senior Director of Governmental Affairs
Routine Contacts (Federal):	Ana Schwab, Deputy Director of Governmental Affairs;
	Lowry Crook, Partner
Routine Contact (State):	Syrus Devers, Director of Governmental Affairs

ITEM 10A

INFORMATION ONLY

September 8, 2020 JPA Board Meeting

TO: JPA Board of Directors

FROM: Engineering and External Affairs

Subject : Saddle Peak and Cordillera Tank Rehabilitation: Reissuance of Call for Bids

---

The Las Virgenes-Triunfo Joint Powers Authority (JPA) approved funding for this matter in the adopted Fiscal Year 2020-21 JPA Budget. On August 4, 2020, the LVMWD Board, acting as Administering Agent of the JPA, authorized the reissuance of a Call for Bids for the construction of Saddle Peak and Cordillera Tank Rehabilitation Project.

SUMMARY:

On November 19, 2019, the LVMWD Board authorized the issuance of a Call for Bids for the Saddle Peak and Cordillera Tank Rehabilitation Project. One bid was submitted and the proposed cost was significantly higher than the Engineer's Estimate; therefore, no recommendation was made to award a construction contract at that time. On January 7, 2020, the LVMWD Board rejected the bid from Spiess Construction Company, Inc., due to the lack of competition.

The scope of work for renovation of the tanks generally consists of recoating the interior and exterior of the tanks, updating or replacing any deteriorated equipment used to operate the tanks, and identifying any seismic upgrades that may be needed. The project was not immediately recommended for re-advertisement due to seasonal constraints associated with taking the tanks out of service. The work must be conducted when water demand is low and after the Santa Ana winds season; December through March were determined to be the preferred months for the work to be performed.

Several contractors indicated that they had declined to bid on the job in 2019 because of similar on-going projects at the same time and lack of capacity to bid on the project. Inviting proposals earlier in the year may increase interest in the project and help to solicit multiple, competitive bids. A review of the bidding documents was also completed and revisions were made to promote a competitive bidding environment.

FISCAL IMPACT:

No

ITEM BUDGETED:

Yes

FINANCIAL IMPACT:

There is no financial impact associated with issuance of a call for bids.

The adopted Fiscal Year 2020-21 JPA Budget includes carry-forward funds for the Saddle Peak Tank and Cordillera Tank Rehabilitation Project. Costs for design and construction work are tracked and allocated separately for each tank because the Saddle Peak Tank is an LVMWD-owned facility and the Cordillera Tank is a JPA-owned facility. The cost of work for the Cordillera Tank will be allocated 70.6% to LVMWD and 29.4% to Triunfo Water & Sanitation District. The cost of work for the Saddle Peak Tank will be allocated 100% to LVMWD.

DISCUSSION:

On May 22, 2018, the LVMWD Board authorized the issuance of a request for proposals to prepare plans and specifications and provide engineering services during construction for the Saddle Peak and Cordillera Tank Rehabilitation Project. Staff recommended accepting a proposal from Cannon Corporation, in the amount of $59,100. On July 24, 2018, the LVMWD Board authorized the execution of a professional services agreement for the design, as well as engineering services during construction. The scope of work for the renovation of both tanks generally consists of recoating the interior and exterior of the tanks, updating or replacing any deteriorated equipment used to operate the tanks, and identifying any seismic upgrades that may be needed.

This project is part of a Tank Coating Master Plan, which was developed as an asset management tool and is used to plan, budget and prioritize rehabilitation of District and JPA water tanks based on multiple factors. Rehabilitation of the Saddle Peak and Cordillera Tanks was originally planned to begin early in 2019; however, circumstances following the Woolsey Fire required construction of the project to be postponed. Seasonal constraints limit the time of year when the tanks can be taken offline. Ideally, the work should be conducted when water demand is low and once the Santa Ana wind season has passed. This typically would occur sometime between December and March. Temporary tanks are proposed to provide continuous service in the Saddle Peak area, while Reservoir No. 3 will be utilized to continue meeting recycled water demands.

