

AGENDA  
IRVINE RANCH WATER DISTRICT  
ENGINEERING AND OPERATIONS COMMITTEE MEETING  
MONDAY, DECEMBER 6, 2021

This meeting will be held in person at the District's headquarters located at 15600 Sand Canyon Avenue, Irvine, California. The meeting will also be broadcasted via Webex for those wanting to observe the meeting virtually.

To observe this meeting virtually, please join online using the link and information below

Via Web:

<https://irwd.webex.com/irwd/j.php?MTID=mc538534614f741ed44c113c948936163>

Meeting Number: 146 860 7987

Meeting Password: Sf4Cv5V4Ctm

PLEASE NOTE: Webex observers of the meeting will be placed into the Webex lobby when the Committee enters closed session. Participants who remain in the "lobby" will automatically be returned to the open session of the Committee once the closed session has concluded. Observers joining the meeting while the Committee is in closed session will receive a notice that the meeting has been locked. They will be able to observe the meeting once the closed session has concluded.

CALL TO ORDER 1:30 p.m.

ATTENDANCE      Committee Chair:    John Withers      \_\_\_\_\_  
                         Committee Member: Karen McLaughlin      \_\_\_\_\_

<u>ALSO PRESENT</u>	Paul Cook	_____	Kevin Burton	_____	Wendy Chambers	_____
	Jose Zepeda	_____	Paul Weghorst	_____	Cheryl Clary	_____
	Rich Mori	_____	Eric Akiyoshi	_____	Richard Mykitta	_____
	Jacob Moeder	_____	Jim Colston	_____	Ken Pfister	_____
	Lars Oldewage	_____	Malcolm Cortez	_____	Scott Toland	_____
	Belisario Rios	_____	Bruce Newell	_____	Mitch Robinson	_____
	Belisario Rios	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____

PUBLIC COMMENT NOTICE

Public comments are limited to three minutes per speaker on each subject. If you wish to address the Committee on any item, you may attend the meeting in person and submit a "speaker slip."

You may also submit a public comment in advance of the meeting by emailing  
comments@irwd.com before 9:00 a.m. on Monday, December 6, 2021.

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## COMMUNICATIONS

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1. Notes: Burton
2. Public Comments
3. Determine the need to discuss and/or take action on item(s) introduced that came to the attention of the District subsequent to the agenda being posted.
4. Determine which items may be approved without discussion.

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## INFORMATION

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| 5. <u>RESEARCH BUSINESS PLAN UPDATE – COLSTON / BURTON</u> |  |
|--|--|

Recommendation: Receive and file.

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## ACTION

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| 6. <u>PFAS TREATMENT UPDATE AND SHALLOW GROUNDWATER UNIT<br/>PFAS TREATMENT SYSTEM CONSULTANT SELECTION – MCGEHEE /<br/>MORI / BURTON</u> |  |
|---|--|

Recommendation: That the Board authorize the General Manager to execute a Professional Services Agreement with Tetra Tech in the amount of \$348,000 for engineering design services for the SGU PFAS Treatment System, Project 11834.

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|---|--|
| 7. <u>CAPITAL IMPROVEMENT PROGRAM ASSET MANAGEMENT –<br/>ROBINSON / AKIYOSHI / BURTON</u> |  |
|---|--|

Recommendation: That the Committee provide input regarding the updated Capital Improvement Program Asset Management project.


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## OTHER BUSINESS

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8. Directors' Comments
9. Adjourn

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Availability of agenda materials: Agenda exhibits and other writings that are disclosable public records distributed to all or a majority of the members of the above-named Committee in connection with a matter subject to discussion or consideration at an open meeting of the Committee are available for public inspection in the District's office, 15600 Sand Canyon Avenue, Irvine, California ("District Office"). If such writings are distributed to members of the Committee less than 72 hours prior to the meeting, they will be available from the District Secretary of the District Office at the same time as they are distributed to Committee Members, except that if such writings are distributed one hour prior to, or during, the meeting, they will be available electronically via the Webex meeting noted. Upon request, the District will provide for written agenda materials in appropriate alternative formats, and reasonable disability-related modification or accommodation to enable individuals with disabilities to participate in and provide comments at public meetings. Please submit a request, including your name, phone number and/or email address, and a description of the modification, accommodation, or alternative format requested at least two days before the meeting. Requests should be emailed to comments@irwd.com. Requests made by mail must be received at least two days before the meeting. Requests will be granted whenever possible and resolved in favor of accessibility.

December 6, 2021  
Prepared by: J. Colston  
Submitted by: J. Colston / K. Burton  
Approved by: Paul A. Cook 

## ENGINEERING AND OPERATIONS COMMITTEE

### RESEARCH BUSINESS PLAN UPDATE

#### SUMMARY:

Staff will provide an update on the research projects in which IRWD is currently involved.

#### BACKGROUND:

Periodically IRWD receives requests to participate in various research projects pertaining to emerging technologies through either direct funding or dedication of in-kind staff resources. Guidelines were developed to assist staff with its evaluation and response to those requests. These guidelines were incorporated into the IRWD Research Business Plan, which also provides a tracking mechanism for the various requests and ongoing research projects and programs in which IRWD participates. The underlying purpose of the Research Business Plan is to ensure that IRWD's research resources are being prioritized and utilized effectively.

One of the components of the Research Business Plan is for staff to provide a status update on the research projects to the Engineering and Operations Committee on a quarterly basis. IRWD actively participates in the Technology Approval Group (TAG) sponsored by Isle Utilities. The TAG hosts numerous developing technology providers in order to match interested agencies with their technologies. A status update on the current research projects is attached as Exhibit "A".

#### FISCAL IMPACTS:

Not applicable.

#### ENVIRONMENTAL COMPLIANCE:

Not applicable.

#### RECOMMENDATION:

Receive and file.

#### LIST OF EXHIBITS:

Exhibit "A" – Research Projects Summary Table

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## Exhibit "A"

### Research Projects Summary Table


No.	Project Title	Project Description	IRWD Contact	Organizations Involved	Type of Research	IRWD Participation Resource	Start Date	Projected Completion Date	Comments/Next Steps
1	UCI Industry-University Research Center-Perfluorinated Compound Sources and Loading at Wastewater Treatment Plants-A Sewershed-Scale Analysis	This project will develop and implement methodology for sewershed analysis to identify raw wastewater sources of PFAS.	Weghorst	UCI Industry-University Research Center	Case study, data review, best practice analysis and technical report.	Staff time for review of reports, sharing information, and site analysis. Also providing automated sampling equipment.	Sep-20	TBD (1-2 years)	The Civil and Environmental Engineering Department at UCI began the research on September 1, 2020. UCI is in the process of collecting and analyzing influent samples from OC San to refine analysis methods. Residential sampling was delayed due to the pandemic; however, the sampling is scheduled to begin in December 2021.
2	Restoration of Local Recharge Sources from Invasive Mussels	This is an independent study that supports a larger effort by the Metropolitan Water District (MWD) to control invasive Dreissenid Mussels. Task 1 is to establish dose-response curves for mussel control with EarthTec QZ at locations that feed IRWD MWD water. Task 2 will evaluate the toxicity of EarthTec QZ to other species including minnow, trout and the water flea.	Colston	Trussel Technologies, Inc.	In situ	IRWD provides \$26K funding and access to Irvine Lake.	Jul-20	Dec-21	Trussel has begun Task 1; however, insufficient mussels have been found in Irvine Lake. IRWD staff continues to take samples at Irvine Lake. The research continues at other local sites using MWD imported water. Three of five sites have completed testing. The final report is scheduled for December 31, 2021.
3	Automated, AI Based CCTV Video Analysis for Pipeline Assessments	The Abyss Extract software utilizes machine learning and AI technologies to automate the analysis of CCTV video footage. CCTV videos of sewer pipes are collected and analysed using machine learning algorithms to identify anomalies. The goal is to decrease the time it takes to inspect, identify and recommend repairs for any defects.	Zepeda	Abyss Solutions	Testing and Optimization	Staff time for review of reports, sharing information, and compare results of software tool against current methods.	Apr-21	Aug-21	Technology will be reviewed by staff for possible implementation to optimize current work practices of inspecting sewer pipelines and identifying defects. A second round of CCTV data will be provided by Abyss Solutions. The first data set was not consistent with field conditions. <b>Project testing completed.</b> We will be testing a similar product and will compare the results to make a decision on which product provides the best value.
4	Bio-electrochemical Sensor for Real-time Monitoring of Microbial Activity and Organic Carbon	The SENTRY system can be inserted at various locations at the treatment process (aerobic and anaerobic), providing real-time visualisation of microbial metabolic activity and correlations to bio-available carbon. The sensor provides real-time data for insight on the health of the treatment plant and organic load at key locations (influent, nutrient removal bioreactors, anaerobic digesters and effluent).	Zepeda	Island Water Technologies (IWT)	Treatment Process Optimization	Staff time for review of performance data.	Jun-20	Feb-22	The installation of the test unit is currently on hold. Staff will be reviewing results from a trial that was performed at LACSD prior to moving forward.

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December 6, 2021

Prepared by: J. McGehee / R. Mori

Submitted by: K. Burton

Approved by: Paul A. Cook 

## ENGINEERING AND OPERATIONS COMMITTEE

### PFAS TREATMENT UPDATE AND SHALLOW GROUNDWATER UNIT PFAS TREATMENT SYSTEM CONSULTANT SELECTION

#### SUMMARY:

Per- and polyfluoroalkyl substance (PFAS) compounds have emerged as “contaminants of concern” primarily due to human health impacts. Design of treatment systems to remove PFAS compounds from IRWD’s Orange Park Acres Well No. 1 (OPA-1) and the Department of the Navy’s (DON) Well ET-1 are nearing completion, and the design for the DON’s extraction wells that discharge to IRWD’s Shallow Groundwater Unit (SGU) treatment facility will begin soon. To facilitate design and construction of the SGU treatment system, staff recommends the Board authorize the General Manager to execute a Professional Services Agreement in the amount of \$348,000 with Tetra Tech for engineering design services for the SGU PFAS Treatment System.

#### BACKGROUND:

##### PFAS Treatment Facilities at Well OPA-1:

The engineering design for the PFAS treatment facilities at Well OPA-1 is nearly complete. AECOM is the design engineer for the PFAS removal facilities Well OPA-1. The Well OPA-1 PFAS removal facilities will consist of two pairs of ion exchange vessels that will be capable of treating up to 3,200 gallons per minute (gpm). Orange County Water District (OCWD) is administering the OPA-1 design contract with AECOM, while IRWD provides the day-to-day management and technical oversight of the design development. OCWD is funding the design and construction of the OPA-1 facilities. Staff anticipates that the design documents for these facilities will be complete in January 2022, after which the construction of this project will be put out to bid. Construction of the PFAS removal facilities at Well OPA-1 is anticipated to be completed by Winter 2023.

##### PFAS Treatment Facilities at Well ET-1:

The engineering design for the PFAS treatment facilities at Well ET-1 is also nearly complete. Tetra Tech is the design engineer for the PFAS removal facilities Well ET-1. The Well ET-1 facilities will consist of two 40,000-pound granular activated carbon vessels to treat both PFAS and volatile organic compounds (VOCs). The vessels will be capable of treating up to 1,000 gpm to be utilized for non-potable purposes. Exhibit “A” shows the location of the ET-1 facilities. IRWD is managing the design development in close collaboration with the DON. The design and construction of the Well ET-1 facilities will be fully funded by IRWD’s pollution insurance policy. Staff anticipates that the design documents for these facilities will be complete in January 2022. Well ET-1 will be advertised for construction bids upon final approval from the DON, which is expected in the next few months. Construction of the PFAS removal facilities at Well ET-1 is anticipated to be completed by Spring 2023.

PFAS Treatment Facilities at the SGU:

The existing SGU treatment facility provides treatment for 43 DON extraction wells located within the boundary of the former MCAS El Toro site (also shown on Exhibit “A”) that contain elevated levels of VOCs. The existing treatment system consists of a packed-tower air stripper and vapor phase granular activated carbon (GAC) adsorbers. The facility is capable of treating a maximum flow of 550 gpm. Treated water from the facility is pumped into the South Irvine Brine Line, which conveys the water to the Los Alisos Water Recycling Plant, where the treated water is conveyed to the SOCWA ocean outfall for disposal.

In recent years, elevated levels of PFAS compounds have been detected at SGU, which cannot be removed by the existing treatment system. To effectively remove both VOCs and PFAS compounds from the SGU influent water, the existing treatment system will be replaced with a liquid phase GAC treatment system, similar to the improvements currently being designed for Well ET-1.

In accordance with the 2001 Settlement Agreement, IRWD has maintained a \$20,000,000 pollution insurance policy to reasonably cover risks associated with the facilities included in the 2001 Settlement Agreement. Staff submitted a claim to the insurance carrier to cover the cost associated with implementing modifications at SGU to incorporate PFAS treatment. The insurance carrier accepted the claim, so all costs associated with the design, construction, and implementation of PFAS treatment facilities at SGU will be reimbursed by the insurance carrier. The insurance policy carries a \$250,000 deductible, but that deductible has already been satisfied through the ongoing work associated with implementing PFAS treatment improvements at Well ET-1.

In late 2020, staff contracted with Tetra Tech to identify and evaluate various treatment systems that would be capable of effectively removing both PFAS and VOCs from the water produced at Well ET-1, which also has significant concentrations of PFAS. The evaluation included analysis of existing water quality parameters, finished water quality goals, pretreatment requirements, and evaluation of media selection options including GAC and ion exchange. The evaluation concluded with a recommendation to replace the existing air stripper and vapor phase GAC treatment systems with a liquid phase GAC treatment system, which would effectively remove both VOCs and PFAS compounds. The recommended improvements at Well ET-1 will also be incorporated at SGU since both facilities currently contain the same vapor phase GAC adsorbers for VOCs removal.

In parallel with the Tetra Tech evaluation described above, staff directed Jacobs Engineering Group to conduct bench-scale treatability testing of various adsorbent products capable of effectively removing PFAS compounds. The bench testing program consisted of a series of rapid small-scale column tests for each of the adsorbent products, which can simulate months to years of full-scale operations in a relatively short period of time. This reduces the time for testing, the amount of water required, and the waste produced. The testing has been completed, and Jacobs Engineering identified the Calgon F400 GAC media as the highest-performing media, which is the same recommendation that was made for the media proposed at Well ET-1.



For the past several years, staff has coordinated closely with Orange County Water District (OCWD), DON, and the Department of Justice to develop ways of addressing the PFAS compounds in the wells. All parties have been actively involved in developing solutions and are supportive of the implementation of the proposed treatment system that will address both PFAS compounds and VOCs. Staff will continue to coordinate closely with all parties as the implementation of the proposed improvements progresses.

*SGU PFAS & VOCs Removal Facilities Design Consultant Selection:*

Staff requested a proposal from Tetra Tech for engineering design services for the proposed treatment system at the SGU. In addition to developing the design of the GAC treatment system at Well ET-1, Tetra Tech was also the design engineer for the existing treatment system at SGU, has extensive knowledge of the existing site, has performed several recent similar PFAS treatment improvement projects for OCWD and other local agencies, and is best suited to progress the design effort quickly and efficiently. Tetra Tech's proposal is provided as Exhibit "B" and includes scope for removal of the existing treatment system and design of the proposed treatment system and other ancillary improvements to existing infrastructure that are needed to support the proposed treatment system. Staff confirmed that the insurance carrier does not require multiple proposals and that IRWD can select a design engineer of its choice.

Staff reviewed Tetra Tech's scope of work and fee and recommends that the Board authorize the General Manager to execute a Professional Services Agreement with Tetra Tech in the amount of \$348,000 for engineering design services for the SGU PFAS Treatment System.

*SGU PFAS & VOCs Removal Facilities Anticipated Schedule:*

The project is anticipated to be completed in accordance with the following schedule milestones:

Design Notice of Award	December 13, 2021 (subject to Board approval)
Kick-off Meeting	January 2022
90% Design Submittal	April 2022
100% Design Submittal	June 2022
Plans Approved	July 2022
Bid Opening	August 2022
Construction Notice of Award	September 2022
Construction Completion	August 2023

FISCAL IMPACTS:

All three projects are included in the FY 2021-22 Capital Budget and the existing budgets are sufficient. The SGU PFAS Treatment System, Project 11834, and Well ET-1 Treatment System, Project 11171, will be funded through insurance reimbursement. The Well OPA-1 Treatment System, Project 11720, will be funded by the OCWD.

ENVIRONMENTAL COMPLIANCE:

These projects are subject to the California Environmental Quality Act (CEQA). In conformance with the California Code of Regulations Title 14, Chapter 3, Section 15004, the appropriate environmental document will be prepared when “meaningful information” becomes available for the SGU and Well ET-1 Treatment System projects. It is expected that preliminary analysis will lead to the preparation of a Notice of Exemption. For the OPA-1 project, section 15164 of the State CEQA Guidelines provides for the preparation of an addendum to a previously certified MND by a lead agency or a responsible agency if some changes or additions to the project are necessary but none of the conditions described in CEQA calling for preparation of a subsequent MND have occurred. Based on the information and analysis presented in Addendum No. 1, the Determination section of the Addendum set forth the proposed determinations by IRWD that none of such conditions occurred and therefore, IRWD’s Board of Directors approved Addendum No. 1 on September 27, 2021. Staff filed a Notice of Determination with the Orange County Clerk-Recorder and the State Clearinghouse on September 28, 2021.

RECOMMENDATION:

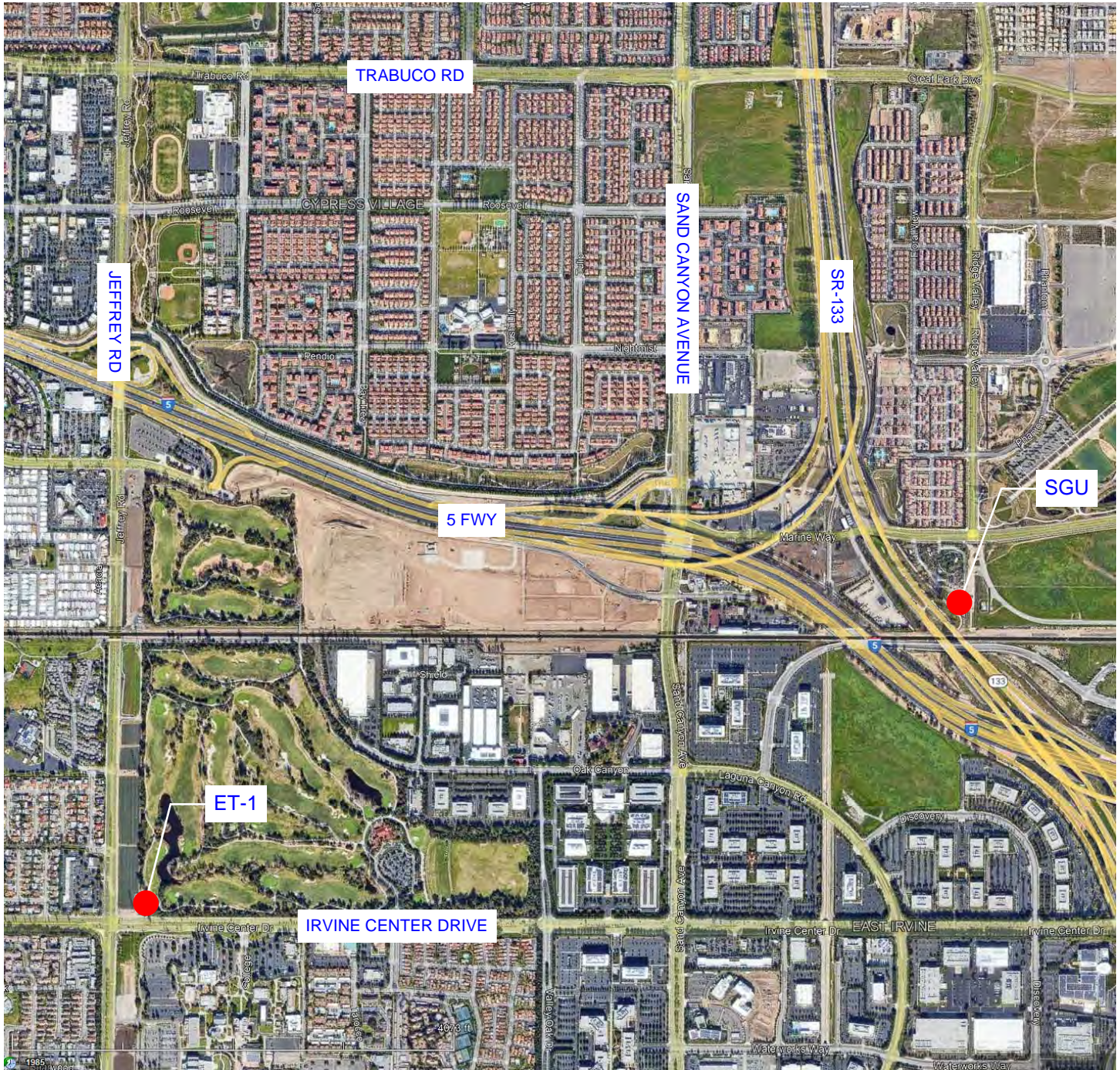
That the Board authorize the General Manager to execute a Professional Services Agreement with Tetra Tech in the amount of \$348,000 for engineering design services for the SGU PFAS Treatment System, Project 11834.

LIST OF EXHIBITS:

Exhibit “A” – Location Map for ET-1 and SGU Facilities  
Exhibit “B” – Tetra Tech Scope of Work and Fee Proposal



EXHIBIT "A"  
LOCATION MAP  
FOR ET-1 AND SGU FACILITIES





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November 12, 2021

Mr. Richard K. Mori, PE  
Engineering Manager – Capital Projects  
Irvine Ranch Water District  
15600 Sand Canyon Avenue  
Irvine, CA 92618

**Reference: Proposal to Provide Design Services for Shallow Groundwater Unit (SGU)  
PFAS Water Treatment Plant**

Dear Mr. Mori:

Thank you for providing Tetra Tech with the opportunity to submit our proposal for design of the SGU PFAS Water Treatment Plant project. We plan to use the same experienced, local team of water quality experts and design engineers currently completing the Well ET-1 PFAS project. Our team is very familiar with the requirements of these types of projects. The team has recently completed the design on three similar PFAS projects for Orange County Water District.

Our team will work closely with the Irvine Ranch Water District (IRWD) throughout the design to ensure that we provide detailed design drawings and contract documents. As you know our team is very familiar with the SGU site from our past design projects.

This proposal includes information on the following:

- Scope of Work
- Qualifications
- Project Team
- Drawing Sheet Count
- Schedule
- Price Proposal

Our team is available to begin work on the project immediately upon receipt of your authorization to proceed. As outlined in our schedule we will have the project designed and ready to bid within 6 months of receiving your notice to proceed.

A detailed breakdown of tasks, labor hours and expenses are also included. Tetra Tech will provide the services listed in our Scope of Work for a not to exceed fee of \$348,000.

If you have any questions regarding our proposal, please feel free to contact us.

Sincerely,

A blue ink signature of Steve Tedesco, consisting of a stylized 'S' and 'T' followed by a horizontal line.

Steve Tedesco, PE  
Senior Vice President

SDT/de

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## SCOPE OF WORK

Tetra Tech proposes to provide the following Scope of Work for the SGU PFAS Water Treatment Plant Design based on the information provided by IRWD.

All work performed on the project will conform to the IRWD standards and requirements including but not limited to the following: IRWD Project Manual; IRWD Construction Manual; and IRWD Electrical, Instrumentation, and Control (I&C) Design Standards.

### 1.0 Design

#### 1.1 Project Management

Tetra Tech will conduct project management activities to ensure adherence to scope, schedule, and budget; promote efficient communication between Tetra Tech, IRWD, and others as required; and implement an effective quality assurance/quality control (QA/QC) program.

- 1.1.1 Site Survey – Tetra Tech will perform a topographic survey of the treatment plant site and the domestic water pipeline that will be designed from Marine Way connection to the plant. The topographic survey will collect all site features as well as surface utilities within the project area extending to the far side of the street. Survey will identify or set onsite horizontal and vertical control points to assist during the construction phase of the project. The survey will also include locating the existing IRWD water line easement and identifying any obstructions in the easement.
- 1.1.2 Geotechnical Report – Our geotechnical engineer will review the existing previously completed geotechnical report for the site. They will then drill, sample and log one hollow-stem auger boring at the site to a depth of 20 to 25 feet below existing grade or auger refusal, whichever is shallower. Boring log and laboratory testing will be reviewed, and recommendations provided for the following:
  - 1.1.2.1 Site conditions
  - 1.1.2.2 Geologic hazards
  - 1.1.2.3 Seismicity per 2016 California Building Code
  - 1.1.2.4 Corrosivity of soil
  - 1.1.2.5 Foundation design parameters
  - 1.1.2.6 Lateral earth pressures
  - 1.1.2.7 Pipe installation
  - 1.1.2.8 Construction considerations
- 1.1.3 Quality Control/Quality Assurance (QA/QC) Plan – Tetra Tech will prepare a job specific QA/QC Plan for the project. It will include the staff responsible for QA/QC along with the method of performing and documentation.
- 1.1.4 Water Quality Analysis – Our water quality expert will review the water quality data provided and determine the design parameters required for pretreatment, media selection and backwashing requirements. We will also incorporate the results of the RSSCT testing being provided by Jacobs into our design criteria. A memorandum

explaining our analysis of the Jacobs results and our recommendations for incorporating them into our design will be provided for IRWD review.