On November 19, 2019, the LVMWD Board authorized a Call for Bids for the project. During the bidding process, five contractors expressed interest in the work by attending a pre-bid meeting. One bid was received from Spiess Construction Company, Inc. (Spiess CCI), in the amount of $2,389,200, which was nearly double the Engineer's Estimate of $1,205,500. Upon reviewing the submitted bid and following up with the other contractors, staff determined that the bid did not meet the requirements of a competitive bidding process. Several eligible contractors stated that they declined to bid on the project because of similar on-going projects during the same timeframe. On January 7, 2020, the LVMWD Board rejected the bid from Spiess CCI, and staff proposed the following recommendations for a future solicitation:

- Begin the bidding process during the summer months to avoid conflict with similar work being conducted by prospective bidders.

- Find an equivalent product and list more than one coating manufacturer to promote competitive pricing.
- Award a construction contract in the late summer/early fall to allow more time to complete the project during the winter of 2020-21.
- Re-evaluate the Engineer's Estimate and adjust it, if necessary.

Cannon and staff reviewed the design plans and specifications and updated them as appropriate. An equivalent pre-approved product was added to the coating specifications to promote competitive bidding, and the cost estimate has been adjusted based on staff's review of the previous bid and current market prices. With these changes, the Saddle Peak and Cordillera Tank Rehabilitation Project is ready to proceed with re-advertisement for construction bids.

Following is the proposed bid schedule:

Notice Inviting Sealed Proposals	August 3, 2020
1st Advertisement	August 6, 2020
2nd Advertisement	August 13, 2020
Mandatory Pre-bid Meeting	August 20, 2020
Bids Due	September 16, 2020
Award of Contract	October 6, 2020

The work is categorically exempt from the provisions of the California Environmental Quality Act (CEQA), pursuant to Section 15301(b) of the CEQA Guidelines because it involves rehabilitation of existing facilities with no expansion of use. On November 19, 2019, the LVMWD Board approved a determination that the project is exempt from the provisions of CEQA and authorized the filing of Notice of Exemptions with the County Clerk. Attached for reference are copies of the Notice of Exemptions, one for each site, that were recorded.

GOALS:

Construct, Manage and Maintain All Facilities and Provide Services to Assure System Reliability and Environmental Compatibility

Prepared by: Veronica Hurtado, Assistant Engineer

ATTACHMENTS:

Saddle Peak Notice of Exemption

Cordillera Notice of Exemption

Notice Inviting Sealed Proposals

Print Form

Notice of Exemption

Appendix E

To: Office of Planning and Research
P.O. Box 3044, Room 113
Sacramento, CA 95812-3044
County Clerk
County of: Los Angeles
12400 Imperial Highway
Norwalk, CA 90650

From: (Public Agency): Las Virgenes Municipal Water District
4232 Las Virgenes Road
Calabasas, CA 91302
(Address)

2019 313524
FILED
Dec 04 2019
Dean C. Logan, Registrar – Recorder/County Clerk
Electronically signed by LAKEISHA MCCOY

Project Title: Saddle Peak Tank Rehabilitation

Project Applicant: Las Virgenes Municipal Water District

Project Location - Specific: Saddle Peak Tank is located near Stunt Rd and Schueren Rd at APN 4453017902

Project Location - City: Unincorporated Project Location - County: Los Angeles

Description of Nature, Purpose and Beneficiaries of Project:
The scope of work generally consists of the following: recoating the interior and exterior of the tank, modifying Existing manways, reconfiguring the inlet/outlet piping, replacing deteriorated valves, improving vent systems, updating the roof hatch to current standards, replacing ring seals, and repairing access roads.