- 1.1.5 Preliminary Site Layouts and Sizing – Our team will provide preliminary design layouts and equipment sizing for the project. The SGU facility will be sized for a maximum flow of 550 GPM. We will review the existing influent pumps to confirm if they are sized adequately for the new treatment plant and recommend upsizing if required.
- 1.1.6 Meetings – We have included a total of ten meetings during the design phase of the project including: Kickoff Meeting, Review Meeting at 60%, 90% and 100% plus six-monthly status review meeting.
- 1.1.7 Preparation of Project Status Reports – Tetra Tech will prepare weekly and monthly status reports. Each weekly status report shall be submitted on Monday and shall consist of a brief (one to two paragraphs) e-mail summarizing the activities completed the previous week, the activities planned for the upcoming week, and critical decisions that need to be made. Each monthly status report shall be submitted along with the billing invoice for that month and shall provide more detail, summarizing the work completed and reviewing work status relative to budget and schedule. The project schedule shall also be updated monthly for inclusion in the monthly status report.
- 1.2 Design Drawings – Tetra Tech will prepare detailed construction drawings for each set of Contract Documents in the latest version of AutoCAD and using NCS V4.0 layering standards, on 22-inch x 34-inch sheets utilizing IRWD's standard border template. Separate sheets with sheet index/location map/legend, general notes, index map, construction notes, phasing, and detail connections will be included. Construction notes will be used (callouts on the plans are not allowed) on all construction drawings. Existing IRWD utilities will be identified on the plan view by as-built plan set number with the pipeline material and IRWD pressure zone labeled. The index map will include sheet legend, final alignment, valve locations, surrounding streets, and significant project site locations. Construction plans will be prepared using the NAVD 88 and NAD 83 survey standards.
  - 1.2.1 Design 60% Plans – Preliminary design level drawings will be prepared at approximately 60% complete level including:
    - 1.2.1.1 General (3 sheets)
    - 1.2.1.2 Civil and Demolition (6 sheets)
    - 1.2.1.3 Mechanical Process (6 sheets)
    - 1.2.1.4 Structural (4 sheets)
    - 1.2.1.5 Electrical (6 sheets)
    - 1.2.1.6 Instrumentation (4 sheets)
    - 1.2.1.7 Traffic Control Plans (3 sheets)
  - 1.2.2 Draft Specifications – We will provide a Draft set of project specifications for review by IRWD. Draft Specifications at 60% will include Technical Specifications only.
- 1.3 90% Design – Tetra Tech will prepare and submit a 90% level design and specifications for the project including:
  - 1.3.1 Address District comments on 60% Design.

- 1.3.2 Design 90% Plans – Provide the following plans at a 90% level:
  - 1.3.2.1 General (6 sheets)
  - 1.3.2.2 Civil and Demolition (11 sheets)
  - 1.3.2.3 Mechanical/Process (9 sheets)
  - 1.3.2.4 Structural (7 sheets)
  - 1.3.2.5 Electrical (6 sheets)
  - 1.3.2.6 Instrumentation (4 sheets)
  - 1.3.2.7 Traffic Control (3 sheets)
- 1.3.3 Specifications 90% – We will provide a 90% complete level of specifications for the project including Technical Specification, Special Provisions, Bid Descriptions and Bid Forms.
- 1.3.4 Cost Estimate 90% – We will provide a cost estimate based on the 90% plans and specifications. We will also provide an analysis of costs to justify the amount of contract liquidated damages.
- 1.4 Final Design – Tetra Tech will prepare and submit a Final Design and specifications for the project including:
  - 1.4.1 Address comments on 90% Design.
  - 1.4.2 Final Design Plans – Provide the following plans at a 100% level:
    - 1.4.2.1 General (6 sheets)
    - 1.4.2.2 Civil and Demolition (11 sheets)
    - 1.4.2.3 Mechanical/Process (9 sheets)
    - 1.4.2.4 Structural (7 sheets)
    - 1.4.2.5 Electrical (6 sheets)
    - 1.4.2.6 Instrumentation (4 sheets)
    - 1.4.2.7 Traffic Control (3 sheets)
  - 1.4.3 Specifications – We will provide a 100% complete Technical Specifications, Special Provisions, Bid Descriptions and Bid Forms for the project.
  - 1.4.4 Final Cost Estimate – We will provide a cost estimate based on the Final Design plans and specifications.

## 2.0 Additional Services

- 2.1 Demolition of Existing Facilities – Tetra Tech will provide a summary of onsite facilities that are recommended for demolition that may interfere with the proposed locations of any new facilities.
- 2.2 Project Schedule – Tetra Tech will prepare a project schedule which includes detailed schedules for both design and construction activities. The schedule will include all critical factors impacting the project schedule including implementation, permitting, and coordination activities to ensure that the project is completed in accordance with the proposed schedule. The schedule shall be prepared in Microsoft Project and submitted with the 90% and 100% design deliverables.



- 2.3 Additional Facility Evaluations – IRWD anticipates that through a review of background information and the execution of the work, additional onsite facilities will need to be reviewed and evaluated. We have budgeted \$15,000 for evaluation of additional facilities located at the site as requested by IRWD. Work under this task will proceed only as authorized by IRWD.
- 2.4 Permitting and Easement Support – IRWD anticipates that through a review of background information and the execution of the work, additional permits and/or easement may be required. We have budgeted \$10,000 for evaluation of additional permits and/or easements as requested by IRWD. Work under this task will proceed only as authorized by IRWD.
- 2.5 CEQA Documentation – IRWD will hire a CEQA consultant separately from this contract to prepare the CEQA documentation for this Project. IRWD anticipates the preparation of a Mitigated Negative Declaration or Notice of Exemption. Tetra Tech may need to review portions of the environmental document, prepare exhibits, attend meetings, and/or provide project specific information. We have budgeted \$5,000 for supporting IRWD and the CEQA consultant through the CEQA documentation process.
- 2.6 Obtain City of Irvine Encroachment Permit – Tetra Tech will submit pipeline plans and traffic control plans to the City of Irvine for review. We will address all City comments and process a final permit with the City. We have included a City plan check fee of \$1,500 and a City permit/inspection fee of \$2,000 in our price proposal.

### **3.0 Bid Phase Services**

During the bidding period, Tetra Tech will assist with providing information and clarification of bid documents to prospective bidders. This shall include the preparation of up to three addenda including revisions to the design plans and specifications and assistance with addressing bidder questions. We have budgeted the following hours for these tasks:

- 3.1 Plan Revisions – Ten hours of appropriate staff time for plan revisions to the construction drawings.
- 3.2 Specification Revisions – Ten hours of appropriate staff time for revisions or additions to the project specifications.
- 3.3 Bidder Questions – Ten hours of appropriate staff time to address and respond to bidder questions.

## QUALIFICATIONS

Tetra Tech offers a full range of professional services related to groundwater contaminant characterization and remediation. We have more than 50 years of experience in the groundwater field. Our extensive groundwater knowledge covers all phases of concern, including site investigation and characterization, testing, remedial engineering, regulatory support, treatment facility design, construction management, operation, and maintenance. This section summarizes our experience on relevant projects in which proposed team members have participated on. The following project descriptions demonstrate that our team members have the experience to successfully implement the proposed project:

### NATIONWIDE PFAS EXPERIENCE MATRIX

PROJECT/LOCATION	CLIENT TYPE
Drinking Water and Groundwater PFOA/PFOS at Former Pease Air Force Base, NH	Government
Nationwide PFOS and PFOA ARNG owned/operated drinking water systems, Nationwide	Government
PFAS Groundwater Testing, City of Cape Canaveral, FL	Municipal
Muskogee Mill Water PFAS Sampling, OK	Industrial
Facility Wide PFAS PA/SI, Bethpage, NY	Government
Site Investigation for PFAS Contamination, Brunswick, ME	Government
Swanson PFAS Engineering Investigation, Georgetown, Washington, D.C.	Industrial
On-Site Perfluoroalkyl Substances Investigation, Former Naval Air Station, Cecil Field, FL	Government
Land use control management, real estate support and PFAS, CNC Charleston, SC	Government
Owasso Wastewater PFAS Assessment, MI	Industrial
NAS Corpus Christi PFAS PA/SI, Corpus Christi, TX	Government
PFAS Treatment System Design, Wallops Flight Facility, VA	Government
PFAS Excavation Dewatering Fluids Treatment, Kennedy Space Center, FL	Government
PFAS Site Investigation, Kalamazoo, MI	Industrial
Martha's Vineyard/PFAS MCP Services, Marlborough, MA	Municipal
Tank Farms Groundwater PFAS Investigations (39 Wells), Newport, RI	Government

### LOCAL TREATMENT PLANT EXPERIENCE MATRIX (STUDY, DESIGN & COST ESTIMATING)

PROJECT/LOCATION	CAPACITY (MGD)	CONTAMINANT REMOVAL	TREATMENT
Serrano Water PFAS WTP, Villa Park, CA	4.0	PFOA, PFOS	IX
Kimberley 1A PFAS WTP, Fullerton, CA	4.3	PFOA, PFOS	IX
Fullerton Main Plant, Fullerton, CA	12.0	PFOA, PFOS, TCE	GAC
YLWD Headquarters Plant, Placentia, CA	25.0	PFOA, PFOS	IX
PFAS Study for 5 Wells, Downey, CA	3.0 to 4.5	PFOA, PFOS	IX
Well ET-1 PFAS Study & Design, Irvine, CA	1.4 to 4.5	PFOA, PFAS, TCE	GAC
Well #15, Huntington Park, CA	2.0	TCE	GAC
Well #9 WTP, Signal Hill, CA	2.6	Color, TOC, Benzene	NF, GAC
MTBE WTP, San Juan Capistrano, CA	5.3	MTBE	GAC
Well #9 WTP, Signal Hill, CA	2.6	Color, TOC, Benzene	NF, GAC
Richardson WTP, Loma Linda, CA	6.9	TCE, Perchlorate	GAC, IX
Tippecanoe Final Expansion, Redlands, CA	3.5	TCE, Perchlorate	GAC, IX
Burbank Operable Unit, Burbank, CA	13.0	TCE, PCE, 1,2,3-TCP, 1, 4-Dioxane	GAC, UVAOP

Legend: GAC – Granular Activated Carbon IX – Ion Exchange UVAOP – Ultraviolet Light Advanced Oxidation Process

# OCWD PFAS On-Call Design Contract

ORANGE COUNTY, CALIFORNIA



#### owner:

Orange County Water District  
Chris Olsen, PE  
714.378.3232

#### schedule:

2020 - 2021 (Design)

#### value:

\$30M (construction)

#### key staff:

Steve Tedesco, PE, BCEE  
Project Manager

Tom Epperson, PE  
QA/QC

James Christopher, PE, BCEE  
QA/QC

Kara Buttacavoli, PE  
Project Team Lead

Amanda Taylor, PE  
Process Engineer

Crisna Raymond, PE  
Project Engineer

Victor Ramirez, PE, SE  
Structural Engineer

Mazen Kassar, PE  
Electrical Engineer

Nicole Han, PE I&C  
Engineer

The OCWD selected Tetra Tech as one of the Engineering Firms to design PFAS Systems for their groundwater producers. Tetra Tech is currently working on the following four projects:

- ▶ **Serrano Water District Well #5 and #9** (Completed Design) – This project consists of a 3,000 GPM IX System with a bag filter pre-treatment, 3,000 GPM Booster Pump Station and new chemical feed system for disinfection. Estimated Const. Cost - \$6.2M.
- ▶ **Kimberley Well 1A** (Completed Design) – Located on a very small site with a single well this facility is designed to produce 3,000 GPM using an IX System with a bag filter pre-treatment and new chemical feed system for disinfection. Estimated Const. Cost - \$3.7M.
- ▶ **Fullerton Main Plant** – The Fullerton Main Plant will treat six (6) onsite wells with a total capacity of 10,100 GPM. PFOS, PFOA and VOCs will be removed using 6 to 12 ft diameter, 40,000 lb. GAC vessels that will discharge into an existing forebay then pumped into the distribution system. The remaining wells will be treated with an IX system consisting of 8 vessels and bag filters for pre-treatment. Estimated Const. Cost - \$26.5M.
- ▶ **Yorba Linda Water District Headquarters Plant** (Completed Design) – This system will treat water from 10 wells with a total capacity of 17,400 GPM. An IX System consisting of 11 pairs of Lead/ Lag Vessels (22 vessels total), bag filter pre-treatment, Booster Pump Station, and new Onsite Generation System for chlorine disinfection. In order to get the system on the existing site an extensive analysis of the site improvements was completed. Estimated Const. Cost - \$32.5M.

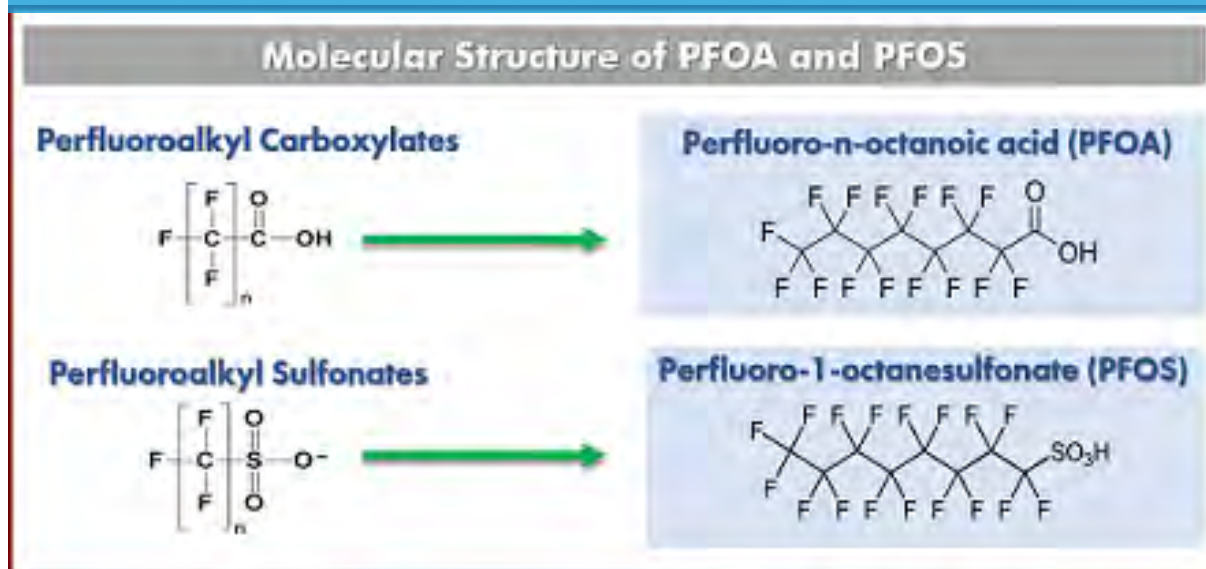
The Tetra Tech team prepared the Engineer's Report and Operating Plan for the State of California Division of Drinking Water (DDW) for each of the projects.

## Innovation

- *Performed detailed operational analysis of IX and GAC usage from both RSCCT and Pilot Data.*
- *Used early submittal process to obtain DDW approvals in less than 5 months from start of the design.*
- *Performed detailed wells analysis to determine how to maximize well production after adding IX and GAC systems.*

# PFAS Study for Five Wells

DOWNEY, CALIFORNIA



**owner:**

City of Downey  
Dan Mueller, PE  
562.904.7110

**schedule:**

2020 - 2021

**value:**

\$4M (construction)

**key staff:**

Steve Tedesco, PE, BCEE  
Principal in Charge

Kara Buttacavoli, PE  
Project Engineer

Amanda Taylor, PE  
Process Engineer

Crisna Raymond, PE  
Project Engineer

Victor Ramirez, PE, SE  
Structural Engineer

Eric Yuen, PE, SE  
Structural Engineer

Mazen Kassar, PE  
Electrical Engineer

Nicole Han, PE  
Electrical Engineer

The City of Downey found that they had five existing groundwater wells in their system that had PFOA and PFAS higher than the new California Response Levels (RL) set in February 2020. Tetra Tech was hired to review perform a study to determine the best means for the City to continue to operate the wells.

Alternatives were analyzed including isolating certain zones in the wells that contained PFAS, blending PFAS contaminated water with other City well water, using IX or GAC wellhead treatment and/or piping PFAS contaminated water to a central location for treatment.

The scope of work of the project includes:

- ▶ Analyze Project Water Quality
- ▶ Review Well Screen Data to determine if well modifications can solve the PFAS issue
- ▶ Develop options for treating the PFAS at the Wellhead
- ▶ Develop option for treating PFAS at a Central Location
- ▶ Determine if IX or GAC treatment should be used
- ▶ Develop capital and operations cost estimates

## Innovation

- *Well sites are within a highly developed urban area.*
- *All existing well sites are on very small sites.*
- *Detailed analysis of Capital and Operating Costs.*
- *Study used to supplement funding application.*



# Well ET-1 PFAS Study & Design

IRVINE, CALIFORNIA



## owner:

Irvine Ranch Water District  
Rich Mori, PE  
949.453.5571

## schedule:

2020 - 2021

## value:

\$4M (construction)

## key staff:

Steve Tedesco, PE, BCEE  
Principal in Charge

Kara Buttacavoli, PE  
Project Engineer

Amanda Taylor, PE  
Process Engineer

Victor Ramirez, PE, SE  
Structural Engineer

Mazen Kassir, PE  
Electrical Engineer

ET-1 was developed to increase utilization of the Irvine Subbasin through recovery and treatment of VOC- impaired, poor-quality groundwater. The project cleans up the contaminated VOCs, with the treated water used for non- potable purposes. Water extracted from inside the VOC plume is treated using granular activated carbon and air stripping technologies. The scope of work of the project includes:

- ▶ Analyze Project Water Quality
- ▶ Develop three options for treating the PFAS discovered at ET-1
- ▶ Develop three option to include wells ET-1 and 78 into the project if PFAS is found at those wells
- ▶ Determine if IX or GAC treatment should be used
- ▶ Develop capital and operations cost
- ▶ Prepare Final Design, Schedule, and Cost Estimate

## Innovation

- *Site with VOCs and very High PFAS and PFOA levels.*
- *Existing Operating Site with small footprint.*
- *Treated water will be used in the non-potable distribution system for irrigation and industrial uses.*

# Well No. 15 Water Treatment System

HUNTINGTON PARK, CALIFORNIA



## owner/operator:

Water Replenishment District  
of Southern California  
Charlene King  
562.275.4252

## schedule:

2018 - 2019

## value:

\$1.1M (construction)

## role:

Lead Designer and  
Engineer of Record

## key staff:

Steve Tedesco, PE, BCEE  
Project Manager

Corey Hess, PE  
Civil Engineer

Mazen Kassar, PE  
Electrical Engineer

Victor Ramirez, PE, SE  
Structural Engineer

Nicole Han, PE  
I&C Engineer

The City of Huntington Park's Well 15 was drilled in 1954 at a depth of 1,582 feet and design capacity of 1,400 gpm. The current capacity is 1,050 gpm. Since 1986, this well has been affected with elevated concentrations of trichloroethylene (TCE). In 1994, a treatment system was installed using six low profile air strippers, which were no longer effective.

Tetra Tech was hired by the Water Replenishment District of Southern California to provide a preliminary design report, final design, and construction engineering services to upgrade the Wellhead Treatment system at Huntington Park Well 15. Design included removing the existing air stripping units at Well 15 and replacing with the liquid phase granular activated carbon (LPGAC) treatment system to remove contamination, particularly VOCs from the well. Tetra Tech worked closely with GAC suppliers to incorporate the new LPGAC system into the existing well, pumping and storage facilities onsite. In addition, coordination for deliveries of LPGAC was also incorporated into the design.

## Innovation

- Tetra Tech worked closely with the City and WRD to coordinate work on a very small site.
- Special design consideration was required for GAC delivery, backwash and well purge water discharge.
- Tetra Tech prepared all reports and permit applications for the DDW approvals.

# Well No. 9 NF & GAC Plant

SIGNAL HILL, CALIFORNIA



## owner:

City of Signal Hill  
Cecil Looney  
562.989.7253

## schedule:

2010 - 2011

## value:

\$6.8M (construction)

## role:

Lead Design Report Author

## key staff:

Steve Tedesco, PE, BCEE  
Project Manager

Kara Buttacavoli, PE  
Project Engineer

Beverly Encina, PE  
Design Engineer

Crisna Raymond, PE  
Resident Engineer

Mazen Kassar, PE  
Electrical Engineer

Tetra Tech was contracted by City of Signal Hill to prepare a preliminary design report to treat water with high color from Well No. 9. A membrane treatment system was proposed to be used to remove color and organics from the groundwater.

The membrane system was designed to treat well water containing low salinity (less than 400 ppm TDS) and high level of color (over 50 color units). The objective of the treatment was to produce potable water with color below 5 color units without significant reduction of concentration of dissolved ions.

The NF membrane system was designed for operation at a recovery rate of 98%. Based on operation of similar units at other locations and consultations with the membrane manufacturer, operation at this level of high recovery rate was possible using a three stage configuration. The feasibility study also analyzed several different treatment capacities from 1,200 gpm to the full well capacity of 2,000 gpm. The City constructed the NF plant through a design-build project delivery method. Tetra Tech prepared the 30% design, procurement documents, and provide construction management services.

## Innovation

- During startup benzene was detected in the feed water. Tetra Tech and contractor Pascal + Ludwig then designed and built a GAC treatment system to remove the benzene, saving the city close to \$300,000. The GAC system was operational within 4 months of the Notice-to-Proceed with design.
- City of Signal Hill being a relatively small community needed a feasibility study that could provide an accurate cost for both capital and operational costs. Tetra Tech was able to use its past experience on RO and NF projects to develop accurate cost estimates. The costs of the new NF plant were then compared to the costs for other available water sources. These detailed cost estimates were also used to help obtain funding for the project from the State of California.



# MTBE Treatment Plant

SAN JUAN CAPISTRANO, CALIFORNIA



## owner/operator:

City of San Juan Capistrano  
Eric Bauman  
949.487.4312

## schedule:

2011 - 2012

## value:

\$2.8M (design-build)

## key staff:

Steve Tedesco, PE, BCEE  
Project Manager

Steve Ellis, PE, BCEE  
QA/QC Manager

Victor Ramirez, PE, SE  
Structural Engineer

Beverly Encina, PE  
Design Engineer

The Tetra Tech designed and built this \$2.8 million modification to the Ground Water Treatment Plant to remove MTBE found in the feed water. The 5.3 MGD system includes eight 10-foot diameter granular activated carbon (GAC) vessels with feed, backwash, and effluent piping.

Located on a very constructed site, the team was challenged to find a way to design and build the facility while keeping the existing plant in service. As shown in the above picture, a concrete slab was completed first followed by installation of vessels. Due to space constraints each vessel had to be “walked” into place with a movable crane in order to complete installation. Other work on the project included:

- ▶ Relocation of Cartridge Filter
- ▶ Piping Modifications
- ▶ Replacement of Greensand Media in Fe/Mn Filters
- ▶ Obtaining Division of Drinking Water Permit
- ▶ Programming and SCADA Upgrades
- ▶ Obtaining Division of Drinking Water approvals

## Innovation

- GAC System added to an operational plant to remove MTBE.
- Phased construction approach to build on a constricted job site.
- Upgrades to existing Brackish water pre-treatment system.



# Tippecanoe Final Expansion

REDLANDS, CALIFORNIA



## owner/operator:

Lockheed Martin Corporation /  
City of Redlands, CA  
Tom Patterson  
949.553.8417

## schedule:

2011 - 2012

## value:

\$2.8M (design-build)

## key staff:

Steve Tedesco, PE, BCEE  
Project Manager

Steve Ellis, PE, BCEE  
QA/QC Manager

Victor Ramirez, PE, SE  
Structural Engineer

Beverly Encina, PE  
Design Engineer

Tetra Tech prepared final design documents and acted as the general contractor to construct the Tippecanoe Regional Groundwater Treatment Facility using a Design-Build delivery process. Pascal & Ludwig constructed the facility under a subcontractor agreement. The completed facility utilizes granular activated carbon (GAC) to remove trichloroethylene (TCE) and Ion Exchange (IX) to remove perchlorate. Groundwater is pumped from three wells to the site where it is metered prior to treatment. The GAC units consist of a battery of 12 units, with each battery consisting of two (2) 20,000-pound carbon vessels. The vessel piping and valving are arranged so that each battery of carbon vessels can be operated either in series or in parallel. Treated water is discharged directly into the potable water system. The California Department of Public Health reviewed and approved the engineering design and monitoring provisions.

Tetra Tech constructed the expansion of the existing pump station that boosts water through the facility. The total pump station capacity is 10,000 gallons per minute.

## Innovation

- *The backwash system utilizes treated water that has been stored in a 30,000-gallon steel holding tank. Backwash water is pumped from the tank and to the carbon vessels. After going through the vessels in an up flow direction, the waste backwash passes through a series of 25 micron, then 10 micron bag filters to remove carbon fines and returned to the holding tank for re-treatment through the carbon vessels.*

# Richardson Water Treatment Plant

LOMA LINDA, CALIFORNIA



## owner/operator:

Lockheed Martin Corporation /  
City of Loma Linda, CA  
Tom Patterson  
949.553.8417

## schedule:

2008 - 2010

## value:

\$8M (construction)

## key staff:

Steve Tedesco, PE, BCEE  
Project Manager

Kara Buttacavoli, PE  
Process Engineer

Victor Ramirez, PE, SE  
Structural Engineer

Crisna Raymond, PE  
Design Engineer

Mazen Kassar, PE  
Electrical Engineer

The Richardson Water Treatment Plant utilizes both ion exchange (IX) and granular activated carbon (GAC) processes. The process removes VOCs, TCE, PCE, and perchlorate, from the supplied well water. Two wells supply 4,800 gpm to the process. The plant includes pre- and post-treatment filtration, an on-site product storage tank, an on-site backwash waste tank and a product water booster station. Backwash waste is allowed to settle in the tank before it is pumped to the head of the plant to be treated. Purge water from well starts are treated by a smaller 200 gpm similar system prior to discharge to the local storm drain. In addition, the project contains one on-site well and one off-site groundwater well. Project included obtaining permits from the City of San Bernardino, California Department of Drinking Water, and the Regional Water Quality Control Board. Design included mistake-proofing the design workshop required on Lockheed Martin projects.