Name of Public Agency Approving Project: Las Virgenes – Triunfo Joint Powers Authority

Name of Person or Agency Carrying Out Project: Las Virgenes Municipal Water District

Exempt Status: **(check one):**
- ☐ Ministerial (Sec. 21080(b)(1); 15268);
- ☐ Declared Emergency (Sec. 21080(b)(3); 15269(a));
- ☐ Emergency Project (Sec. 21080(b)(4); 15269(b)(c));
- ☒ Categorical Exemption. State type and section number: Existing Facilities, Section 15301 (b)
- ☐ Statutory Exemptions. State code number:

Reasons why project is exempt:
The project involves rehabilitation of existing facilities with no expansion of use. The project would not have a significant effect on the environment.

Lead Agency
Contact Person: Veronica Hurtado Area Code/Telephone/Extension: (818) 251-2332

If filed by applicant:
1. Attach certified document of exemption finding.
2. Has a Notice of Exemption been filed by the public agency approving the project? ☐ Yes ☐ No

Signature: VHurtado Date: 11/19/19 Title: Assistant Engineer

☒ Signed by Lead Agency ☐ Signed by Applicant

Authority cited: Sections 21083 and 21110, Public Resources Code.
Reference: Sections 21108, 21152, and 21152.1, Public Resources Code.

Date Received

THIS NOTICE WAS POSTED
ON December 04 2019
UNTIL January 03 2020
REGISTRAR – RECORDER/COUNTY CLERK

Print Form

Notice of Exemption

Appendix E

To: Office of Planning and Research

P.O. Box 3044, Room 113
Sacramento, CA 95812-3044

County Clerk
County of: Los Angeles
12400 Imperial Highway
Norwalk, CA 90650

From: (Public Agency): Las Virgenes Municipal Water District

4232 Las Virgenes Road
Calabasas, CA 91302

(Addres

2019 313533
FILED
Dec 04 2019
Dean C. Logan, Registrar – Recorder/County Clerk
Electronically signed by LAKEISHA MCCOY

Project Title: Cordillera Tank Rehabilitation

Project Applicant: Las Virgenes – Triunfo Joint Powers Authority

Project Location - Specific: Cordillera Tank is located in Calabasas, CA along Prado de los Ciervos At APN 2069088029

Project Location - City: Calabasas Project Location - County: Los Angeles

Description of Nature, Purpose and Beneficiaries of Project:
The scope of work generally consists of the following: recoating the interior and exterior of the tank, modifying Existing manways, reconfiguring the inlet/outlet piping, replacing deteriorated valves, improving vent systems, updating the roof hatch to current standards, replacing ring seals, and repairing access roads.

Name of Public Agency Approving Project: Las Virgenes – Triunfo Joint Powers Authority

Name of Person or Agency Carrying Out Project: Las Virgenes Municipal Water District

Exempt Status: **(check one):**

- ☐ Ministerial (Sec. 21080(b)(1); 15268);
- ☐ Declared Emergency (Sec. 21080(b)(3); 15269(a));
- ☐ Emergency Project (Sec. 21080(b)(4); 15269(b)(c));
- ☒ Categorical Exemption. State type and section number: Existing Facilities, Section 15301 (b)
- ☐ Statutory Exemptions. State code number:

Reasons why project is exempt:
The project involves rehabilitation of existing facilities with no expansion of use. The project would not have a significant effect on the environment.

Lead Agency
Contact Person: Veronica Hurtado Area Code/Telephone/Extension: (818) 251-2332

If filed by applicant:

1. Attach certified document of exemption finding.
2. Has a Notice of Exemption been filed by the public agency approving the project? ☐ Yes ☐ No

Signature: VHurtado Date: 11/19/19 Title: Assistant Engineer

☒ Signed by Lead Agency ☐ Signed by Applicant

THIS NOTICE WAS POSTED

ON December 04 2019

UNTIL January 03 2020

REGISTRAR – RECORDER/COUNTY CLERK

Authority cited: Sections 21083 and 21110, Public Resources Code.
Reference: Sections 21108, 21152, and 21152.1, Public Resources Code.

vised 2011

NOTICE INVITING SEALED PROPOSALS (BIDS)

Saddle Peak and Cordillera Tank Rehabilitation Project

NOTICE IS HEREBY GIVEN that the Board of Directors of Las Virgenes Municipal Water District (LVMWD) invites and will receive sealed proposals (bids) up to the hour of 3:00PM on September 16, 2020, for furnishing the work described in the contract documents. Precautions are being taken by LVMWD in response to the COVID-19 outbreak in order to protect employees, customers, and our partners. LVMWD is currently closed to public access. Until further notice, LVMWD is suspending in-person meetings relating to bids (including public bid openings, the hand-delivery of bids by company employees, and in-person pre-bid meetings) to reduce the number of people coming into LVMWD facilities.