Tetra Tech provided all design on the project and was responsible for procurement of the IX and GAC vessels. Pascal & Ludwig and Halcyon Electric were responsible for all construction efforts on the two groundwater wells.

## Innovation

- *Siemens (now Evoqua) was the supplier of the IX and GAC treatment vessels. Vessel equipment and piping were pre-purchased by Tetra Tech to expedite the construction schedule. The equipment layout was designed for ease of access and operation on a relatively small site.*
- *A temporary treatment scenario was implemented to develop each of the two wells supplying the process. The project included a percolation pond to capture startup and testing water from each of the wells.*

## PROJECT TEAM

Tetra Tech has assembled a local team of dedicated and experienced professionals uniquely qualified to complete your project. In order to provide the most comprehensive services possible, our team has been thoughtfully assembled to capitalize on the strengths of each team member and provide you with a team of unparalleled technical excellence. Through our past experience we fully understand how to successfully complete this type of project.

The strength of our team is that our team members have all worked on several local PFAS projects. Our experience in similar studies and in full designs will be an asset in completing this project. We have provided a biographical sketch that introduces the background and unique skill set of each of the talented key personnel of our core management team that we are committing to the project.

**Project Manager, Kara Buttacavoli, PE**, will serve as the Project Manager. She has recently completed the design of three other PFAS plants ranging in size from 4.0 mgd to 25.0 mgd. Kara fully understands all the tasks needed for completing this type of project. She will provide overall design direction, coordination, and technical oversight. In addition, she will make certain that the proper resources are allocated to the project to meet the desired completion schedule.

**QA/QC, Steve Tedesco, PE**, will provide QA/QC Management. Steve understands the SGU site and is well versed in design of groundwater treatment plants. He also worked with Kara on three recently completed PFAS plants in Orange County. He also understands local permitting and construction costs.

**Civil & Mechanical Lead, Beverly Encina, PE**, brings to the team over 18 years of experience in analysis, design, and construction management for various types of public works projects including, but not limited to, water treatment plants, wells, water booster pump stations, reservoirs, hydraulic analysis, storm drainage systems, and site improvement design. Beverly has worked on four PFAS water treatment plants and one PFAS well study.

**Process Lead, Amanda Taylor, PE**, brings to the team extensive experience in process engineering for water treatment facilities. In her 11 years of experience she has provided analysis, studies, design, and construction management for various types of public works projects including five PFAS projects, two advanced water treatment plants and numerous wellhead treatment plants for nitrates, iron, manganese, and TDS.

**Structural Lead, Victor Ramirez, PE, SE**, has over 39 years of structural engineering design experience with special emphasis in the design of water storage/water containment and water conveyance related structures. This includes reservoirs, water/wastewater treatment plants, booster pump stations, flow control facilities, pressure reducing stations and pipelines. Victor will be responsible for the design of all the structures, management and oversight of the structural design team, and interdisciplinary coordination.



**Electrical Lead & Controls, Mazen Kassar, PE**, is experienced in the electrical design of water and wastewater facilities, system studies, power distribution, emergency power supply, motor and instrumentation control. During his 29 years of experience his projects have included designing water and wastewater facilities, desalination plants, lift stations, pump stations, drinking water wells, pipelines, and odor control systems. Mazen will use this experience and his knowledge of the operation of water facilities and cost analysis to assist the team.

***Our team knows firsthand that the key to our success is the people we have assigned to this project!***

### Team Availability

Tetra Tech is dedicating our project team shown to complete this project. Each of the team members will be assigned so they are available to meet the schedule for the design of this project. The following table shows our Project Teams' availability, areas of responsibility of the key team members, and percentage of time key personnel will contribute to the project:

Name	Role	Areas of Responsibility	Availability	Project Need
Kara Buttacavoli, PE	Project Manager	Project Oversight, Technical Input, Quality Control, Constructability Review	40%	30%
Steve Tedesco, PE	QA/QC Manager	Coordinate, Manage and Ensure QA/QC is Completed	10%	5%
Beverly Encina, PE	Civil & Mechanical Lead	Lead Civil & Mechanical Design, Coordinate Inter-discipline Review	50%	40%
Amanda Taylor, PE	Process Lead	Lead Process Design, Prepare P&IDs, Coordinate with Electrical & Controls	50%	40%
Victor Ramirez, PE, SE	Structural Lead	Lead Structural Design	50%	40%
Mazen Kassar, PE	Electrical & Controls Lead	Lead Electrical Design	35%	25%
Mark Wilf, PhD	Water Quality Expert	Review Water Data, Determine Treatability	15%	5%

Resumes of Key Team Members can be found on the following pages.

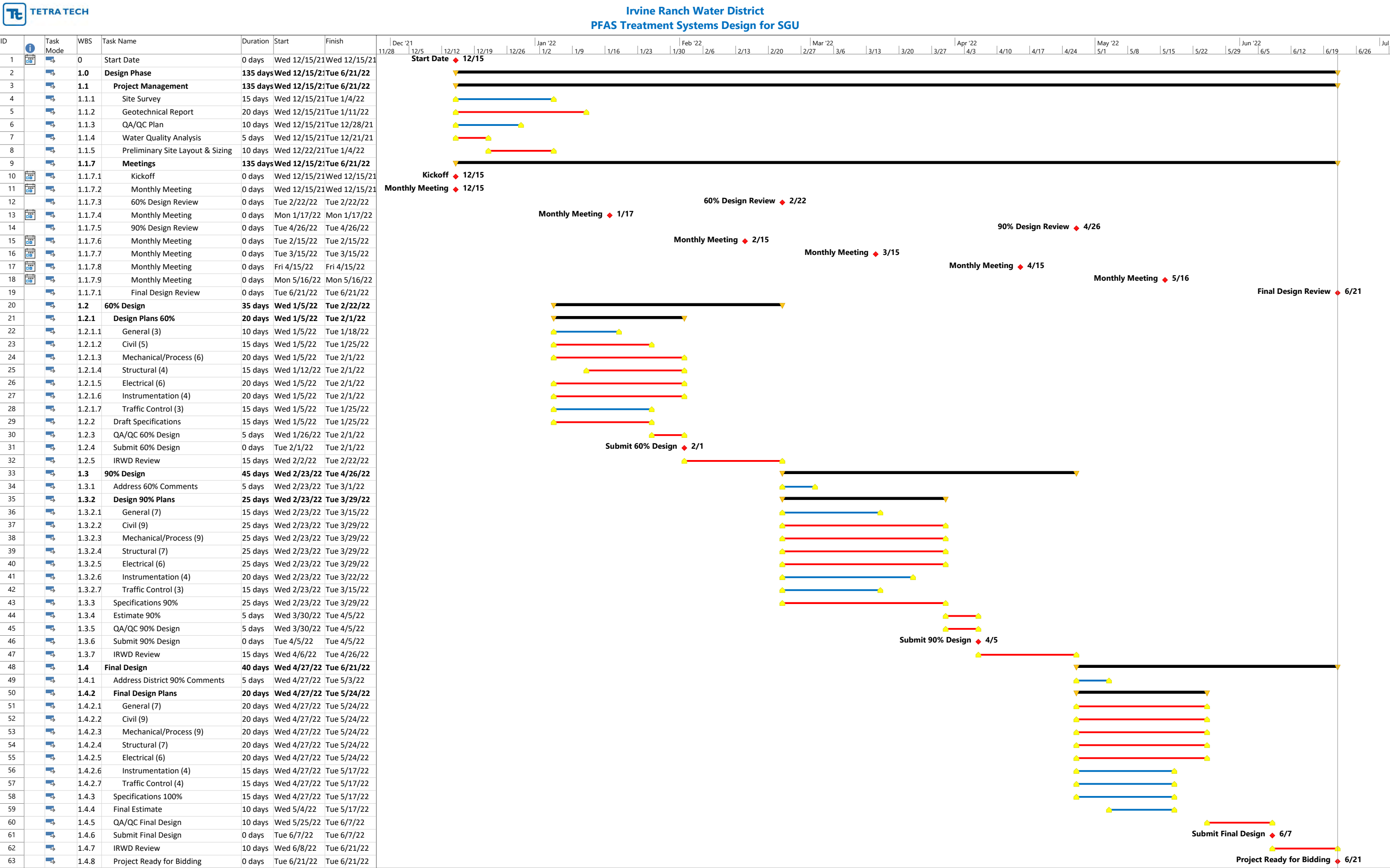
***The strength of our team is demonstrated by our qualifications, experience, and prior completion of similar PFAS projects!***





**IRWD - SGU PFAS Water Treatment Plant**  
**Drawing Sheet Count**

				60% Design	90% Design	100% Design
Sequential Number	Subset Count	Sheet Number	Description	Planned	Planned	Planned
General						
1	1	G-000	Title Sheet	60%	90%	100%
2	2	G-001	Sheet Index, Vicinity Map & Location Map		90%	100%
3	3	G-002	General Notes, IRWD Notes, and Erosion Control Notes		90%	100%
4	4	G-003	Standard Drawings, Symbols, Abbreviations, & Survey Data	60%	90%	100%
5	5	G-004	Process Flow Diagram	60%	90%	100%
6	6	G-005	Horizontal Control Plan		90%	100%
		Civil				
7	1	C-101	Site Demolition Plan	60%	90%	100%
8	2	C-102	Demolition Details 1	60%	90%	100%
9	3	C-103	Demolition Details 2	60%	90%	100%
10	4	C-104	Proposed Site Plan	60%	90%	100%
11	5	C-105	Yard Piping Plan		90%	100%
12	6	C-301	Yard Piping Profiles		90%	100%
13	7	C-501	Civil Details 1	60%	90%	100%
14	8	C-502	Civil Details 2		90%	100%
15	9	C-503	Connection Details		90%	100%
16	10	C-106	Pipeline Plan & Profile	60%	90%	100%
17	11	C-504	Marine Way Connection Details	60%	90%	100%
		Structural				
18	1	S-001	General Structural Notes	60%	90%	100%
19	2	S-002	Special Inspection & Structural Observations	60%	90%	100%
20	3	S-101	Foundation Plan	60%	90%	100%
21	4	S-301	Sections	60%	90%	100%
22	5	S-501	Structural Details 1		90%	100%
23	6	S-502	Structural Details 2		90%	100%
24	7	S-503	Structural Details 3		90%	100%
		Mechanical/Process				
25	1	M-100	Overall Process Plan	60%	90%	100%
26	2	M-101	Influent Pump Modifications Plan & Section	60%	90%	100%
27	3	M-103	GAC Vessel Process Plan	60%	90%	100%
28	4	M-301	SGU Effluent Connection Modifications	60%	90%	100%
29	5	M-302	GAC Vessel Process Sections	60%	90%	100%
30	6	M-501	Piping Sections	60%	90%	100%
31	7	M-502	Process Details 1		90%	100%
32	8	M-901	Process Details 2		90%	100%
33	9	D-502	Treatment Plant 3D Perspective		90%	100%
		Electrical				
34	1	E-001	Electrical Symbols, Notes & Abbreviations	60%	90%	100%
35	2	E-101	Electrical Site Demolition Plan	60%	90%	100%
36	3	E-103	Electrical Overall Site Plan	60%	90%	100%
37	4	E-104	Vessels Electrical Plan	60%	90%	100%
38	5	E-201	Panel & Conduit Schedule	60%	90%	100%
39	6	E-301	Electrical Details	60%	90%	100%
		Instrumentation				
40	1	I-001	P&ID Symbols & Abbreviations	60%	90%	100%
41	2	I-101	P&ID Existing SGU Facilities	60%	90%	100%
42	3	I-102	P&ID GAC - Train 1	60%	90%	100%
43	4	1-103	P&ID Effluent Modifications	60%	90%	100%
		Traffic Control Plans				
44	1	I-001	Traffic Control Notes	60%	90%	100%
45	2	I-101	Traffic Conrol Plan 1	60%	90%	100%
46	3	I-102	Traffic Control Plan 2	60%	90%	100%
Total Drawing Count				33	46	46



Price Proposal							Labor Plan													Price Summary / Totals									
Revision Date: Nov 12, 2021							13 Resource													Task Pricing Totals									
IRWD SGU - PFAS Water Treatment Plant							Bill Rate >	225.00	185.00	215.00	125.00	150.00	225.00	125.00	145.00	225.00	185.00	125.00	120.00	185.00	Specify Add'l Fees on Setup								
							Proj Area >															Technology Use Fee							
Design of 500 GPM PFAS Treatment Plant at existing SGU Site Submitted to: Irvine Ranch Water District (Attn: Richard K. Mori, PE)								Project Mngt	Project Manager 2	Civil & Process	Sr Engineer 2	Sr Engineer 3	Engineer 3	Sr CAD Designer 2	Structural	Sr Engineer 3	Engineer 3	Sr CAD Designer 2	Elect & Instmt	Sr Engineer 3	Sr Engineer 2	Engineer 2	Administration	Sr Project Administrator	Traffic	Sr Engineer 2	Pricing by Resource		
Contract Type: T&M																											Labor Rate Esc.	Labor	Subs
Project Phases / Tasks							Total Labor Hrs	2,052	148	264	26	580	168	40	92	130	74	140	314	40	36	0.00%	318,015	29,095	778	-	112	348,000	
1.0 Design							1,804	132	186	26	426	168	40	92	130	74	140	314	40	36	280,760	25,070	778	-	112	306,720			
1.1 Project Management							136	40	26	12	32	-	4	8	-	4	8	-	2	-	24,910	25,070	448	-	-	50,428			
1.1.1 Site Survey							2	2	-	-	-	-	-	-	-	-	-	-	-	-	450	7,475	-	-	-	7,925			
1.1.2 Geotechnical Report							2	2	-	-	-	-	-	-	-	-	-	-	-	-	450	17,595	-	-	-	18,045			
1.1.3 QA/QC Plan							8	2	-	-	4	-	-	-	-	-	-	-	2	-	1,190	-	-	-	1,190				
1.1.4 Water Quality Analysis							14	2	-	4	4	4	-	-	-	-	-	-	-	2,550	-	-	-	2,550					
1.1.5 Preliminary Site Layouts & Sizing							70	2	-	12	8	24	-	4	8	-	4	8	-	-	11,670	-	-	-	11,670				
1.1.6 Meetings (10)							24	14	-	10	-	-	-	-	-	-	-	-	-	5,000	-	448	-	-	5,448				
1.1.7 Project Status Reports							16	16	-	-	-	-	-	-	-	-	-	-	-	-	3,600	-	-	-	3,600				
1.2 60% Design							539	23	60	-	128	48	10	28	32	28	48	104	14	16	82,685	-	-	-	-	82,685			
1.2.1 Design Plans 60%							411	13	36	-	100	48	6	12	32	20	40	88	-	-	62,635	-	-	-	-	62,635			
1.2.1.1 General (3)							10	2	-	-	8	-	-	-	-	-	-	-	-	-	1,450	-	-	-	1,450				
1.2.1.2 Civil & Demolition (5)							46	2	-	4	24	16	-	-	-	-	-	-	-	6,590	-	-	-	-	6,590				
1.2.1.3 Mechanical/Process (6)							126	2	-	32	68	24	-	-	-	-	-	-	-	-	18,470	-	-	-	-	18,470			
1.2.1.4 Structural (4)							52	2	-	-	-	-	6	12	32	-	-	-	-	-	7,940	-	-	-	-	7,940			
1.2.1.5 Electrical (6)							74	2	-	-	-	-	-	-	-	8	24	40	-	-	11,690	-	-	-	-	11,690			
1.2.1.6 Instrumentation (4)							77	1	-	-	-	-	-	-	-	12	16	48	-	-	11,885	-	-	-	-	11,885			
1.2.1.7 Traffic Control (3)							26	2	-	-	8	-	-	-	-	-	-	-	-	-	4,610	-	-	-	-	4,610			
1.2.2 Draft Technical Specifications							96	4	-	8	24	-	4	16	-	8	8	16	-	8	-	14,520	-	-	-	-	14,520		
1.2.3 QA/QC							20	4	-	12	-	-	-	-	-	-	-	-	-	4	-	3,600	-	-	-	-	3,600		
1.2.4 Submit 60%							12	2	-	4	4	-	-	-	-	-	-	-	-	2	-	1,930	-	-	-	-	1,930		
1.3 90% Design							640	35	52	8	132	84	16	44	54	24	36	126	17	12	97,315	-	281	-	112	97,708			
1.3.1 Address 60% Comments							29	2	-	4	2	-	2	4	4	-	2	4	4	-	1	-	4,780	-	-	-	-	4,780	
1.3.2 90% Design							429	13	28	-	88	84	6	12	48	-	14	32	92	-	-	64,305	-	-	-	-	64,305		
1.3.2.1 General (7)							10	2	-	-	8	-	-	-	-	-	-	-	-	-	1,450	-	-	-	-	1,450			
1.3.2.2 Civil (9)							98	2	-	16	40	40	-	-	-	-	-	-	-	-	-	14,410	-	-	-	-	14,410		
1.3.2.3 Mechanical/Process (9)							86	2	-	12	40	32	-	-	-	-	-	-	-	-	-	12,470	-	-	-	-	12,470		
1.3.2.4 Structural (7)							68	2	-	-	-	-	6	12	48	-	-	-	-	-	-	-	10,260	-	-	-	-	10,260	
1.3.2.5 Electrical (6)							86	2	-	-	-	-	-	-	-	8	16	60	-	-	-	12,710	-	-	-	-	12,710		
1.3.2.6 Instrument (4)							55	1	-	-	-	-	-	-	-	6	16	32	-	-	-	8,535	-	-	-	-	8,535		
1.3.2.7 Traffic Control (3)							26	2	-	-	-	12	-	-	-	-	-	-	-	-	-	4,470	-	-	-	-	4,470		
1.3.3 Specifications 90%							76	4	-	4	16	-	4	16	-	4	16	16	-	12	-	10,880	-	-	-	-	10,880		
1.3.4 Estimate 90%							56	2	-	4	24	-	-	12	-	-	-	12	-	2	-	7,430	-	-	-	-	7,430		
1.3.5 QA/QC							36	12	-	8	8	-	4	-	-	4	-	-	-	-	7,700	-	-	-	-	7,700			
1.3.6 Submit 90% Design							14	2	-	4	2	-	-	2	-	-	2	-	2	-	2,220	-	281	-	112	2,613			
1.4 Final Design							489	34	48	6	134	36	10	12	44	18	48	84	7	8	75,850	-	49	-	-	-	75,899		
1.4.1 Address 90% Comments							21	2	-	2	4	-	2	4	-	2	4	4	-	1	-	3,420	-	-	-	-	3,420		
1.4.2 Final Design Plans							406	12	32	2	112	36	8	12	40	-	16	48	80	-	-	61,510	-	-	-	-	61,510		
1.4.2.1 General (6)							10	2	-	-	8	-	-	-	-	-	-	-	-	-	1,450	-	-	-	-	1,450			
1.4.2.2 Civil (9)							30	2	-	8	8	12	-	-	-	-	-	-	-	-	4,730	-	-	-	-	4,730			
1.4.2.3 Mechanical/Process (9)							138	2	-	24	96	16	-	-	-	-	-	-	-	-	19,290	-	-	-	-	19,290			
1.4.2.4 Structural (7)							62	2	-	-	-	-	8	12	40	-	-	-	-	-	9,550	-	-	-	-	9,550			
1.4.2.5 Electrical (6)							74	2	-	-	-	-	-	-	-	8	24	40	-	-	11,690	-	-	-	-	11,690			
1.4.2.5 Instrumentation (4)							73	1	-	-	-	-	-	-	-	8	24	40	-	-	11,465	-	-	-	-	11,465			
1.4.2.6 Traffic Control (3)							19	1	-	2	8	-	-	-	-	-	-	-	-	-	3,335	-	-	-	-	3,335			
1.4.3 Final Specifications							28	4	-	8	12	-	-	-	-	-	-	-	-	4	-	4,360	-	-	-	-	4,360		
1.4.4 Final Estimate							6	2	-	-	4	-	-	-	-	-	-	-	-	-	950	-	-	-	-	950			
1.4.5 Final QA/QC							20	12	-	4	4	-	-	-	-	-	-	-	-	-	4,300	-	-	-	-	4,300			
1.4.6 Submit Final Design							8	2	-	2	2	-	-	-	-	-	-	-	-	2	-	1,310	-	49	-	-	1,359		
2.0 Additional Services							218	12	70	-	136	-	-	-	-	-	-	-	-	-	-	32,625	4,025	-	-	-	36,650		
2.1 Demolition of Existing Facilities							3	1	-	-	2	-	-	-	-	-	-	-	-	-	475	-	-	-	-	475			
2.2 Project Schedule							10	2	-	-	8	-	-	-	-	-	-	-	-	-	1,450	-	-	-	-	1,450			
2.3 Additional Facility Evaluations							98	4	40	-	54	-	-	-	-	-	-	-	-	-	15,000	-	-	-	-	15,000			
2.4 Permitting & Easement Support							69	2	20	-	47	-	-	-	-	-	-	-	-	10,000	-	-	-	-	10,000				
2.5 CEQA Documentation							34	1	10	-	23	-	-	-	-	-	-	-	-	5,000	-	-	-	-	5,000				
2.6 City of Irvine Encroachment Permit							4	2	-	-	2	-	-	-	-	-	-	-	-	700	4,025	-	-	-	-	4,725			
3.0 Bid Phase Services							30	4	8	-	18	-	-	-	-	-	-	-	-	-	4,630	-	-	-	-	4,630			
3.1 Plan Revisions (10 Hours)							10	1	2	-	7	-	-	-	-	-	-	-	-	1,470	-	-	-	-	1,470				
3.2 Specification Revisions (10 Hurs)							10	1	2	-	7	-	-	-	-	-	-	-	1,470	-	-	-	-	1,470					
3.3 Bidder Questions (10 Hours)							10	2	4	-	4	-	-	-	-	-	-	-	-	1,690	-	-	-	-	1,690				
Totals							2,052	148	264	26	580	168	40	92	130	74	140	314	40	36	0.00%	318,015	29,095	778	-	112	348,000		

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December 6, 2021

Prepared by: E. Akiyoshi / M. Robinson

Submitted by: K. Burton

Approved by: Paul A. Cook



## ENGINEERING AND OPERATIONS COMMITTEE

### CAPITAL IMPROVEMENT PROGRAM ASSET MANAGEMENT

#### SUMMARY:

IRWD is developing a more proactive approach to capital-focused asset management. The Capital Improvement Program (CIP) Asset Management project used risk-based analyses to develop preliminary repair and rehabilitation recommendations for the most critical pump stations, storage tanks, wells, and sewage lift stations. At the Committee meeting, staff will present details of the analysis.

#### BACKGROUND:

Since 1961, IRWD has largely focused on planning based on future growth and development. As the District's facilities mature, there is a growing need for replacement and rehabilitation of existing facilities. Over the past year, an interdepartmental team completed the first phase of IRWD's CIP Asset Management project. The team used a risk-based approach and conducted high-level condition assessments at 158 facilities in the potable, non-potable, and sewage collection systems. The field condition assessments helped identify the Likelihood of Failure and evaluated remaining useful life expectancies at all the facilities. Concurrently, a multi-faceted Consequence of Failure analysis looked at social, environmental, and financial factors to identify the most critical pump stations, storage tanks, wells, and sewage lift stations. The Likelihood of Failure and Consequence of Failure analyses helped develop a preliminary list of facilities that will be more closely evaluated for specific repair and rehabilitation projects.

The CIP Asset Management project is a multi-phased program, with Phase 1 focusing on pump stations, lift stations, tanks, and wells, and future phases focusing on pipelines and treatments plants. Phase 1 also developed powerful and sustainable business intelligence (i.e., reporting and data analysis) tools in the Microsoft Power Business Intelligence (BI) environment. Phase 2 will focus on the 3,700 miles of potable, non-potable, and sewage collection pipelines. Subsequent phases will develop approaches for IRWD's potable and recycled water treatment plants.

The project incorporated data from enterprise systems, such as the Geographic Information System (GIS), Replacement Planning Model (RPM), and the Maximo Computer Maintenance and Management System (CMMS). BI and data analytics were created that allowed staff to quickly view results and update facility data as needed. The Microsoft Power BI environment provides for a seamless integration with future phases of the project and sustainability by IRWD staff.

Staff will present details of the analysis at the Committee meeting. A draft PowerPoint presentation is provided as Exhibit "A".

FISCAL IMPACTS:

None.