This policy is effective, Monday, April 6, 2020, and remains in force until further notice. All bids must be sent by mail to, 4232 Las Virgenes Road, Calabasas, California 91302 or can be dropped into the mail box outside the District Headquarters' main entrance. Bidders must allow enough time for bids to be delivered to LVMWD by the due date. All submittals will be time stamped as soon as they are received. Bids received after the time stated in the Call for Bids will not be accepted and will be returned, unopened, to the bidder. The time shall be determined by the time on the receptionist telephone console in our Headquarters lobby. Said bids shall conform to and be responsive to the Specifications and Contract Documents for said work as heretofore approved by the District.

Pre-bid meetings and other meetings associated with the bidding process will be held via telephone conference and/or through web enabled video conference. Details for these meetings will be provided on bid announcements specific to each project. Any questions related to this announcement, including requests for special accommodations to attend the meetings, may be directed to the Project Manager, Veronica Hurtado at 818-251-2332 or vhurtado@lvmwd.com.

*A **mandatory** pre-bid meeting will be conducted at 9:00AM on August 20, 2020 via teleconference. A pre-recorded video of the job site will be made available to all in attendance at the pre-bid meeting. The meeting link will be issued via addendum or you may request the information from the District Project Manager, well in advance of the meeting time. Attendance at the pre-bid meeting is a condition precedent to submittal of the bid and the District will not consider a bid from any bidder not represented at the pre-bid teleconference.*

A bid opening will also be available for public viewing through video teleconference at 10:00AM on September 17, 2020. The meeting link will be issued via addendum or you may request the information from the District Project Manager, before the bid deadline. A recording of the bid opening will be posted on the District's website at the following link - www.LVMWD.com/PublicWorksContracts.

Sets of contract documents may be downloaded for free by going to http://www.LVMWD.com/Ebidboard and following links to this project.

In order to be placed on the plan holder's list, contractors shall register for free as a document holder for this project on Ebidboard by going to www.LVMWD.com/Ebidboard and following the links to this project. Addendum notifications will be issued through Ebidboard.com, but may also be provided by calling the District's Project Manager. Although Ebidboard will fax and/or email all notifications to registered plan holders after the District uploads the information, Bidders are responsible for obtaining all addenda and updated contract documents.

Each bid must be on the District bid form and shall be sealed and filed with the secretary of the District at or before the time stated in the Notice.

No Contractor or Subcontractor may be listed on a bid proposal for a public works project submitted on or after March 1, 2015 unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5. No Contractor or Subcontractor may be awarded a contract for public work on a public works project awarded on or after April 1, 2015 unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5. Effective January 1, 2016, no Contractor or Subcontractor may perform on a contract for public work on a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5. This project is subject to compliance monitoring and enforcement by the DIR.

All terms and conditions contained in the Specifications and Contract Documents shall become part of the contract. The Board of Directors of Las Virgenes Municipal Water District reserves the right to reject any and all bids and to waive any and all irregularities in any bid.

No bidder may withdraw his bid after the said time for bid openings until 60-days thereafter or until the District has made a final award to the successful bidder or has rejected all bids, whichever event first occurs.

The Board of Directors of the District reserves the right to select the schedule(s) under which the bids are to be compared and contract(s) awarded.

BY ORDER OF THE GOVERNING BODY OF
LAS VIRGENES MUNICIPAL WATER DISTRICT

______________________ __________________________________

Dated *Jay Lewitt, President*