ENVIRONMENTAL COMPLIANCE:

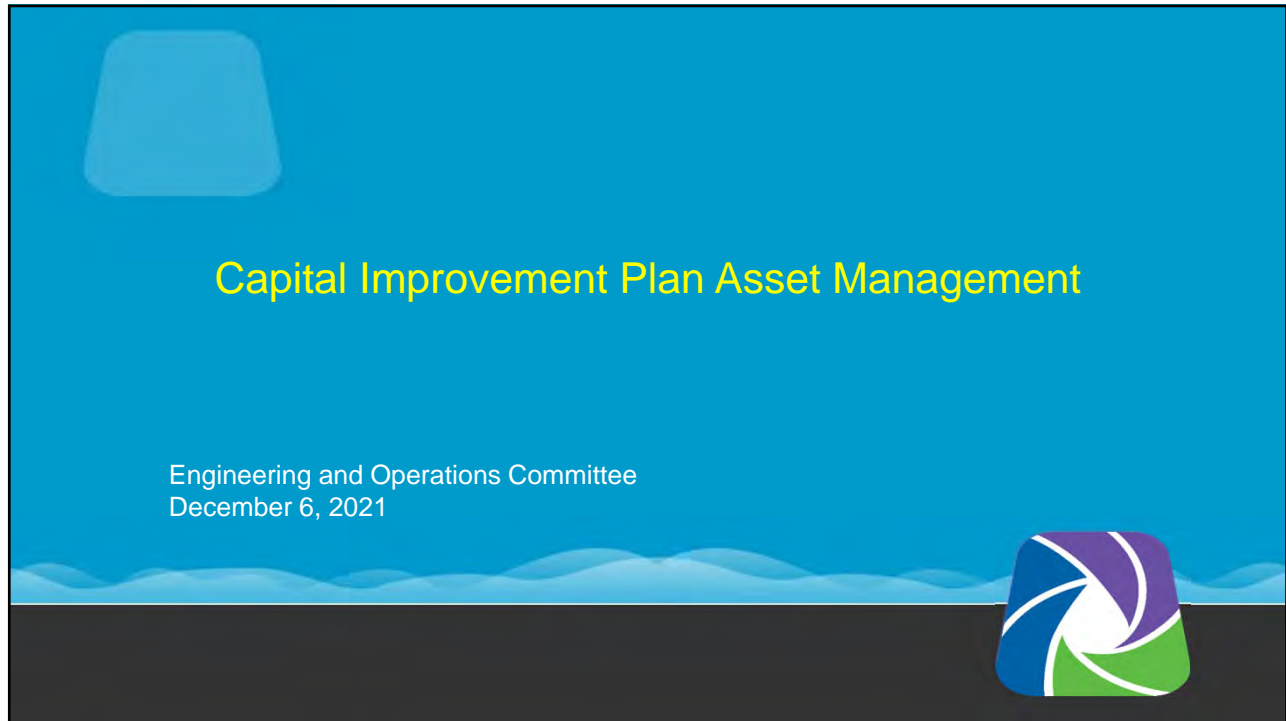
California Environmental Quality Act (CEQA) as authorized under the California Code of Regulations, Title 14, Chapter 3, Section 15262 provides exemption for planning studies.

RECOMMENDATION:

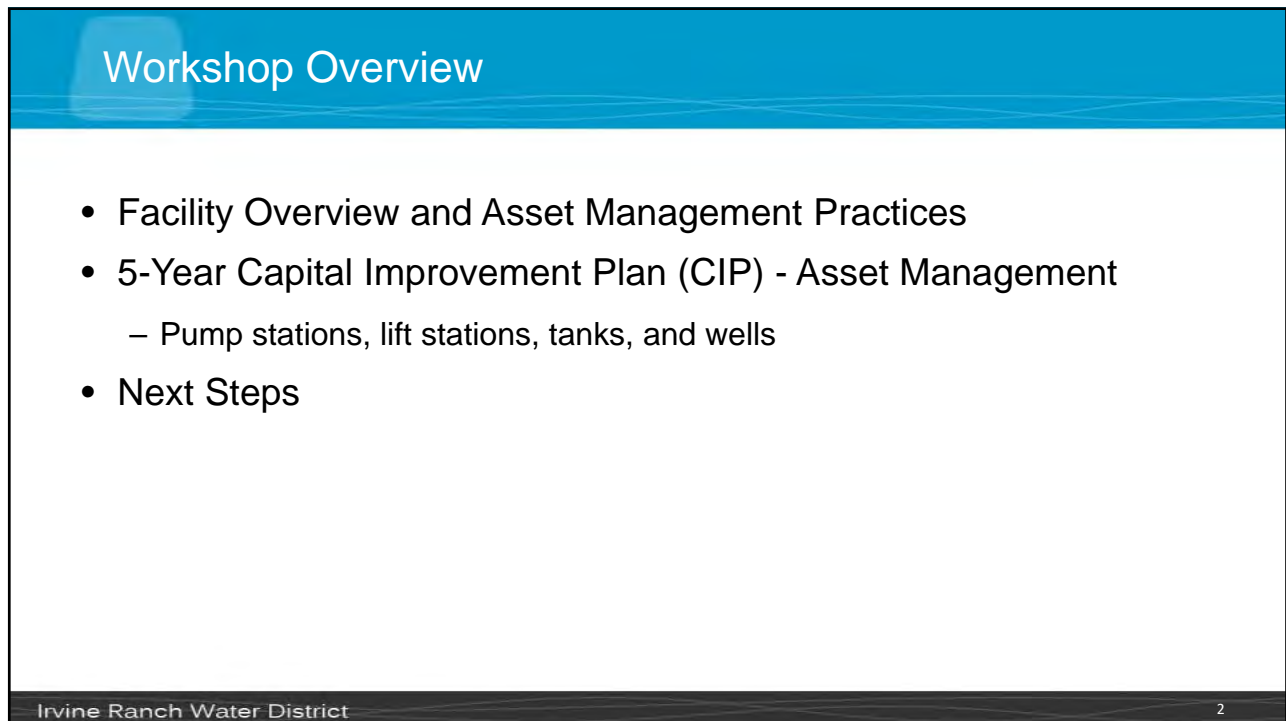
That the Committee provide input regarding the updated Capital Improvement Program Asset Management project.

LIST OF EXHIBITS:

Exhibit “A” – Capital Improvement Program Asset Management PowerPoint Draft Presentation



1



2

## Asset Management Practices

### Replacement Planning Model

- Addresses long term planning financial needs over the next 50 years

### Maximo

- Addresses short term maintenance activities

3

## Asset Management Practices

### Capital Improvement Program

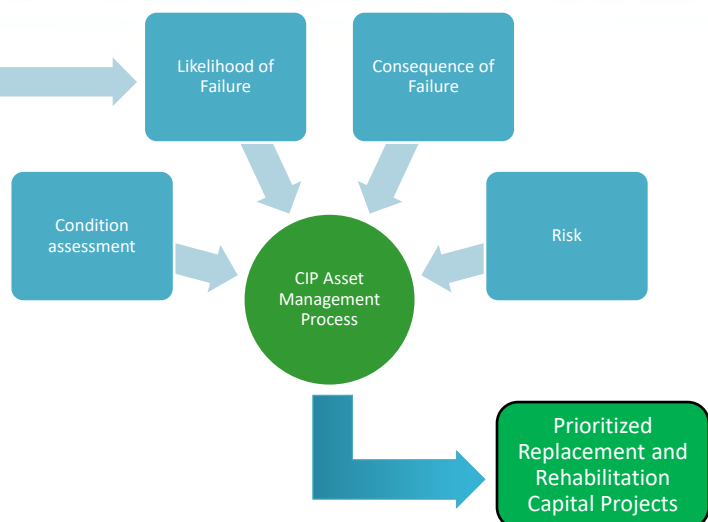
- Addresses near term capital planning needs

### Replacement Planning Model

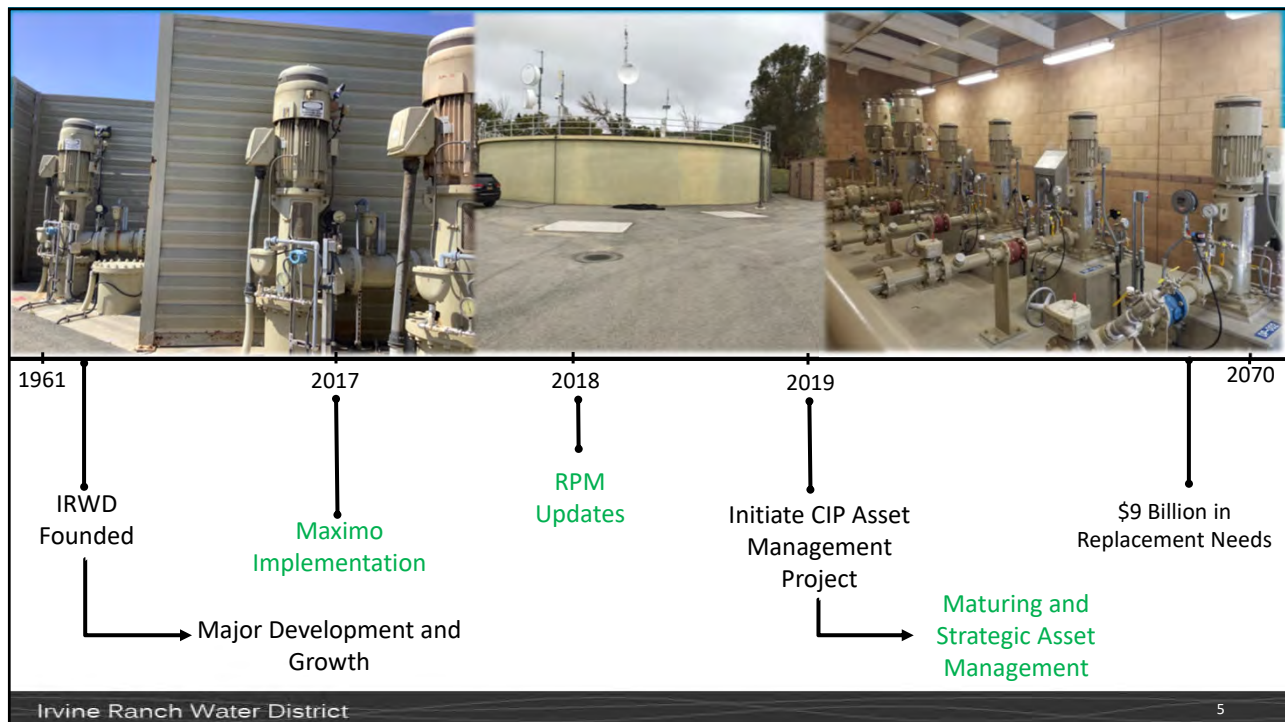
- Addresses long term planning financial needs over the next 50 years

### Maximo

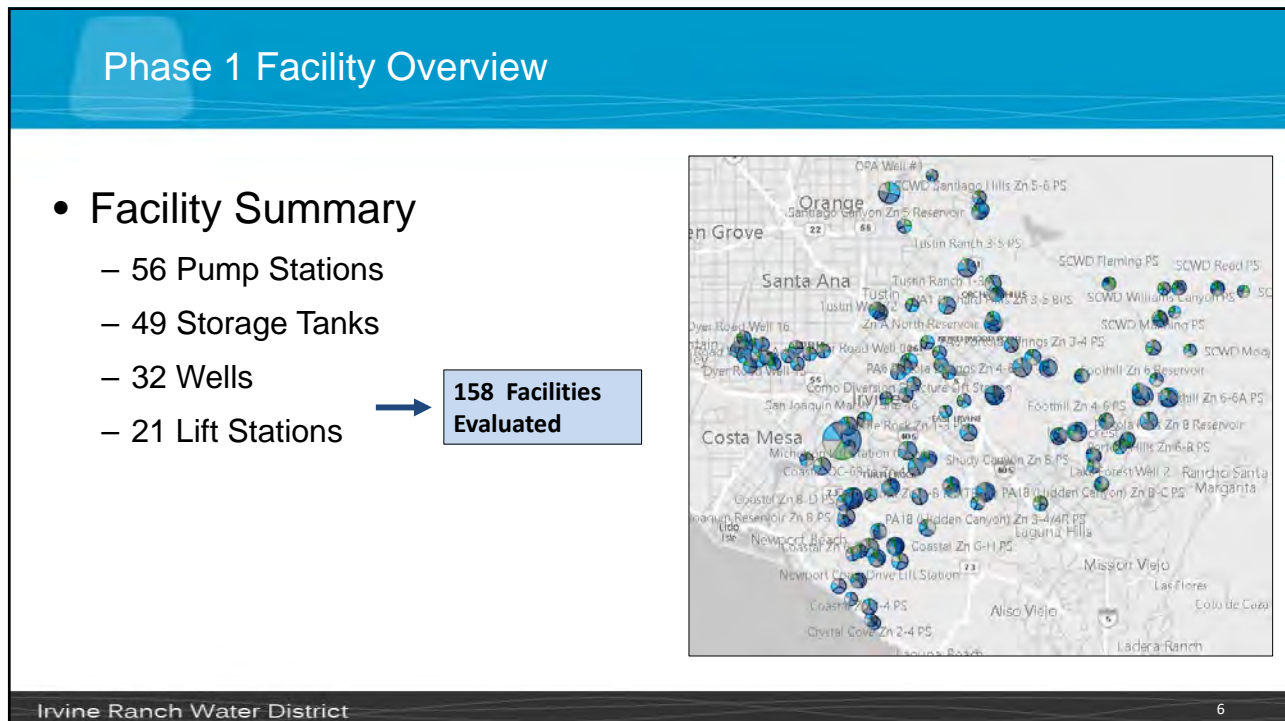
- Addresses short term maintenance activities



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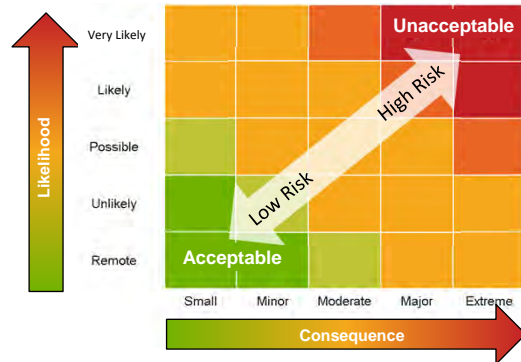
# Probability and Risk Based Asset Management and Capital Planning

- **Risk based Asset Management and Capital Planning**

- Utilizes modern data driven analyses to help prioritize capital focused repair and rehabilitation (R&R) projects
- Uses Likelihood of Failure (LoF), Consequence of Failure (CoF), and Risk concepts
- Matures the approach, IRWD understanding, and integration as facilities continue to age

- **Benefits**

- Optimizes R&R CIP expenditures
- Identifies financial, social, and environmental consequences of failure
- Includes Level of Service
- Integrates the entire capital system for a more holistic approach to planning



Irvine Ranch Water District

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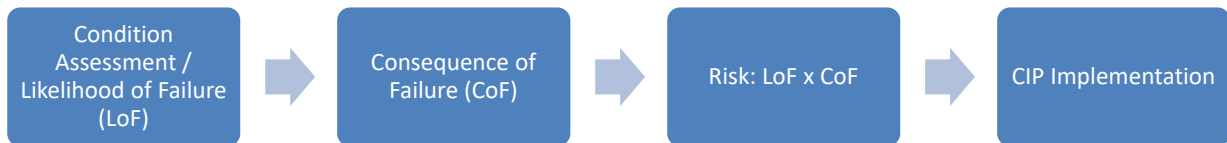
## 5-Year Capital Improvement Plan



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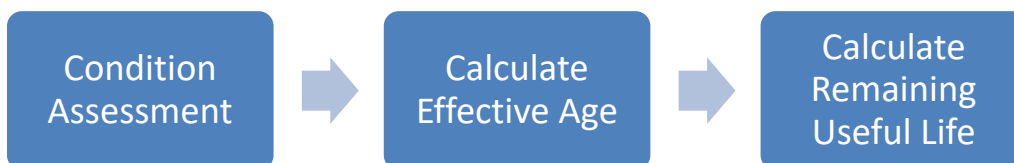
## CIP Asset Management Process Overview

The CIP Asset Management project uses a risk-based integrated approach that is comprehensive, considers levels of service, and assesses and prioritizes the replacement and life-cycle costs of system improvements



## Likelihood / Probability of Failure

Likelihood of Failure (LoF) incorporates data from field and desktop condition assessment scores, facility chronological age, and applies this to service life estimates using industry standard curves to determine the Likelihood of Failure.





## Condition Assessment Scores

Facility **Condition** is a combination of Physical Condition (C), Performance (P), and Reliability (R), resulting in a CPR score.



Cloud based approach to facility condition assessments

### Scoring Process

- ✓ Facilities scored by major discipline: Mechanical, Electrical, Instrumentation and Control, Site, Structural, Emergency Power
- ✓ Assessed Physical Condition (C) based on visual inspection
- ✓ Addressed Performance (P) and Reliability (R) scores based on input from Operations
- ✓ Cascaded to Assets Types within each Facility-Discipline
- ✓ Cascaded to Assets within each Asset Type
- ✓ Used Maximo data to provide additional Performance (P) and Reliability (R) scoring

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## Consequence of Failure

### Criticality factors:

- Environmental
  - Proximity to waterways, environmental impact, water quality
- Economic
  - Repairability and access constraints, total cost
- Social
  - Containment and diversion (odor complaints), retention time, facility function, water flow rate, facility size
- Redundancy
  - Based on the number of facilities serving a pressure zone



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## Risk

### Combining Likelihood of Failure and Consequence of Failure

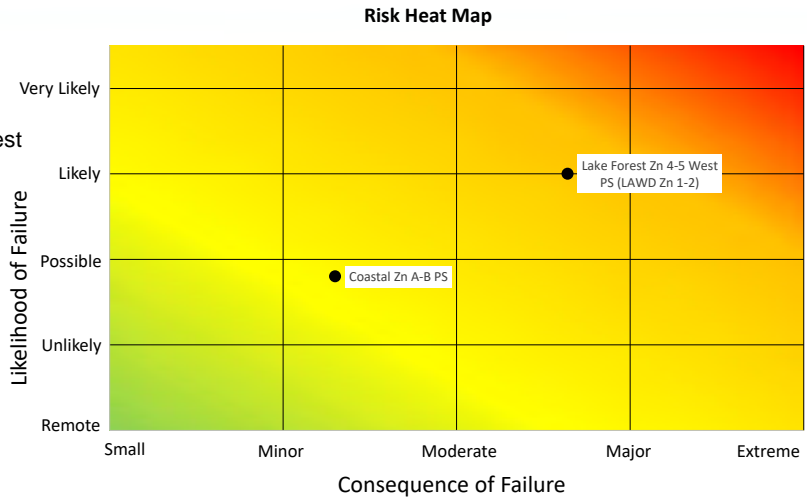
$$\text{Risk} = \text{CoF} \times \text{LoF}$$

#### Example 1

- Facility: Lake Forest Zn 4-5 West
- Discipline: Electrical
- CoF = Moderate
- LoF = Likely
- Risk = Medium-High

#### Example 2

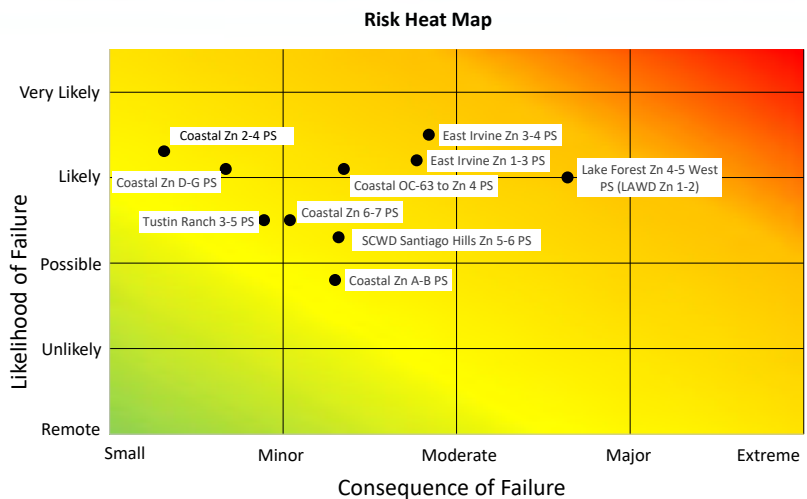
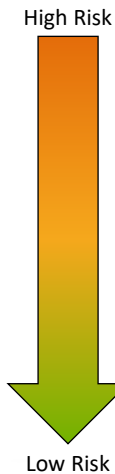
- Facility: Coastal Zn A-B
- Discipline: Electrical
- CoF = Minor
- LoF = Possible
- Risk = Medium-Low



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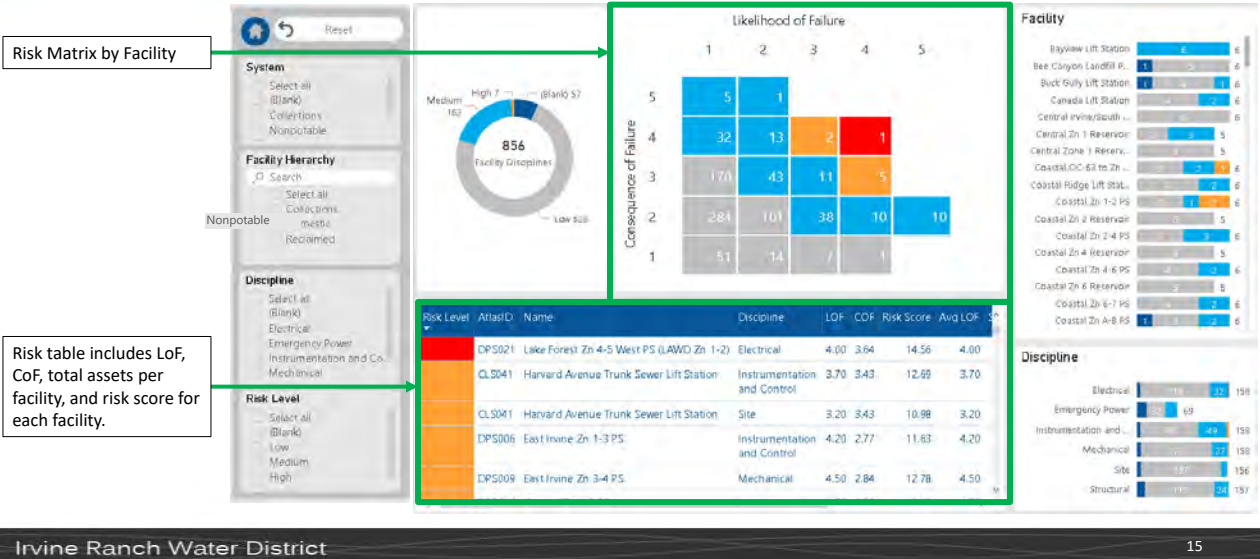
## 5-Year CIP Top Projects: Pump Stations

Facility Name
East Irvine Zn 3-4
East Irvine Zn 1-3
Coastal OC-63 to Zn 4
Coastal Zn 1-2
SCWD Santiago Hills Zn 5-6 PS
Coastal Zn 6-7
Coastal Zn D-G
Tustin Ranch 3-5
Coastal Zn A-B
Coastal Zn 2-4



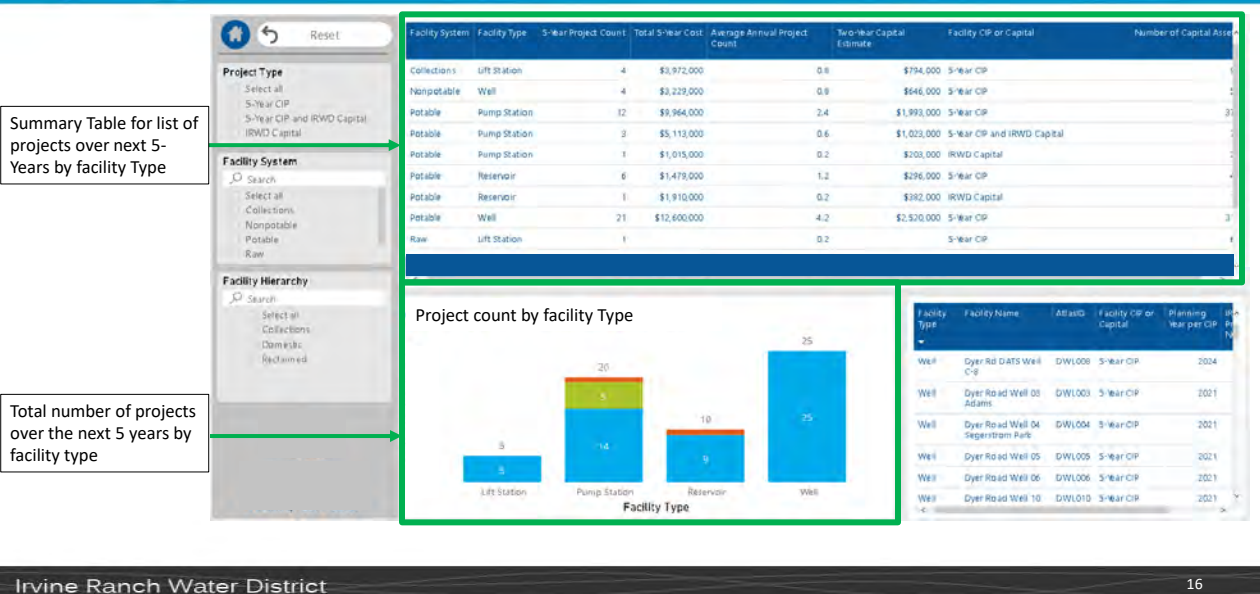
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## Risk Dashboard



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## 5-Year CIP Dashboard



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## Next Steps

- Include top projects into the FY 2022-23 and FY 2023-24 Capital Budget Update
- Complete condition assessment at the asset level for the top projects
- Proceed with Phase II for pipelines

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